A REVIEW OF
OFFSHORE OIL AND GAS DEVELOPMENT
IN BRITISH COLUMBIA

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B.C. OFFSHORE OIL AND GAS DEVELOPMENT: EXECUTIVE SUMMARY

ES.1 BACKGROUND AND PURPOSE

The Geological Survey of Canada estimates that there may be substantial oil and gas resources in the Queen Charlotte Basin (QCB). However, no offshore oil and gas exploration or development has been allowed, except for a short period from 1966 to 1969 to permit drilling of some exploratory wells.

Interest in offshore oil and gas development (OOGD) in the early 1980s resulted in the appointment of a five-person panel, which published its environmental assessment entitled *Offshore Hydrocarbon Exploration, a Report and Recommendations of the West Coast Offshore Exploration Environmental Assessment Panel* in 1986. This report contained 92 recommendations that had to be implemented if oil and gas development were ever to proceed. However, several oil spills affecting B.C. coastal waters and the grounding of the *Exxon Valdez* in March 1989 raised public concern over oil and gas development and the federal and B.C. governments decided to maintain their moratoria. The House of Assembly of the Haida Nation also passed a moratorium in 1985 prohibiting any OOGD in their territory.

Recently, there is renewed interest in OOGD. OOGD, however, faces a number of issues including jurisdictional conflict between the Canadian, B.C. and First Nations governments, environmental risks, economic viability, regulatory gaps, and public opposition. The B.C. and Canadian governments have initiated their own separate scientific reviews of the moratorium to assess these issues.

This report is undertaken in response to a request from Turning Point Initiative, which is a cooperative organization representing Coastal First Nations (CFN) that include indigenous communities located along the shores of the QCB. The content of this study relative to the federal study (Royal Society of Canada (RSC)) and the B.C. study (B.C. Scientific Review Panel (B.C. SRP)) is summarized below (table ES.1). As indicated in table ES.1, this study is more comprehensive than the federal (RSC) and provincial (B.C. SRP) scientific reviews because it includes a review of social, economic, regulatory, jurisdictional, legal, and environmental issues. The federal and B.C. studies were restricted to assessing only technological and environmental issues. This study also develops and utilizes explicit decision-making criteria for assessing OOGD based on international best practices.

This study was completed by an interdisciplinary team of researchers from the School of Resource and Environmental Management at Simon Fraser University. The methodology used by the research team was to review primary and secondary data relevant to B.C. OOGD. The reviews were divided into the following thematic areas: environmental, socioeconomic, legal, jurisdictional, and regulatory. International best practices for OOGD were identified and used to evaluate the current B.C. OOGD management and moratorium review process. A draft report was then prepared and sent to OOGD experts in government, industry, academia, and non-governmental agencies (NGOs) for review, and revisions were made to the report based on the reviews.

Like other recent reports on OOGD, this report was completed with limited resources over a relatively short period of time. Consequently, this report is not intended to provide definitive answers on OOGD issues. Instead, this report identifies major issues that need to be addressed and knowledge gaps where more information is required before an informed decision can be made on OOGD.

TABLE ES.1: COMPARISON OF B.C. SRP, RSC AND SFU STUDY CONTENTS

TOPIC	B.C. SRP	RSC	THIS STUDY
Environmental	✓	✓	✓
Social			✓
Economic			✓
Jurisdictional			✓
Legal			✓
Regulatory			✓
Explicit Evaluation Criteria			✓

✓ indicates topic included, blank indicates topic not included.

ES.2 JURISDICTIONAL ISSUES

Jurisdiction over OOGD is complex. Canadian law gives jurisdiction over natural resource development undertaken in Canada's offshore territorial waters to the Canadian government. Under the 1958 *Geneva Convention,* the Canadian government also holds exclusive rights to natural resources in the continental shelf even though these resources are beyond Canada's territorial waters.

Jurisdiction over oil and gas resources located in "inland waters" is more complicated because of overlapping jurisdiction. British Columbia owns resources located in inland waters, which are defined as waters east of the west coast of Vancouver Island. Therefore, B.C. has greater powers than the Maritime Provinces where OOGD is in waters exclusively under Canadian government jurisdiction. However, ownership of oil and gas resources in inland waters does not provide the province with exclusive jurisdiction. The Canadian government is still able to exert jurisdiction through its control of: navigation and shipping (s. 91(1)), sea coast and inland fisheries (s. 91(12)), peace, order and good government (s. 91(1A)), power to declare undertakings within a province to be in the national interest (s. 92(10)(c)), and power to regulate and tax exports. This issue of competing jurisdictions can only be resolved by an accord between the Canadian and B.C. governments on the management structure for OOGD, similar to the accord signed between the two levels of government to manage OOGD on the East Coast.

An additional complicating jurisdictional factor on the West Coast arises from Aboriginal title and rights. Although Canadian law is unclear and rapidly evolving in this area, First Nations have basis in law for exerting control over OOGD that affects their natural resources, such as fish, and/or occurs in waters subject to Aboriginal title. Most of the First Nations in areas impacted by OOGD are currently engaged in treaty negotiations with the federal and provincial governments. Additionally First Nations as Indigenous Peoples have certain rights under international law and conventions to which Canada is a signatory.

The oil and gas industry has indicated that they would not resume exploration activity until the uncertainty and complexity over jurisdiction is resolved. This uncertainty means that accords must be struck between the Canadian, B.C. and First Nations governments on jurisdictional issues, such as regulatory control and revenue sharing, before OOGD could ever proceed.

ES.3 THE EXISTING REGULATORY REGIME FOR OOGD

Both the federal and provincial governments have environmental assessment (EA) processes that apply to OOGD. Although there is a harmonization agreement between the federal and B.C. governments, it is unclear how both processes would be harmonized to provide a clear decision-making process for a significant undertaking such as OOGD.

THE FEDERAL ASSESSMENT PROCESS

The federal EA process in Canada is governed by the *Canadian Environmental Assessment Act* (*CEAA*), which was first passed in 1992 with recent amendments in 2003. The *CEAA* sets out four types of EAs that may be carried out. Screenings are the least detailed level of assessment, and generally provide a brief analysis of the environmental and cumulative effects of a project. Comprehensive studies assess these effects as well as the purpose of the project, its alternatives, and the need for project monitoring. Mediation and assessment by a review panel may also be used if a comprehensive study determines that a project may cause significant adverse environmental effects. There are few instances where a federal EA has led to the rejection of a project.

PROVINCIAL (B.C.) REGULATORY PROCESS

The provincial EA process is legislated by the *British Columbia Environmental Assessment Act* (*B.C. EAA*), which was first introduced in 1995 and subsequently revamped in 2002. The application of the *B.C. EAA* begins with the determination of whether a project is deemed to be "reviewable." Once a determination has been made as to the application of the *B.C. EAA*, a review path is developed and the project is assessed. The EA is then submitted to the appropriate ministers for a decision. The ministers have 45 days to decide whether to issue an environmental assessment certificate, which usually contains project-specific conditions such as requirements for ongoing environmental monitoring. The *Act* does not mention the criteria that should be used in the evaluation of proposed projects.

Currently, provincial EA has the following weaknesses as applied to OOGD.

- Oil and gas exploration is not included as a reviewable project in the *B.C. EAA*;
- Although oil and gas production is included as a reviewable project, it can be excluded by an Order in Council passed by Cabinet, and/or at the discretion of the director of the EA office; and
- There is no requirement in the *B.C. EAA* for public involvement or cumulative effects analysis.

Consequently, the B.C. government has no statutory obligation to conduct EAs for all aspects of OOGD.

THE UNITED STATES REGULATORY PROCESS

Given similarities in OOGD issues between Canada and the United States, it is useful to review the U.S. system for managing OOGD. OOGD in the United States is subject to the U.S. *National Environmental Policy Act* (*NEPA*), which requires a comprehensive environmental, social, and economic impact assessment of proposed OOGD, and a public review process. OOGD in the U.S. is also prohibited by a Congressional moratorium imposed in 1982, and a presidential

moratorium imposed in 1991 that prohibits OOGD in all jurisdictions in the U.S. other than Alaska and the Gulf of Mexico, where OOGD had already developed prior to both moratoria. The Congressional moratorium has been reaffirmed each year since its institution in 1982 and the presidential moratorium was extended to the year 2012 by President Clinton in 1998.

The moratoria in the U.S. were instituted because of concern about environmental impacts and uncertainties documented in a series of studies by the U.S. National Research Council.

EVALUATION OF CURRENT B.C. OOGD REGULATORY REGIME

The current regulatory regime is evaluated against best practices criteria based on an integration of best practice frameworks established by the International Association of Impact Assessment (IAIA) and other agencies. Twelve criteria are used to define best practices. The results of the evaluation of the current OOGD regulatory regime show that seven evaluative criteria are not met, five are partially met, and none are fully met (table ES.2). The regulatory regime for OOGD receives an effectiveness rating of only 21%; therefore, the regulatory regime has significant deficiencies.

TABLE ES.2: OOGD REGULATORY REGIME EVALUATION

BEST PRACTICE PRINCIPLE	DISCUSSION	ASSESSMENT
1. ***Roles and Responsibilities:*** should be clearly defined.	Roles and responsibilities are not clearly defined.	Not Met
2. ***Legislative Base:*** the structure of the management regime should be formally structured through legislation or regulation.	Legislative basis exists but allows too much discretion.	Partially Met
3. ***Decision-Making Criteria and Methods:*** the decision-making process should be based on clear criteria and methods for assessing options.	There are no clear criteria for decision making and no guidelines or requirements to use adequate methodology.	Not Met
4. ***Efficiency:*** decisions should be reached in a timely manner at a reasonable cost.	Confusion over roles and responsibilities would lead to an inefficient process.	Not Met
5. ***Stakeholder Involvement:*** a framework should be in place to ensure that stakeholders are fully engaged in the decision-making process through shared decision making.	Stakeholder engagement includes some consultation, but consultation is not legally mandated and does not use principles of shared decision making.	Partially Met
6. ***First Nations:*** legal and fiduciary obligations, such as to consult and address First Nations' interests, should be fully met.	Courts provide some basis for enforcing obligations but court process is costly, lengthy, and constrained by poor definition of legal and fiduciary obligations.	Partially Met
7. ***Monitoring and Enforcement:*** the regulatory framework should clearly outline monitoring and enforcement processes, infractions, and penalties.	The current system does not provide for adequate enforcement or monitoring.	Not Met
8. ***Equity***: the decision-making process should contain a legal obligation to provide compensation to those negatively affected by the project.	No obligation is in place for compensating those negatively affected.	Not Met
9. ***Resources:*** decision-making bodies should have sufficient resources in place to ensure effective and efficient decision-making process.	Resources currently are not adequate.	Not Met
10. ***Appeal Process:*** the decision-making process should include a mechanism to allow stakeholders to appeal a decision.	Courts provide for appeal on questions of law but court process is costly, lengthy and constrained by poor definition of legal obligations.	Partially Met
11. ***Adequate Information:*** decisions should be based on adequate information.	Current information is inadequate for evaluating costs and benefits of OOGD.	Not Met
12. ***Democratic Accountability:*** the management regime should be structured such that impartial decision-makers represent the publics' interests, and are directly, or indirectly, accountable through the democratic process to those affected by the decision.	The process is ultimately democratically accountable but important decisions reside with officials who are not democratically accountable and consultative mechanisms are inadequate.	Partially Met

ES.4 THE B.C. MORATORIUM REVIEW PROCESS

PROVINCIAL REVIEW PROCESS

The provincial review of the moratorium consists of two processes, both of which have been completed.

B.C. Offshore Oil and Gas Task Force (OOGTF)(2001-2002)

The first process was a government review undertaken by a committee comprised of six members of the liberal caucus with a mandate to seek public opinion on OOGD. The committee, referred to as the Offshore Oil and Gas Task Force (OOGTF), held public hearings in nine coastal communities: Port Hardy, Masset, Skidegate, Bella Bella, Bella Coola, Terrace, Kitimat, Kitkatla, and Prince Rupert. The committee received more than 150 oral presentations and almost 130 written submissions. The committee concluded that "before the government decides upon a final course of action, the public would like to see the following issues addressed" (B.C. OOGFT 2002: 12).

- Resolution of ownership of offshore resources.
- Estimates of offshore resources.
- Processes for involvement of First Nations.
- Assessment of environmental impacts.
- Assessment of economic and social impacts.

Provincial Scientific Review Panel (B.C. SRP) (2001-2002)

The second provincial process was the creation of a three-person scientific panel chaired by Dr. David Strong from the University of Victoria and included Dr. Patricia Gallagher, from Simon Fraser University and Dr. Derek Muggeridge, Dean of Science at Okanagan University College. The mandate of the panel was to identify:

- The scientific and technological considerations relevant to OOGD;
- Further research that should be undertaken to advance the state of knowledge on scientific and technological considerations relevant to OOGD;
- Any government actions required prior to a decision on whether to remove the moratorium; and
- Specific conditions or parameters that should be established as part of a government decision to remove the moratorium.

The panel had approximately three months to complete its report, which was finished on 15 January 2002. The panel review did not include any public engagement process or comprehensive independent peer review, and given the time constraints, did not undertake any original research.

In its review of the literature, the panel made the following observations:

> While B.C. is unique in the particular combination of components of its marine ecosystem, resources and coastal heritage, most of these can be found individually or in combinations in other areas of offshore production…Nevertheless, any offshore activities in British Columbia, at least in the inland waters between the Queen Charlotte and Vancouver Islands, would be near-shore activities, and any adverse environmental impacts would be quickly felt in coastal communities and habitats (Strong et al. 2002: i).

> Although the risks of direct impacts on marine ecosystems may be small, there is a poor understanding of potential long-term cumulative impacts on marine ecosystems of oil and gas spills or discharges from production activities, or of the impact of seismic explorations on marine mammals in particular and the ecosystem in general. These potential impacts may be of very low probability but may be catastrophic in the short term and carry serious and possibly irreversible consequences in the long term (Strong et al. 2002: i).
>
> Although the region is subject to intense storms as well as seismic activity, present engineering knowledge, technology, industry practice, and regulatory regimes can ensure that structures necessary for drilling and production activities are constructed to survive any foreseeable natural threats and to operate within acceptable standards (Strong et al. 2002: i).
>
> Offshore hydrocarbon exploration and development cannot be undertaken without impacts on the environment (Strong et al. 2002: 38).
>
> However, significant gaps remain in a number of scientific and technical areas that would be of special relevance to British Columbia if the government should decide to revise the current blanket moratorium policy and signal its willingness to consider offshore exploration and development (Strong et al. 2002: 41).
>
> It is of a similar concern that the public sector capacities to regulate the range of activities that might ensue from such a policy (lifting the moratorium) appear to be deficient (Strong et al. 2002: 41).
>
> The evidence suggests that at the present there is insufficient capacity for the research, assessment, monitoring and management needed to provide an adequate baseline knowledge framework for ocean and coastal policy-making (Strong et al. 2002: 44).

B.C. SRP identified four issues requiring resolution before any development should proceed.

1. Development of an integrated federal-provincial regulatory framework.
2. Negotiation of an Accord providing for revenue sharing between the Canadian, B.C. and First Nations governments.
3. Identification of sensitive areas requiring special protection from development.
4. Development of capacity to build baseline data, analysis of ecosystems, risk assessment, and evaluation of management options.

The terms of reference of B.C. SRP did not explicitly ask the panel to make a recommendation on the merits of the existing moratorium. Nor did the limited assessment based on a review of existing literature on natural science issues provide the basis for an informed decision on whether the moratorium should be lifted. Nonetheless, B.C. SRP concluded that

> There is no inherent or fundamental inadequacy of the science or technology properly applied in an appropriate regulatory framework, to justify retention of the B.C. moratorium (Strong et al. 2002: 51).

The wording of this conclusion makes it prone to misinterpretation. B.C. SRP is not recommending that the moratorium be lifted. Indeed, B.C. SRP implicitly acknowledged that there may still be good reasons for maintaining the moratorium including:

- Important factors not related to science and technology such as economic and social impacts, risk assessment, institutional weaknesses, and public values that were not assessed by B.C. SRP; and
- An inappropriate regulatory framework.

B.C. SRP's own conclusions that there are significant gaps in knowledge, that environmental impacts could be catastrophic, that existing regulatory structures are deficient, and that a number of preconditions need to be met before OOGD can proceed all suggest that the lifting of the existing moratorium would be premature.

FEDERAL REVIEW PROCESS

On 28 March 2003, the Canadian government announced a process to review issues regarding OOGD. The objectives are to:

1. Identify science gaps related to possible OOGD off the B.C. coast;
2. Hear the views of the public regarding whether the moratorium should be lifted; and
3. Consult with First Nations to ensure that their interests are fully explored.

Reflecting the competing jurisdiction, the Canadian government initiated two processes that largely duplicate processes completed by the B.C. government to meet these objectives.

Federal Scientific Review Panel (2004)

The first process was the creation of a federal expert panel (FEP), whose chair, Dr. Jeremy Hall, was appointed on 5 July 2003. FEP was managed under the independent auspices of the Royal Society of Canada (RSC) and completed its report in February 2004.

The FEP mandate was to:

- Identify gaps in scientific knowledge that need to be filled before a decision is made with respect to the moratorium;
- Provide a workplan to fill any scientific gaps; and
- Identify sensitive zones requiring protection from any OOGD and other zones requiring special management measures.

Like the provincial scientific panel, FEP completed its report in a relatively short period of time and relied on existing knowledge. FEP (RSC 2004) made a number of observations including:

> The rugged nature of the seabed (in the QCB) poses several potential hazards to oil and gas activities: slope instability, moving sediment, shallow gas, and active faulting (xi).
>
> The QCB is an area of current earthquake activity. A fault movement would endanger the integrity of seabed structures cutting across the fault surface and could destabilize sediments (xi).
>
> Wind and sea conditions in the QCB are among the most severe in Canada (xi).
>
> As of November 2003, sixteen marine species in the QCB were listed by COSEWIC [Committee on the Status of Endangered Wildlife in Canada] as endangered, threatened or a species of special concern (xii).
>
> The QCB has significant potential for oil and gas… The hydrocarbon potential of the Basin is thus of similar order to the mature Cook Inlet oil and gas fields in Alaska, and to the currently developed or developing fields in the Jeanne d'Arc Basin offshore Newfoundland (xii).
>
> Except for commercially valuable species, the distribution of most marine species (and therefore the areas of critical habitat) in the QCB remain poorly known (xi).
>
> Any fish or marine mammal within a couple of meters of an airgun detonation would be killed or suffer permanent hearing damage. Farther away, effects are more variable, but some marine

> mammals and fish change behavior, with largely unassessed consequences for survival of individuals or populations in the presence of airgun detonations (xii).
>
> The probability of major spills or blowouts has been declining over the last two decades of oil extraction and transport. Such an event could still occur (xiii).
>
> The QCB is largely an enclosed basin, so any oil spill originating within it is likely to be caught up in the internal circulation eddies, until it reaches the shore, probably within a few days. Negative impacts can be expected on mammal, fish, and invertebrate populations (xiii).

FEP identified seventeen categories of scientific gaps that need to be filled prior to OOGD. The panel recommended:

1. Creating a body of stakeholders to advise government on OOGD;
2. Filling the scientific gaps by completing a number of baseline and monitoring studies; and
3. Identifying protected areas and other areas for exclusion.

FEP concluded that **"**provided an adequate regulatory regime is put in place, there are no scientific gaps that need to be filled before lifting the moratoria on oil and gas development**"** (RSC 2004: xix). It is important to emphasize that this statement on the moratorium is in the conclusion section of the report and is not a recommendation. In other words, **FEP did not recommend lifting the moratorium.** FEP emphasized that a number of conditions need to be met prior to OOGD proceeding, which is in effect maintaining a moratorium on OOGD. The problem is that FEP did not clearly specify a sequence for filling these information gaps. Instead, FEP assumed that the fifteen-year period between lifting the moratorium and production would provide sufficient time to fill all these gaps without any specific timetables. FEP also argued that lifting the moratorium would enhance the ability to fill scientific gaps. This argument is dubious, given that there is nothing preventing government from funding the studies to fill these gaps while the moratorium is in place. Indeed, governments are already funding some of the necessary research.

Most importantly, FEP excluded important factors such as legal, social, regulatory, economic, public values, risk profiles, and other issues that need to be taken into account in assessing whether the moratorium should be lifted. FEP, therefore, did not provide the basis for making an informed decision on the merits of the B.C. moratorium.

Federal Consultation Process (2004)

The second process initiated by the federal government after completion of the phase one FEP scientific report is a public hearing process to assess public views on OOGD. A separate, special component of this process will be conducted specifically with First Nations. This process, under the chair of Roland Priddle, former chair of the National Energy Board, runs from January to June 2004.

OTHER STUDIES ON B.C. OOGD

In addition to the official federal and provincial processes, there are a number of other studies being undertaken on OOGD (table ES.3). These include:

1. Western Diversification Office provided a grant to Royal Roads University to analyze social and economic impacts of OOGD. These studies were released in May 2004.

2. A research program financed by the B.C. government being undertaken at the University of Northern British Columbia (U.N.B.C.).
3. Studies being undertaken by the David Suzuki Foundation, which include completion of a report by Stuart Hertzog published in March 2003 on environmental issues associated with OOGD, and an ongoing monitoring and review program. The study by Hertzog (2003) concluded that

   . . . the risks of opening up offshore activity in British Columbia waters far outweigh any possible rewards (8).

TABLE ES.3: B.C. OIL AND GAS – SUMMARY OF MAJOR RESEARCH INITIATIVES

INITIATIVE	RESPONSIBILITY	COMPLETION DATE
1. B.C. Caucus Public Review Process	B.C. government	15 January 2002
2. B.C. Scientific Review Panel	B.C. government	15 January 2002
3. Federal Expert Panel	Royal Society of Canada	February 2004
4. Federal Public Review Process	Canadian Government	June 2004
5. Social and Economic Impact Analysis	Western Diversification Office (contract to Royal Roads University)	May 2004
6. U.N.B.C. Research Program	Managed by U.N.B.C. (Norman Dale) and funded by B.C. government	ongoing
7. Hertzog Report	David Suzuki Foundation	March 2003

OTHER MORATORIUM REVIEWS

U.S. Moratoria

The U.S. undertook a moratorium review at the request of President Bush in 1989 in response to proposals for OOGD off the coasts of Florida and California. An extensive review by the relevant U.S. agency (U.S. Dept. of Interior Minerals Management Service) and the National Research Council of the National Academy of Sciences concluded that there are significant risks and uncertainties associated with OOGD. Based on these reviews, the president of the United States imposed a moratorium on all new OOGD on the east and west coast of the United States until 2000. In 1998, President Clinton extended the moratorium to 2012 due to continued uncertainty and risk over impacts of OOGD documented in additional National Academy of Science studies. In addition, the U.S. Congress in 1982 imposed a moratorium on new OOGD on most of the eastern and western coastlines of the U.S. To date, the Congressional moratorium has been renewed on an annual basis by the U.S. Congress.

Georges Bank Moratorium

In 1988, the Canadian and Nova Scotia governments imposed a moratorium until 2000 on OOGD in the Georges Bank in Nova Scotia in response to concerns about the impacts on the environment and fisheries. In 1996, a three-person expert panel was appointed to review the moratorium and submitted its report on 1 July 1999. The panel recommended that the

moratorium remain in place because Georges Bank has important ecological and fisheries values that could be jeopardized by OOGD. In the words of the panel, "it would be inappropriate to permit the associated risks on Georges" (Canada 1999: 58). It should be noted that the Georges Bank moratorium review was more comprehensive than the current B.C. moratorium review.

EVALUATION OF THE B.C. MORATORIUM REVIEW PROCESS

The B.C. moratorium review process can be evaluated using similar best practices criteria used to evaluate the management regime (table ES.4). Because the moratorium process is only a subcomponent of the larger process, only some of the best practices criteria are relevant. These criteria include: adequate information, clear decision-making criteria, stakeholder participation, and First Nations partnership. The B.C. moratorium review process is based on a review of scientific information and includes consultation processes with the public. However, the process fails to meet any of the best practice criteria. The process has inadequate engagement of stakeholders, no government-to-government partnership with First Nations to manage the review process, inadequate information, and inadequate delineation of decision-making criteria. Assessments are being completed in short periods of time and exclude key variables in the analysis. Engagement of stakeholders is limited to comments.

TABLE ES.4: EVALUATION OF THE MORATORIUM REVIEW PROCESS

BEST PRACTICE PRINCIPLE	DISCUSSION	ASSESSMENT
1. ***Clear Decision-Making Criteria:*** the decision-making process should be based on clear criteria and adequate methodology such as multiple accounts analysis to evaluate projects.	The moratorium review process has not set clear criteria or used adequate evaluation methodology to determine whether the moratorium should be lifted.	Not Met
2. ***Stakeholder Involvement:*** a framework should be in place to ensure that stakeholders are fully engaged in the decision-making process through a process of shared decision making.	Stakeholder involvement is limited to submission of briefs. Stakeholders are not engaged in the moratorium review process through a process of shared decision making.	Partially Met
3. ***First Nations Partnership:*** a framework should be in place to provide a government to government partnership between First Nations and the federal and provincial government to manage the moratorium review process.	No framework exists for a partnership with First Nations. Both the federal and provincial governments have designed and implemented their moratorium review processes unilaterally.	Not Met
4. ***Adequate Information:*** decisions should be based on adequate information.	There is a consensus that there are significant information gaps in understanding impacts of OOGD. Therefore, there is insufficient information to assess the merits of the moratorium.	Not Met

The assessment of whether to proceed with OOGD must be based on the values and assessments of those most affected: not by outside "experts." Consequently, the review process needs to be restructured to ensure adequate stakeholder involvement based on the

principles of shared decision making, clear decision-making criteria, and adequate information. Therefore, any conclusions on the merits of removing the moratorium await additional, more comprehensive review.

ES.5 OOGD ISSUES

Issues associated with OOGD are assessed in more detail in the main body of this report. Key findings are provided below.

ENVIRONMENTAL

1. There is a consensus in the literature that there are significant gaps in scientific knowledge regarding impacts of OOGD. The following list summarizes 26 areas where there are knowledge gaps. The first 17 are identified in RSC (2004) and the next nine are additional gap areas identified in this report. Knowledge gap areas include:
    1. Identification of valuable species
    2. Identification of unstable areas
    3. Measure of currents, winds, and waves
    4. Earthquake monitoring
    5. Impact assessment of acoustic propagation
    6. Space-time distributions of fish
    7. Identification of confined spawning areas for critical fish species
    8. Space-time distribution of mammals
    9. Impacts of seismic activity on diving birds
    10. Baseline information on benthic fauna and habitat
    11. Oil spill trajectories
    12. Impact of oil spills on landfalls
    13. Seasonal variation in species populations along shorelines
    14. Proposed marine protected areas
    15. Critical species close to shore
    16. Areas of critical habitat
    17. Identification of coastal zone buffers for drilling
    18. Impact of water-based and alternative-based drilling muds
    19. Impact of produced water
    20. Behavior and toxicity of natural gas in marine environment
    21. Long-term impacts of spills and recovery rates
    22. Appropriate use of spill clean-up techniques
    23. Cumulative environmental impacts
    24. Ecological-level impacts
    25. Oil spill risks
    26. QCB ecosystem dynamics

2. Although improvements in technologies and management practices could continue to reduce impacts, there is a consensus that OOGD would have negative environmental affects. These affects would occur at all phases including exploration, development, production, and decommissioning. While some impacts are local and short in duration, others affect larger areas and last longer.

3. Although there is a consensus that negative environmental impacts would occur, considerable uncertainty regarding the exact nature and magnitude of these impacts exists. The uncertainty is due to several factors. First, research on environmental impacts of OOGD is incomplete; there are substantial gaps in knowledge. Second, impacts are unique to each ecological

system. Results based on the experience of other regions would not accurately predict impacts for B.C. Third, impacts are based on unknown probabilities of events, such as accidental oil spills. Fourth, impacts would vary depending on the type of regulations, management practices, and technology governing OOGD.

4. The frequency and severity of oil spills is declining due to improvements in technology and management practices; however, small oil spills, defined as less than 1,000 barrels, are a common occurrence in OOGD. Recent analysis for OOGD in the Cook Inlet in Alaska forecasts a total of 484 small spills over the 25-year life of proposed OOGD. The same analysis forecasts that the probability of a large spill, defined as over 1,000 barrels, is 19% over the life of the project. Although probabilities vary depending on the magnitude of the project, the Cook Inlet probability forecasts are a reasonable order-of-magnitude indication of the oil spill risks for B.C. OOGD.

5. Oil spill clean-up measures are largely ineffective in mitigating the impacts of oil spills. Clean-up efforts on average recover 5-15% of the hydrocarbons and the clean-up process can itself cause additional environmental damage.

6. Recent research shows that the impact of oil spills lasts at least several decades. Recovery time from spills is therefore lengthy.

7. OOGD in the QCB would likely have greater negative impacts than it has in other regions because the QCB is more environmentally vulnerable. Due to the nature of local currents, oil spills in the QCB are more likely to affect ecologically rich coastal waters and shorelines than oil spills on the East Coast, which are more likely to move further offshore.

8. Potential environmental impacts are documented in more detail in chapter 2 of this report. A brief summary is provided below. It should again be emphasized that impacts would vary depending on the regulations and management practices for OOGD.

Exploration Phase: Exploration consists of three primary activities: mapping, seismic surveys, and exploratory drilling. Sonar mapping produces sound waves that have unknown potential affects on marine life. Seismic surveys are based on subsurface airgun detonations that can kill and damage marine life in the immediate vicinity, and can affect the behavior and function of marine life as they attempt to avoid sound. Studies indicate, for example, significant declines in fish harvests due to seismic survey activity. Exploratory drilling and associated transportation activities (helicopters, drilling ships) has noise impacts that alter marine life behavior. Drilling wastes also alter the marine communities in the near vicinity of offshore platforms, and can contaminate seabed sediments tens of kilometers away. While many of these impacts can be mitigated by better management practices, negative impacts will still occur. The most serious potential impact of exploratory drilling, albeit with a low probability of occurrence, is a potential blowout, which can cause major environmental damage similar to an oil spill.

Development and Production Phases: Offshore well development and production requires long-term presence of production platforms that can alter marine habitat above and below the sea surface, as well as contaminate the environment. Drilling wastes, production discharges, and frequent small spills provide chronic pollution to the waters around production platforms. Such

pollution adversely impacts marine life on the sea surface, such as birds, and affects subsurface marine communities. Flaring waste gases can attract and kill seabirds; it is also a substantial source of greenhouse gases and other air pollutants. Production and transportation of the oil and gas also increase risks of oil and gas spills, which could have long-term deleterious impacts on the environment. Transportation of oil and gas over land also has negative impacts. Again, while it is possible that these impacts could be mitigated by better management practices and improved technology, some negative impacts will occur.

SOCIOECONOMIC

1. Socioeconomic analysis of projects is best assessed through a comprehensive multiple accounts evaluation that includes: a benefit-cost analysis, and should be an economic impact assessment and a social impact assessment. To date, no comprehensive multiple accounts evaluation has been done to assess the merits of B.C. OOGD.

2. A primary interest in promoting OOGD is to stimulate both the North Coast and B.C. provincial economy. Economic development could occur through direct investment in OOGD and through various multiplier effects. OOGD, like any natural resource development, could also generate rent, defined as a surplus above normal costs of production, which could be used for regional trust funds or other socioeconomic purposes. Recent economic impact assessments of OOGD in Newfoundland and Nova Scotia illustrate the stimulative affect that OOGD can have. However, potential regional economic impacts of OOGD do not provide sufficient justification for development. For development to be justified, overall benefits must exceed the costs, including environmental and social costs. Further, potential economic impacts of OOGD are constrained by a number of factors including the following:

    a. OOGD is a very capital-intensive industry that generates few jobs, and would rely on highly skilled services and equipment produced outside of B.C. Consequently, economic impacts are less per dollar of output than experienced by almost every other sector of the B.C. economy. For example, the oil and gas sector generates about 1.5 jobs (direct person years) per million dollars of output compared to forestry (3.5 jobs), fishing, hunting and trapping (3.5 jobs), and tourism (22.23 jobs). Although capital intensity is not necessarily a negative characteristic—it can indicate high productivity—it does illustrate the limited job creation potential of OOGD.

    b. The recent experience in the development of the Sable Offshore Energy Project (SOEP) in Nova Scotia illustrates the economic impact limitations of OOGD. The investment in SOEP of $2.3 billion generated only 310 direct jobs, for a ratio of $7.4 million per job created. Also, 90% of the revenue generated by gas production accrued to recipients outside of Nova Scotia, most in the form of profits to the companies exploiting the resource. Nova Scotia received just 6% of the revenue in the form of royalties and taxes and employees located in Nova Scotia received 4%.

    c. OOGD is a very cyclical industry that can create significant economic instability. Like any resource industry, investment patterns in OOGD can follow a boom/bust cycle based on volatile movements in international commodity prices and changing estimates of

resource abundance. This boom/bust cycle is particularly acute in OOGD, which is higher cost and riskier than other, more conventional, oil and gas development. Investment patterns are also "lumpy" with the development phase generating short-term construction employment followed by a significant employment decline during the production phase. Hibernia, for example, generated 5,448 jobs during construction, which declined to 878 jobs during production. This boom/bust pattern may be mitigated somewhat by the sequencing of different OOGD projects. For example, the decline in Hibernia construction employment was compensated to some extent by the subsequent construction of two other projects (Terra Nova and White Rose). However, the ability to avoid boom/bust patterns is limited by market cycles and resource availability. Ultimately, all employment disappears as the oil and gas resources are exhausted. This decline can occur quickly or gradually over an extended period depending on the characteristics of the resource and markets. Therefore, relying on a nonrenewable resource subject to international commodity market cycles is an inherently risky foundation for a regional development strategy.

d. When assessing economic impacts of OOGD it is important to take into account potential negative impacts that OOGD could have on other sectors such as fishing and tourism. To date, no analysis of these potential impacts of B.C. OOGD on other sectors has been done. When these potential negative impacts are taken into account, the net employment impact of OOGD could be less than the gross impact.

e. A principal economic benefit of OOGD is the rent or profit generated by the sale of the resource. Therefore, the key to receiving benefits from OOGD is obtaining a share of the profits through revenue sharing agreements. The potential share of profits is limited by several factors. First, revenue from B.C. OOGD would be lower than conventional development in regions such as the northeast because OOGD is higher cost and would therefore generate less economic rent. Royalty rates on OOGD in Eastern Canada, for example, average only 4% of gross value of oil and gas compared to rates on conventional production in B.C. that average 28%. Second, most of the leases are already granted and therefore cannot be sold to generate bonus bids, which are a major source or revenue in northeast oil and gas development. Third, collection of rent by the provincial government is offset to some degree by reductions in equalization payments. A recent study of the fiscal impacts of OOGD on Newfoundland, for example, forecast that the federal government will in effect receive 75-80% of OOGD royalty revenue through reduced equalization payments resulting from Newfoundland's improved economic performance stimulated by OOGD. Given, B.C.'s current receipt of equalization payments, the impact of OOGD in equalization needs to be taken into account in estimating royalty income.

3. An economic impact evaluation of a probable B.C. OOGD development scenario confirms that OOGD has limited provincial and regional development impacts. The scenario assumes an investment of $1.3 billion and production of 25,000 Bbl/day of oil and 78 MMcf/day of natural gas. Overall, B.C. OOGD scenario would generate only 173 direct jobs (person years) during production, and few of these jobs would be taken by people currently living in the local region. Multiplier effects would create between 91 and 245 additional spin-off jobs in B.C. (table ES.5). This increase represents less than 0.02 % of provincial employment and

0.9 % of regional employment. Further, the employment gain would not occur for many years and would not address the current economic problems of the region.

TABLE ES.5: EMPLOYMENT IMPACTS OF B.C. OOGD

GEOGRAPHIC AREA	EXPLORATION: DIRECT	DEVELOPMENT: DIRECT	PRODUCTION: DIRECT	PRODUCTION: MULTIPLIER
Local Region	n.a.	n.a.	n.a	n.a
B.C.	30	209	173	91-245
Rest of Canada	18	162	0	0
International	18	144	0	0
Total	**66**	**515**	**173**	**91-245**

The B.C. OOGD scenario forecasts an increase in the B.C. gross provincial product of $422 million, which is an increase of less than 1% (0.33%) above current levels (table ES.6). Oil and gas royalty income from B.C. OOGD would average 4% of gross value of production, which is considerably less than the 28% average earned on northeast oil and gas production. Oil and gas royalties from B.C. OOGD accruing to the resource owners (provincial government and/or First Nations) would be $18 million/year, which represents an increase of 0.07% of current B.C. government revenue and 0.36% of 2003/04 B.C. government oil and gas revenue. It should be noted that actual impacts of OOGD in B.C. could be greater or less than these forecasts, depending on the magnitude of development.

TABLE ES.6: POTENTIAL ECONOMIC IMPACTS OF OOGD ON B.C. – PRODUCTION PHASE

INDICATOR	ANNUAL AVERAGE DIRECT (MILLIONS OF $/YR)	ANNUAL AVERAGE INCLUDING MULTIPLIER EFFECTS (MILLIONS OF $/YR)
Value of Production	460	507
GDP	422	448
Operating Costs (non-wage)	31	33
Operating Costs (wages)	10	22
Federal Taxes	49	51
Provincial Taxes	71	91
Provincial Royalties	18	18
Investor Earnings	281	n/a

4. The small economic impact of OOGD is also illustrated in an economic impact assessment of a potential significant expansion of OOGD in Cook Inlet that forecasts the creation of only 83 direct and 37 indirect jobs (annual average person years) during the operation phase. The development is based on the production of 190 BCF of gas and 140 million barrels of oil over a 23 year production period.

5. Regional economic benefits can be enhanced by various initiatives such as training and hiring regional residents, undertaking more regional value added, and creating trust funds or partnerships with local residents. Newfoundland, for example, pursued policies to build equipment locally and to train local residents, and Alaska has revenue sharing partnerships between First Nations and oil and gas companies. Changes in technology and restrictions in the North American Free Trade Agreement (NAFTA) make it more difficult to implement these types of policies than in Newfoundland OOGD, which was exempt from NAFTA provisions. The relatively modest royalty revenue that could be generated by B.C. OOGD also constrains the potential of trust funds to finance regional development programs. If a regional development trust fund is desirable, it could be created more easily by simply redirecting a small portion of existing resource revenue to the fund.

6. Some studies, such as the RSC, attempt to estimate the economic value of B.C. OOGD reserves by multiplying the median reserve estimates by the market value of oil and gas to derive multibillion dollar estimates. These estimates, however, are misleading. Reserve estimates are highly speculative due to inadequate data and there is no guarantee that it is economically viable to recover the reserves even if they exist. Even if the reserves are economically viable, the value of the resource should be based on the net value after deducting production costs, not the gross value. Depending on production costs and markets, the net value of the oil and gas reserves could be zero.

ES.6 ASSESSING THE MERITS OF THE MORATORIUM

A decision on the continuation of the B.C. moratorium should be based on explicit decision-making criteria. Based on a review of international literature the following criteria or "tests" can be used to assess whether the current B.C. moratorium should be lifted. The evaluation shows that none of the tests for removing the moratorium have been met (table ES.7).

TABLE ES.7: MORATORIUM EVALUATION CRITERIA

CRITERIA	PRINCIPLE	ASSESSMENT
1. ***Adequate Understanding of Impacts:*** there must be an adequate understanding of environmental, social and economic impacts prior to lifting the moratorium.	Both scientific review panels identify significant information gaps that must be filled before OOGD could proceed.	Not Met
2. ***Interest from Proponents:*** project proponents must be ready and willing to develop offshore oil and gas resources.	Project proponents consider B.C. OOGD a lower priority in their development plans and would only consider OOGD if jurisdictional conflicts between First Nations and other governments are resolved.	Not Met
3. ***Stakeholder and First Nations Support:*** a decision to lift the moratorium should have broad stakeholder and First Nations support.	Some key stakeholder groups and First Nations are opposed to lifting the moratorium.	Not Met
4. ***Comprehensive Evaluation of Costs and Benefits:*** there should be a reasonable probability that the benefits of OOGD exceed costs based on a comprehensive multiple accounts evaluation as prescribed in provincial government guidelines.	No multiple accounts or benefit cost study has been done to determine that there are net benefits for OOGD.	Not Met
5. ***Adequate Management Structures:*** adequate planning and management structures should be in place prior to any decision lifting the moratorium.	Evaluation of the current planning and management structures (table ES.2) show that none of the best practice criteria are met and the process is therefore deficient.	Not Met

ES.7 CONCLUSIONS

1. Jurisdiction over OOGD is unclear, with overlapping responsibilities between the Canadian, B.C. and First Nations governments.

2. The current regulatory regime for OOGD is deficient. The regulatory regime for OOGD does not meet any of the 12 international best practices criteria for good resource management.

3. The federal (RSC) and B.C. scientific panels (B.C. SRP) have produced useful reports for assessing the consequences of OOGD. Both studies, however, by their own admission, exclude crucial information necessary for assessing the merits of the current moratorium and therefore do not provide the basis for making an informed decision on whether the moratorium should be lifted.

4. The argument in the RSC and the B.C. SRP that lifting the moratorium would enhance the ability to fill gaps in information about the QCB is without merit. This information could and should be collected and analyzed while the moratorium is in place.

5. Lifting the moratorium in B.C. would be counter to decisions in the United States and Canada (Georges Bank), which led to extensions of moratoriums based on extensive reviews that documented concerns over environmental risks of OOGD.

6. Overall, the current process for reviewing the moratorium is deficient. None of the four best practice criteria for the moratorium review are met (table ES.4). The key deficiencies of the moratorium review process include: inadequate engagement of stakeholders, no government-to-government partnership with First Nations, inadequate information, and inadequate delineation of decision-making criteria.

7. Although technological improvements and better management practices can mitigate and reduce the risk of some impacts, there is a consensus in the RSC, B.C. SRP, and this report that OOGD would have negative impacts on the environment. These negative effects could be severe to catastrophic depending on the occurrence of events such as major oil spills. Further, the QCB is particularly vulnerable to impacts because of the nature of currents and regional ecological conditions.

8. There is a consensus in the RSC, B.C. SRP, and this report that there are significant gaps in knowledge regarding impacts of OOGD and understanding of regional ecological conditions where more information is required to properly assess impacts of OOGD. In total, 26 scientific knowledge gaps are identified.

9. The economic and social impacts of OOGD have not been adequately assessed. Economic impacts on growth would be small and would be constrained by several factors. It is likely that fewer than 200 direct jobs would be created in the operational phase, and many of these jobs would be taken by skilled workers from other regions and countries. Ultimately, the jobs would disappear as the resource is exhausted. Although there is some capacity to increase regional economic impacts by benefit planning, this is constrained by technology and NAFTA.

10. OOGD is higher cost and riskier than conventional oil and gas development. Consequently, OOGD would be more cyclical and would generate less rent and royalty revenue to government than more conventional oil and gas development. The low rent generation of OOGD would further reduce potential economic benefits.

11. The role of oil and gas development in B.C.'s energy policy needs to be assessed in light of Canada's Kyoto commitments. Alternative energy strategies based on renewable and green technologies may produce greater economic benefits with fewer environmental costs.

12. None of the five conditions or tests necessary to justify removal of the B.C. moratorium has been met (table ES.7). The five gaps include:
    - Inadequate understanding of the environmental, social, and economic impacts;
    - Opposition from some key stakeholder groups and First Nations;
    - Reluctant project proponents (proponents have preconditions that have not been met);
    - A deficient regulatory regime; and
    - Failure to demonstrate with reasonable probability that the benefits of OOGD exceed the costs.

    Therefore, it is concluded that the current moratorium on B.C. OOGD should be maintained.

13. The decision on whether to undertake OOGD is based on public values and attitudes towards risk. Scientists can help identify risks and tradeoff, but they can not determine whether to lift the moratorium and proceed with OOGD. The decision on whether to proceed or not proceed with OOGD can only be made by stakeholders and governments through a comprehensive process of shared decision making based on best practice guidelines. The principal finding of this report is that the moratorium review process is deficient and the information necessary for making an informed decision has not been collected or analyzed.

    Therefore, it is concluded that the process for reviewing the B.C. moratorium and assessing management options for OOGD be restructured to include:
    - **A shared decision-making partnership between First Nations, the federal government, the B.C. government;**
    - **Greater engagement of stakeholders to assess management options for OOGD;**
    - **A research program to provide adequate information, comprehensive multiple accounts evaluation of costs and benefits, and clear decision criteria to assess management options for OOGD.**

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BIOGRAPHIES:
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Dr. Gunton is Director of the Resource and Environmental Planning Program in the School of Resource and Environmental Management (REM). Dr. Gunton has extensive professional experience including: Deputy Minister of Environment, Lands, and Parks; Deputy Minister of Cabinet Policy Secretariat; and Deputy Minister of Finance (Treasury Board) for the Government of British Columbia. He has also held the position of Assistant Deputy Minister of Energy and Mines for the Government of Manitoba. He has worked as a consultant to the private and public sector, and has appeared as an expert witness before a number of tribunals including the National Energy Board and the Ontario Energy Board. Dr. Gunton has published over 100 scientific articles and reports on resource and environmental management.

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Dr. Day is founding Director of the School of Resource and Environmental Management at Simon Fraser University. Dr. Day is a past director of the International Association for Impact Assessment, a director of the Canadian Coastal Engineering and Science Association, as well as the current chair of the Greater Vancouver Regional Water Advisory Committee. He was a panel member for the Federal Environmental Assessment Review Office during the assessment of the Third Runway at Vancouver International Airport. Dr. Day specializes in water and land management, environmental impact assessment, and sustainable development. His major focus concerns the effectiveness and efficiency of institutional arrangements to support sustainable resource management practices. Within this area, he has extensive experience in international river basin and coastal zone management, interbasin water transfers, water quality management, environmental regulation, and coal and mineral regulation policy. Further, since 1990 he has been involved in a variety of projects in China related to sustainable management of water and land management projects, as well as advising on regional economic development proposals in China. Dr. Day has published over 100 scientific articles and professional reports.

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Katie Silcox attended North Carolina State University on soccer and academic scholarships. She has a Bachelor of Science degree in Business Management, graduating Summa Cum Laude. During her undergraduate career, she held several internship positions including two market research positions, one with Nortel Networks in which she analyzed market size and Nortel share of telecom switching equipment and the other with ABB where she analyzed market opportunities for development of alternative energy products and services. Prior to that, she held

two research internships one with the University of Waterloo in which she conducted water quality analyses to detect pollutants in local watersheds using field testing and GIS analysis, the second with North Carolina State University in which she analyzed the relationship between flora and fauna in Northern California, to determine how human development impacted the environment. Katie is currently completing in masters degree at Simon Fraser University in the School of Resource and Environmental Management. She currently spends any spare time she has playing Capoeira (a Brazilian martial art/dance) and mountain biking on the North Shore.

TIM VAN HINTE (B.ES., MCIP)

Tim Van Hinte is a graduate student in the School of Resource and Environmental Management where he is specializing in land and resource planning. He received a Bachelor of Environmental Studies at the University of Waterloo's School of Planning. Tim has extensive professional experience in both the public and private sectors in Ontario. He has worked as a land use planner for the Ministry of Municipal Affairs and Housing and the Regional Municipality of Waterloo, as well as for planning consultants and land use developers. Tim is also a Provisional Member of the Planning Institute of British Columbia and the Canadian Institute of Planners.

LIST OF ACRONYMS

ABM	synthetic/alternative based mud
AGRA	AGRA Earth and Environmental Ltd.
Bbl	billion barrels
BBO	billion barrels of oil
B.C.	British Columbia
BCF	billion cubic feet
B.C. EAA	*British Columbia Environmental Assessment Act*
B.C. EAO	B.C. Environmental Assessment Office
B.C. SRP	British Columbia Scientific Review Panel
B.C. TC	B.C. Treaty Commission
CAPP	Canadian Association of Petroleum Producers
CEAA	*Canadian Environmental Assessment Act*
CEQ	Council on Environmental Quality
CER	categorical exclusion review
CFN	Coastal First Nations
CHN	Council of the Haida Nation
C-NOPB	Canada-Newfoundland Offshore Petroleum Board
C-NSOPB	Canada-Nova Scotia Offshore Petroleum Board
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
COTA	Council of Tourism Associations
CPUE	catch per unit effort
CZMA	*Coastal Zone Management Act*
DOCD	development operations coordination document
EA	environmental assessment
EP	exploration plan
EIS	environmental impact statement
FEP	federal expert panel
FPSOs	floating production, storage, and off loading systems
GBS	gravity-based structures

GDP	general development permit
GESAMP	Group of Experts on the Scientific Aspects of Marine Pollution
GPP	gross provincial product
IAIA	International Association of Impact Assessment
IMO	International Maritime Organization
ITOPF	International Tanker Owners Pollution Federation Limited
JNCC	Joint Nature Conservation Committee
JPM	jobs generated per million dollars of investment
JWEL	Jacques Whitford Environment Ltd.
km	kilometer
MMcf	Thousands of cubic feet
MMS	Minerals Management Service
NAFTA	North American Free Trade Agreement
NEPA	*National Environmental Policy Act*
NOAA	National Oceanic and Atmospheric Administration
NORM	naturally occurring radioactive materials
OBM	oil-based mud
OCS	outer continental shelf
OCSLA	*Outer Continental Shelf Lands Act*
OGC	Oil and Gas Commission
OOGD	Offshore oil and gas development
OOGTF	Offshore Oil and Gas Task Force
POGG	peace, order, and good government
PROOGM	Federal Public Review of the B.C. Offshore Oil and Gas Moratorium
QC	Queen Charlottes
QCB	Queen Charlotte Basin
REM	School of Resource and Environmental Management
RSC	Royal Society of Canada
SAIC and MEC	Sciences Applications International Corporation and MEC Analytical Systems, Inc.
SOEP	Sable Offshore Energy Project
SPSA	*Significant Project Streamlining Act*

TEDA	Terrace Economic Development Authority
U.N.B.C.	University of Northern British Columbia
URS	URS Australia Pty. Ltd.
U.S. DOI	U.S. Department of the Interior
U.S. NAS	United States National Academy of Sciences
WBM	water-based mud
WCOEEAP	West Coast Offshore Exploration Environmental Assessment Panel
WLAP	Ministry of Water, Land, and Air Protection

CHAPTER 1: INTRODUCTION

1.1 BACKGROUND

The Geological Survey of Canada estimates that there may be substantial oil and gas resources in the Queen Charlotte Basin (QCB). However, no offshore oil and gas exploration or development has been allowed, except for a short period from 1966 to 1969 to permit drilling of some exploratory wells. Current leases held for British Columbia's (B.C.) offshore area are depicted by fig. 1.1.

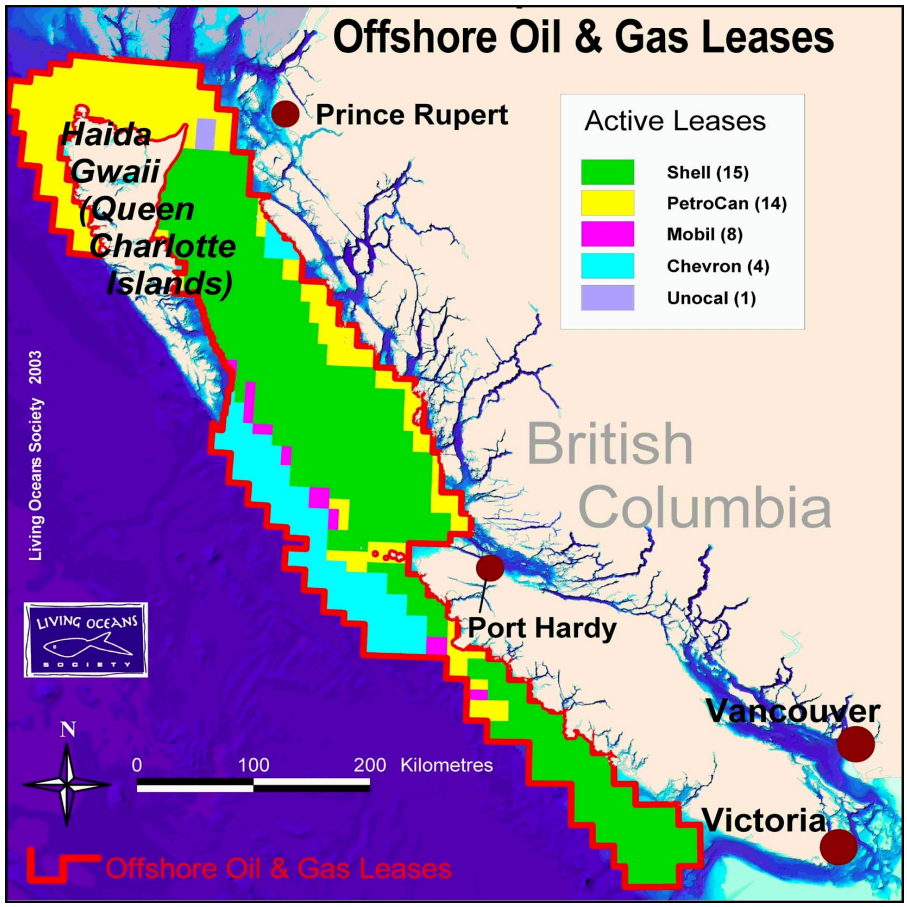


FIGURE 1.1: CURRENT LEASES HELD IN B.C.'S OFFSHORE AREA

Interest in offshore oil and gas development (OOGD) in the early 1980s resulted in the appointment of a five-person panel, which published its environmental assessment entitled *Offshore Hydrocarbon Exploration, a Report and Recommendations of the West Coast Offshore Exploration Environmental Assessment Panel* in 1986. This report contained 92 recommendations that had to be implemented if oil and gas development were ever to proceed.

However, several oil spills affecting B.C. coastal waters and the grounding of the *Exxon Valdez* in March 1989 raised public concern over oil and gas development and the federal and B.C. governments decided to maintain their moratoria. The House of Assembly of the Haida Nation also passed a moratorium in 1985 prohibiting any OOGD in their territory.

Recently, there is renewed interest in OOGD. OOGD, however, faces a number of issues including jurisdictional conflict between the Canadian, B.C., and First Nations governments, environmental risks, economic viability, regulatory gaps, and public opposition. The B.C. and Canadian governments have initiated their own separate reviews of the moratorium to assess these issues. The B.C. government review of the moratorium consists of the following components:

1. ***B.C. Offshore Oil and Gas Task Force (OOGTF***): The OOGTF was a B.C. government caucus committee appointed by the B.C. government to report on public views of OOGD. The OOGTF held public meetings and received more than 150 oral presentations and almost 130 written submissions. The OOGTF delivered their report on 15 January 2002. In their report, the OOGTF concluded that the following issues needed to be resolved before the government made a decision on the moratorium.

    - Resolution of ownership of offshore resources.
    - Estimates of offshore resources.
    - Processes for involvement of First Nations.
    - Assessment of environmental impacts.
    - Assessment of economic and social impacts.

2. ***B.C. Scientific Review Panel (B.C. SRP):*** The B.C. SRP was a three-person expert panel appointed by the B.C. government in 2001 with a mandate to review the following issues:

    - Scientific and technological considerations relevant to OOGD.
    - Further research that should be undertaken to advance the state of knowledge on scientific and technological considerations relevant to OOGD.
    - Necessary government actions required prior to a decision on whether to remove the moratorium.
    - Specific conditions or parameters that should be established as part of a government decision to remove the moratorium.

    B.C. SRP delivered its report to the B.C. government on 15 January 2002. In its report, the panel identified four issues requiring resolution before OOGD can proceed.

    - Development of an integrated federal-provincial regulatory framework.
    - Negotiation of an accord providing for revenue sharing between the Canadian, B.C., and First Nations governments.
    - Identification of sensitive areas requiring special protection from development.
    - Development of capacity to build baseline data, analysis of ecosystems, risk assessment, and evaluation of development options.

B.C. SRP also concluded that

> . . . there is no inherent or fundamental inadequacy of the science or technology applied in an appropriate regulatory framework, to justify retention of the B.C. moratorium (Strong et al. 2002: 51).

The Canadian government's review consists of the following two components.

1. ***Scientific Panel Report on OOGD***: The Canadian government requested the Royal Society of Canada (RSC) to undertake a scientific review of OOGD to:

   - Identify gaps in scientific knowledge that need to be filled before a decision is made with respect to the moratorium and/or before OOGD proceeds.
   - Provide a workplan to fill any scientific gaps.
   - Identify risks associated with not filling knowledge gaps.
   - Identify sensitive zones requiring protection from OOGD and other zones requiring special management measures.

   The Royal Society Report was completed in February 2004 and made the following recommendations.

   - Create a body of stakeholders to advise government on OOGD.
   - Fill the scientific gaps by completing a number of baseline and monitoring studies.
   - Identify protected areas and other areas for exclusion of OOGD activities.

   The RSC also concluded that

   > . . . provided an adequate regulatory regime is put in place, there are no scientific gaps that need to be filled before lifting the moratoria on oil and gas development (RSC 2004: xix).

2. ***Federal Public Review of the B.C. Offshore Oil and Gas Moratorium (PROOGM)***: The Canadian government initiated a process to seek public views on OOGD in 2003, with expected completion in June of 2004. A special component of the consultation process focused on seeking input of First Nations. The mandate of the PROOGM is to report on public opinion, not to make recommendations on OOGD.

1.2 PURPOSE

This report is undertaken in response to a request from Turning Point Initiative, which is a cooperative organization representing Coastal First Nations, to complete a review of issues related to OOGD in B.C. The content of this study relative to the federal scientific study (RSC) and the B.C. study (B.C. SRP) is summarized below (table 1.1). As indicated in table 1.1, this study is more comprehensive than the federal (RSC) and provincial (B.C. SRP) scientific reviews because it includes a review of social, economic, regulatory, jurisdictional, legal, and environmental issues. The federal and B.C. studies were restricted to assessing only technological and environmental issues. This study also develops and utilizes explicit decision-making criteria for assessing OOGD based on international best practices.

TABLE 1.1: COMPARISON OF B.C. SRP, RSC AND SFU STUDY CONTENTS

TOPIC	B.C. SRP	RSC	THIS STUDY
Environmental	✓	✓	✓
Social			✓
Economic			✓
Jurisdictional			✓
Legal			✓
Regulatory			✓
Explicit Evaluation Criteria			✓

✓ indicates topic included, blank indicates topic not included.

This study was completed by an interdisciplinary team of nine researchers from the School of Resource and Environmental Management at Simon Fraser University. The methodology used by the research team was to review primary and secondary data relevant to B.C. OOGD. The reviews were divided into the following thematic areas: environmental, socioeconomic, legal, jurisdictional, and regulatory. International best practices for OOGD were identified and used to evaluate the current B.C. OOGD management and moratorium review process. A draft report was then prepared and sent to OOGD experts in government, industry, academia, and nongovernmental agencies (NGOs) for review, and revisions were made to the report based on the reviews.

The report begins with a review of the scientific literature on OOGD environmental impacts. The review identifies impacts by type, and identifies areas of uncertainty and knowledge gaps where more information is required. The next section of the report assesses economic and social impacts of OOGD, and utilizes a probable B.C. OOGD scenario to identify likely impacts on B.C. The third section of the report reviews legal, jurisdictional, and regulatory issues associated with B.C. OOGD. Explicit evaluation criteria based on international best practices are used to

evaluate the current OOGD regulatory process, moratorium review process, and the merits of retaining the current moratorium. The final section provides conclusions.

Like the other recent reports on OOGD, this report was completed with limited resources over a relatively short period of time and relies on a review of existing information. Consequently, this report is not intended to provide definitive answers on whether OOGD should be undertaken. Instead, this report identifies major issues that need to be addressed and knowledge gaps that need to be filled before an informed decision can be made on OOGD.

CHAPTER 2: ENVIRONMENTAL IMPACTS

2.1 INTRODUCTION

This section of the report assesses environmental impacts of offshore oil and gas development (OOGD). The assessment is based on a review of scientific literature, environmental impact statements, and environmental review reports, including several recent reports specifically addressing OOGD in the Queen Charlotte Basin (QCB).

The discussion of impacts is organized around the four phases in OOGD: exploration, development, production, and decommissioning. Exploration entails geophysical surveying and exploratory drilling. Development entails well drilling and establishing semipermanent structures overtop reserves. Production entails extracting petroleum hydrocarbons and transporting them to onshore refineries through pipelines and marine vessels. Decommissioning entails well capping and removing some or all of the equipment used in production. Impacts occur during each of these phases and are discussed in this order.

FACTORS AFFECTING IMPACTS

The environmental impact of OOGD is a function of a number of factors. Impact varies with:

- Choice of technology used. For instance, different drilling muds available for OOGD have different toxicities.
- The regulatory framework that governs OOGD practices.
- The scale of the project. The longer and more intense the activity, the greater the impacts, and the greater the risk of accidents.
- Location and time of OOGD in relation to sensitive natural processes such as fish spawning.
- Accident rates.
- Cumulative effects. While impacts are described in this report in isolation, such impacts may compound upon one another to pose a substantially greater impact in combination.
- Host environment characteristics. Impacts are unique to the specific environment where OOGD occurs. Experience in some regions may therefore underestimate the impacts in more vulnerable regions such as the QCB.

CHARACTERIZING IMPACT

A number of impacts are described in the following discussion. Lethal impacts are those impacts that cause immediate death to organisms. Sublethal impacts alter an organism's health by affecting an its function, behavior, growth, success, recruitment, and other biological functions and processes. Ecological impacts are changes within marine communities that affect the health and population viability of more than one species. Long-term impacts are impacts that last more than a few years.

2.2 EXPLORATION

DESCRIPTION OF ACTIVITIES

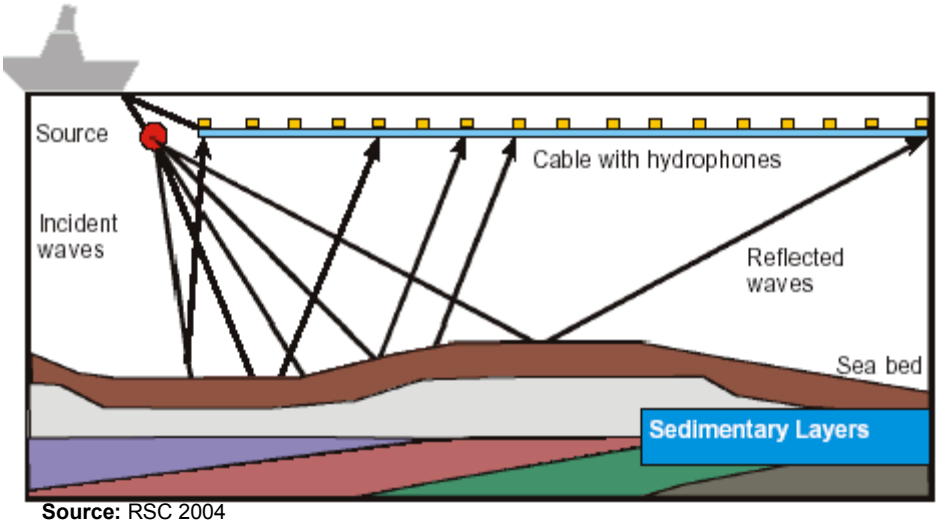
Exploration involves surveying with seismic and other geophysical technologies, and exploratory drilling into areas exhibiting resource potential. Marine vessel and aircraft traffic accompanies these activities.

A variety of geophysical survey technologies are used to map the seabed and subsurface geology. Technologies include seismic surveying, gravity and geomagnetic surveying, vertical seismic profiling, magnetic resonant imaging, swath (or multibeam) bathymetry, sidescan sonar, acoustic seabed classification, and high-resolution seismic reflection profiling. Geophysical surveys can be conducted from boats, drilling equipment, underwater vehicles, and aircraft. Often, multiple geophysical surveys are required, and are undertaken before, during, and after exploratory drilling (Jacques Whitford Environment Ltd. (JWEL) 2001).

The survey technologies of greatest concern generate substantial levels of underwater noise. Sonar and other technologies are used to gather information on sea depth and seabed character. Swath bathymetry, for example, uses high frequency sound pulses generated from transducers mounted on the undersides of marine vessels (JWEL 2001). In seismic surveys, airguns are detonated underwater to bounce sound waves through underlying geologic strata so the returning waves can be analyzed to give information on the composition of the strata (fig. 2.1). Survey vessels typically tow an array of 12-70 airguns at depths of 4-8 m, with the airguns typically firing once every 10-15 seconds or 25 meters. Initially, 2D surveys are conducted in which survey vessels comb large areas in gridlines a few kilometers apart, and fire roughly a thousand shots for every 100 km^2 of surveying (Royal Society of Canada (RSC) 2004). In areas of high hydrocarbon potential, 3D surveys are conducted involving gridlines of about 0.5 km apart. During 3D surveys, about 8,000 shots are typically fired to cover 100 km^2 (RSC 2004). Survey vessels typically operate 24 hours a day.

A number of geophysical surveys are required to facilitate OOGD in the QCB. Sonar and related technologies must be employed in order to fill gaps in bathymetric (water depth) data for much of the QCB (JWEL 2001). FEP (RSC 2004) estimated that about two months would be required to complete 2D surveying of the QCB (which is about 30,000 km^2), and another two months would be required to complete 3D surveying of likely hydrocarbon reserves. In practice, however, seismic surveys typically occur over many years by multiple parties. Repeat surveys may be conducted to improve data and explore other likely areas, as well as during production to help determine reserve depletion rates (RSC 2004; JWEL 2001).

If underlying geologic strata appear promising, exploratory wells are drilled. Initially, wells are drilled directly into sediments and rock without casings. During this stage of drilling, cuttings (the geological material being drilled through) and drilling muds (chemical mixtures used to aid drilling) are discharged directly into the ocean. At a certain point, wells are lined with casings, and muds and cuttings are pumped to the surface. During this latter stage, drilling wastes may be discharged directly to the ocean, or cleaned first and then discharged, or simply stored for later disposal onshore.



Source: RSC 2004

FIGURE 2.1. SEISMIC SURVEYING SKETCH

IMPACTS DURING EXPLORATION

Seismic Surveys

Seismic surveys generate underwater sounds that are among the loudest in the marine environment, with an intensity equivalent to lightning striking the water surface, or a seafloor volcano eruption (JWEL 2001). The noise from seismic surveys can be detected in water hundreds of kilometers away from the source (JWEL 2001; Richardson et al. 1995).

Seismic surveys can cause lethal and sublethal impacts to marine life. Mortalities and injuries generally occur in close proximity to seismic shooting (Richardson et al. 1995). However, sublethal impacts—such as injury and behavior modification—can occur at substantial distances (Popper 2003b). For example, because marine life uses sound to communicate, navigate, and hunt, hearing impairment can compromise viability (Popper 2003a; Richardson et al. 1995). In light of these impacts, the Joint Nature Conservation Committee (JNCC) in the U.K. recently established guidelines for seismic surveying (JNCC 1998). The following discussion elaborates on the impacts from seismic surveys.

Fish: Close-range seismic noise can seriously injure and even kill fish (McCauley, Fewtrell, and Popper 2003; McCauley et al. 2000; Canada 1999; CEF Consultants 1998 in JWEL 2001; Booman et al. 1996; Chamberlain 1991 in Kenchington 1997). Fish with swim bladders, such as pelagic groundfish, immobile organisms that cannot avoid the noise, or those that live in the upper water column, are highly susceptible to injury or death (Strong et al. 2002; Canada 1999; Booman et al. 1996). However, the "zone of injury" is generally considered to be within about six meters of airguns (RSC 2004; Canada 1999; Kenchington 1997). Consequently, very few fish and larvae are typically killed (RSC 2004; Strong et al. 2002; Kenchington, 2001, Saetre and Ona 1996 in RSC 2004).

Sublethal noise impacts on fish include physiological (including hearing) damage and changes to feeding, reproductive, or other behavior (McCauley 2003; Popper 2003a; McCauley et al. 2000;

Booman et al. 1996; Pearson et al. 1992 in JWEL 2001). In turn, these impacts may compound one another (Popper 2003a). For example, hearing loss may impede hunting ability, and may predispose individuals to greater predation rates.

The most substantial affect of seismic surveying on fish appears to be related to behavior. Fish respond to seismic survey noise 100 km away or further (Kenchington 1997; Dalen et al. 1996 in Patin 1999). Declines observed in catch per unit effort (CPUE) for some fisheries are blamed on seismic surveying (Boudreau et al. 1999; Engas et al. 1993; Engas et al. 1996, Lokkeborg and Soldal 1993, Skalski et al. 1992, in Kenchington 1997). Engas et al. (1996 in Kenchington 1997) found acoustic estimates of fish population in a 40 nautical-mile-diameter study area dropped 45% upon commencement of seismic work. Fish populations continued to fall over a number of days and the affected area continued to increase even after seismic surveying stopped; catches declined more than 70% and did not increase in the five days after surveying ended. Numerous accounts from fishers support these scientific data (Hertzog 2003; JWEL 2001; Hayne 2000; Canada 1999; Kenchington 1997).

Birds: Birds—such as Cassin's Auklets—may be disturbed by seismic surveying during nesting, leading to nest abandonment (Strong et al. 2002). Birds diving for prey may also be exposed to seismic survey noise (RSC 2004).

Marine Mammals: To date, injuries and mortalities in marine mammals from seismic surveys are poorly documented. However, Hildebrand (2003) noted two occasions in which seismic surveys are suspected to have caused the stranding, injury, and eventual death of beaked whales. A variety of sublethal impacts have also been observed. Sublethal impacts include hearing impairment, stress, avoidance, long-term displacement, energetic consequences, abandonment of young, and possibly changes in reproductive behavior (Hildebrand 2003; U.S. National Academy of Sciences (U.S. NAS) 2003a; Weller et al. 2002; Goold and Fish 1998, Goold 1996 both in RSC 2004; Gordon et al. 1998; Kenchington, 1997; Richardson et al. 1995; Malme et al. 1984, 1983 both in Hertzog 2003). In some studies, marine mammals stayed up to 20 km away from seismic noise sources, and showed greater sensitivity during different stages in their life cycles such as pregnancy (Hildebrand 2003; Harris et al. 2001; McCauley et al. 2000; Richardson et al. 1997 in Hertzog 2003; Richardson et al. 1995; Ljungblad et al. 1985). Interestingly, male humpback whales are sometimes attracted to a single airgun blast, as the sound is similar to a breaching event (McCauley et al. 2000).

Other Noise

Sonar and Other Geophysical Survey Technologies: Cetaceans exhibit stress, avoidance responses, and sometimes stop their activity in response to sonar noise (Richardson et al. 1995). In addition, exposure to intense sonar noise has caused numerous mass strandings of whales around the world (Balcomb 2004; Hildebrand 2003). Despite these observations, little research has been conducted, and understanding of the impact of sonar noise is limited (Hildebrand 2003). Little is known regarding the impacts of other geophysical survey technologies on marine life.

Aircraft Noise: The impact from noise generated by aircraft, such as planes and helicopters, is generally limited to the surface and the upper-most portions of the water column. The impact is a function of aircraft characteristics and operation (aircraft type, altitude, flying pattern), water

depth, and the sensitivity and depth of the receiving organism (Richardson et al. 1995; Hunt 1985 in JWEL 2001).

Marine mammals typically exhibit avoidance and other behavioral responses when aircraft fly nearby, and sometimes even abandon their young (Petro Canada 1995, Richardson et al. 1985a, 1985b, Payne et al. 1983, Watkins and Moore 1983, Leatherwood et al. 1982 all in JWEL 2001; Richardson et al. 1995). Helicopters disturb bird and whale migration paths, and can disturb nesting seabird colonies (JWEL 2001; Richardson et al. 1995). Impact of aircraft noise on fish is considered negligible (JWEL 2001).

Marine Vessel Noise: Vessels are a major contributor to background noise, although data are lacking on the character of noise from different types of vessels (Richardson et al. 1995). Ross (1976 in Richardson et al. 1995) found supertanker noise was audible up to 463 km. Bain and Dahlheim (1994) found that vessel noise impairs killer whale hearing. Richardson et al. (1995) concluded that impacts on marine mammals from marine vessel noise are most likely negligible. However, Richardson et al. (1995) cautioned the data are insufficient to reach firm conclusions. It is not known how other marine life may be affected by marine vessel noise.

Drilling Noise: The character of noise given off underwater during drilling depends on the type of drilling rig employed. Underwater, semisubmersible rigs emit substantial levels of noise within one kilometer, and weak tones up to 18 km (Richardson et al. 1995). Drill ships emit noise that is louder than semisubmersibles, and platforms—where drilling machinery is above the water's surface—emit much lower levels of noise (Richardson et al. 1995). The impact of these low-level noises are discussed in section 2.3 where noise associated with production is discussed.

Uncertainties Regarding Impacts from Noise

Overall, the impact of anthropogenic sound on marine life is poorly understood (RSC 2004; Hildebrand 2003; U.S. NAS 2003a; McCauley 2003; Payne 2003; Popper 2003a; Strong et al. 2002; JWEL 2001; Canada 1999; Gordon et al. 1998; Richardson et al. 1995). Knowledge is essentially limited to understanding short-term impacts of seismic surveying on a few species.

These knowledge gaps make it impossible to determine the impact of noise on marine life with any certainty. As Dr. C.W. Clark, director of the Bioacoustics Research Program at Cornell University, New York, recently argued

> . . . the consequences [of anthropogenic noise on the marine environment] cannot be determined with any reasonable certainty, yet the potential harm is immeasurable, and irreversible (2002: 2).

Drilling Waste Pollution

Wells are drilled during exploration in order to confirm geological data, and in order to delineate the size of reserves. In the process, gaseous, fluid, and solid pollutants are discharged from survey vessels, exploratory drilling rigs, and other equipment. Drilling wastes, primarily composed of cuttings and muds, form the most substantial discharge during exploratory drilling.

Drill cutting composition reflects the rock being drilled. Cuttings often contain heavy metals (such as mercury, lead, cadmium, zinc, chromium, and copper), drilling mud components, and sometimes contain naturally occurring radioactive materials (NORM) (Bornholdt and Lear 1997;

Kenchington 1997). Cuttings typically resemble the consistency of sand or finer materials. Three types of drilling muds may be used: water-based mud (WBM), synthetic/alternative-based mud (SBM or ABM[1]), and oil-based mud (OBM). WBMs are primarily composed of seawater. ABMs are primarily composed of paraffin oils or nonmineral oils, such as animal, vegetable, or synthetic oils. OBMs are primarily composed of diesel. In addition to their prime ingredients, drilling muds often contain deflocculating agents (bentonite), weighting agents (barite), emulsifiers (such as alkyl-acrylate sulfonate, or alkyl-acryl sulfate), thinning agents, pH and ion control agents (such as sodium and calcium chlorides, and lime), anticorrosion agents (such as sodium sulfite, ammonium bisulfite, and zinc carbonate), lubricants, biocides, caustic soda, soda ash, sodium bicarbonate, inorganic salts, surfactants and detergents, viscosifiers, dispersants, shale inhibitors, xanthan gum natural polymer, oil, paraffin oils, nonmineral oils, calcium chloride, calcium hydroxide, and wetting agents. WBMs and ABMs also often contain high levels of heavy metals (Canada 1999; Group of Experts on the Scientific Aspects of Marine Pollution (GESAMP) 1993; Gillam 1987 in Kenchington 1997).

Drilling wastes are disposed of to the sea, back into wells, or onshore. During initial drilling, cuttings and muds are not contained by casings and are thus discharged directly to the marine environment. Today, WBMs and ABMs are generally used in place of OBMs during initial drilling because they are less toxic; however, OBMs may be used in deeper drilling with casings in place where muds and cuttings are drawn up through drilling equipment, separated from cuttings, and possibly reused.

The amount of wastes generated during drilling is a function of the number of wells drilled, their diameter, and their depth. Upwards of 1,500 tonnes of cuttings and muds are disposed per well (GESAMP 1993). While cuttings, WBMs, and ABMs are typically discharged to the ocean, industry typically reinjects OBMs into disposal wells by permit (JWEL 2001).

Physical Impacts from Drilling Wastes: Drilling wastes cause a number of physical changes to the local marine environment near drilling rigs. First, the input of wastes alters the local habitat by burying the original sea floor, smothering the local benthic community, and providing a new substrate for colonization (Canada 1999; Neff 1987). However, these discharges tend to create anoxic conditions in the piles that form on the seabed, making colonization of the new substrate much more difficult (Kenchington 1997). Second, discharges typically introduce different sediment textures down current from discharge points (Kennicutt et al. 1996). Third, turbidity in the water column is increased due to the input of discharges. The resulting cloudy plumes drift in the seawater, reduce light penetration, and may affect organisms in the water column and on the seabed (Krautter 2003; Patin 1999).

Biological Impacts of Drilling Wastes: Cuttings and muds are toxic to marine life in varying degrees. Cuttings can contain toxic levels of heavy metals (Bornholdt and Lear 1997; Kenchington 1997), as well as mud content. WBMs are the least harmful to marine life, though impacts from WBM contamination are observed in scallops and may occur in other species (Boudreau 1998 in Canada 1999; Cranford and Gordon 1992 in Kenchington 1997). OBMs are the most toxic to marine life (Cranford et al. 1999a; 1999b; Leonov 1999; AGRA Earth and

[1] We refer to both synthetic- and alternative-based muds using the latter term.

Environmental Ltd. (AGRA) 1998; Bornholdt and Lear 1997; Neff 1987; Sanders and Tibbets 1987; Davies et al. 1984). Consequently, many jurisdictions regulate OBM use. ABMs are also toxic to marine life (Canada 1999; Kenchington 1997; Payne et al. 1998, 2001a, 2001b in JWEL 2001; Leaver et al. 1987), and appear to be no more biodegradable than OBMs (Wills 2000, Society of Petroleum Engineers 1998-2000 in RSC 2004). Many biocides in muds—such as sodium salts of hypochlorite, formalin releasers, glutaraldehyde, biguanidine, and quaternary ammonium—are also toxic, and a number of nations have regulated their use (Patin 1999).

Drilling wastes disposed into the sea—whether at the sea surface, seabed, or in the water column—disperse away from drilling sites. The distance that these pollutants disperse is the subject of debate. Many studies concluded that dispersal of hydrocarbons from drilling wastes is limited to five km from drilling sites (Bornholdt and Lear 1997; Kenchington 1997; McDonald et al. 1996; Nihoul and Ducrotoy 1994; Gray et al. 1990 in Nihoul and Ducrotoy 1994; Bedborough Blackman and Law 1987; Davies et al. 1984). Other studies found that components of drilling wastes spread 15 km or further from drilling sites (Heriot University 2001; McDonald et al. 1996; GESAMP 1993; Muschenheim and Milligan 1996, Reierson et al. 1989 both in Kenchington 1997). Somerville et al. (1987) found that mussels up to 10 km from platforms in the North Sea had elevated hydrocarbon concentrations in their tissues. Subsequent reinterpretation of those results suggested that bioaccumulation occurred up to 50 km from drilling sites (Kenchington 1997). In the Norwegian North Sea, where OBMs have been used, areas around drilling sites greater than 100 km^2 were contaminated with elevated levels of barium, hydrocarbons, and sometimes heavy metals (Olsgard and Gray 1995). After six to nine years, contamination spread to all sampling sites up to six km away. Heavy metals were detected as far as one km from some North Sea platforms (GESAMP 1993). Of all contaminants studied, bentonite and barite, common ingredients of all types of drilling muds, appear to disperse the furthest. Neff et al. (1989) found that during drilling, barium levels doubled in sediments 35 km away in one direction and rose to six times original levels 65 km in the direction of the residual current. Testing difficulties appear to have prevented finding whether there were elevated levels of pollutants at further distances (Neff et al. 1989). Others also noted that bentonite and barite can disperse from eight to 40 km from platforms (Canada 1999; Muschenheim, Milligan, and Gordon 1995 in Kenchington 1997).

As a function of their toxicity and dispersal characteristics, biological impacts of drilling wastes are generally thought to be limited to within a few kilometers of drilling sites (URS Australia Pty. Ltd. (URS) 2001 in JWEL 2001; Bornholdt and Lear 1997; Kennicutt et al. 1996; GESAMP 1993; Kingston 1992; Davies et al. 1984). However, other research suggested that impacts occur up to 10 km away (Kenchington 1997; Bakke et al. 1989 in Kenchington 1997), and in broad areas around drilling sites (Olsgard and Gray 1995). In addition, impact footprints grow significantly when multiple drilling sites are in close proximity to one another (GESAMP 1993). OBMs cause the greatest impacts, while impacts from ABMs and WBMs appear to be much more constrained (JWEL 2001; Jensen et al. 1999 in JWEL 2001; Olsgard and Gray 1995). While WBMs and ABMs are used much more frequently in modern drilling operations compared to OBMs because of environmental concerns, further research is required to confirm their impacts on marine life.

Blowouts: In drilling through geologic strata, there is a possibility that high-pressure reserves of hydrocarbons may be encountered. If unconfined, such "blowouts" can spill into the marine

environment at the seabed or from drilling equipment. Blowouts are discussed further in section 2.4.

2.3 DEVELOPMENT, PRODUCTION, AND TRANSPORTATION

DESCRIPTION OF ACTIVITIES

If oil and gas resources discovered during the exploration stage appear to be economically viable, then a developer may decide to exploit the resource. Development entails constructing marine and onshore infrastructure (such as drilling rigs, onshore supply ports, and submarine pipelines), and also preparing on and offshore sites for activity. Pile driving, dredging, construction, and pipeline emplacement may be required, and further surveying and well drilling may be conducted. The number of wells drilled depends on the size of the reserve and the drilling strategy of the developer. Gas is typically transported from offshore sites via subsea pipelines; oil and gas condensates are typically transported via tanker. In some cases, liquid natural gas (LNG) may be transported via tanker. During transport, hydrocarbons are transferred up to 15 times between equipment before reaching consumers (Environment Canada undated). Onshore, development may involve construction of supply bases, roads, helicopter landing pads, pipelines, processing plants, employee housing, and other infrastructure.

The transition from exploration to production generally occurs over a few years. Production lasts as long as the reserve allows. Leonov (1999) suggested that production typically lasts for 20 to 40 years.

IMPACTS DURING DEVELOPMENT, PRODUCTION, AND TRANSPORTATION

Development, production, and transportation cause a number of impacts on the marine environment that may be much more significant than those introduced through exploration alone (Canada 1999). By the time production is in progress, impacts are no longer local but are regional due to the variety and scope of OOGD activities (Leonov 1999). These phases represent a long period in which many impacts are sustained, and accidental events may occur.

Noise

Noise is generated during well drilling, dredging, pile driving, and the servicing required for such activities. In production, noises are generated during extraction, equipment maintenance, servicing via vessel and aircraft, and from tankers and other vessels. In addition, further exploration activities may continue generating additional noise.

Marine life exhibit a variety of responses to offshore development, production, and transportation noise; however, research suggests that impacts are minor and/or insignificant. While some studies reported that cetaceans exhibit avoidance responses up to eight km away, other studies reported that cetaceans are often observed near drilling rigs, and may become habituated to their presence (Richardson et al. 1995). AGRA (1998) wrote

> . . . the fact that fish are well-known to be attracted to offshore drilling and production platforms indicates that fish adapt well to noises associated with offshore development activities (46).

Kenchington (1997: 75) concluded that underwater noises from platforms are unlikely to have any "remotely significant impacts." However, relatively little research has investigated the impacts of operational noise on many species.

Physical Changes at Drilling Sites

At the seabed, habitat is altered and destroyed during installation of offshore structures and pipelines. However, new habitat that may accommodate some species is provided by disturbed sediment. Areas occupied by structures also provide habitat protection as waters surrounding offshore structures and pipelines are typically closed from fishing. The areal extent of physical impact is determined by the number of offshore wells, the number of pipelines, and the size of areal exclusions around platforms created by regulations.

The structures themselves also alter marine habitat. Seabirds, squid, and fish are attracted to offshore structures due to lighting and structural stimuli, and concentrations of food (Wiese et al. 2001). However, some species also incur impacts. Impacts on fish and squid are highly localized and are generally considered negligible (Husky Oil 2001b in JWEL 2001). Impacts on birds tend to be much more serious (Wiese et al. 2001). Birds tend to fly into lights and flares, and consequently are often injured or killed (Wiese and Montevecchi 2003; Wiese et al. 2001). Mortality rates are generally low (JWEL 2001), though these rates may be larger during periods of migration (Wiese et al. 2001). In addition, birds tend to circle offshore structures for long periods of time. In the process, birds consume energy stores, delay feeding, migration or other activities (Wiese et al. 2001; Avery et al. 1978, Bourne 1979, Sage 1979, and Wood, 1999 all in JWEL 2001). Overall, the environmental impact associated with the physical presence of offshore structures is poorly understood (Wiese and Montevecchi 2003; Wiese et al. 2001). In reference to Newfoundland offshore platforms, Wiese et al. (2001) noted:

> . . . despite the attention these negative impacts . . . have received and their mention in past environmental assessment reports, the extent of these problems has not been quantified (1287).

Pollution

The most substantial impacts of the development and production phases may be due to the discharge of a variety of pollutants to the marine environment. Discharges include those from further drilling, hydrocarbon extraction, miscellaneous routine activities, and spills. Discharges unique to production include produced water, produced sands, a number of miscellaneous wastes, and accidental releases. It may be possible to have zero emissions of drilling wastes, but as Strong et al. (2002: 27) point out, there appears to be "no site where this is currently the standard practice."

Produced Water: During production, "produced water," which naturally occurs within, or near subsurface oil and gas formations, is extracted along with hydrocarbons. Produced water is typically separated from extracted hydrocarbons on production platforms, and then discharged into the ocean with little or no treatment to remove contaminants. Rising concern over the impacts of produced water on ambient water quality has lead some jurisdictions to require its disposal onshore, or in some cases, to reinject it into formations (RSC 2004). In terms of volume, produced water is the greatest discharge from offshore platforms. Up to 3,000 tons of produced water are typically discharged per platform per day (Canada 1999; Kenchington 1997). Hawboldt (2003) noted that Hibernia releases 25,000 to 99,000 m^3 per month. Patin (1999) noted that up to 20,000 m^3 of produced water are discharged daily from some platforms in Russian waters.

Produced water contains both constituents characteristic of the geology of the formation, as well as constituents added during different stages of drilling and extraction. As such, the composition

of produced water is ever changing and difficult to predict (Patin 1999). Typical constituents of produced water include hydrocarbons, greases, barium, heavy metals (such as cadmium, lead, magnesium, benzene, sodium, potassium, and ions of chloride and sulfide), and various chemical additives including corrosion inhibitors, polymers, descalers, biocides, dispersants, emulsion breakers, and others (Kenchington 1997). In addition, produced water frequently contains high levels of naphthalenes, as well as NORMs, such as radium-226 and radium-228 (Patin 1999). Produced water is often not saline, is a higher temperature, and a different pH than seawater (JWEL 2001; Kenchington 1997). Kenchington (1997) wrote

> . . . in short, [produced water] is a hot, contaminated brine, with a chemical composition quite different to that of seawater (69).

Produced water discharged to the marine environment disperses and dilutes rapidly. At its point of release, produced water discharges may be hot enough to cause thermal shock in some organisms; however, Husky (in JWEL 2001) suggested that water temperature should return to ambient levels within 50 m of discharge points. Acute toxicity is only expected in the immediate vicinity of outlets (Nihoul and Ducrotoy 1994) and is considered negligible greater than two km away (Kenchington 1997; Stroemgren et al. 1995).

Nonetheless, dilute concentrations of produced water impact marine life. Sessile organisms are the most likely to be impacted from chronic discharges, though mobile species may also be affected. Studies have indicated that produced water impacts benthic (bottom dwelling) organisms (Din and Abu 1992, Krause et al. 1992, Osenburg et al. 1992, Rabalais et al. 1992, Raimondi and Schmitt 1992 in JWEL 2001), kelp (Reed, Lewis, and Anghera 1994), sea urchins (Cherr and Fan 1997; Krause 1994), mussels (Cherr and Fan 1997), and the eggs and larvae of haddock, lobster, and scallop (Cranford et al. 1998 in Canada 1999).

Concern regarding produced water is varied. Both Kenchington (1997) and GESAMP (1993) concluded that impacts should be marginal beyond half a kilometer from discharge points in most oceanic waters. In contrast, others argued that contamination and impact may be occurring at distances from discharge points much further than commonly thought (Lee 2003; GESAMP 1993; Kingston 1992). Some contaminants—such as heavy metals—appear to bioaccumulate (Canada 1999), and the long-term impacts of chronic discharges of produced water are poorly understood (Strong et al. 2002). In addition, Higashi and Crosby (1999) suggested that much, if not most, research on the affects of produced water may be flawed. Clearly, more research is required to investigate the impacts of produced water on marine life.

Miscellaneous Discharges: During production, small volumes of produced sand are discharged alongside produced water. Produced sand often contains a variety of toxic constituents, including hydrocarbons and radioactive elements. In turn, the deposition of produced sands alters seabed sediment texture (Bornholdt and Lear 1997).

A miscellany of other pollutants is typically discharged during offshore oil and gas production. Such discharges include wash and drainage water, sewage and sanitary waste, losses from process equipment, minor spills and leaks—including fuels, lubricants, hydrocarbons, and any of the other chemicals on board—water from fire hoses, platform run-off, fire-fighting foam, well work-over fluids, well-bore fluids, well-treatment fluids, desalinator brine, ballast, chlorinated and high temperature cooling water, sludge from mud treatment, hypochlorite, glycols,

cementing discharge, cement and other dusts, antifouling compounds, and other miscellaneous pollutants (Patin 1999).

To date, impacts associated with these discharges have not been well described. According to Mobil (1985 in JWEL 2001), an average platform with 100 personnel discharges approximately 40 m^3 gray water and 19 m^3 black water daily. Garbage and debris are usually lost to the sea. In the Gulf of Mexico, 13% of marine debris is attributed to the offshore industry (Bornholdt and Lear 1997). Chemicals in antifouling paints leach into the marine environment from ship hulls and other surfaces and have been found to adversely affect marine life and persist in the marine environment (International Maritime Organization (IMO) undated). According to the IMO, some antifouling paints contain tributylin, which causes deformations in oysters and sex changes in whelks. However, as the quantities of these miscellaneous pollutants are generally small, only minor, local impacts are typically expected (JWEL 2001; Husky Oil 2000 in JWEL 2001; Kenchington 1997).

Marine vessels—including vessels used in industries aside from OOGD—also discharge many of these same, as well as other, pollutants. While OOGD activities may not add a substantial volume of vessel traffic in some regions, the impact associated with their use must be considered. Ballast water, used to maintain the stability of vessels and offshore structures, are discharged routinely. While regulations in Canada currently require ballast to be cleaned of oil, the allowable concentrations remain a source of pollution (JWEL 2001). Ballast water are also associated with alien species introductions as vessels collect water in one locale and discharge it elsewhere (JWEL 2001). The European green crab was recently introduced to San Francisco Bay through ballast water and is currently migrating up the West Coast threatening indigenous crab populations (Strong et al. 2002). Alien species can cause significant, permanent, ecological impacts in marine ecosystems (IMO undated; Strong et al. 2002; Primack 1993). Contaminated bilge water is also linked to bird kills in coastal waters, and may be an important contributor to beach tar (GESAMP 1993). Ballast and bilge waters contain hydrocarbons, lead, chlorinated dibenzodioxins, and other toxic contaminants (GESAMP 1993). While the acute toxic impacts of these discharges may be negligible, these contaminants contribute to chronic pollution of waters, tend to concentrate at the sea surface, in seabed sediments, and may be chronically toxic to species using these areas (Patin 1999; GESAMP 1993).

Spills and Pollution: The pollution around production platforms from discharges mentioned thus far are added to by frequent spills. This topic is explored in detail in section 2.4.

Air Pollution: OOGD is a significant contributor of air pollution. Sources include engine combustion (such as generators, ships, and production facilities), well fluid burning during production tests and clean-ups, as well as flaring and fugitive gas venting during production, treatment, transportation, and storage (JWEL 2001; Leonov 1999; Patin 1999). Air pollutants include nitrogen oxides, sulfur oxides, carbon monoxide, carbon dioxide, particulate matter, unburned hydrocarbons, volatile organic compounds, and hydrogen sulfide (JWEL 2001; Patin 1999; Bornholdt and Lear 1997; Lindberg, Roekke, and Celius 1990 in Leonov 1999).

Combined, these activities contribute substantial volumes of air pollution. For example, in 1998, almost 25 million tonnes of air pollutants were released by U.K. offshore and associated onshore facilities and equipment[2]. And while flaring is expensive to OOG companies, flared gases from oil and gas production facilities provide roughly 30% of the gross world production of gaseous hydrocarbons and are one of the major sources of atmospheric emissions in the world (Patin 1999). Up to 300 m^3 of gas may be flared for each ton of extracted oil (Patin 1999).

OOGD air pollution has a number of associated environmental impacts. First, air pollution contributes to global greenhouse gas emissions and climate change. Second, air pollutants react in the atmosphere and fall onto nearby sea and land surfaces (GESAMP 1993). Such residue is sometimes present in volumes large enough to create oil slicks (Kingston 1991 in Patin 1999). Third, the emissions contribute to local air pollution (Patin 1999; Bornholdt and Lear 1997). Smog is formed from the photochemical interaction of nitrogen oxides and volatile organic compounds, and is linked to a number of human respiratory diseases. JWEL (2001) concluded that air pollution impacts of OOGD are negligible. Bornholdt and Lear (1997), however, cautioned that OOGD activities in the U.S. contribute to regional air quality degradation.

Onshore Impacts

Onshore, OOGD is also associated with a number of environmental impacts. Air pollutants released by equipment onshore contribute to global greenhouse gas emissions, smog, and the general contamination of the environment. Liquid and solid wastes from offshore and onshore activities are often disposed of onshore, and thus can cause impacts. Spills also occur at onshore facilities, transfer points, and during land transportation. Onshore facilities require land bases and thus alter shoreline and inland habitat. Finally, the noise, traffic, and aesthetic impact of onshore infrastructure and activities affect humans and other organisms alike.

[2] United Kingdom Offshore Operators Association website "Atmospheric Emissions", www.ukooa.co.uk/issues/1999report/enviro99_atmospheric.htm; accessed 5 May 2004.

2.4 SPILLS

The OOG industry has a lengthy history of spills. Globally, tanker spills of greater than 51 barrels accounted for over 39 million barrels of lost oil between 1974 and 2003, as recorded by the International Tanker Owners Pollution Federation Limited (ITOPF) (undated(a)). In the U.S. Outer Continental Shelf, the Minerals Management Service (MMS) recorded over 31 million barrels lost in spills between 1974 and 1997 (U.S. DOI 1997a). The largest oil spill in history was caused by the 1979 blowout from the *Ixtoc I* offshore production facility, which released more than three million barrels of oil into the Gulf of Mexico over a 10-month period. The largest tanker spill in history occurred in the same year when the *Atlantic Empress* spilled just over two million barrels of oil off Tobago, West Indies. The *Exxon Valdez* spill, in which roughly 260,000 barrels of oil were spilled into Prince William Sound in Alaska in 1989, ranks 34th in size. Major spills resulting from blowouts, tanker, and pipeline accidents are listed in tables 2.1 and 2.2. Conversion factors are presented in appendix A.

TABLE 2.1: BLOWOUTS >10,000 BARRELS

LOCATION OF BLOWOUT	REPORTED SPILL SIZE (BARRELS)	YEAR
Mexico – Ixtoc 1	3,000,000	1979
Dubai	2,000,000	1973
Mexico	247,000	1986
Nigeria	200,000	1980
North Sea – Norway	158,000	1977
Iran	100,000	1980
U.S.A. – Santa Barbara	77,000	1969
Saudi Arabia	60,000	1980
Mexico	56,000	1987
U.S.A. - S. Timbalier 26	53,000	1970
U.S.A. - Main Pass 41	30,000	1970
U.S.A. - Timbalier Bay – Greenhill	11,500	1992
Trinidad	10,000	1973
Canada – Uniake G72	**1,500**	**1984**

Source: RSC 2004; Johnston and Hildebrand 2001

Fortunately, spill frequency and volumes are declining due to improvements in practices, technology, and regulations despite increases in hydrocarbon production and transportation (RSC 2004; Etkin 2001; JWEL 2001; Anderson and LaBelle 2000). ITOPF (undated(a)) reported that the quantity of oil spilled globally in large (>51 barrels) spills declined from roughly 23 million barrels in the 1970s to just over 8 million barrels in the 1990s. U.S. data also show declining trends (fig. 2.2 and fig 2.3)[3].

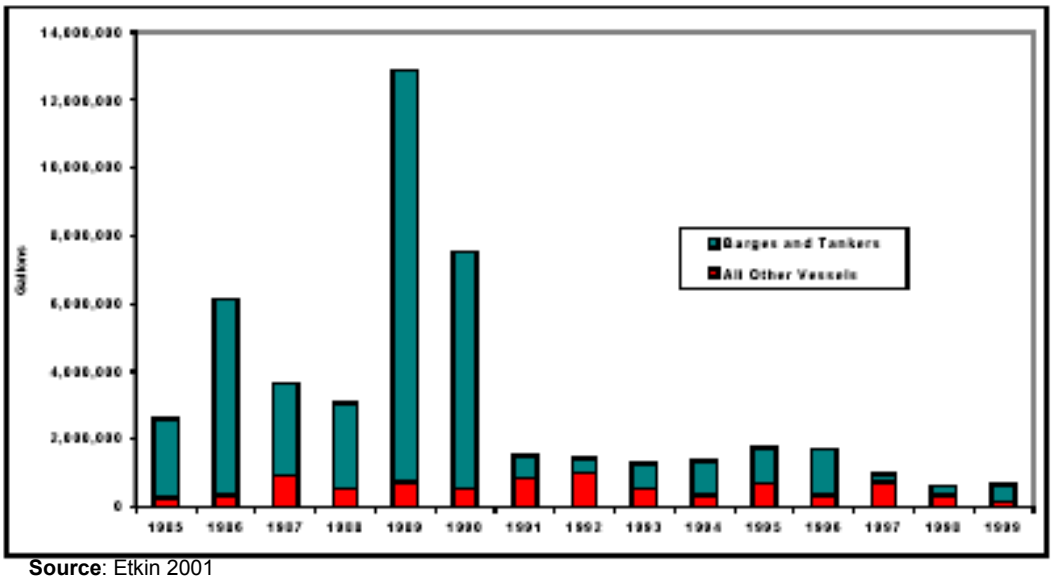
[3] However, spill data should be treated with caution because of underreporting of spills. A 1987 Dutch audit found that the number of spills around installations was in excess of the statistics reported to authorities (Nihoul and Ducrotoy 1994).

Despite decreases in accident rates, spills continue to occur. Environment Canada (undated) notes that with current levels of tanker traffic, Canada can expect over 100 "small" spills, roughly 10 "moderate" spills, and at least one "major" spill offshore each year. Furthermore, Environment Canada notes that a "catastrophic" spill over 10,000 tonnes may occur once every 15 years.

TABLE 2.2: SUMMARY OF MAJOR SPILLS DURING TRANSPORT

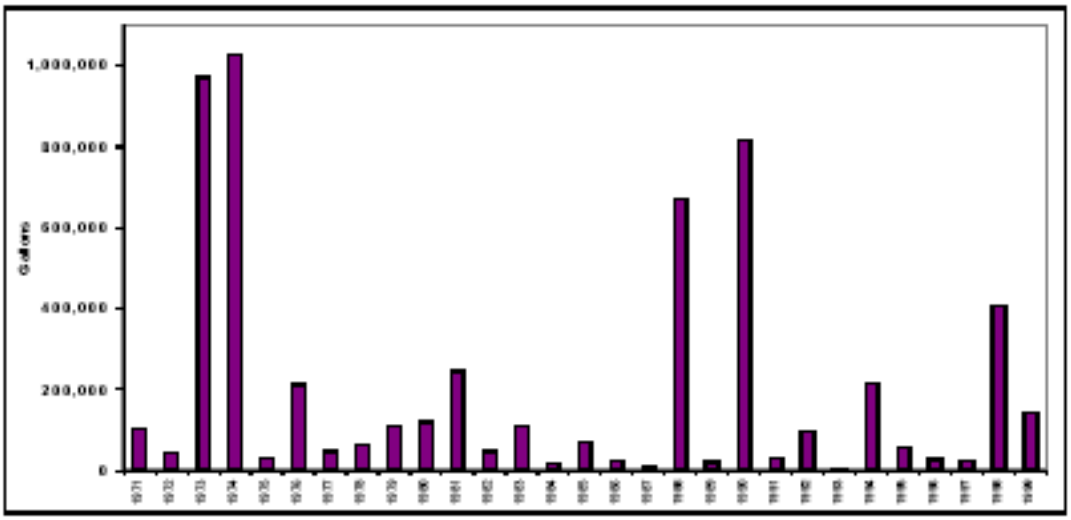
SPILL	LOCATION	SIZE (BARRELS)	YEAR	SIZE RANK
Atlantic Empress (tanker)	Off Tobago, West Indies	2,095,100	1979	1
ABT Summer (tanker)	700 nautical miles off Angola	1,898,000	1991	2
Castillo de Bellver (tanker)	Off Saldanha Bay, South Africa	1,839,600	1983	3
Odyssey (tanker)	700 nautical miles off Nova Scotia	963,600	1988	6
Prestige (tanker)	Off Spain	562,100	2002	16*
Exxon Valdez (tanker)	Prince William Sound, Alaska	270,100	1989	34
Arrow (tanker)	Off Nova Scotia	65,450	1970	unknown
West Delta 73 (pipeline)	U.S. Outer Continental Shelf	160, 638	1967	unknown
Eugene Island 317 (pipeline)	Off New Jersey, U.S.A.	19,833	1974	unknown

Source: ITOPF undated(a); Anderson and LaBelle 2000



Source: Etkin 2001

FIGURE 2.2: TOTAL AMOUNT OF OIL SPILLED FROM VESSELS INTO U.S. WATERS, 1985 TO 1999



Source: Etkin 2001

FIGURE 2.3: TOTAL ANNUAL SPILLAGE FROM U.S. OUTER CONTINENTAL SHELF FACILITIES, 1971 TO 1999.

RISK ASSESSMENT

Estimating risk of hydrocarbon spills from OOGD is complex. Risk can be estimated by size of spill on an annual, or project life-cycle basis. Risk assessments can be based on historical rates that may or may not be adjusted for factors affecting probability of occurrence such as changing technology and other factors. Risk assessments may also be based on a low number of observations, which reduces confidence levels of prediction.

FEP (RSC 2004) provided probability assessments of blowouts based on industry estimates in its report on OOGD (table 2.3). The information illustrated that the risk of a blowout is small, ranging from 1/6,666 during exploratory drilling to 1/40,000 during production for spills greater than 10,000 barrels. This is generally consistent with other estimates (Environment Canada undated; U.S. DOI 2002a; Johnston and Hildebrand 2001; U.S. DOI 1997a; Sakhalin-1 1994 in Patin 1999). FEP (RSC 2004) pointed out that these risk estimates may be high because they are based on averages over a longer period that do not take into account the declining rates of spills.

TABLE 2.3: PROBABILITIES OF BLOWOUTS AT PLATFORMS BASED ON GLOBAL HISTORICAL RATES

PHASE OF DRILLING	PROBABILITY OF BLOWOUT >10,000 BARRELS	PROBABILITY OF BLOWOUT >150,000 BARRELS
Exploratory drilling	1.5×10^{-4} (1 in 6,666)	2.86×10^{-5} (1 in 34,965)
Well development	7.8×10^{-5} (1 in 12,820)	3.9×10^{-5} (1 in 25,641)
Production or workover	2.5×10^{-5} (1 in 40,000)	1×10^{-5} (1 in 100,000)

Source: after RSC 2004

Risk analyses, however, can result in a misleading impression of the risks associated with OOGD in B.C. for several reasons. First, probability estimates are often provided only for large spills. Smaller spills, which can also cause significant damage, are much more frequent. Offshore Newfoundland and Labrador, for example, there were 138 spills less than 1,000 barrels during exploration drilling and production between 1997 and 2002[4]. In the U.S. Outer Continental Shelf, there were 20,074 spills less than 1,000 barrels from production facilities and transport equipment between 1985 and 1999 (Anderson and LaBelle 2000). Second, the probabilities of spills from other sources such as transportation must also be considered. As the analysis for the Sable Offshore Energy Project in Nova Scotia shows (table 2.4), spills from transportation are a significant component of the potential risk. While tankers currently transport hydrocarbons along the outer margins of the West Coast of B.C., any OOGD within the QCB will introduce tanker traffic and/or pipelines for transporting hydrocarbons in this inner region. Third, risk estimates are often presented in terms of individual OOG developments or activities, such as on a per well/year basis. The probability of a spill for an entire project, such as B.C. OOGD, is the summation of these probabilities over the 15- to 20-year span of the project for all activities.

TABLE 2.4: PROBABILITIES OF SPILLS DURING TRANSPORT OVER THE LIFE OF THE SABLE OFFSHORE ENERGY PROJECT, NOVA SCOIA

TYPE OF SPILL	PROBABILITY
Condensate tanker spill < 1,000 barrels	4 (-)
Condensate tanker spill ≥ 1,000 barrels	0.071 (1 in 14)
Condensate tanker spill ≥ 10,000 barrels	0.043 (1 in 23)
Condensate tanker spill ≥ 150,000 barrels	0.012 (1 in 83)
Pipeline rupture ≥ 1,000 barrels	0.078 (1 in 13)
Pipeline rupture ≥ 10,000 barrels	0.026 (1 in 38)

Source: after Kenchington 1997

A relevant assessment of oil spill risk for B.C. OOGD is provided in the Cook Inlet environmental assessment (EA) for proposed expansion of the Alaska OOG industry (U.S. DOI 2002a). The proposed project includes drilling of four exploration wells and production of 140 million barrels of oil and 190 BCF of gas over about a 20-year production period. This is comparable to probable development scenarios for B.C. (Bridges 2003a). The Cook Inlet study, which uses more recent analysis than FEP, predicted that there will be 484 small spills (less than 1,000 barrels), and a 19% probability of a large oil spill greater than 1,000 barrels over the life of the project (U.S. DOI 2002a). As the Cook Inlet EA shows, spills are a common and inevitable occurrence in OOGD. Although, spill risks vary with the size of projects, the Cook Inlet risk assessment provided an order of magnitude estimate of the spill risk facing B.C. OOGD.

[4] C-NOPB website "Exploration and Production Hydrocarbon Spill Information, Newfoundland and Labrador Offshore Area, www.cnopb.com; accessed 5 May 2004.

FATE OF HYDROCARBONS FOLLOWING SPILLAGE INTO MARINE ENVIRONMENT

When liquid hydrocarbons are spilled, they are rapidly acted upon by a number of physical, chemical, and biological "weathering" processes. Spills at the water's surface rapidly spread into slicks millimeters thick, and continue to spread, eventually covering substantial areas of the sea surface (Patin 1999). Patin (1999) noted that a spill from a tanker carrying 5,000 to 50,000 tons (roughly 36,500 to 365,000 barrels) can spread to cover an area of 50,000 km^2. Slicks immediately begin moving with the prevailing water flow regime and may break into many 'windrows' parallel to the wind direction. In the process, slicks may travel very long distances. In underwater releases, hydrocarbons spread through the water column and drift with currents; portions of underwater spills will reach the surface.

Concurrently, hydrocarbons dissolve, evaporate, emulsify, disperse within the water column, aggregate into lumps or tar balls, oxidize, enter the sediment, adhere to shorelines or other surfaces, and absorb into the ecosystem (Environment Canada undated; ITOPF undated(b); Crawford et al. 2002; Patin 1999). Liquid hydrocarbons are typically moved by waves and currents to near shore subtidal areas (U.S. National Oceanic and Atmospheric Administration (U.S. NOAA) 1997; Carlson and Kvenvolden 1996; O'Clair et al. 1996). When gas is spilled, most of its volume evaporates, and a small portion dissolves (U.S. DOI 2002a; Patin 1999). However, little is known regarding the behavior of gas once released in the marine environment (Patin 1999).

The recent Cook Inlet EA indicated that if a spill >1,000 barrels did not strike shore first, 50% would remain after 30 days and would cover an area on the sea surface greater than 1,000 km^2 (U.S. DOI 2002a). Spills <1,000 barrels would degrade in less than 10 days over about 50 km^2 (U.S. DOI 2002a). Unfortunately, history demonstrates that substantial portions of spills reach shorelines before they are completely weathered at sea (Patin 1999).

IMPACT OF LIQUID HYDROCARBON SPILLS

Spills can cause immediate and harmful impacts on exposed marine communities (table 2.5). Following the relatively large *Exxon Valdez* oil spill, for example, an estimated 2,800 sea otters, 250,000 birds, 1.9 million salmon, and 12.9 billion herring were killed (Brown et al. 1996; Geiger et al. 1996; Piatt and Ford 1996; Garrott et al. 1993 in Rice et al. 2000), and impacts—some severe—were noted in many other marine life inhabiting the area (Spies et al. 1996). The immediate effects of spills on marine life are also compounded by linkages within ecosystems, as impacts in one species can lead to impacts in other species (Birtwell and McAllister 2002).

Specific impacts, however, are difficult to predict because many factors determining impacts are poorly understood and are unique to the nature of the spill and the local environment (Birtwell and McAllister 2002; Strong et al. 2002; Wells et al. 1995). One factor influencing impacts is hydrocarbon toxicity, which is a function of the specific chemical composition of the spilled hydrocarbon (Birtwell and McAllister 2002; Patin 1999; GESAMP 1993). Generally, impacts occur when dissolved oil concentrations reach about 0.01 to 0.001 mg/L (Leonov 1999; Patin 1999). Gas condensate toxicity is compounded by the addition of methanol, which is often introduced to prevent hydrate formation in pipelines or other equipment. Methanol is highly soluble and toxic, but the specific nature of its impact is inadequately studied (Patin 1999).

TABLE 2.5: SUMMARY OF LITERATURE REGARDING IMPACT OF LIQUID HYDROCARBON SPILLS ON MARINE LIFE

LIFE TYPE	SPECIFIC IMPACTS NOTED	REFERENCES
Microbes	Increase in abundance of some species	Braddock et al. 1996
Copepods	(none specifically noted)	Wertheimer et al. 1996
Intertidal communities, including invertebrates and vegetation	• ***General:*** lethal and sublethal effects • ***Invertebrates:*** lethal and sublethal effects, including premature egg release; reduced mating; reduced brood size; effects on success and timing of moulting; increased oxygen consumption; reduced feeding; reduced growth rate; narcotization; impaired movement • ***Vegetation:*** lethal and sublethal effects, including smothering; poisoning; habitat destruction; growth due to herbivore decline	• Driskell et al. 1996; Highsmith et al. 1996; Jewett et al. 1996; Lees, Houghton, and Driskell 1996; Spies et al. 1996; Stekoll et al. 1996. • Strong et al. 2002; AGRA 1998; Dean et al. 1996; Ebert and Lees 1996; Fleeger et al. 1996; Highsmith et al. 1996; Hooten and Highsmith 1996; Houghton et al. 1996; Jewett, Dean, and Laur 1996; Stekoll et al. 1996; Johns and Pechenik 1980 in JWEL 2001; Johnson 1977, Rice et al. 1977 in Strong et al. 2002 • Strong et al. 2002; JWEL 2001; Bornholdt and Lear 1997; Dean, Stekoll, and Smith 1996; Duncan and Hooten 1996; Van Tamelen and Stekoll 1996
Fish	Lethal and sublethal effects, including coating of gills; inhibited or modified feeding behaviour; long-term physiological and behavioral impacts; reproductive and immune system effects; behavioral abnormalities; genetic damage; reduced growth; decreased larval production; disease; population-level and potentially ecosystem-level impacts	Strong et al. 2002; Rice et al. 2000; Carls, Rice, and Hose 1999; Leonov 1999; AGRA 1998; Brown et al. 1996; Carls et al. 1996a; 1996b; Collier et al. 1996; Geiger et al. 1996; Hepler et al. 1996; Hose et al. 1996; Laur and Haldorson 1996; Norcross et al. 1996; Templin et al. 1996; Weidmer et al. 1996; Wertheimer and Celewycz 1996; Willette 1996; Pearson et al. 1995; GESAMP 1993; U.S DOI 2001; Husky Oil 2000, Marty et al. 1997, Trudel 1985, Foy 1982, Berman and Heinle 1980, Berdugo et al. 1979, and Kuhnhold 1974 all in JWEL 2001; Murphy et al. 1999 in Rice et al. 2000; Howarth 1991 in Kenchington 1997; Pearson et al. 1984, Sindermann 1982 both in Birtwell and McAllister 2002
Birds	Lethal and sublethal effects, including loss of waterproofing; hypothermia; drowning; stress; altered immune function; altered metabolic function, breeding success, and chick success; potentially indirect reproductive failure due to nest and chick abandonment by parents	Weise et al. 2001; Briggs, Gershwin, and Anderson 1997; Bernatowicz et al. 1996; Ford et al. 1996; Irons 1996; Oakley and Kuletz 1996; Piatt and Ford 1996; Sharp et al. 1996; Boersma et al. 1995; Erikson 1995; Johnson and Garshelis 1995; Rattner et al. 1995; Wiens 1995; U.S. DOI 2001, Weise 1999, Hartung 1995, Leighton et al. 1995, Stubarrelefield et al. 1995, Stout 1993, Khan and Ryan 1991, Harfenist et al. 1990, Eppley and Rubega 1990, Hughes et al. 1990, Butler et al. 1988, Clark 1984, Parnell et al. 1984, Trivelpiece et al. 1984, Albers and Gay 1982, Peakall et al. 1980, 1982, Ainley et al. 1981, Szaro et al. 1981, Macko and King 1980, McEwan and Whitehead 1980, Vangilder and Peterle 1980, Hoffman 1978, 1979a, 1979b, Holmes et al. 1979, Albers 1977, 1978, Albers and Szaro 1978, Holmes et al. 1978, Lawler et al. 1978, Miller et al. 1978, Hartung and Hunt 1966, Hartung 1965 all in JWEL, 2001.

Marine mammals	Lethal and sublethal effects, including loss in waterproofing and thermoregulatory capability; drowning; hypothermia; starvation due to the increased energy needs to compensate for heat loss; stress responses; reduced ability for parents to recognize young when young are oiled; increased exposure from contaminated haulout sites; may be exposed to greater predation rates; external oiling; fouling of baleen; avoidance and behavioral effects; sublethal poisoning; reduced diversity in prey; reduced diving ability; increased oxygen consumption	Strong et al. 2002; JWEL 2001; Loughlin, Ballachey, and Wright 1996; Ballachey 1994; Frost et al. 1994; Harvey and Dahlheim 1994; Lipscomb et al. 1994; Loughlin et al. 1994; Lowry et al. 1994; Matkin et al. 1994; Spraker et al. 1994; St. Aubin and Geraci 1994; Ziegesar et al. 1994; AGRA 1998; Baker et al. 1981 in U.S. DOI 2002a; U.S. DOI 2001, Bence and Burns 1995, Smultea and Wursig 1995, Geraci 1990, Wursig 1990, Yochem et al. 1987, Engelhardt 1985, St. Aubin et al. 1985, 1984, Boulva and McLaren 1979, Engelhardt et al. 1977, Geraci and Smith 1976, all in JWEL, 2001; Ben-David, Duffy, and Bowyer 2001, Ben-David, Williams, and Ormseth 2000 both in U.S. DOI 2002a
Terrestrial animals	Lethal and sublethal effects, including poisoning through ingestion of contaminated food sources and/or ingestion from cleaning activities, and absorption through skin; loss of shoreline habitat	Lewis and Sellers 1991 in U.S. DOI 2002a

Biological factors also influence the impact of spills. Organisms living at the sea surface, in intertidal zones, and in river estuaries and other coastal habitat—such as seabirds, juvenile salmon, and larvae—are impacted most severely (Strong et al. 2002; GESAMP 1993). In addition, organisms that are immobile—such as mollusks—are particularly vulnerable. Organisms that cannot detect pollution—such as Dungeness crab larvae—are even more vulnerable. In some cases, organisms may not be able to leave a contaminated area, even if they can detect the pollutants and are thus adversely affected (Husky Oil 2000 in JWEL 2001; AGRA 1998; GESAMP 1993).

Early life stages in marine life are very susceptible to the impact of spills (Birtwell and McAllister 2002; GESAMP 1993; Kovaleva and Mazmanidi 1978 in Leonov 1999). Early life stages are up to 10 times as sensitive as adults to hydrocarbon pollution and are adversely affected at concentrations less than a part per billion (Carls, Rice, and Hose 1999; Leonov 1999; U.S. DOI 2001, Rice 1985, Moore and Dwyer 1974 all in JWEL 2001; Howarth 1991 in Kenchington 1997).

Spill size affects impact; however, the relationship is complex due to the influence of other factors such as location and timing of a spill, and ecological vulnerability (Burger 2003; U.S. NAS 2003b; Wiese and Montevecchi 2003; Birtwell and McAllister 2002; Kenchington 1997). FEP (RSC 2004) noted, for example, that the 1993 *Braer* spill off the U.K., which released almost 600,000 barrels, only resulted in sublethal impacts in gray seals compared to the high mortalities following the smaller *Exxon Valdez* spill. As such, smaller spills can cause significant environmental damage. The Cook Inlet EA (U.S. DOI 2002a) predicted that the impacts of a 1,500-barrel spill in Cook Inlet, Alaska would be as follows:

- Water quality in the vicinity of the spill would be at chronic toxicity levels for up to 30 days.
- Up to 38 km of shoreline would be contaminated for up to a decade.
- Local intertidal and subtidal organisms would be affected for up to a year.
- Mortalities of some adults and millions of young fish would occur, and recovery could require multiple generations.
- Fish may also become tainted, resulting in closure of some or the entire affected fishery.
- Impacts to fish habitat would last for more than a decade due to residual oil.
- Tens of thousands of birds would be killed and recovery could take up to a few generations.
- Small numbers of resident marine mammals would be killed and recovery would be expected within five years.
- Similarly, a small number of terrestrial mammals would be killed with recovery within three years expected.

IMPACT OF GAS SPILLS

Like liquid hydrocarbons, the toxicity of natural gas is a function of its composition. Natural gas is primarily composed of methane, but also often contains related organic compounds, as well as carbon dioxide, hydrogen sulfide, and other components (Patin 1999). Currently, only limited data on the impacts of natural gas in the marine environment are available (Patin 1999).

Knowledge of the effect of natural gas on marine life is derived from research on the effects of other gases on organisms. Research has suggested that minor exposure to gas may induce behavioral responses, while heavy exposure affects functional systems, through physiological, narcotic, and toxic effects (Patin 1999). Toxicity of gas is greater in higher temperatures and lower oxygen environments (Patin 1999). Field observations, and the limited medical literature on the effects of natural gas, support these assertions (Patin 1999). Gas hydrocarbons appear to cause effects if concentrations reach about 1 mg/L, but potentially as low as 0.02 mg/L (Patin 1999).

The factors that influence the impact of liquid hydrocarbon spills—size of spill, location, timing, species, and life-stage sensitivity—also influence the impact of gas spills. One of the differences between the impacts of the two types of hydrocarbons is the type of habitat affected. While gas—like oil—tends to accumulate at the water's surface, a submarine gas spill (such as in the case of a blowout at the seabed) results in pollution of the water column. Such spills put subsurface species at risk. Gas spills can also lead to flameless explosions due to rapid evaporation of liquefied gas on the water's surface, formation of gas clouds, and combustion. Patin (1999) suggested that these types of explosions can cover areas of up to 400 km^2 with obviously dire consequences.

Empirical data on the impacts of gas spills are limited. However, data from Russian blowouts in the 1980s show mass fish mortalities, numerous pathological changes in fish both near and distant from the sites, effects on zoobenthic organisms, and declines in benthos biomass (Patin 1999).

DURATION OF IMPACTS FROM SPILLS

The duration of environmental impacts is a key factor in assessing the risks of OOGD. Initial studies of impacts in Prince William Sound, Alaska following the *Exxon Valdez* oil spill suggested that species generally recover in less than five years (Rice et al. 1996; Wells, Butler, and Hughes 1995; Loughlin et al. 1994); however, recent research indicated that impacts from spills can last much longer. Peterson et al. (2003) found that a number of species were still showing signs of serious impacts from the *Exxon Valdez* oil spill by 2003, 14 years after the spill.

One of the most important factors influencing the time span of impacts appears to be the degree that oil is retained in shoreline sediments. In beaches composed of coarser materials, such as gravel and cobbles, oil can persist for long periods (U.S. NOAA 1997; GESAMP 1993). In 2003 in Prince William Sound, relatively unweathered oil from the 1989 *Exxon Valdez* spill remained in shoreline sediments (Peterson et al. 2003). In some places, oil infiltrated shoreline sediment up to 10 m deep (Rice et al. 2000; U.S. NOAA 1997; Carlson and Kvennolden 1996; O'Clair et al. 1996; Spies et al. 1996; Weidmer et al. 1996; Michel and Hayes 1992, 1991 in Spies et al. 1996). Reddy et al. (2002) found that near-surface marsh sediments in the eastern U.S. retained appreciable amounts of oil from a 1969 spill, and concluded that oil could persist indefinitely in the sedimentary record.

Such retention provides for a long period of leaching of hydrocarbon compounds into the marine environment. Weathering removes lighter aromatic fractions of hydrocarbons at a faster rate than

heavier, more toxic fractions (Rice et al. 2000; Carls, Rice, and Hose 1999; Heintz, Short, and Rice 1999; Spies et al. 1996; GESAMP 1993). The end result is a long period of toxic contamination of marine ecosystems. In light of these facts, Strong et al. (2002) described the *Exxon Valdez* oil spill's legacy of impact as a transformation from a point source, to a nonpoint source, problem.

CLEAN-UP STRATEGIES AND THEIR IMPACTS

Oil spills may be cleaned up using a variety of techniques. Spills on the sea surface are sometimes corralled by floating booms so that specially equipped boats can skim oil from the surface. Another technique involves spraying chemical control agents over the spill or impacted area. Dispersants—a chemical agent—are used to speed up natural degradation and weathering in the water column. Dispersants are also applied to shorelines prior to their contact with hydrocarbons to minimize adhesion. Affected shorelines are often cleaned by hand in a very labor-intensive process. Oil-eating bacteria are also sometimes used in a technique called "bioremediation." Other times, hydrocarbons are simply ignited.

Unfortunately, clean-up efforts to date have had little success. A mass balance estimate of the *Exxon Valdez* oil 2.5 years after the spill found that the intensive clean-up effort removed only 14% of the oil (Spies et al. 1996). Others report that only 5-15% of oil from spills is ever recovered or cleaned up (Ocean Conservancy 2003; Clarke 1990; Holing 1990). To make matters worse, clean-up efforts can injure wildlife and hamper recovery (Burger 2003; Peterson et al. 2003; Strong et al. 2002; Houghton et al. 1996; Spies et al. 1996). For example, dispersants destroy water repellency and insulating capacities of fur- or feather-bearing animals, and have a toxic effect on young life stages of fish and other biota, (Strong et al. 2002; U.S. NAS 1989). In addition, dispersed oil penetrates sediment to a greater extent, and thus may lead to contamination over longer terms (GESAMP 1993). Manual cleaning of seabirds has proven ineffectual to date; "cleaned" birds rarely resume breeding and have low survival rates (Burger 2003). In sum, clean-up efforts can prolong and/or complicate recovery (U.S. NOAA 1997; Spies et al. 1996). More research is necessary in order to guide appropriate use of clean-up strategies and to assess their impacts.

2.5 DECOMMISSIONING

Decommissioning of offshore oil and gas facilities requires less than a few months, and the area impacted is limited to the vicinity of those structures and/or areas being decommissioned.

In some cases, whole structures are removed. Typically, explosives are used, and some small fish mortality and injury may result (Patin 1999; Manago and Williamson 1998). In other cases, submarine portions of structures are left in place. The remaining "artificial reef" maintains the ecological community that has developed during operations. Debate remains regarding whether or not artificial reefs increase fish populations, or simply attract fish from elsewhere and shift regional fish distributions (P. Reid, pers. comm. 7 May 2004; Patin 1999; Manago and Williamson 1998).

Decommissioning is necessarily noisy and involves traffic to offshore sites for short periods of time that can contribute to local air pollution (Manago and Williamson 1998). In addition, drilling rig structures are typically contaminated with toxins, including radioactive elements. Any materials left on site would thus continue to pollute the local environment (Manago and Williamson 1998). However, such pollution may not be significant (Kenchington 1997).

2.6 RECOVERY AT OFFSHORE SITES

Recovery of marine communities at offshore sites begins soon after activity ceases. However, the rate of recovery is unclear (GESAMP 1993). A number of studies suggested that partial recovery in benthos communities around sites occurs within one to two years (URS 2001 in JWEL 2001; Kenchington 1997; Daan and Mulder 1996; GESAMP 1993). Other studies have documented longer recovery periods of up to eight years (Daan and Mulder 1996; Daan et al. 1992, Heip 1992, Kroncke et al. 1992 in Kenchington 1997) and some studies indicated that impacts have actually increased following cessation of activity (Kenchington 1997; Olsgard and Gray 1995).

Generally, recovery is influenced by a number of factors, including the type of drilling mud used. Sites contaminated by OBMs appear to recover much more slowly than those that used WBMs and/or ABMs; however, further research is required to confirm this observation (Kenchington 1997). Second, offshore sites that are shallow, have fast ocean currents, and are not isolated from colonist organisms recover more rapidly (Bornholdt and Lear 1997; Kennicutt et al. 1996; Stegemeier and Simonett 1979). Third, sites exposed to more drilling for longer periods will take longer to recover than those sites that experienced limited activity (GESAMP 1993). Finally, the manner in which a site is decommissioned is also an important factor. When portions of drilling rigs are left in place as artificial reefs, impacts are permanent.

2.7 CUMULATIVE EFFECTS

INCREMENTAL EFFECTS OF OOGD ACTIVITY

Due to the combined effects of exploration, development, production, transportation, and decommissioning, marine ecosystems are subjected to substantial impacts. As a consequence, different ecological communities develop at offshore sites (Heriot University 2001; Wiese et al. 2001; Patin 1999; Bornholdt and Lear 1997; Kenchington 1997; Montagna and Harper Jr. 1996; Mulino et al. 1996 in JWEL 2001; Peterson et al. 1996; Street and Montagna 1996; Sciences Applications International Corporation and MEC Analytical Systems, Inc. (SAIC and MEC) 1993 in Bornholdt and Lear 1997; Leaver et al. 1987; Neff, 1987).

Another and perhaps more substantial consequence of OOGD is chronic pollution. While the marine environment naturally contains hydrocarbons, OOGD activities globally contribute over 1,370,000 barrels each year in addition to other anthropogenic inputs (U.S. NAS 2003b). Consequently, waters used for OOGD are associated with high levels of hydrocarbon pollution (Bertram 2003; Wiese et al. 2001; Patin 1997 in Leonov 1999; Patin 1999). As Patin (1999) observed, there is

> . . . convincing evidence of . . . persistent background contamination of seawater in areas of offshore oil production (311).

Chronic pollution is worrisome for several reasons. First, toxicity from long-term, chronic exposure occurs at levels much lower than short-term acute exposure (Ott, Peterson, and Rice undated; Peterson et al. 2003; Rice et al. 2000; Patin 1999; Davies et al. 1984). Patin (1999) cited abundant evidence of subcellular and cellular stress and disease in many marine species in chronically polluted areas. Second, hydrocarbons tend to accumulate at the water's surface and the water-seafloor boundary, where life is most active (Patin 1999). The Natural Environment Research Council (NERC) (1994 in Patin 1999) found that in some locations the most toxic fractions of hydrocarbons were 10,000 times higher at the surface than at 0.5 m deep. Such concentrations of pollutants can have substantial impacts. For example, chronic oil pollution around offshore platforms off Newfoundland is estimated to kill up to 300,000 birds annually[5] (Wiese, Robertson, and Gaston 2004; Wiese and Ryan 2003; Wiese 2002 in Burger 2003). Third, chronic pollution causes changes in lower-trophic levels of marine ecosystems (Patin 1999). Combined, chronic pollution can cause substantial ecological changes in marine ecosystems (Peterson et al. 2003; Patin 1999; U.S. NOAA 1997). As Patin (1999) observed:

> . . . the biggest concern regarding the ecological consequences of offshore oil and gas activity in the coastal zone is connected with the possibility of long-term effects caused by low levels of chemical (mainly oil) pollution. In spite of the difficulties of revealing such responses, more and more studies prove the existence of nonobvious (subtle) long-term consequences of chronic contamination (350).

SYNERGISTIC EFFECTS OF OTHER STRESSES

Assessment of the impact of OOGD in isolation may understate overall impacts by excluding potential impacts of other activities and stresses. The incremental effects of OOGD, combined

[5] Recall that 250,000 birds were estimated to have been killed by the *Exxon Valdez* spill.

with other past, present, or future impacts of other human activities, may combine synergistically and pass certain environmental thresholds that could result in significant damage (Macdonald, Morton, and Johannessen 2003; Canada 1999). In addition, regional and global changes to oceanic, atmospheric, and climate regulation processes pose threats. Indeed, OOGD may be the "straw" that "breaks the camel's back" (Kenchington 1997).

Unfortunately, information on studies of cumulative impacts is limited (U.S. NAS 2003b; Strong et al. 2002; JWEL 2001; C-NSOPB 1998 in JWEL 2001). Several pre-project environmental assessments for OOGDs have predicted no significant cumulative effects. JWEL (2001) observed that forecast cumulative effects for the Sable Offshore Energy Project, Terra Nova Development Project, and White Rose Oilfield Development are not significant. The recent Cook Inlet EA also predicted no significant cumulative effects, unless a large, or very large, oil spill occurs (U.S. DOI 2002a). On the other hand, the Strategic Environmental Assessment for Nova Scotia projects concluded that offshore activity, in conjunction with other uses of the offshore, would result in "greater stress" to the marine environment and key habitats (JWEL 2001: 132). The Georges Bank Review Panel also concluded that cumulative impacts of offshore activity could have "significant impacts on the life and fisheries of Georges" (Canada 1999: 58). The accuracy of these predictions awaits comprehensive post-project assessment.

In an ex-post assessment of cumulative effects on U.S. Outer Continental Shelf OOGD, Bornholdt and Lear (1997) found some, but not many, cumulative effects on resources. More recently, the U.S. NAS's (2003c) ex-post review of the cumulative impacts of oil and gas activities on Alaska's North Slope concluded:

> . . . the impacts of North Slope industrial development on the physical and biotic environments and on the human societies that live there have accumulated, despite considerable efforts by the petroleum industry and regulatory agencies to minimize them (10).

Clearly, cumulative impact analysis requires more study.

2.8 SUMMARY OF IMPACTS

The impacts of OOGD are summarized in table 2.6.

TABLE 2.6: SUMMARY OF IMPACTS ON QCB OF OFFSHORE HYDROCARBON ACTIVITY

IMPACT SOURCE	KNOWN IMPACTS	KEY UNCERTAINTIES	RELEVANT CHARACTERISTICS OF QCB	DURATION OF IMPACT[1]
EXPLORATION				
Geophysical surveying; marine and air traffic	limited lethal impacts, but sublethal impacts, including behavioral effects	species' sensitivity; impact of chronic noise and low levels of noise; nature of sublethal impacts; ecological, and long term impacts; impacts of some technologies	data gaps regarding wind and wave regimes, water depth, geological and geomorphological hazards, species habitat usage, and ecosystem sensitivity	months to years
Exploratory drilling; drilling discharges	water quality degradation; physical changes; lethal and sublethal impacts in the vicinity of drilling sites; long-term ecological change in vicinity of drilling sites	toxicity of some discharges; degree of dispersal and spatiality of impacts; cumulative nature	rapid dilution/dispersal in water column; data gaps regarding ecosystem sensitivity	years to decades
Exploratory drilling; flare gasing and air pollution	relatively small air pollution contributions	none specifically noted	none specifically noted	days to ?
Blowouts	See Spills (below)	See Spills (below)	inadequate subsea geological data	years to decades
DEVELOPMENT AND PRODUCTION				
Noise during drilling, production, and other activities	potential avoidance responses from marine mammals and other species	impact of chronic noise	data gaps regarding sound transmission characteristics of QCB; species distribution/ habitat usage	decades
Physical changes at offshore sites	local lethal, sublethal, and ecological impacts from habitat alteration above and below sea surface; disruption of biota movement/migration patterns	impact on bird populations, including migration and movement	vigorous currents, oceanic scouring and depositional processes; large bird populations	years to ?

Discharges during production and transportation	water quality degradation; local lethal, sublethal, and ecological impacts from pollution; chronic pollution; ecological impacts of species introductions; also see Spills (below)	dispersal and impacts of produced water; nature of impacts of species introductions; duration of impacts; also see Spills (below)	rapid dilution/dispersal in water column; data gaps regarding ecosystem sensitivity	months to decades
Air pollution	local air quality degradation; atmospheric fallout; greenhouse gas emissions	none specifically noted	none specifically noted	weeks to ?
Onshore impacts	local pollution and habitat change leading to local impacts	magnitude of impacts	none specifically noted	likely permanent[2]
SPILLS				
Small spills (<1,000 barrels)	water and air quality degradation; local lethal and sublethal impacts	none specifically noted	none specifically noted	days to months
Large spills (>1,000 barrels)	water and air quality degradation; lethal and sublethal impacts to exposed species; long-term persistence in certain shoreline sediments; population- and ecosystem-level impacts that may be long term	size of spill (because a chance event); nature of impacts, including time length, scale, and ecological aspects; impact of methanol on marine life; models of spill trajectories; models of spill impacts	models of spill trajectories indicate spills will strike coast (unless prevented by countermeasures); shorelines would absorb and retain substantial volumes of hydrocarbons; large numbers of biota inhabit QCB	decades
Clean-up activities	population- and ecosystem-level impacts at spill sites	impact of clean-up on marine life; proper use of clean-up strategies; recovery	many shorelines are moderately to highly susceptible to hydrocarbon infiltration and retention	months to years

DECOMMISSIONING				
Noise, activity, possibly including explosions	local lethal and sublethal impacts	none specifically noted	none specifically noted	days to months
Remnants at site	legacy of chemical contamination, providing lethal, sublethal, and local ecological impacts; legacy of habitat change if artificial reef abandoned, resulting in unnatural local community	duration of chemical contamination	none specifically noted	decades or longer
Disposal of used equipment	chemical and radioactive pollution on or offshore, resulting in local impacts	none specifically noted	none specifically noted	decades or longer
COMBINED IMPACTS				
Incremental impacts	ecological change at offshore sites; ecological change in chronically polluted waters	significance of impacts of chronic pollution	none specifically noted	?
Cumulative impacts	mixed data, though evidence in Alaska	capacity of impacts to accumulate; magnitude that cumulative impacts would constitute	QCB currently under stress and demonstrating change	?

(1) Duration of impact is a function of a) duration of activity, and b) duration of effects from impact.
(2) Onshore impacts may be permanent, assuming that land use changes for facilities do not revert to original state.

2.8 B.C. WEST COAST CHARACTERISTICS THAT INFLUENCE IMPACTS

Impacts of OOGD vary with the characteristics of the area in which it occurs. Consequently, research findings on impacts for one region are not necessarily applicable to other regions. This is particularly true of the West Coast, which has a unique blend of features that will generate unique impacts. The area of interest for West Coast OOGD is primarily centered on the Queen Charlotte Basin (QCB). Key characteristics of the QCB are described below.

WEATHER

Important data gaps preclude definitive assessments of the impacts of weather on OOGD in the QCB (RSC 2004; Neil 2003). Available information shows that the QCB is a stormy marine environment subject to winds recorded as high as 151 km/h. (Petro Canada 1983 in JWEL 2001). FEP (2004: 40) noted that the QCB "give[s] rise to extreme sea state conditions." JWEL (2001: 57) described the wave regime as "relatively severe." In winter, waves may reach heights of up to about 25 m (Cretney et al. 2002). Average wave heights in the QCB are twice those of the Jeanne d'Arc Basin on the East Coast (Strong et al. 2002), and characteristics of the West Coast provide the potential for much more severe waves that can pose a hazard to OOGD (Neil 2003).

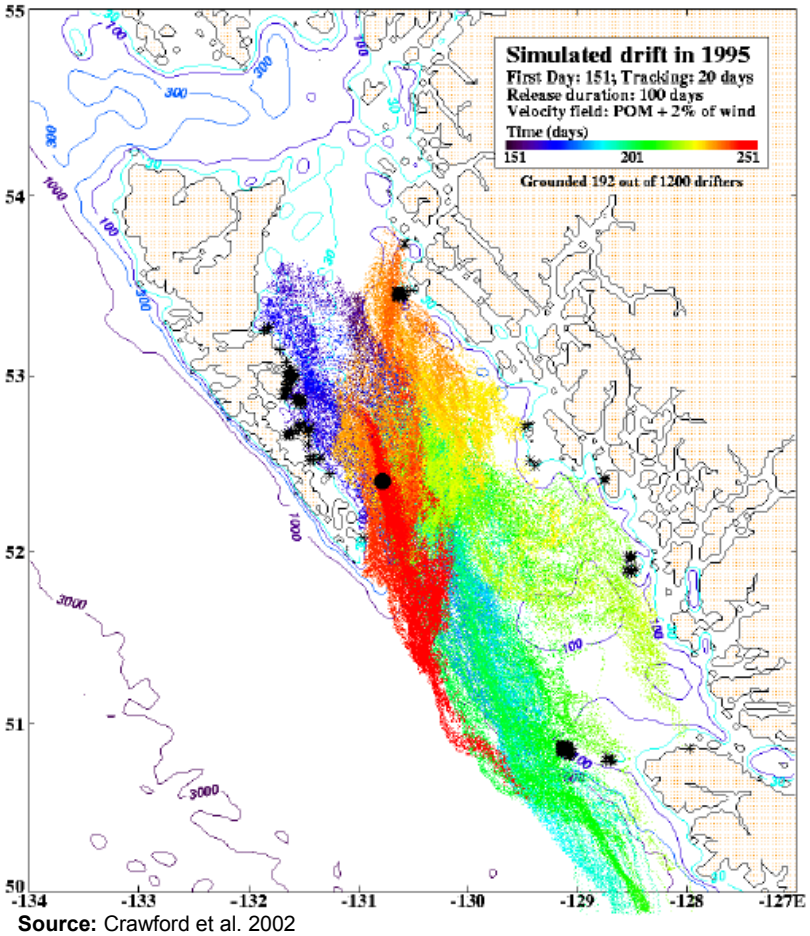
BATHYMETRY

Water depth data are lacking for much of the QCB (JWEL 2001). While water depth in the QCB is not unique compared to elsewhere in the world where OOGD occurs, lack of accurate knowledge of water depths poses an obstacle to OOGD (Neil 2003; JWEL 2001).

TIDES AND CURRENTS

The QCB has a strong, complex current and tide regime (RSC 2004; Crawford et al. 2002; Cretney et al. 2002; Strong et al. 2002). Tides in the QCB move up to 50 cm/sec, which is much faster than other regions where OOGD is undertaken such as the Jeanne d'Arc Basin where tides move up to only eight cm/sec (Strong et al. 2002). Consequently, subsea equipment in the QCB—such as pipelines—would be exposed to substantial stress. Furthermore, currents shape the fate and dispersal of pollutants, such as drilling muds and oil spills. Pollutants within the water column are expected to dilute and disperse rapidly (Crawford et al. 2002; Cretney et al. 2002), but in the process may travel long distances from discharge points.

Models show that pollutants in surface waters—such as spilled oil—would likely be retained in the QCB and eventually strike one of the coastlines (fig. 2.4; Crawford 2003; Crawford et al. 2002; Cretney et al. 2002). Crawford et al. (2002: 7) noted, "for Queen Charlotte Sound and Hecate Strait, particularly in winter, prevailing winds and storm systems will undoubtedly transport spilled oil onto shores," and "most regions of Hecate Strait and Queen Charlotte Sound seem to be vulnerable" (36). Further research is required to accurately understand pollutant behavior in the QCB (Crawford 2003; Crawford et al. 2002).

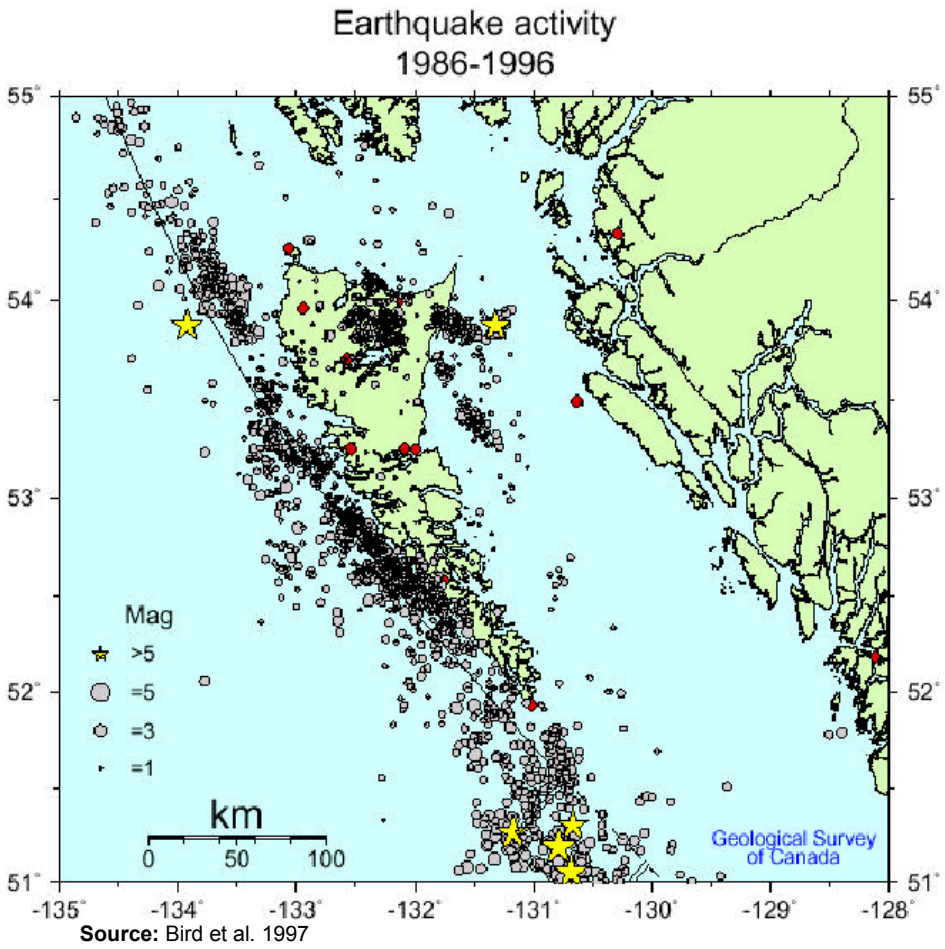


Source: Crawford et al. 2002

FIGURE 2.4: DRIFT SIMULATION OF PARTICLES RELEASED FROM A SINGLE LOCATION IN HECATE STRAIT (MARKED BY BLACK CIRCLE)

GEOLOGICAL HAZARDS

The QCB is among the most earthquake prone area in Canada, and is one of the most seismically active areas of the world (JWEL 2001). Historical data (fig. 2.5) indicate that the nearby Queen Charlotte Fault is capable of generating "megathrust" earthquakes up to magnitude 9.0 on the Richter scale (Strong et al. 2002; Cretney et al. 2002; JWEL 2001). Large earthquakes in the close vicinity of the QCB could produce severe tsunamis without warning (RSC 2004). Additionally, tsunamis generated thousands of kilometers away could damage OOGD facilities in the QCB (JWEL 2001). While major earthquakes and tsunamis are rare in the QCB, substantial uncertainty surrounds the specific hazard level of these events (RSC 2004; Rogers 2003; Strong et al. 2002; Cretney et al. 2002; JWEL 2001). In addition, bedrock outcrops, boulder beds, sediment mobility, mass wasting, steep slopes, gas-infiltrated sediment and deposits, and dynamic coastal processes pose hazards to OOGD (RSC 2004; Strong et al. 2002; Cretney et al. 2002).



Source: Bird et al. 1997

FIGURE 2.5: EARTHQUAKE ACTIVITY AS OBSERVED FROM 1986-1996

OIL SPILL SENSITIVITY OF COASTLINE

Physical shoreline characteristics of the QCB, such as wave exposure and sediment permeability, influence the impacts arising from a spill (Strong et al. 2002; GESAMP 1993). Bornhold and Harper (2001 in Strong et al. 2002) estimated that substantial portions of the coastline within the QCB are highly permeable to oil and have low wave exposure. They estimate that 6,000 km, or 35%, of the North Coast has the highest oil residence class.

ECOLOGY

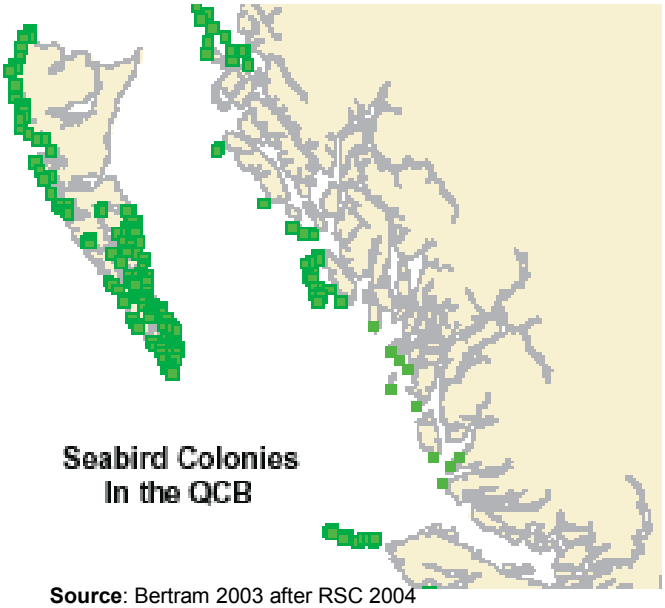
The QCB marine ecosystem is rich and highly productive, and, according to B.C. SRP, are "currently in very good condition relative to many of the globe's marine ecosystems" (Strong et al. 2002: 23). Estimates of total numbers of species that inhabit or migrate through the QCB vary between 500 and a few thousand (Hertzog 2003; Strong et al. 2002).

The QCB is particularly noted for its fish, marine mammal, and seabird populations. Six species of salmon, over 70 species of groundfish, and numerous small fish species inhabit the QCB (Strong et al. 2002). Thirty species of marine mammals are documented in the QCB, including blue, North Pacific right, fin, gray, humpback, minke, sei, and sperm whales, as well as orcas,

Harbour and Dall's porpoises, Pacific White-sided dolphins, Northern elephant seals, Harbour seals, Stellar sea lions, California sea lions, Northern fur seals, and sea otters. Additionally, many fish and marine mammal species use the QCB as a migration corridor (RSC 2002). For example, approximately 12,000 gray whales migrate from Mexico to Arctic waters annually.

The QCB is one of the most important habitats for marine birds on the west coast of North America, and has populations of national and international importance (Bertram 2003, Harfenist et al. 2002 in Strong et al. 2002). Figure 2.6 illustrates the locations of seabird colonies in the QCB. Coastal B.C., as a whole, is home to approximately 80% of the world's population of Cassin's auklets, 50% of the world's Rhinocerus auklets, 50% of the world's Ancient murrelets, and 20% of the world's Marbled murrelets (Rodway 1991, Gaston and Jones 1998 both in Strong et al. 2002). Strong et al. (2002) noted

> . . . the waters of Western Canada are biologically among the richest in the Pacific, and thus attract vast and still unknown numbers of seabirds from the entire Pacific and beyond (120).



Source: Bertram 2003 after RSC 2004

FIGURE 2.6: SEABIRD COLONIES IN THE QCB

In addition, hexactinellid sponge reefs have been discovered in the QCB (Conway et al. 2001). These sponge reefs are about 9,000 years old, and are the only known living hexactinellid sponge reefs in the world (Conway et al. 2001). Unfortunately, about 50% of the slow-growing reefs are already damaged from trawling (Conway 2003 in RSC 2004). At present, very little is known about the sponge reefs, however Krautter (2003) argued that they are highly sensitive to sedimentation and pollution from OOGD.

Currently, the QCB marine ecosystem is stressed by fishing, forestry, marine vessel traffic, municipal and agriculture pollution, atmospheric fallout, introduced species, and climate change. Consequently, the West Coast is already subject to activity, pollution, and noise. As a result, a

number of species in the QCB are demonstrating substantial population fluctuations or declines (RSC 2004; Sinclair 2003; Strong et al. 2002; JWEL 2001). Estes et al. (1998) recently suggested that anthropogenic influences in the marine ecosystem of the West Coast have caused dramatic changes in sea otter abundance. Bertram (2003) linked declining seabird success with rising sea surface temperature, introduced species, and fishing practices, while Stellar sea lions were considered particularly vulnerable to oil spills (RSC 2004). A number of species occupying the QCB are recognized by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and the B.C. Ministry of Water, Land, and Air Protection (WLAP) as being at risk of extinction (table 2.7).

There are many data gaps in our understanding of the QCB marine ecosystem. Key science gaps include population abundance, species interrelationships, habitat usage, habitat importance, migration patterns, and ecosystem dynamics (RSC 2004; Bertram 2003; Mackas 2003; U.S. NAS 2003a; Sinclair 2003; Birtwell and McAllister 2002; Harfenist et al. 2002 in Strong et al. 2002; Strong et al. 2002). FEP (RSC 2004) also noted that further effort must be devoted to accurately define valued ecological and economic species in the QCB.

TABLE 2.7: SPECIES AT RISK WITHIN THE QCB THAT MAY BE AFFECTED BY OOGD

SPECIES CATEGORY	SPECIES	COSEWIC STATUS	MWLAP STATUS
Birds	Marbled Murrelet	Threatened	Red-listed
	Short-Tailed Albatross	Threatened	
	Ancient Murrelet	Species of Special Concern	
	Great Blue Heron		Blue-listed
	Green Heron		Blue-listed
	Brandt's Cormorant		Blue-listed
	Cassin's Auklet		Blue-listed
	Thick-billed Murre		Red-listed
	Common Murre		Red-listed
	Horned Puffin		Red-listed
	Tufted Puffin		Blue-listed
	Northern Goshawk	Vulnerable	Red-listed
	Peregrine Falcon	Vulnerable	Blue-listed
	Pelagic Cormorant		Red-listed
	Pine Grosbeak		Blue-listed
Fish	Coho (Interior Fraser)	Endangered	
	Sockeye (Cultus and Saginaw populations)	Endangered	
	Bocaccio Rockfish	Threatened	
	Cutthroat Trout		Blue-listed
	Dolly Varden		Blue-listed
	Eulachon	Under Review	Blue-listed
Invertebrates	Northern Abalone	Threatened	
Marine Mammals	Blue Whale	Endangered	
	North Pacific Right Whale	Endangered	Red-listed
	Harbour Porpoise	Species of Special Concern	
	Sei Whale	Endangered	
	Sea Otter	Threatened	Red-listed
	Humpback Whale	Threatened	Blue-listed
	Orcas (Northeast Pacific Offshore Population)	Threatened	Blue-listed
	Orcas (Northeast Pacific Resident Population)	Threatened	Red-listed
	Orcas (West Coast Transient Population)	Threatened	Red-listed
	Fin Whale	Species of Special Concern	
	Stellar Sea Lion	Species of Special Concern	
	Sperm Whale		Blue-listed
	Gray Whale	Under Review	Blue-listed
	Northern Sea Lion		Red-listed
	Minke Whale	Under Review	
	Harbour Seal	Under Review	
Terrestrial Mammals	Grizzly Bear	Vulnerable	Blue-listed
	Townsend's Vole		Red-listed

Source: After WLAP website srmwww.gov.bc.ca/atrisk/; accessed 19 April 2004; RSC 2004

2.9 UNCERTAINTIES AND KNOWLEDGE GAPS

Much of the science regarding the environmental impact of OOGD is weak at providing the information necessary for sound decision making. Most science is reductionist, and focuses on specific discharges, individual species, or short periods of time (Birtwell and McAllister 2002; Strong et al. 2002; Patin 1999; Kenchington 1997). Little information exists regarding impacts over broader scales. Kenchington (1997) argued that most studies on the environmental impacts of OOGD are based upon faulty presumptions, and are thus of limited use. Kenchington also noted that subsequent reinterpretation of studies show that impacts occur at distances or degrees much greater than previously concluded. Such methodological problems are compounded by the fact that detecting change and understanding cause-effect relationships in marine ecosystems is very difficult (U.S. NAS 2003c; Strong et al. 2002; Heriot University 2001; Rice et al. 2000; Patin 1999; Kenchington 1997). Subtle, yet potentially important, changes are especially difficult to detect. As Kenchington (1997) observed

> . . . gross damage could be done to resource productivity without anybody being aware of the fact (46).

Further, existing research has limited applicability to B.C. OOGD because it was conducted in locales that are markedly different from the QCB. More science is required to investigate environmental impacts in the specific context of the QCB (Birtwell and McAllister 2002).

In addition to these problems with the science, there are specific gaps in understanding of OOGD in B.C. Seventeen knowledge gaps were identified by FEP (RSC 2004). This report also identified nine additional gaps, which have been added to FEP's list and noted below with a *.

1. Identification of valuable species
2. Identification of unstable areas
3. Measure of currents, winds, and waves
4. Earthquake monitoring
5. Impact assessment of acoustic propagation
6. Space-time distributions of fish
7. Identification of confined spawning areas for critical fish species
8. Space-time distribution of mammals
9. Impacts of seismic activity on diving birds
10. Baseline information on benthic fauna and habitat
11. Oil spill trajectories
12. Impact of oil spills on landfalls
13. Seasonal variation in species populations along shorelines
14. Proposed marine protected areas
15. Critical species close to shore
16. Areas of critical habitat
17. Identification of coastal zone buffers for drilling
18. Impact of water-based and alternative-based drilling muds*
19. Impact of produced water*
20. Behavior and toxicity of natural gas in marine environment*
21. Long-term impacts of spills and recovery rates *
22. Appropriate use of spill clean-up techniques*
23. Cumulative environmental impacts*

24. Ecological-level impacts*
25. Spill risk assessment*
26. West Coast ecosystem dynamics*

In sum, fundamental knowledge gaps preclude a complete understanding of OOGD impacts. As Strong et al. (2002) concluded:

> Overall, we know relatively little about our oceans . . . . there are extensive gaps in our knowledge about marine ecosystems . . . . we need more complete knowledge in order to understand their complexity and how the removal of resources and disturbance of habitat will affect them (18-19).

2.10 CONCLUSION

There is a consensus in the scientific literature that OOGD has negative short- and long-term impacts on the marine environment. These impacts will occur at all stages of OOGD; however, there is considerable uncertainty regarding the magnitude and nature of the impacts. Despite decades of study, research on the environmental impacts of OOGD is still in its embryonic stages. Impacts on many species and broader ecosystem-wide impacts are unknown. Research results in one ecological system are not relevant to other systems with different characteristics. Probabilities and impacts of accidents, such as large oil spills that can have catastrophic impacts on the environment, are poorly understood. Evolving technology, improved management practices, and stricter regulatory regimes provide an opportunity to further mitigate environmental impacts of OOGD in B.C., though considerations of their relevance must be based upon rigorous assessments of their effectiveness.

The QCB is a unique environment characterized by a rich and diverse ecosystem that is highly vulnerable to impacts from OOGD. The QCB also has a unique combination of hazards that will pose special challenges for OOGD. While it may be possible to address many of these challenges successfully through the regulatory process, improvements in technology and management practices, there are substantial risks. There are significant knowledge gaps regarding the ecological characteristics of the region, the magnitude of hazards, and the impacts that OOGD will have. For all these reasons, more research is required before environmental consequences of OOGD in B.C. can be assessed, and before an informed decision can be made on OOGD.

CHAPTER 3:
SOCIOECONOMIC CONSIDERATIONS

Offshore oil and gas development (OOGD) is promoted as an economic development initiative that will strengthen the economy of the province of British Columbia (B.C.) and the North Coast region of B.C. The purpose of this chapter is to assess socioeconomic impacts of OOGD by reviewing experiences in other jurisdictions, and analyzing a probable OOGD development scenario for B.C. The chapter will begin with a general overview of B.C.'s oil and gas sector, followed by an analysis of the impacts of OOGD on employment, revenue, social health, and other key variables. The section concludes with an economic impact assessment of a probable OOGD scenario on the B.C. economy.

3.1 OVERVIEW OF OIL AND GAS SECTOR

B.C. OIL AND GAS SECTOR

British Columbia is Canada's second largest natural gas producer, accounting for approximately 16% of Canadian production. Most of the industry's activity is northeast B.C., where about 2,800 oil and gas pools have been identified, and about 13,000 wells have been drilled[1]. The B.C. Ministry of Energy and Mines suggests that B.C's oil and gas resources remain largely untapped; onshore volumes of 73 TCF (trillion cubic feet) of gas and 8.49 BBO (billion barrels of oil) could still be discovered[2]. In 2002, actual production was 42,000 barrels per day of conventional oil, 10,000 barrels per day of pentanes, 52,000 barrels per day of crude oil, and 2.7 BCF (billion cubic feet) per day of gas[3]. Much of this energy is destined for export to the U.S. Pacific Northwest, the U.S. Midwest states, and California. B.C. is also a major supplier of gas to Eastern Canada[4].

In fiscal year 2001-2002, the provincial government collected revenues from the oil and gas industry that exceeded those from the forest industry for the second year in a row[5]. Payments to the province through royalties, bonuses, and fees were $1.2 billion[6].

The oil and gas sector has experienced significant growth over the last several decades. Natural gas production has increased by about 7% per year from 1981 to 2002 (fig. 3.1), and the number of wells drilled per year has increased from 212 in 1981 to 643 in 2002 (fig. 3.2). The industry

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[1] From B.C. Government Factsheet: www.gov.bc.ca/em/popt/factsheet_oil_gas_resources.htm; accessed 14 April 2004.

[2] Ibid.

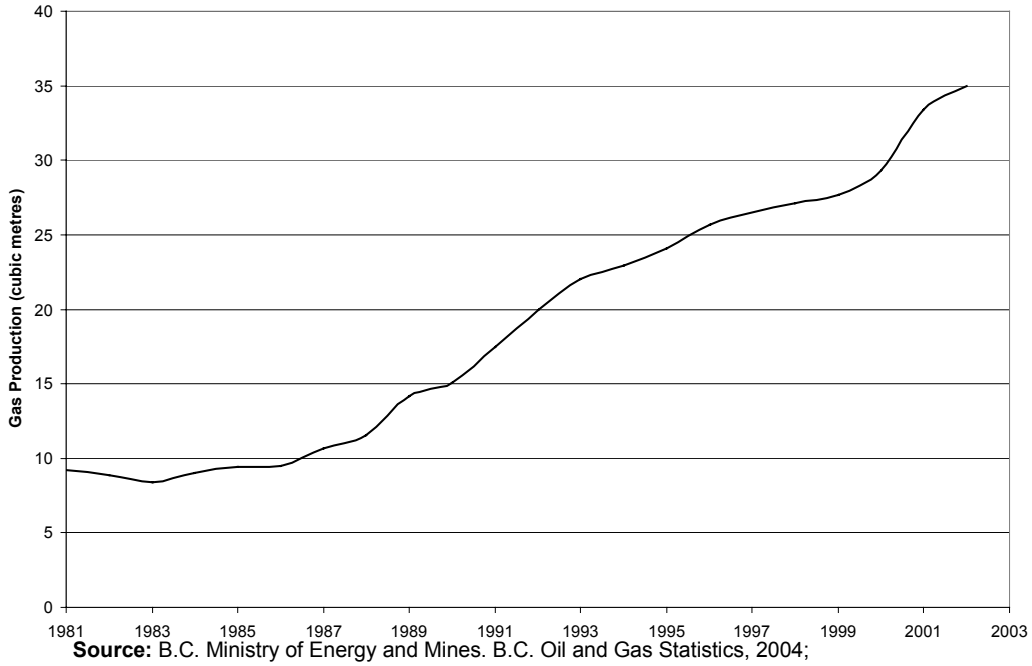
[3] From Canadian Association of Petroleum Producers (CAPP) website: www.capp.ca/default.asp?V_DOC_ID=603; accessed 14 April 2004.

[4] From B.C. Government Factsheet: www.gov.bc.ca/em/popt/factsheet_oil_gas_resources.htm; accessed 14 April 2004.

[5] From CAPP website: www.capp.ca/default.asp?V_DOC_ID=603; accessed 14 April 2004.

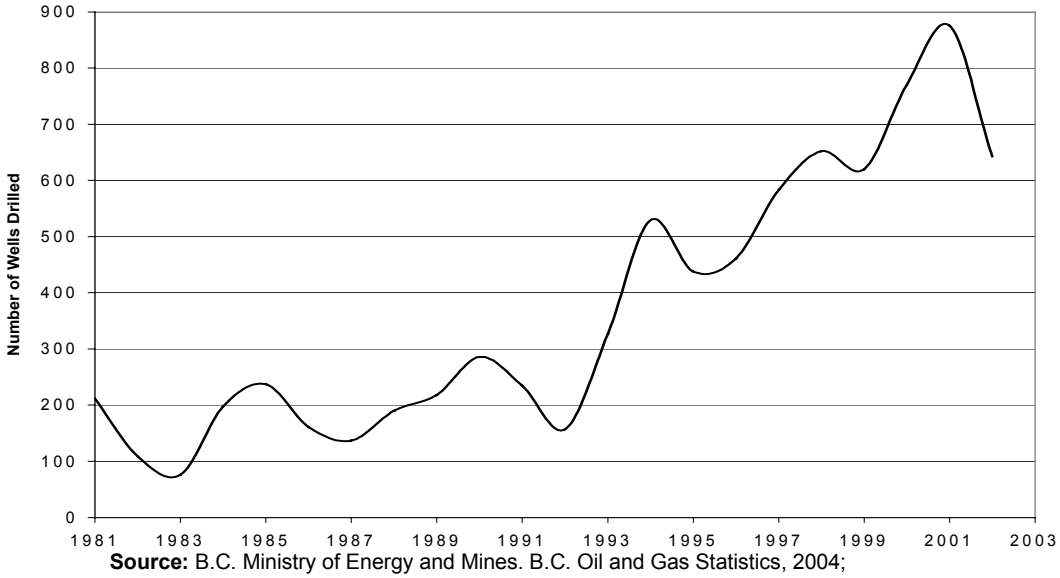
[6] From B.C. Ministry of Energy and Mines website: www.em.gov.bc.ca/subwebs/oilandgas/stat/stat.htm; accessed 14 April 2004.

currently employs 2600 workers in oil and gas extraction (B.C. Stats 2004b) and accounts for 1.3% of B.C. gross provincial product (GPP) (Lillian Hallin, B.C. Stats, pers. comm., 17 February 2004).



Source: B.C. Ministry of Energy and Mines. B.C. Oil and Gas Statistics, 2004; www.em.gov.bc.ca/subwebs/oilandgas/stat/stat.htm; accessed 14 April 2004.

FIGURE 3.1: NATURAL GAS PRODUCTION IN B.C., 1981 TO 2002



Source: B.C. Ministry of Energy and Mines. B.C. Oil and Gas Statistics, 2004; www.em.gov.bc.ca/subwebs/oilandgas/stat/stat.htm; accessed 14 April 2004.

FIGURE 3.2: OIL AND GAS WELLS DRILLED IN B.C., 1981 TO 2002

OFFSHORE OIL AND GAS POTENTIAL

Median estimates for offshore resources in the QCB by the Geological Survey of Canada (GSC) are 9.8 BBO and 25.9 TFC of gas (Royal Society of Canada (RSC) 2004: 14). Recoverable reserves are estimated at 1.3 BBO, and 9.8 TCF of gas. Reserve estimates by the Canadian Gas Potential Committee are a more conservative 7.5 TCF of gas reserves, with no estimate of recoverable reserves (CGPC 2001). The federal expert review (FEP) attempted to estimate the economic value of QCB reserves by multiplying the GSC median reserve estimates by the market value of oil and gas; however, such efforts should be interpreted with caution for three reasons. First, reserve estimates are highly speculative due to inadequate data. Second, there is no guarantee that it is economically viable to recover the reserves even if they exist. Third, even if the reserves are economically viable, the value of the resource is based on the net value after deducting production costs, not the gross value as estimated by FEP. Depending on markets and production costs, the net value of QCB oil and gas reserves could be zero.

The FEP Report states that these median estimates of recoverable offshore oil and gas from the QCB are

> . . . broadly similar to—perhaps a little smaller than—estimates for the Jeanne d'Arc Basin, offshore Newfoundland, in which the Hibernia and Terra Nova fields are currently productive, and the White Rose field is being developed (RSC 2004: 14).

The report further states that

> . . . the median estimate of oil for the QCB would satisfy total present Canadian demand (1.6 million bbl per day) for about 2.5 years; the median estimate for gas would satisfy current Canadian demand (7 BCF per day) for about 4 years. By contrast, the total ultimate potential for production recovery of crude bitumen from Canada's oil sands is about 315 billion barrels, over 200 times the volume of oil likely to recoverable from the QCB (RSC 2004: 14).

3.2 ECONOMIC DEVELOPMENT IMPACTS

One of the primary arguments used in support of OOGD is then it will stimulate economic growth. Several caveats should be kept in mind when assessing this argument. First, economic growth is not a justification for developing a project. For a project to be justified, the benefits must exceed costs as measured by a benefit-cost study. Second, economic growth forecasts often exaggerate economic impacts of projects by assuming that the capital and labour used in a project would otherwise not be employed; thus gross impacts instead of net impacts are forecast. Sound economic impact analysis must be based on the net incremental impacts With these caveats in mind, it is useful to assess economic impacts of OOGD.

Oil and gas development can stimulate regional economic growth through direct investment in oil and gas extraction and by secondary or "multiplier effects" stimulated by oil and gas extraction. Potential multiplier effects can be divided into four categories: forward linkages involving processing of natural resources prior to export; backward linkages involving production of inputs such as resource machinery and transportation infrastructure required to extract oil and gas; final demand linkages involving production of consumer goods and services to meet the regional needs of those employed in the oil and gas sector; and fiscal linkages involving the expenditure of rents and profits generated by oil and gas. Backward and forward linkages are sometimes classified as indirect impacts, and final demand and fiscal linkages as induced impacts. Regional development impacts of oil and gas are determined by these direct and multiplier effects as well as other factors such as hiring practices, economic cycles, social impacts, and impacts of oil and gas on other sectors. Each of these issues is discussed below.

DIRECT ECONOMIC IMPACTS

OOGD occurs in four stages: exploration, development, production, and decommissioning. The economic impacts vary with each stage. Exploration and decommissioning generally hold the fewest prospects for employment. Development supports the highest number of jobs, but is a short-lived boom, while production supports significantly fewer jobs, but for a longer duration.

Exploration

Exploration involves seismic surveys and exploration drilling to identify commercial reserves. The exploration phase generates the least employment and is the most unstable phase because it is short term and highly vulnerable to international market cycles. A seismic survey may only last for several weeks involving specialized crews of 20-30 people, and an exploratory well can be completed in about 3-4 weeks (Jacques Whitford Environmental Ltd. (JWEL) 2001). AGRA Earth and Environmental Ltd. (AGRA) (1998) and JWEL (2001) reports identified several reasons for the limited employment potential of the exploration phase. Exploratory drilling requires expensive, specialized equipment that individual communities do not usually manufacture or service. Similarly, the labor required to operate exploration equipment is specialized and imported from elsewhere by the company. In order to cut costs, companies often pool resources for the exploratory phase, further reducing the potential for local jobs and the need for local services. In the event that local residents are employed in the exploration phase, their prospects for future work in the area are limited, and they would be forced to look internationally for employment based on these skills.

Development

Development involves the construction of production and transportation facilities required to extract and transport oil and gas. The development phase offers the greatest potential for employment in terms of numbers of jobs created, but the jobs are short term. Community employment increases sharply during the development stage and then declines after construction is complete.

The type and duration of jobs created during the development phase are largely dependent on the type of platform and transportation systems that are chosen for a given project. In the past, offshore drilling has tended to occur on fixed, gravity-based structures (GBS), connected to shore by pipelines. The construction of GBSs and pipelines are large projects that require a significant amount of labor. For example, the government of Newfoundland insisted that the Hibernia project use a GBS platform because of the higher employment potential (Marshall 2001). With government funding, a dry-dock was built for the construction of the Hibernia GBS in Bull Arm, Newfoundland in 1990[7].

Recent developments, such as the FPSOs (floating production, storage, and off-loading systems) have reduced the required labor for construction. Similarly, more reliance on shipping for the transport of oil (gas is still largely moved by pipeline) over the construction of pipelines has reduced potential employment in the development phase (JWEL 2001). While there is potential for local employment during this phase in the construction of GBSs, the tendency toward FPSOs means that platforms and platform components can be prefabricated elsewhere and transported to the project site (JWEL 2001). For example, despite the existence of the dry-dock at Bull Arm, a large part of the platform for Newfoundland's Terra Nova project was built in South Korea because it relied on FPSO technology (Marshall 2001). Resources are also often pooled between companies, resulting in fewer opportunities for local residents (JWEL 2001).

Proponents of offshore development argue that Prince Rupert has the potential to become specialized in the construction, operation, and maintenance of offshore equipment, once the industry is up and running in the area (JWEL 2001). However, the amount of short-term construction likely to take place in the North Coast is small given that there are no deep-sea ports with shipbuilding or large steel fabrication facilities (Marshall 2001). Given the trend toward resource pooling and the importation of FPSOs, it may be unlikely that government and industry investment in the construction of a Bull Arm type facility in B.C.'s North Coast is economically viable.

Production

Production offers the greatest opportunity for sustained, local employment. However, far less labor is required for this phase, so communities normally experience a sharp decline in employment from the development stage. Table 3.1 summarizes the change in employment from the development phase to the production phase for four projects: Hibernia, Terra Nova and White Rose in Newfoundland, and the Sable Offshore Energy Project (SOEP) in Nova Scotia. Declines in employment range from a 48% drop at Terra Nova to an 84% drop at Hibernia.

[7] From Hibernia website: www.hibernia.ca/html/about_hibernia/index.html; accessed 27 February 2004.

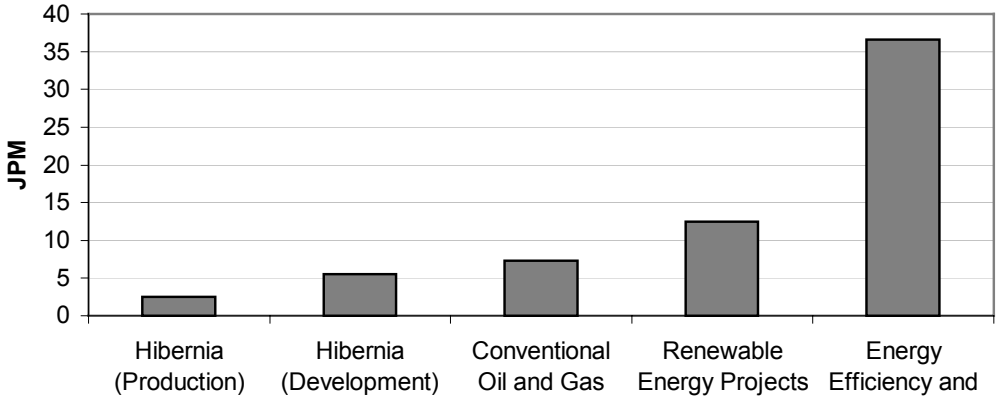
Potential employment in the production phase is limited by introduction of new technologies and practices: the use of FPSOs allows for more resource pooling and production drilling can be undertaken by floating rigs identical to those used in exploration. In addition, FPSOs increase the viability of smaller and relatively short-lived fields (JWEL 2001).

TABLE 3.1: CHANGES FROM DEVELOPMENT TO PRODUCTION PHASE EMPLOYMENT

PROJECT	DEVELOPMENT EMPLOYMENT	PRODUCTION EMPLOYMENT
Hibernia	5,448[1] (1995)	878[3] (2002)
Terra Nova	1,900[1] (2000)	985[3] (2002)
White Rose	200[1] (2002)	n/a
SOEP	850[2] (1997-2000)	310[2] (average annual)

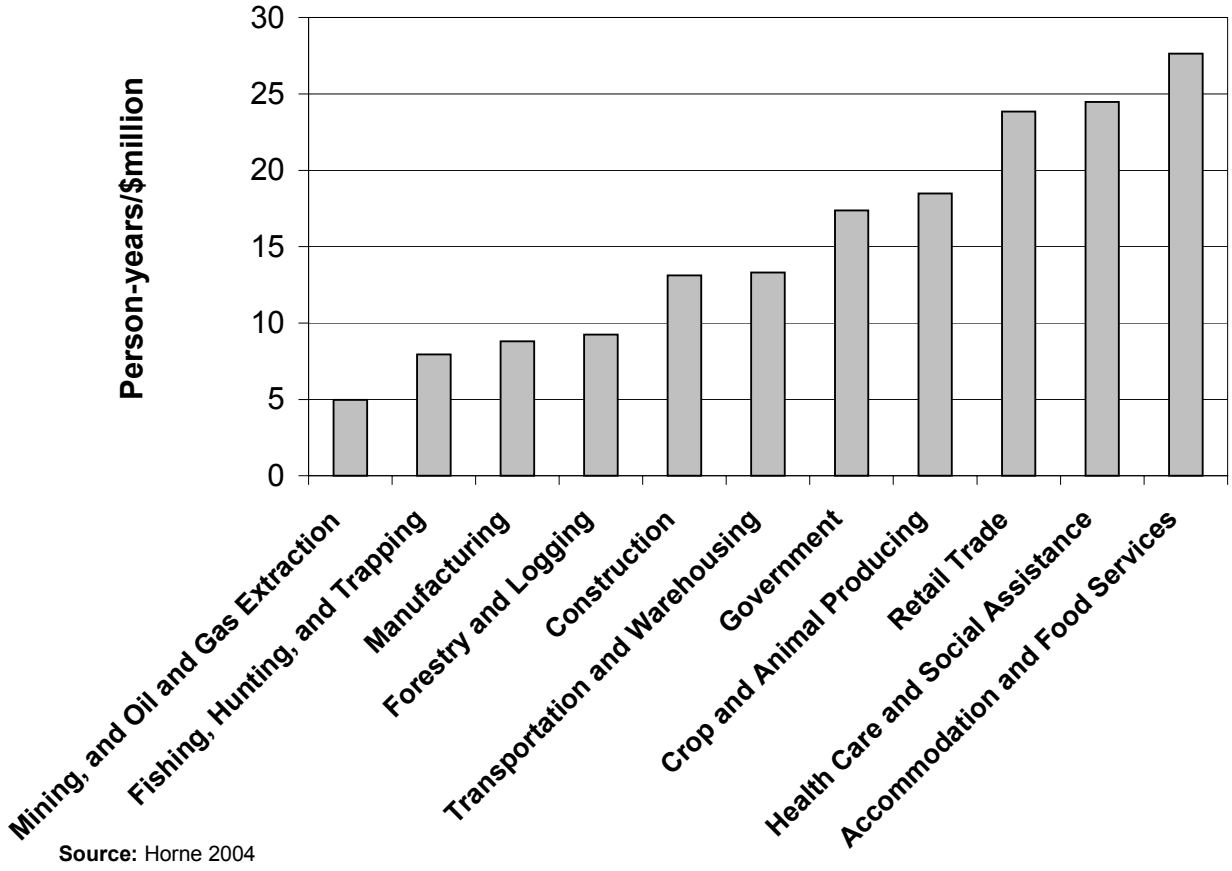
(1) Vodden, Pierce, and House 2002; **Source**: Newfoundland Statistics
(2) Gardiner Pinfold Consulting Economists Ltd. 2002 (employment is annual average)
(3) Canada-Newfoundland Offshore Petroleum Board (C-NOPB) 2003

As a result of capital-intensive technology, the offshore oil and gas production phase generates few jobs per dollar invested. Figure 3.3 illustrates that the jobs generated per million dollars of investment (JPM) for OOGD in Hibernia is 2.5 (Canada-Newfoundland Offshore Petroleum Board (C-NOPB) 2001 in Marshall 2001), which is considerably lower than other energy sectors such as conventional oil and gas (7.3 JPM), renewable energy projects (12.5 JPM), and energy conservation (36.6 JPM) (Campbell et al. 1997 in Marshall 2002). Oil and gas also generates fewer jobs than almost any other sector in the B.C. economy per dollar of production (fig. 3.4). Although capital intensity is not necessarily a negative characteristic—it could indicate higher productivity—it does illustrate the limited job creation potential of OOGD.



Source: Shrimpton 1999 and C-NOPB 2001 in Marshall 2001, Campbell et al. 1997 in Marshall 2002

FIGURE 3.3: JOBS CREATED PER MILLION DOLLARS INVESTED IN VARIOUS SECTORS



Source: Horne 2004

FIGURE 3.4: PERSON-YEARS OF DIRECT EMPLOYMENT BY SECTOR PER MILLION DOLLARS OF OUTPUT

Decommissioning

Given that oil and gas are nonrenewable resources, all projects are finite and have a planned end. The decommissioning stage has a large impact on the economy of a given area as all direct and indirect employment and provincial revenues from oil and gas terminate. The decline may occur gradually over a number of years or quickly over a short period depending on markets and resource supply. The level of dependency of an area on the offshore oil and gas industry will determine the severity of this impact.

Like exploration, decommissioning itself offers few employment prospects. Structures are increasingly being designed with decommissioning in mind, reducing the time and labor required for these activities. The Cohasset Project in Nova Scotia was decommissioned in 2000 in less time than expected and under the projected budget (JWEL 2001).

ECONOMIC MULTIPLIER EFFECTS

Economic multiplier impacts of the oil and gas sector are determined by the structure and technology of the industry. Backward linkages involving the production of inputs such as equipment required by the industry are minimal because these highly specialized inputs are

ususally produced elsewhere. Estimates for the oil and gas industry in northeast B.C. indicate that there are 0.26 additional jobs generated in backward linkages for each job generated in the oil and gas sector (B.C. Stats 2004a). Forward linkages involving the processing of oil and gas are minimal too because little processing is required to transform oil and gas products prior to consumption; what processing is required, such as refining oil or transforming natural gas into electricity, will occur outside the producing region.

Final demand linkages are determined by the income and expenditure patterns of oil and gas employees. Estimates for northeast B.C. indicate that each job in the oil and gas sector generates an additional 0.31 jobs to provide goods and services to workers (B.C. Stats 2004a). When combined with indirect impacts based on backward linkages, each job in the oil and gas sector generates an additional 0.57 jobs in the region. This estimate is similar to ones for OOGD in Alaska, which forecast that each job in offshore oil and gas sector generates an additional 0.42 jobs in the region and 0.02 jobs in the rest of the state (U.S. Department of the Interior (U.S. DOI) 2002a: IV.B.19).

ECONOMIC IMPACT STUDIES

There have been several recent economic impact studies of OOGD. One study of the impact of OOGD on Newfoundland shows that over the period 1999-2002, OOGD resulted in an increase of 14.7% in GDP, 6% in personal incomes, and 3.7% increase in employment, including multiplier effects (CRSL 2003). In total, the OOGD in Nfld. provided 3,328 direct jobs (annual person years) over the study period and a total of 13,900 jobs when multiplier impacts are included. It is interesting to note that the increase in employment was less than one-quarter the increase in economic output, again illustrating the capital-intensive nature of OOGD. It should also be kept in mind that the impacts are large proportionally because of the relatively small size of the Newfoundland economy.

A recent economic impact assessment of OOGD in Nova Scotia was done for the period 1990-2000 (Gardiner Pinfold Consulting Economists Ltd. (GPCA) 2002). During this period, one OOGD project (Cohasset-Panuke) started production in 1992 and closed in 1999 and a second project (Sable Island) commenced production in 1999. The average annual contribution of OOGD to GDP was $120 million over the study period, which is equivalent to about .5% of Nova Scotia's GDP. The economic impact assessment of the OOGD in Nova Scotia illustrates several interesting features of OOGD. First, the analysis showed the highly cyclical nature of the industry, with employment varying between 700 and 11,000 during the study period. Second, the study showed the high rate of leakage of OOGD revenue from the provincial economy. The value of SOEP gas production in 2000 was about $810 million. However, most of this revenue was leaked from the provincial economy and accrued to nonresidents of Nova Scotia, leaving only $81 million or 10 % of the value accruing to the province. Of this 10% retained in Nova Scotia, 6% accrued as royalty revenue to the province and 4% as employment income distributed to local workers.

A third recent economic impact study was done for proposed OOGD in the Cook Inlet. The study forecast the creation of 83 direct and 37 indirect jobs (annual person years) for the operating phase of a significant proposed expansion in OOGD involving the production of 140

million barrels of oil and 190 BCF of gas over a 23 year production period (U.S. DOI 2002a: IV.B.19).

REGIONAL HIRING

One of the arguments for OOGD is to provide jobs for local residents. Unfortunately, experience shows that much of the employment generated by large resource development projects is often taken by highly skilled in-migrants, leaving local residents either unemployed or employed in lower paying service sector jobs. In the northeast coal project in B.C., for example, 85% of the jobs were taken by in-migrants (Gunton 2003).

The oil and gas industry also relies on highly skilled labor that is recruited from a global marketplace. The lack of local hiring is particularly acute in the exploration and development phases. Employment tends to concentrate in urban centers as is evident in Nova Scotia where 90% of the offshore contracts awarded went to firms located in Halifax (Gardiner Pinfold Consulting Economists Ltd. 2002). In Alaska, this trend has larger demographic implications: of the towns influenced by OOGD, the highest per capita incomes were reported in those communities with the lowest percentage of native Alaskans (Fall and Utermohle 1995). Similarly, benefits of offshore oil and gas development accrue mainly to men: in Newfoundland, only 5% of the offshore workforce was female (Shrimpton 2000).

Evidence on local hiring in OOGD is not detailed enough to draw precise conclusions. The reported percentage of provincial residents employed for several East Coast projects ranges from 57% in SOEP to 90% in Hibernia (table 3.2). However, these numbers overstate provincial hiring because they include in-migrants who have relocated to the province to take employment and are now classified as provincial residents. Further, these hiring statistics do not make any distinction between residents hired from the local region and residents hired from other areas of the province. The actual proportion of local residents obtaining employment is therefore much lower that indicated by these numbers. A study of hiring practices for the Bull Arm construction site for Hibernia distinguished between residents hired from the local region and the rest of the province. The study concluded that people from outside the region—defined as more than 50 km. from the site—took 93% of the jobs (Storey, Shrimpton, and Grattan 1996). Again, this does not accurately indicate how successful local residents were in obtaining jobs because the low proportion of local hiring may have been due to a shortage of local labour and/or a preference for hiring outside skilled labour. The issue from regional residents perspective is what proportion of residents who wanted work were able to find work. In the case of Bull Arm, Storey, Shrimpton, and Grattan (1996) found that local residents believed that they did not receive a fair share of the employment and that there was a bias for outside hiring.

Lack of local hiring can produce unfulfilled expectations. On the East Coast, many local residents felt that their expectations were not met in terms of actual employment and financial benefits accruing to their communities (JWEL 2001). Storey, Shrimpton, and Grattan (1996) found based on a survey done before and during Hibernia construction that the proportion of residents citing employment creation as a benefit of OOGD had declined from 89% before the project to 65% after the project. JWEL (2001) cited unrealistic expectations as a primary "lesson learned" from development on the East Coast, stressing that communities must have realistic expectations of what the offshore oil and gas industry can bring.

TABLE 3.2: PERCENTAGE OF PROVINCIAL AND LOCAL RESIDENTS EMPLOYED IN THE PRODUCTION PHASE

PROJECT	AVERAGE PRODUCTION EMPLOYMENT	PERCENTAGE OF PROVINCIAL RESIDENTS[4] EMPLOYED	PERCENTAGE OF LOCAL RESIDENTS EMPLOYED
Hibernia	878[1]	90%[1] (2002)	7%[5]
Terra Nova	985[1]	83%[1] (2002)	n/a
SOEP	310[2]	57%[3] (2001)	n/a

(1) C-NOPB 2003
(2) Gardiner Pinfold Consulting Economists Ltd. 2002
(3) Canada-Nova Scotia Offshore Petroleum Board (C-NSOPB) 2002
(4) "Resident" includes anyone who has resided in an area for six months. This definition includes individuals who migrated to an area for the purposes of employment.
(5) Storey, Shrimpton, and Grattan 1996

REGIONAL BENEFIT PLANNING

Jurisdictions undertaking OOGD often attempt to increase regional economic impacts by what has been termed benefit planning. Benefit planning can include programs such as local training and hiring, local value added and creation of local trust funds or revenue sharing agreements to reinvest some of the oil and gas rents back into the regional economy.

In Newfoundland and Nova Scotia provincial governments have attempted to regulate the percentage of local employment and the benefits provided by oil corporations operating within their jurisdictions. The Canada-Nova Scotia Offshore Petroleum Board (C-NSOPB) and C-NOPB oversee offshore development in an attempt to ensure that local businesses are able to compete with multinationals (JWEL 2001). The *Canada-Nova Scotia Industrial Benefits and Employment Plan* has as its stated objectives:

> . . . the employment of Canadians, and in particular, residents of Nova Scotia; the participation of Canadian, and in particular, Nova Scotia[n] businesses in the provision of goods and services (C-NSOPB 1994: 2).

Newfoundland is often cited as a successful example of benefit planning (Storey, Shrimpton, and Grattan 1996; Shrimpton 2002). The training of local labor to take jobs in OOGD and the construction of the Hibernia GBS production platforms in Newfoundland increased local economic impacts and the proportion of provincial residents obtaining employment in OOGD. However, the increasing propensity to use foreign suppliers for FPSO technology for the subsequent OOGD projects such as Terra Nova, despite successful construction of the Hibernia project, indicates some of the limitations of local procurement programs (Marshall 2001).

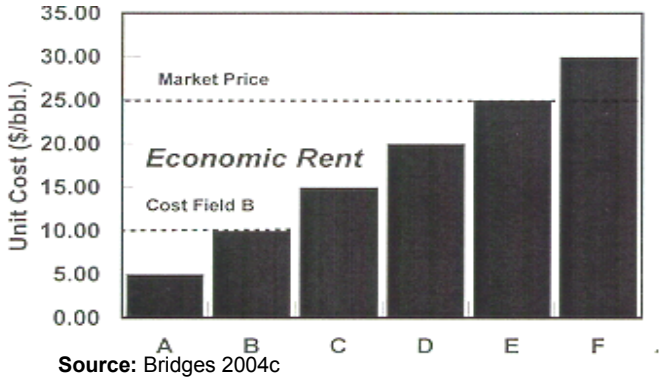
It is also important to note when reviewing the Newfoundland experience that being assertive about local benefits is more difficult than it was when the *Atlantic Accord* was written. The *Atlantic Accord* was specifically exempt from NAFTA, allowing the governments to require local hiring. Under NAFTA, performance requirements could be considered a form of economic discrimination unless accompanied by a subsidy (Marshall 2001). When contemplating the future

of offshore development in B.C., any local employment forecast or economic impact assessment must take this potential limitation into account.

3.3 GOVERNMENT REVENUE

One of the principal benefits of oil and gas development is that it generates rent, which is the surplus revenue available to the resource owner after deducting all costs of extraction including a the cost of capital. Oil and gas rents can finance social and economic infrastructure and trust funds to support economic growth and social welfare. However, several factors constrain the potential fiscal contribution of OOGD.

OOGD generates less rent than conventional oil and gas development because of higher production costs. Figure 3.5 illustrates the difference in rent generated by producers as production costs increase (moving from producer A to producer F).



Source: Bridges 2004c

FIGURE 3.5: ECONOMIC RENT FROM OIL AND GAS PRODUCTION

The combination of less rent and different royalty structures means that revenue generated by OOGD is significantly less than conventional production. This is illustrated in revenue data for four oil and gas producing regions (table 3.3). The data show that royalty rates for offshore production jurisdictions (Nova Scotia, Newfoundland) are considerably less than royalty rates for jurisdictions engaged in conventional production (B.C., Alberta). These royalty rates for OOGD may also overstate the net return for governments because they exclude subsidies that are sometimes required to compensate for the high risk of offshore production (Marshall 2001).

TABLE 3.3: ROYALTY RATES FOR OIL AND GAS IN SELECTED JURISDICTIONS

JURISDICTION	AVERAGE ROYALTY RATE (% OF SALES REVENUE)
Newfoundland (Offshore)	2.8[1]
Nova Scotia (Offshore)	4.0[1]
B.C. (land based)	28.0[2]
Alberta (land based)	15.8[3]

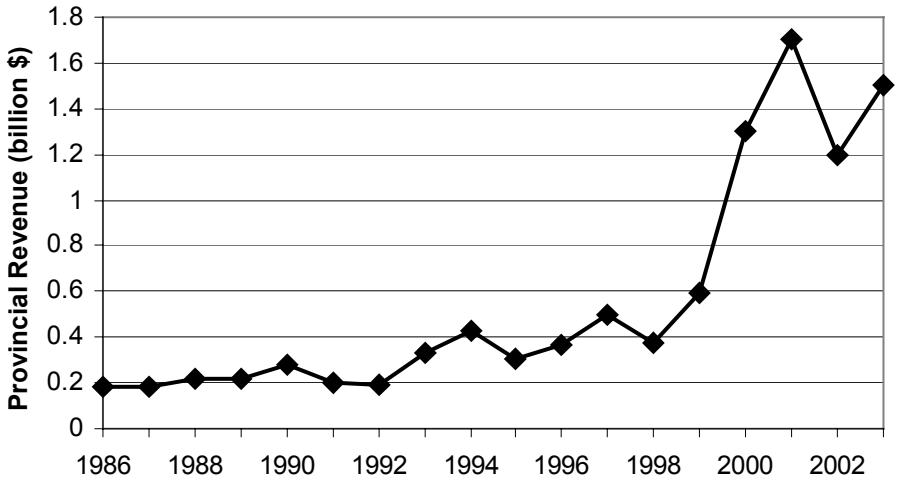
(1) Bridges 2004c: average of 15 years, undiscounted.
(2) B.C. Ministry of Energy and Mines 2003 (*Petroleum and Natural Gas Title Holdings and Revenue 1992-2002*; www.em.gov.bc.ca/dl/oilgas/stat/ogbc02a.pdf; accessed 28 March

2004) and B.C. Ministry of Finance 2003 (*2003 British Columbia Financial and Economic Review* (63rd Edition); www.fin.gov.bc.ca/tbs/F&Ereview03.pdf; accessed 28 March 2004): average 1993-2003, undiscounted including royalties, lease payments and bonus bids.

(3) CAPP 2002 (*2002 Oil and Gas Statistics*; www.capp.ca/raw.asp?NOSTAT=YES&dt=NTV&e=PDF&dn=34090; accessed 28 March 2004): average 1997-2003, undiscounted.

Another constraint is that collection of rent by the provincial government is offset to some degree by reductions in equalization payments. A recent study of the fiscal impacts of OOGD on Newfoundland, for example, forecast that the federal government will receive 75-80% of OOGD royalty revenue, in part, through reduced equalization payments resulting from Newfoundland's improved economic performance stimulated by OOGD (Nfld. 2003). Given, B.C.'s current receipt of equalization payments, the impact of OOGD in equalization needs to be taken into account in estimating royalty income.

A final constraint is that oil and gas royalty revenue is highly volatile. Because of royalty regime structures, revenue based on rent exhibits even greater swings than oil and gas prices. Figure 3.6, for example, illustrates the wide fluctuations in oil and gas revenues accruing to the B.C. government. Wide fluctuations make fiscal planning difficult because governments often mistakenly assume that temporarily high revenues generated during booms are permanent. Therefore, governments use temporary revenues to finance permanent programs. When revenues decline during the inevitable downturn, governments face long-run fiscal imbalances (Auty 1995).

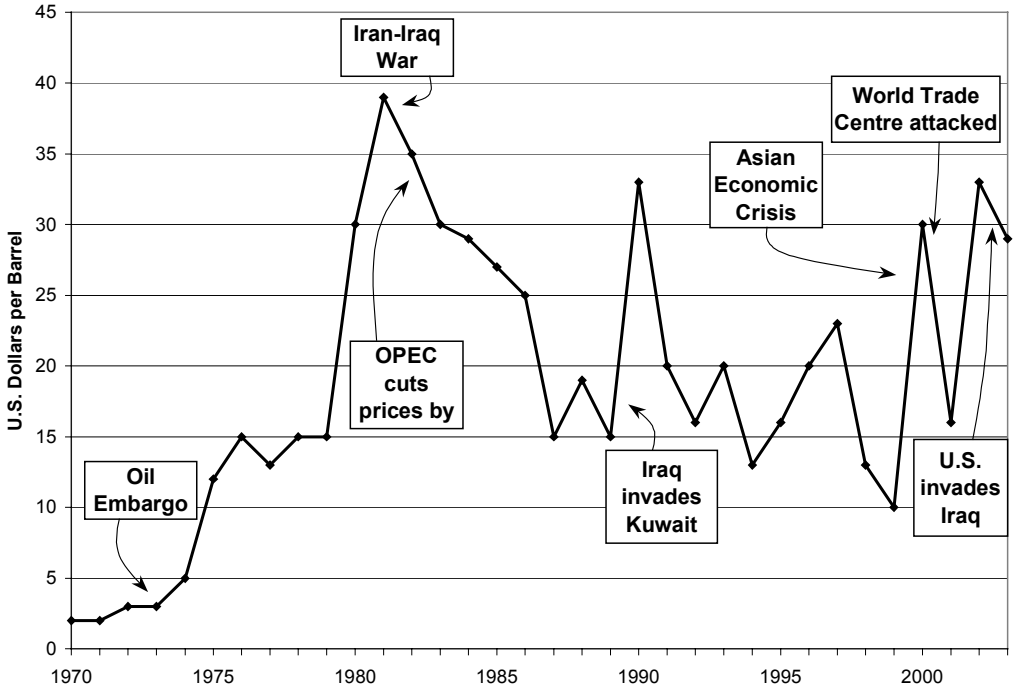


Source: B.C. Ministry of Energy and Mines 2004 (www.em.gov.bc.ca/subwebs/oilandgas/stat/stat.htm; accessed 14 April 2004.): 1986 – 2002; B.C. Ministry of Finance 2003 (*2003 British Columbia Financial and Economic Review* (63rd Edition); www.fin.gov.bc.ca/tbs/F&Ereview03.pdf; accessed 28 March 2004): 2003

FIGURE 3.6: BRITISH COLUMBIA OIL AND GAS REVENUES, 1992-2003

CYCLICAL NATURE OF THE INDUSTRY

Oil and gas, like all natural resource sectors, is a highly cyclical industry driven by volatile international commodity prices and unpredictable political events (fig. 3.7). This commodity cycle is intensified by the development cycle, which results in wide variations in employment and investment during the different phases of development. Employment typically peaks during the development phase and then declines during the production phase.

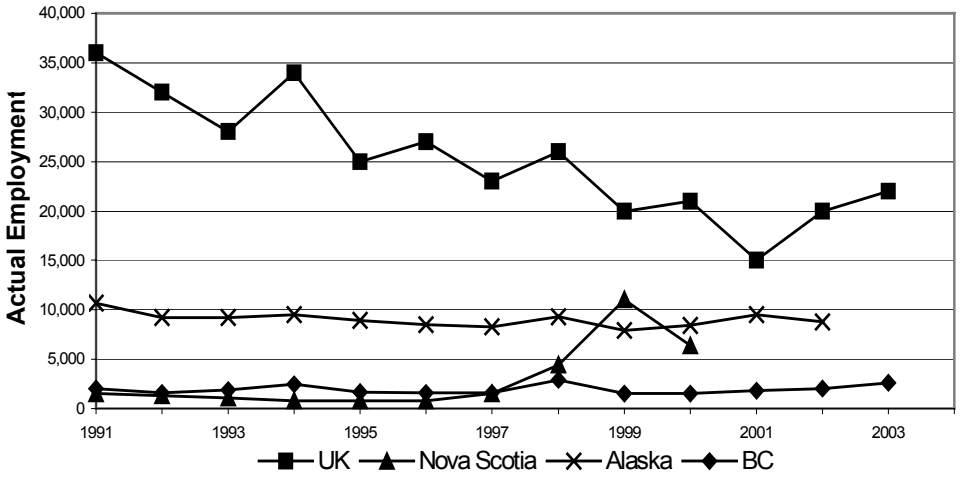


Source: Energy Information Administration. 2004 (*World Oil Market and Oil Price Chronologies*. www.eia.doe.gov/emeu/cabs/chron.html; accessed 28 March 28 2004)
Note: Dollars are nominal (not adjusted for inflation)

FIGURE 3.7: WORLD EVENTS AND OIL PRICES

The combination of commodity market and development cycles in the oil and gas industry can result in significant economic instability. This variability is displayed in fig. 3.8, which illustrates employment trends in selected oil and gas jurisdictions. It should be noted that these figures are for relatively large jurisdictions at the state, provincial, or national level. Employment data for smaller producing areas within these regions would likely show even greater instability.

The cyclical nature of the oil and gas sector can have negative consequences for local economies. During boom periods, the population grows rapidly in local regions driven by an influx of migrants seeking work in the oil and gas sector. This rapid growth can create inflation and social disruption. Expectations of future growth can also be excessive during the boom phase. Unrealistic expectations can cause excess investment in the oil and gas sector, as well as in other sectors, such as housing. The surplus capacity then closes during the downturn in the cycle, causing bankruptcies and layoffs in the local economy.



Source: UK: United Kingdom Department of Trade and Industry 2003 (direct and induced employment); www.og.dti.gov.uk/information/bb_updates/chapters/Chart2_9.htm; accessed 20 February 2004.
Nova Scotia: Gardiner Pinfold Consulting Economists Ltd. 2002 (direct and induced employment)
Alaska: Fried and Windisch-Cole 2003 (includes all "oil industry" employment)
B.C.: B.C. Stats 2004b (employment in "oil and gas extraction") (employment for 1999 and 2000 recorded as "below 1500")

FIGURE 3.8: EMPLOYMENT TRENDS IN OIL AND GAS

The impact of these cycles on specific producing regions can be severe. Bornholdt and Lear (1997), for example, analyzed the impact of oil and gas industry cycles in the Gulf of Mexico. During the period 1981 to 1986, most areas experienced significant declines in employment and income. In some areas, oil and gas employment decreased by 29% and earnings decreased by 28% (Bornholdt and Lear 1997). Generally, communities with diversified economies and those less reliant on extraction as a main pillar of their economies faired better during these bust periods (Bornholdt and Lear 1997).

SOCIAL IMPACTS OF DEVELOPMENT

Understanding social impacts of OOGD is challenging, given the lack of comprehensive time series studies employing consistent methodology. Evidence from the studies that have been done are mixed. Some studies have found that communities involved in resource development suffer a host of problems including higher crime rates, higher suicide rates, lower community satisfaction, inadequate services, and poorer employment and educational prospects for local residents (Seydlitz et al. 1993). House (2000), for example, notes the significant increase in crime rates experienced in Scotland during the development of North Sea OOGD. Irregular schedules, long absences from home, unpredictable patterns of employment, and risky work environments have negative affects on the families and communities of the people who work in the offshore oil and gas industry (U.S. DOI 2002b). Newcomers to high-growth regions are less happy than newcomers in more stable communities (Freudenburg 1981). Newcomers who arrive to fill the jobs also experience more stress and dissatisfaction in general than the local people (Seydlitz et al. 1993).

Economic inequality can also increase with development. For example, in Alaska the average monthly wage for an oil and gas industry worker is $7,754 compared with $3,210 for government employees, among the next highest paid (Information Insights 2001, in Vodden et al.

2002). This income gap creates a divide between oil and gas workers and others who do not benefit directly from the oil and gas development project. In many jurisdictions, the primary economic benefits of oil and gas have accrued to urban areas, exacerbating the urban-rural split As House observes "While oil-related growth has undoubtedly brought new wealth and employment to some individuals and some communities, its impact has tended to be very uneven and unequal" (House 2000: 48).

Other studies based on the North Sea and Eastern Canada present a more positive view on the social impacts of oil and gas development. In each of the oil-affected areas of the North Sea and Eastern Canada, local people initially expressed concerns about the impacts that oil and gas might have on the culture, lifestyle, and social problems in the region. Some research shows that many of these fears have proved unfounded (House 2000). In the cities impacted by oil development (Aberdeen, Stavanger, St. John's, and Halifax), the industry is alleged to have brought diversity, cosmopolitanism, and new dynamism to an urban lifestyle. In the Shetland Islands oil and gas development generated revenue that helped improve local infrastructure such as airports, improved ferry services, schools, houses, roads, waterworks, and hundreds of other oil-related contracts. Increasing numbers of professional people found that they could live and work in Shetland due to improved telecommunications and better services (Wills 1991).

In western Louisiana, the resource extraction industry has long been welcome and has had a positive impact on the local culture: offshore oil and gas was given credit for holding the culture together rather than for pulling it apart (Freudenburg and Grambling 1994).

In sum, the evidence shows that OOGD can have both social costs and social benefits. The balance between costs and benefits will vary depending on the magnitude of development, the characteristics of the development region, and the quality of planning. Clearly, social impacts need to be carefully assessed and policies adopted to maximize local benefits prior to proceeding with OOGD.

IMPACTS ON OTHER SECTORS

Tourism

In 1998, tourism created 113,000 direct jobs in B.C. of which an estimated 13,000 were in ecotourism (Clover Point Cartographics Ltd. 2000). In the Skeena-Queen Charlotte, Mount Waddington, and Kitimat-Stikine regions, tourism directly and indirectly accounts for 7%, 8%, and 5% of employment respectively (B.C. Stats 2004c). Tourism offers great opportunity and potential for further growth and economic diversification in communities that have been traditionally based on resource extraction. The FEP report identifies ecotourism as the fastest growing component of tourism in the region (RSC 2004). Indeed, many communities on the North Coast now include tourism in their economic development plans (Gill 2000).

Clover Point Cartographics (2000) identifies the following future trends in tourism for the North Coast:

- Future tourism growth in Canada and British Columbia will be driven by interest in outdoor experiences, particularly those in the soft adventure market and ecotourism.
- The North Coast has the attributes and appeal to draw domestic and international visitors seeking authentic wilderness and adventure experiences.

- Ecotourism and experiences emphasizing aboriginal culture hold particular promise for the North Coast.
- The demand for outdoor and wilderness experiences on the North Coast will continue to increase as carrying capacity is approached at other tourism destinations elsewhere in B.C. and the world.

The cruise ship industry is another important component of the tourism sector. Currently, cruise ships traversing B.C.'s Inside Passage offer guests spectacular scenery, and a number of coastal communities are pursuing this industry as a tool for economic development. One such community, Prince Rupert, has invested $9 million to build a cruise-ship terminal capable of accommodating the largest cruise ships traveling between Seattle and Alaska (Ford 2003). Prince Rupert expects the first cruise ship to dock in May 2004 (Anonymous 2004), and to host 64 cruise ships through the summer of 2004 (P. Williams, Director: Center for Tourism, School of Resource and Environmental Management, Simon Fraser University, pers. comm. 12 April 2004).

According to some studies, OOGD and tourism have coexisted with little conflict (Williams 2001 in Vodden et al. 2002). In some cases, it is argued that OOGD can actually enhance the tourism sector by providing infrastructure and revenues for investment (Shrimpton 2002; Wills 1998). However, the potential threats that OOGD poses to the tourism industry are significant. Images of oil spills or other environmental degradation have a negative impact on tourism, especially when tourism is marketed as a nature-based experience. As Gill (2000) pointed out, the risks of an oil spill are uncertain, but the adverse impacts and associated negative affects on the tourism industry are well documented (see also Wallace, Kirkely, Macguire, Austin, and Goldfield 2001).

Butler and Fennell (1994) illustrated the vulnerability of the tourism industry to oil and gas development off the coast of the Shetland Islands of Scotland. The Shetland Islands share some of the marketable characteristics of the North Coast of B.C. including remoteness, wilderness, cultural history, and the potential for ecotourism. For at least a decade following development of the industry in Shetland, nearly all pleasure tourism stopped. An aggressive and expensive marketing campaign began to draw pleasure tourists back, only to be completely reversed by the 1993 spill of the oil tanker Braer (almost twice the size of the Exxon Valdez spill). Representatives of the news media descended on Shetland and gave the spill extensive coverage as an ecological disaster across the world. Despite a reasonably successful cleanup, Shetland again became viewed as a tainted environment; tourism revenues dropped significantly and the area had to begin another costly marketing campaign.

Offshore development can also have a significant visual impact. Wallace et al. (2001) documented these impacts in Alabama, U.S.A. Alabama boasts a stretch of white sand tourist development known as Gulf Shores. It features "Pleasure Island", a family-oriented resort featuring charter and sport fishing, marine activities, beaches, golf, and other entertainment (Wallace et al. 2001). In 1995, the tourism industry in Gulf Shores successfully lobbied government to maintain the moratorium on drilling within 15 km of shore, stressing the potential negative visual impact that oil rig sightings would have on the tourism economy (Wallace et al. 2001). Despite this recognition of the impact of offshore development on tourism in this region, conflict between the offshore oil and gas industry and the tourism industry continues to be

apparent. As Wallace et al. 2001 concluded, offshore development and tourism may be "fundamentally incompatible" (Wallace et al. 2001).

Similarly, the impact of a potential oil spill on recreation and tourism is also a major concern in California, where some recreation groups are strongly opposed to new oil and gas development (Vodden et al. 2002). In San Luis Obispo, the travel and recreation industry is healthy, growing, and is a pivotal economic activity for the coastal community (Land and Stanwyck 1998). Visitors go to San Luis Obispo for the parks and beaches because they are clean and unique. The community and visitors to this area would be negatively affected if the oil and gas industry goes forward.

These experiences in other regions that rely on the pristine image of their environment as a basis for tourism are instructive when considering the potential impacts of OOGD in B.C. Clearly, implications of OOGD for B.C.'s growing tourism industry need to be carefully assessed.

Commercial Fisheries

Fishing is a significant industry in the QCB. In the Skeena-Queen Charlotte and Mount Waddington Regions, fishing and trapping directly and indirectly account for 9% and 6% of total employment respectively (B.C. Stats 2004c). Accordingly, any detrimental impacts of offshore oil and gas development on fisheries would have a significant impact on the local economy.

The QCB is an important spawning and migratory habitat for a number of commercially important fish stocks including sockeye, Chinook, Coho, pink, chum, steelhead, Pacific hake, Pacific cod, walleye Pollock, lingcod, sablefish, spiny dogfish, numerous species of rockfish, sole, herring, sand lance, and eulachon (RSC 2004). The commercial fishing industry operating out of Prince Rupert employs an estimated 2,400 workers using over 700 vessels and 11 processing plants (Prince Rupert Community Profile 2001 in RSC 2004). According to the Terrace Economic Development Authority (TEDA), annual income from the fishery is estimated to be around $150 million (TEDA no date in RSC 2004).

Oil and gas development has frequently had a negative impact on the fishing industry in terms of access to fishing grounds, damage to vessels and gear, and threats to fishing stocks (Bornholdt and Lear 1997; U.S. DOI 2002a, Storey et al. 1996). Seismic activity during the exploration phase can affect fish mortality and migration, which can result in significant declines in catch levels. Major oil spills, which can occur during exploration and production, can have devastating impacts on the fishing sector by tainting fish. The impact assessment of OOGD for Cook Inlet, for example, concluded that a moderate size oil spill of 1,500 to 4,600 barrels could cause closure of the fisheries for an entire season (U.S. DOI 2002a). Even potential tainting can affect consumer demand and reduce the market price for fish (RSC 2004). Abandoned structures continue to cause damage to vessels and gear and abandoned pipelines can migrate, causing damage to trawlers in unexpected areas many years after oil production has ceased (Patin 1999).

Most jurisdictions have a compensation program in place to mitigate economic losses to the fishing industry. These programs have met with mixed success and there are many issues left to resolve (Bornholdt and Lear 1997; Hertzog 2003; JWEL 2001; Storey et al. 1996). On the Canadian East Coast, the C-NOPB and C-NSOPB required the fishing industry and the offshore

oil and gas industry to find a mutually agreeable compensation program for losses to fishers. The process has been long and is still ongoing. Among the issues yet to be adequately addressed are:

- The potential issue of stock impairment, in particular who should be compensated if petroleum operations result in actual economic loss;
- The matter of long-term cumulative effects, specifically how any such impacts are, or can be, measured, and whether any related economic effects warrant direct compensation to fishers; and
- The emerging problem of the potential operational, economic, and biophysical impacts of seismic survey activities (Canning 2000).

Experiences in other jurisdictions show that OOGD can have a significant detrimental impact on the fisheries sector. Clearly, comprehensive analyses of potential impacts of OOGD on the B.C. fishing sector and required mitigation measures are required.

Subsistence Economy

Subsistence harvesting forms an important component of the socioeconomic health of the North Coast region. The impact of the Exxon Valdez spill on subsistence practices in this area illustrates the vulnerability to catastrophic events of this important sector. After the Exxon Valdez spill in 1989, harvests in affected areas declined by 9-77% and the number of households sharing wild food resources fell significantly (Fall and Utermohle 1995). Initially, these reductions were due to oil contamination of resources, but in subsequent years, harvests remained low and in some cases continued to decline due to decreases in marine populations (Fall and Utermohle 1995). Most communities reported children were not being educated in traditional harvesting methods and that alienation from the ocean had negative consequences for community health (Fall and Utermohle 1995). Despite concerns of contamination and increased costs of harvesting, the economic and cultural necessity of subsistence harvesting compelled many communities to resume these practices before it was safe to do so (Fall and Utermohle 1995).

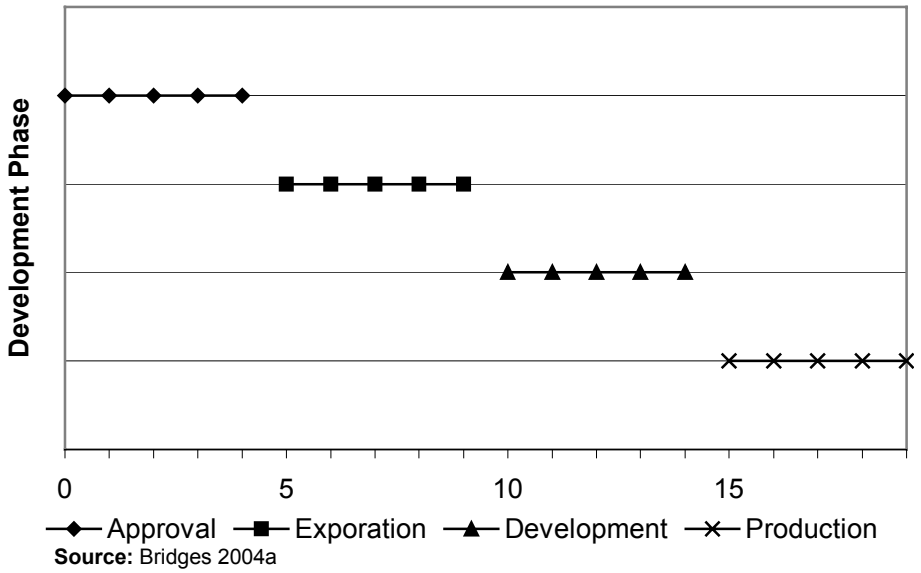
B.C. OFFSHORE DEVELOPMENT SCENARIO

The social and economic impacts of OOGD are directly related to the magnitude of a project and the structure of the regional economy. To further explore potential impacts of OOGD in B.C., the Western Diversification Office of the Canadian government commissioned Royal Roads University to undertake a series of studies examining the economic impacts of potential OOGD in B.C. (Bridges 2004a, 2004b, 2004c). This section of the report summarizes the results of these studies. It should be emphasized when reviewing the results that actual impacts could be larger or smaller depending on the magnitude of any proposed development.

TIME FRAME

Bridges (2004a) estimated a 25-year time horizon for B.C. OOGD development scenario (fig. 3.9). The first five years are devoted to achieving regulatory approval and management accords between levels of government before a project begins. After approvals are obtained, exploration activity to find oil and gas reserves requires about five years. If exploration is successful, development will take up to another five years, with production beginning in the 15th year, or around 2020. Some of these stages may overlap. This long lead time is generally consistent with

the experience in other jurisdictions engaging in OOGD such as Eastern Canada, which experienced about an 18-year lead time before production began.



Source: Bridges 2004a

FIGURE 3.9: POTENTIAL TIME FRAME FOR OOGD IN B.C.

INVESTMENT AND OUTPUT

Bridges (2004a) assumed a production scenario following a pattern similar to the Cook Inlet development in Alaska, which has many physical similarities with B.C. Investment is assumed to occur in two regions: Hecate Strait and Queen Charlotte Sound. Investment is estimated at $1.3 billion over the exploration and development phase (table 3.4). Production is estimated at 25,000 Bbl/day of oil and 78 MMcf/day of natural gas, which is equivalent to about 24% of current B.C. oil production and 2.9% of B.C. natural gas production. Annual operating costs are estimated to be $42 million/year (2003 $).

TABLE 3.4: INVESTMENT IN B.C. OOGD

COMPONENT	HECATE STRAIT (MILLIONS OF $)	Q.C. SOUND (MILLIONS OF $)	TOTAL MILLIONS OF $)
Exploration	50	58	108
Development of Platform	345	337	682
Development of Pipelines, Terminals, and Processing	212	255	467
Total	**607**	**650**	**1,257**

Source: Bridges 2004a

ECONOMIC IMPACTS

Bridges (2004a) estimated the impact of the proposed OOGD scenario on several key economic indicators (table 3.5). Overall, the average annual increase in GDP accounted for by direct impacts of the operating phase of OOGD would be $422 million (table 3.5). This is equivalent to a 0.31% increase in current GPP. When multiplier impacts are included, the average annual increase in GDP is $448 million, or 0.36% of current GPP.

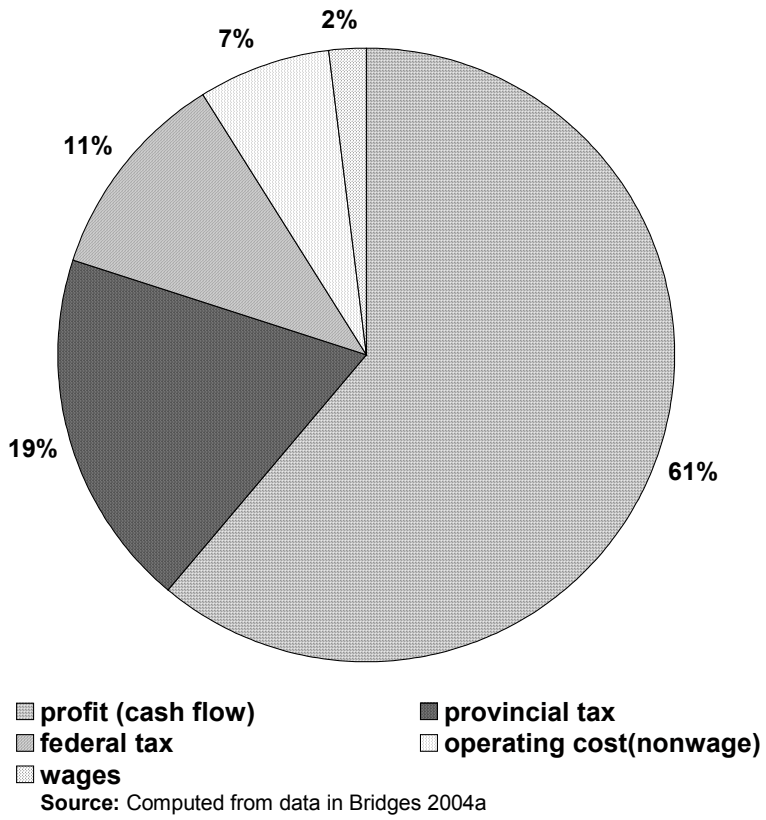
TABLE 3.5: POTENTIAL ECONOMIC IMPACTS OF OOGD ON B.C. - PRODUCTION PHASE

INDICATOR	ANNUAL AVERAGE DIRECT (MILLIONS OF $/YR)	ANNUAL AVERAGE TOTAL* (MILLIONS OF $/YR)
Value of Production	460	507
GDP	422	448
Operating Costs (nonwage)	31	33
Operating Costs (wages)	10	22
Federal Taxes	49	51
Provincial Taxes	89	91
Investor Earnings	281	n/a

* Includes multiplier effect

Source: The data in this table are based on Bridges 2004a. The numbers from tables 4-3 and 4-6 are summed for the respective categories and translated into annual averages by dividing the total cumulative numbers by the number of years the project would be in operation.

Economic impacts of OOGD are modest because a large proportion of the income derived from OOGD accrues to nonresidents. As displayed in fig. 3.10, only 19% of the revenue from oil and gas would remain in B.C. as wages and taxes to the provincial government. Most of the value (81%) from oil and gas would be leaked from B.C. in the form of profits to project investors, nonwage operating costs, and taxes to the federal government. Consequently, the multiplier impacts of OOGD on other sectors of the B.C. economy are small because expenditures are largely made for goods and services supplied from outside of the province. Bridges (2004a) estimated that just over 50% of the $1.2 billion investment would accrue to non-Canadians. The overall GDP multiplier for the operation of OOGD would be 1.06, which is considerably smaller than other sectors of the B.C. economy.



Source: Computed from data in Bridges 2004a

FIGURE 3.10: DISTRIBUTION OF OOGD REVENUE

JOB CREATION

Bridges (2004b) provided an estimate of the employment generation by type and by region for B.C. OOGD. The results are summarized in table 3.6. The exploration phase was anticipated to generate an annual average of 66 person-years of employment. Bridges (2004a, 2004b) cautioned that most of this employment would be generated outside the region. Less than one-half of these jobs would be located in the province and most of the B.C. jobs would be highly skilled planning and engineering jobs located in Victoria or Vancouver. Clearly, there would be little positive impact during the exploration phase on local employment in QCB coastal communities.

The development stage occurring in years 6-10 would generate an annual average of about 515 person-years of employment. Again, less than one-third of these jobs would be located in B.C. and many of the jobs located in B.C. would be in Vancouver or Victoria, not in the local region. The production stage will generate an annual average of 173 person-years of employment. Although almost all of this employment would be in B.C., there is no estimate of how much would be located in the local region. Also, because 90% of these jobs are highly skilled, many would be taken by in-migrants instead of local residents. In addition, the production jobs would generate between 91 and 245 additional jobs in other sectors through the multiplier effect (table 3.6).

As a note of caution, it should be pointed out that the Bridges study (2004a) also presented employment impacts for B.C. as 12,494 person-years of employment over the entire life of the project. This number, however, is prone to misinterpretation because it equates one person employed over 15 years as equivalent to 15 jobs. The 12,494 total persons-years of employment, therefore, would be equivalent to an average production employment of 173 direct and 245 multiplier jobs in any one year, plus exploration and construction employment.

TABLE 3.6: EMPLOYMENT IMPACTS OF B.C. OOGD

GEOGRAPHIC AREA	EXPLORATION: DIRECT	DEVELOPMENT: DIRECT	PRODUCTION: DIRECT	PRODUCTION: MULTIPLIER*
Local Region	n.a.	n.a.	n.a	n.a
BC	30	209	173	91-245
Rest of Canada	18	162	0	0
International	18	144	0	0
Total	**66**	**515**	**173**	**91-245**

* The high estimate is from Bridges and the low estimate is based on using the offshore oil and gas employment multiplier from Alaska, U.S. DOI 2002a: IV.B.19.
Source: Bridges 2004b, table 2-1

REVENUE DISTRIBUTION

A principal benefit of OOGD accruing to B.C. is the rent generated by the resource. Rent is the value of the resource after deducting all costs of extraction, including the costs of capital. The quantity of rent generated is contingent on energy prices, and cost of extraction. The proportion of rent collected by B.C. is contingent on the royalty system.

Bridges (2004c) estimated annual tax and royalty payments for the B.C. scenario. In estimating royalties, he used the current Canada Frontier royalty for oil and gas development on federal lands. The Canada Frontier royalty is a modified *ad valorem* royalty that starts at 1% of gross value of output and increases by 1% every 18 months to a maximum of 5% until project payback is achieved. After project payback, the royalty is calculated at the higher of 5% of gross value of output or 30% of net income (Bridges 2004c). Other taxes that would accrue to the province are based on current provincial corporate income tax rates. Bridges (2004c) estimated that total provincial tax revenue would average $89 million per year (table 3.4). This average amounts to less than 1% (0.3%) of 2003/04 provincial revenues. Further, the estimated revenue approximates gross revenue to B.C., not net revenue, which would be based on deducting incremental costs to government from OOGD.

Although Bridges did not distinguish between royalties and other taxes, the royalty proportion was about $18 million per year, based on the average royalty rate of 4% of gross revenue over the life of the project. This royalty rate is considerably lower than the average royalty rate of 28%, which B.C. earned on oil and gas over the last decade and amounts to an increase of only 0.36% over 2003/04 oil and gas revenue. Royalty revenue would also be lower for B.C. OOGD than north east B.C. because the leases for OOGD in B.C. have already been granted. Consequently, revenue cannot be generated through a bidding process for lease sales.

The revenue forecasted by Bridges illustrates the limitations faced by a revenue-sharing agreement with First Nations or local residents. Even if such an agreement was accepted by B.C., the revenue flow would most likely be based on a share of royalty revenues, which were forecasted to be $18 million per year starting with production about 15 years after project approval. If revenue sharing to promote regional welfare were desirable, it would appear easier and more effective to begin sharing existing resource revenues with the region and First Nations than making revenue sharing contingent on OOGD development.

B.C. SCENARIO SUMMARY

Development scenarios for B.C. OOGD remain uncertain until more analysis is done. Nonetheless, a possible development scenario outlined by Bridges (2004a, 2004b, 2004c) illustrated potential economic impacts. The scenario showed that OOGD is very capital intensive and would generate few jobs. Furthermore, many of the jobs, particularly during the exploration and development phase, would be generated outside the local region. Much of the employment generated locally would be taken by skilled in-migrant labor. Just over 80% of the production value would be leaked from the provincial economy in terms of payments to nonresidents. The proportion leaked from the local regional economy would be even higher. The impact on provincial GDP would be less than 0.4% growth above current levels. Revenues accruing to the province would be less than 1% of current provincial revenues, and the royalty rates would be well below the rates earned on current onshore production. These estimates may also be high because they do not take into account any potential negative impact on other sectors such as tourism and fishing. Although economic impacts may be greater or less than this scenario depending on the magnitude of development, the scenario suggests that OOGD impacts would be modest.

3.4 CONCLUSION

The principal finding of this chapter is that there is insufficient information to assess social and economic impacts of OOGD. Evaluating social and economic impacts of OOGD requires completion of a comprehensive multiple accounts analysis based on provincial government multiple account guidelines. To date, no comprehensive analysis multiple accounts analysis has been done and the social and economic impacts of OOGD have not been adequately assessed. Clearly, more research is required.

The socioeconomic information that is available raises significant cautions about the impacts of OOGD. OOGD is promoted as an economic development initiative to stimulate both the regional and provincial economy. Job creation, however, is not an adequate justification for project approval. For a project to be justified, the benefits must exceed costs as measured by a benefit-cost study and no benefit-cost assessment has been done. Further, the regional employment impacts are constrained by the capital-intensive, cyclical nature of the OOGD industry coupled with potential negative impacts the industry could have on the tourism, fishing, and subsistence sectors along B.C.'s North Coast. The OOGD would generate few local jobs and what local jobs are generated would be taken in large part by in-migrants. Multiplier impacts would be weak because most of the income earned from the sale of oil and gas would accrue to nonresidents, and the equipment to extract oil and gas would be imported. Government revenue potential of OOGD is low compared to conventional oil and gas production in the north east region of B.C. Overall, OOGD would have only a small impact on the B.C. and regional economy, and the offshore oil and gas sector would ultimately disappear as the resource is exhausted. Although these impacts can be enhanced by benefit planning, the implementation of benefit planning is constrained by NAFTA, markets, and technology. In sum, there is inadequate information to make an informed decision of OOGD, and the evidence that does exist raises important cautions about potential socioeconomic impacts.

CHAPTER 4: INSTITUTIONAL ARRANGEMENTS

The goals of this chapter are to assess the B.C. offshore oil and gas development (OOGD) management regime, the moratorium review process, and the merits of the current B.C. OOGD moratorium. The chapter begins by analyzing jurisdictional issues as they pertain to B.C.'s offshore. Next, international best practices criteria are used to evaluate the current B.C. regulatory system and the current B.C. moratorium review process. The merits of retaining the existing moratorium are then assessed on the basis of evaluative criteria.

4.1 JURISDICTION[1]

INTRODUCTION

This section discusses the key aspects of the jurisdictional framework that underpins OOGD in British Columbia. Three levels of government—federal, provincial, and First Nations—have some form of jurisdiction over the offshore area of British Columbia. First Nations' jurisdiction stems from Aboriginal rights, while federal and provincial spheres of influence are ceded by the *Constitution Act* of 1867.

FEDERAL

Under Canadian federalism, the federal and provincial governments each are assigned specific areas of responsibilities by the *Constitution Act,* 1867. Section 91 of that *Act* sets out the federal heads of law-making power, while s. 92 outlines similar powers for the provinces. Many specific matters are well defined under each of these heads of power, but some are not. Specifically, the jurisdiction over offshore natural resources is not explicitly allocated to either government. Moreover, the original *British North America Act* of 1867 (subsequently renamed the *Constitution Act* in 1982 but still referenced by its enactment date) was adopted during an era in which environmental issues were largely unknown. Consequently, the division of powers does not clearly allocate environmental responsibilities.

Two Supreme Court of Canada decisions define jurisdiction over offshore oil and gas projects. The 1967 Supreme Court *Reference re: Ownership of Off Shore Mineral Rights (British Columbia)* ([1967] S.C.R. 792) delineates federal responsibilities, while the court's 1984 ruling (discussed in the next section) in the *Reference re: Ownership of the bed of the Strait of Georgia and related areas (Georgia Strait Reference*, [1984] 1 S.C.R. 388) (the *Georgia Strait Reference*)[2] provides for provincial responsibilities. According to the *B.C. Offshore Mineral Rights Reference* case, the federal government has exclusive jurisdiction over offshore oil and gas projects that may occur in Canada's territorial sea or the continental shelf. The Supreme

[1] Substantial information for this section, particularly the federal and provincial jurisdiction subsections, is based on Rankin, Murray. 2004. *Offshore Oil and Gas and Coastal British Columbia: The Legal Framework*.

[2] Jurisdiction over the Strait of Juan de Fuca, the Johnstone Strait, and the Queen Charlotte Strait was also questioned.

Court held that the territorial sea extending for 12 nautical miles beyond the low-water mark of the outer coastline[3], as well as the seabed and subsoil below these waters, is subject to federal jurisdiction. The federal government owns the land beneath the territorial sea, and exclusively controls exploitation of its resources (*B.C. Offshore Mineral Rights Reference*: 816-817). According to international law, the "continental shelf", which lies beyond the territorial sea, is not owned by any national government; however, the 1958 *Geneva Convention* assigns exclusive exploitation rights over the continental shelf to sovereign coastal states. Since Canada, rather than B.C., constitutes a sovereign state and is the signatory to the *Geneva Convention*, the Supreme Court reasoned that the federal government alone holds the rights and obligations enumerated in that Convention (*B.C. Offshore Mineral Rights Reference*: 821).

The formal division of powers in the *Constitution Act,* 1867*,* explains federal jurisdiction over the territorial sea*.* Section 91(1A) provides the federal government with jurisdiction over public property, while the residual s. 91 "peace, order, and good government power" (the "POGG power") entitles the federal government to formulate legislation pertaining to matters falling outside specific heads of power if these laws further the peace, order, and good government of Canada (*B.C. Offshore Mineral Rights Reference*: 816). The federal government's legislative authority with respect to the continental shelf is only based on the POGG power, since the seabed and subsoil beyond the territorial sea are not Canadian territory. At the same time, the federal government also has jurisdiction over offshore oil and gas projects located in internal waters, which are regarded as provincial territory (see next section), although its influence is more indirect. The following heads of power provide the federal government with several abilities to regulate offshore oil and gas activities occurring in inland waters:

(i) S. 91(1), Navigation and Shipping (floating offshore production systems are "ships"[4], and could be regulated under this power);
(ii) S. 91(12) Sea Coast and Inland Fisheries (this power authorizes legislation for protecting the fisheries against threats from offshore oil and gas activities);
(iii) S. 91(24) Indians, and lands reserved for the Indians;
(iv) S. 92(10)(c) reserves the power to declare a work or undertaking within a province to be for the general advantage of Canada, and thus within its authority (a power that might be invoked for offshore oil and gas activities); and
(v) S. 91 the residual POGG power, discussed above.

PROVINCIAL

The *Georgia Strait Reference* case confirmed the provincial government's ownership of the seabed and subsoil below internal waters, essentially those bodies of water between islands and the mainland coastline. A majority of the Supreme Court held that the western boundary of the Colony of B.C., at the time it joined Confederation in 1866, was the west coast of Vancouver Island. Hence, the ocean waters east of that boundary, as well as the seabed under these internal

[3] The territorial sea used to extend 3 nautical miles beyond the low-water mark of the coast, but is now widely accepted in international law as stretching to 12 nautical miles. Canada adopted this latter view in the *Territorial Sea and Fishing Zones Act*, R.S.C. 1985, c T-8, s. 3, now reflected in the *Oceans Act*, S.C. 1996, c. 31.

[4] M. Harrington et al. "Emerging Issues in East Coast Oil and Gas Development," (1997) 35 *Alta. L. Rev.* (No. 2) 269 at 280.

waters, belonged to the colony, and subsequently to the province, rather than the federal government (*Georgia Strait Reference*: 426-427).

In constitutional law, a clear distinction must be drawn between ownership and jurisdiction. While the *Georgia Strait Reference* case decided ownership of the internal ocean's seabed and subsoil, it did not determine the heads of power authorizing B.C.'s legislative control over these submerged lands; nevertheless, ss. 92(13) and 92A are the two most obvious sources of provincial jurisdiction. Section 92(13) grants the provinces legislative power over property and civil rights, while s. 92A permits them to legislate with respect to, among other things, the "exploration for nonrenewable natural resources in the province" and the "development, conservation, and management of nonrenewable resources . . . in the province." Therefore, at the very least, B.C. must have the power to assign exploration and exploitation rights with respect to resources located in the internal ocean's seabed and subsoil.

Consequently, if offshore oil and gas projects were located within these internal ocean waters, the proponents would be subject to the authority of at least two levels of government. The result could be two overlapping, valid laws regulating the same activity, each on the basis of a different head of power. Where this occurs, the courts generally allow both laws to co-exist. Only if there is a truly unavoidable conflict between the two will they uphold the federal law at the expense of the provincial statute, under what is known as the "paramountcy doctrine."

JURISDICTIONAL COOPERATION

Rather than settling jurisdictional matters through the courts, federal and provincial governments are increasingly negotiating power allocation agreements. These agreements are the product of what has been termed "cooperative federalism," an example of which is the *Canada-British Columbia Agreement for Environmental Assessment Cooperation* (Governments of Canada and British Columbia 2004). Under this agreement (many provinces have established such agreements with the federal government), both levels of government provide a "single window" for proposal review by harmonizing their respective environmental assessment process.

Even if a proposed offshore oil and gas project were, as a matter of strict constitutional law, exclusively subjected to federal jurisdiction, federal-provincial cooperation is expected. Newfoundland and Nova Scotia have both negotiated agreements with the federal government in which both parties share decision-making authority over, as well as profits from, offshore resources[5]. The Canadian government agreed to share power, as well as revenues, even though the Supreme Court explicitly reconfirmed in the *Reference re: Seabed and subsoil of the continental shelf offshore Newfoundland (Hibernia Reference* [1984] 1 S.C.R. 86) (the *"Hibernia Reference"*) that the federal government had the exclusive right to explore and exploit the continental shelf (*Ibid*.: 127). It is likely that the federal government would adopt the same approach if it lifted its moratorium on offshore oil and gas exploration off the B.C. coast.

[5] These agreements are entitled, respectively: *Memorandum of Agreement between the Government of Canada and the Government of the Province of Newfoundland on Offshore Petroleum Resource Management and Revenue Sharing* (11 February 1985) and the *Canada-Nova Scotia Offshore Petroleum Resources Accord* (26 August 1986). A management scheme of offshore projects has been established pursuant to those agreements.

FIRST NATIONS

At the outset, it was noted that Aboriginal peoples may also have jurisdictional standing flowing either from a free standing right to self-government or because of their Aboriginal rights and title, which would include the right to make decisions about the use of land that is subject to Aboriginal title *(Campbell v. British Columbia (Attorney General*) 2000 B.C.S.C. 1123). In addition, resource rights may also include a regulatory component (*R. v. Nikal* [1996] 1 S.C.R. 1013).

Aboriginal Rights

Aboriginal and treaty rights receive constitutional protection under section 35 of the *Constitution Act,* 1982. The Supreme Court of Canada ruling in *R. v. Van der Peet*, [1996] 2 S.C.R. 507 developed a test for Aboriginal rights in which an activity

> . . . must be an element of a practice, custom, or tradition integral to the distinctive culture of the aboriginal group claiming the right. To be integral, a practice, custom, or tradition must be of central significance to the aboriginal society in question—one of the things which made the culture of the society distinctive. The practices or customs and traditions which constitute aboriginal rights are those which have continuity with the practices, customs, and traditions that existed prior to contact with European society.

Under *R. v. Van der Peet*, the court ruled that continuity does not necessarily need to be uninterrupted. A practice, custom, or tradition existing prior to European contact, and resumed after an interval, may still form the basis for an Aboriginal right. This decision also distinguished between specific Aboriginal rights and Aboriginal title.

Aboriginal Title

Aboriginal title relates solely to Aboriginal interests in the land itself and confers an exclusive right to use and occupy such lands. The foremost case on the nature of Aboriginal title is *Delgamuukw v. British Columbia* [1997] 3 S.C.R. 1010 in which the court ruled the territory must have been occupied exclusively by the claimant group at the time the Crown asserted sovereignty, which for B.C. was 1846 (para. 145). Although the use of the land is not restricted to traditional uses, the treatment must not destroy the basis of the Aboriginal connection to the land. The group claiming title to the land must have the capacity and intention to retain exclusive control of the land (Rankin 2004).

Several First Nations have competing, and occasionally overlapping, Aboriginal title claims over offshore areas that are potentially proposed for oil and gas exploration and development. Currently, the Haisla, Heiltsuk, and Tsimshian Nations are about two-thirds of the way through the provincial treaty process (B.C. Treaty Commission (B.C. TC) 2003). The Haisla Nation planned to renew negotiations in September 2003 after a two-year pause, while the Heiltsuk Nation, following a similar pause, voted on resuming negotiations in September 2003 (B.C. TC 2003: 26). Similarly, the Tsimshian Nation has focused on advancing member nations' interests through treaty negotiations (B.C. TC 2003: 34).

Situated near the other end of the negotiation continuum, the Haida Nation has declared "aboriginal title over all of Haida Gwaii [its Aboriginal name and known as the Queen Charlotte Islands] including the seabed resources of over half of Hecate Strait and 320 kilometers out into the Pacific Ocean" (Anonymous 2002). The Haida Nation has rejected the provincial treaty process by recently filing a lawsuit asserting Aboriginal title to Haida Gwaii and the surrounding

waters (B.C. TC 2003: 24). Providing credibility to this assertion, B.C. Supreme Court Justice D.A. Halfyard, in his judgement in *Haida et al. v. Minister of Forests et al.,* [2000] B.C.S.C. 1280, wrote

> . . . there is reasonable probability that the Haida will be able to establish Aboriginal title to at least some parts of the coastal and inland areas of Haida Gwaii (para. 47).

The federal and provincial governments have not recognized or acknowledged Aboriginal title claims to ocean territory (Rankin 2004). First Nations with an interest in ocean resources have only one option for asserting title: seeking court intervention similar to the Haida lawsuit. Consequently, it appears that any proposed offshore oil and gas activity seems destined to become entangled in protracted court proceedings.

Justification of Section 35 Infringements

If oil and gas drilling is located in waters held under Aboriginal title, or if fish and other resources used by First Nations, are negatively impacted, an infringement of section 35 of the *Constitution Act,* 1982, may occur. The government can justify an infringement of s. 35 if it satisfies the test outlined in the Supreme Court of Canada case, *R. v. Sparrow*, [1990] 1 S.C.R. 1075, whereby the infringement would be allowed if it were the result of government pursuing a legitimate objective. In *R. v. Gladstone*. ([1996] 2 S.C.R. 723) Chief Justice Lamer argued that attaining economic objectives might justify the infringement of an Aboriginal right or title, particularly in a region suffering from high unemployment.

> As distinctive aboriginal societies exist within, and are a part of, a broader social, political, and economic community, over which the Crown is sovereign, there are circumstances in which, in order to pursue objectives of compelling and substantial importance to that community as a whole (taking into account the fact that aboriginal societies are a part of that community), some limitation of those rights will be justifiable (para. 73).

In *Delgamuukw v. British Columbia*, Chief Justice Lamer expanded on the justification for infringement.

> In my opinion, the development of agriculture, forestry, mining, and hydroelectric power, the general economic development of the interior of British Columbia, protection of the environment or endangered species, the building of infrastructure, and the settlement of foreign populations to support those aims, are the kinds of objectives that are consistent with this purpose and, in principle, can justify the infringement of aboriginal title (para. 165).

In other words, a justification to breach s. 35 can hold if a valid economic objective is pursued, giving rise to the conclusion that First Nations' Aboriginal title rights may be impinged. However, if the government proceeds with such impinging development projects, it still has a fiduciary obligation to First Nations, as provided for by *Delgamuukw v. British Columbia* (at para. 203), to pay fair compensation.

Duty to Consult

To justify a section 35 violation resulting from offshore energy project approvals, case law has identified the need for the province and third parties to undertake meaningful consultation with affected First Nations, conducted in good faith[6]. The duty to consult includes an obligation for

[6] See *Sparrow, supra* and *Gladstone*, *supra*. It is stated in *Delgamuukw, supra* that "there is always a duty of consultation" when decisions are taken with respect to aboriginal peoples' lands" (at para.

gathering adequate information to ascertain the extent to which a proposed project jeopardizes Aboriginal rights[7]. The B.C. Supreme Court and the B.C. Court of Appeal in *Taku River Tlingit First Nation v. Ringstad et al.* (*Taku River Tlingit First Nation v. Ringstad et al.* [2002] B.C.C.A. 59) ruled that the existence of Aboriginal title does not have to be first proved in court by B.C. First Nations before the duty to consult applies. The B.C. Supreme Court found in favor of the Taku River Tlingit First Nation and prevented the Tulsequah Chief mine project in northern B.C. from proceeding. The province appealed the decision, maintaining that until the Tlingit had rights or title proven in court, the government did not have a legal or fiduciary duty to consult with the Tlingit. However, the Court of Appeal ruled that Aboriginal rights would be subject to a constitutional violation if the provincial government were allowed to proceed. If the government were permitted to disregard the existence of Aboriginal title and rights, the effect would rob "s. 35 (1) of much of its constitutional significance, effectively ending any prospect of meaningful negotiation or settlement of aboriginal land claims" (Dolha 2003). The B.C. Court of Appeal extended the enforceable and legal duty to consult First Nations to private companies in *Haida et al. v. Minister of Forests et al.*

In response to these court rulings, the B.C. government announced revised consultation guidelines relating to Aboriginal interests for all applicable provincial ministries, agencies, and Crown corporations (Anonymous 2002). The *Provincial Policy for Consultation with First Nations* recognizes that consultations with First Nations should occur before government makes any decisions related to land- and resource-use issues. Although this policy is based upon enforceable case law, it is still a policy and as such can be changed at any time. Public bodies should apply a four-step consultation process:

1) Initiate consultation;
2) Consider the impact of the decision on aboriginal interests;
3) Consider whether any likely infringement of aboriginal interests could be justified in the event that those interests were proven subsequently to be existing aboriginal rights and/or title; and
4) Look for opportunities to accommodate aboriginal interests and/or negotiate resolution bearing in mind the potential for setting precedents that may impact other Ministries or agencies (B.C. 2002b: 22).

The policy closes with the following statement:

> If resolution cannot be gained through negotiation, attempted accommodation, or other methods, it will be advisable to reevaluate the project or decision and seek legal advice before proceeding further (36).

The Supreme Court of British Columbia ruled in *Heiltsuk Tribal Council v. B.C. Minister of Sustainable Resource Management,* [2003] B.C.S.C. 1422 that the duty to consult is also a

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168), and the B.C. Supreme Court has reaffirmed this requirement more broadly by saying that there exists a "duty to consult where Aboriginal land issues arise" (i.e., not just title issues) in *Cheslatta Carrier Nation v. B.C.* [1998] B.C.J. No. 178 (B.C.S.C.) at para. 42. It is at para. 48 of that judgement where Williams C.J. specifies that the consultations must be "meaningful" (Rankin 2004, footnote 16).

[7] Thus, in *Cheslatta Carrier Nation v. British Columbia* (the "*Huckleberry Mine*" case), the B.C. Supreme Court held that the "project committee" conducting an environmental assessment pursuant to provincial legislation had not gathered adequate information about the project's implications for local wildlife and that it had thereby failed in its duty to consult, which was there a statutory one as well (*Ibid.* at paras. 58-59)

reciprocal responsibility of First Nations to consult in good faith. However, the Supreme Court of Canada has agreed to hear an appeal of the matter to clarify this outstanding issue (Lawson Lundell Barristers and Solicitors 2003). The outcome of the decision will have some impact on how resource-based industries approach Aboriginal consultation. This appeal is expected to be heard late 2004.

Current First Nations' Perspectives

The Nisga'a, Tsimshian, Haida, Haisla, and Heiltsuk First Nations traditional territories surround the B.C. coastal waters currently protected under the moratorium (see appendix B). The Haida, Tsimshian, and Nisga'a have issued positional statements. The Haida Council of Assembly passed a resolution in 1985 imposing a moratorium on OOGD until the resolution of rights and titles. The Haida Nation president, Guujaaw, has been quoted: "Haida are not totally opposed to offshore exploration as long as it could be done in an environmentally friendly way," but they do not believe that technology exists to protect the waters and coastline of Haida Gwaii. He further added that at this time the Haida are "not prepared to see offshore oil and gas drilling in any waters within a 200-mile limit surrounding Haida Gwaii" (Anonymous 2002). Guujaaw also suggested that any potential oil spills would be "a clear assault on our way of life" (B.C. OOGTF 2002: 6). The Haida and Tsimshian First Nations have issued a joint statement on the moratorium on north coast oil and gas exploration outlining their continued support for the moratorium (see Jacques Whitford Environmental Ltd. (JWEL) 2001, appendix 2).

Other First Nations have also expressed reservations about lifting the moratorium. At the B.C. Minister of Energy and Mines' public hearings held in nine northern communities, Richard Spencer of the Kitkatla First Nations emphasized the cultural, social, and historical importance of the sea by telling the Offshore Oil and Gas Task Force (OOGTF) "the ocean is our table," (B.C. OOGTF 2002: 6). Additionally, Chief Garry Reece of the Lax kw'alaams Band (member of the Tsimshian nation) spoke at a conference held at Simon Fraser University. His people want to conduct their own investigation into the risks and benefits to them before they would contemplate allowing any development to proceed. He stated that the Lax kw'alaams would require revenue-sharing agreements and equal decision-making status before it would reconsider its stance (see JWEL 2001, appendix 2). Moreover, the Heiltsuk do not support removing the existing oil and gas moratorium nor do they support oil and gas exploration and development within Heiltsuk territory (Hogan 2002). See appendix C: *Heiltsuk Nation Position Statement* for further details.

CONCLUDING JURISDICTIONAL REMARKS

In summary, three levels of government—federal, provincial, and First Nations—have some jurisdiction over any proposed offshore energy projects. Consequently, offshore oil and gas exploration and development activities will require these three levels of government—federal, provincial, and First Nations—to negotiate clarifying trilateral agreements. Indeed, the oil and gas sector has stated that such agreements are a prerequisite of the oil and gas industry before and development of offshore resources can proceed (Rankin 2004).

4.2 CURRENT MANAGEMENT REGIME

In 1958, offshore seismic activity commenced for the first time in Haida Gwaii by Shell Canada. Since 1959, B.C. has prohibited exploration drilling. However, Shell continued seismic activity and mapping and, between 1967 and 1969 the moratorium was temporarily lifted to allow the drilling of 14 exploration wells in the QCB. The federal government, in 1972, rendered a policy decision not to approve any new exploration permits or programs in the west coast offshore area, and to suspend all work obligations under existing permits, effectively issuing a moratorium on offshore oil and gas exploration.

Federally, Natural Resources Canada has developed a management regime for what is termed "frontier land." These lands are defined by s. 2 of the *Canada Petroleum Resources Act* as the Northwest Territories and Sable Island, as well as those submarine areas, not within a province, adjacent to the coast of Canada, including the territorial sea and the continental shelf. The Frontier Lands Management Division (FLMD), part of the Energy Sector of Natural Resources Canada, has a mandate to manage federal offshore oil and gas interests. This responsibility includes joint federal-provincial management regimes that have been established for Atlantic Canada by the negotiation of accords. These accords are discussed below since it is reasonably expected that similar accords would be negotiated for British Columbia, thus forming the West Coast management framework. FLMD maintains expertise in rights issuance, oil and gas engineering, environmental assessment, resource assessment, industrial benefits, joint management concepts, and commercial loan facilities. However, the Canadian Environmental Assessment Agency, empowered by the *Canadian Environmental Assessment Act* will likely oversee environmental assessments of offshore oil and gas projects, and, as such, will be the subject of further discussion below.

Due to the existing moratorium, B.C. does not currently have a regulatory process in place for managing offshore oil and gas projects. At this time, the Oil and Gas Commission (OGC) regulates land-based oil and gas activity within B.C., while the B.C. Environmental Assessment Office (B.C. EAO), governed by the 2002 *Environmental Assessment Act*, coordinates environmental reviews of major projects.

OIL AND GAS COMMISSION APPROVAL PROCESS

Oil and Gas Commission's Mandate

The OGC, a relatively new agency created by the enactment of the *Oil and Gas Commission Act* in June 1998, is a provincial Crown corporation responsible for overseeing oil and gas activities in B.C. The OGC's responsibilities are defined by a series of statutes including the *Oil and Gas Commission Act, Petroleum and Natural Gas Act*, and the *Pipeline Act*. Essentially, the commission's mandate is to assist oil and gas industry development by streamlining the approval process while ensuring that environmental and social impacts are taken into account. The specific purposes of the OGC are defined by s. 3 of the *Oil and Gas Commission Act*:

a) regulate oil and gas activities and pipelines in British Columbia in a manner that
   (i) provides for the sound development of the oil and gas sector, by fostering a healthy environment, a sound economy and social well being,
   (ii) conserves oil and gas resources in British Columbia,
   (iii) ensures safe and efficient practices, and

(iv) assists owners of oil and gas resources to participate equitably in the production of shared pools of oil and gas,

b) provide for effective and efficient processes for the review of applications related to oil and gas activities or pipelines, and to ensure that applications that are approved are in the public interest having regard to environmental, economic and social effects,
c) encourage the participation of First Nations and aboriginal peoples in processes affecting them,
d) participate in planning processes, and
e) undertake programs of education and communication in order to advance safe and efficient practices and the other purposes of the commission.

For terrestrial oil and gas activities, OGC controls all phases of oil and gas exploitation. "Activities" that the OGC is authorized to regulate are defined by s. 1 of the *Oil and Gas Commission Act* as:

a) the search for petroleum, natural gas or both;
b) the exploration and development of petroleum, natural gas or both;
c) the production, gathering, processing and storage of petroleum, natural gas or both;
d) the reclamation of sites disturbed because of an activity described herein; and
e) the monitoring and long term protection, control and treatment of those sites.

Consequently, the commission is placed in a dual role of both assisting the oil and gas industry to develop, while at the same time regulating and monitoring its activities for transgressions, as well as for adverse environmental or social impacts. To achieve these, perhaps, contrary goals, it is moving to a streamlined, performance- and results-based, self-administered permitting process (B.C. OGC 2003a).

Oil and gas exploitation activities must be conducted in a way that protects both worker and public safety, while minimizing disturbances to the environment and land. Responsibility for ensuring compliance falls to the Compliance and Enforcement Branch of the OGC, an agency that conducts inspections and communicates infractions to the offending company for subsequent remedial action through issuing a letter of deficiency. For "minor" infractions—those that do not result in a direct threat to the public or the environment, and that do not adversely affect oil and gas operations—the deficiency letter specifies 30 days for the company to conduct remedial actions and report back to the inspector. For "major" infractions—those with the potential to cause an adverse impact on the public or the environment—a company is required to conduct remedial action within 14 days. For serious infractions, those that may cause a significant impact on the public or environment, a company is required to conduct remedial action within one day.

If the appropriate remedial action is not reported back to the inspector by the specified date, enforcement action will take place. Inspectors have the authority to issue stop work orders for wells, pipelines, and facilities, as necessary, to ensure safe operations. Alternatively, company compliance history is also a component of the risk management assessment used for scheduling site inspections, whereby companies with repeated infractions would be subject to increased levels of compliance inspections.

General Development Permit

Due to the moratorium, B.C. does not currently have an approval process for regulating offshore oil and gas development. However, examining the land-based oil and gas activities approval process may yield insight into the likely structure that the offshore permitting system will assume.

In 2003, the OGC introduced a new permitting system known as the general development permit (GDP) (B.C. OGC 2003b). This system allows for project-level review, consultation, and approval in principle for works in a given project area. According to OGC, this process allows for enhanced First Nations' consultation, improved cumulative impact management, and reduced processing times for permits and authorizations.

A GDP is best suited to development fields on Crown land where multiple wells and pipelines are anticipated during a given drilling season, and a high likelihood of drilling success exists. A GDP is not suited to exploration projects where drilling locations are uncertain and likely to be amended during drilling as new information becomes available. Geophysical activities will not be approved-in-principle under a GDP. The GDP application and approval process occurs in three stages.

1. Expression of Interest: A letter of interest, provided by the proponent to the commission, describes the area of interest, as well as the anticipated scope of the project. An appropriately scaled map must accompany this letter indicating the location of the project area under consideration. First Nations' consultation regarding the suitability of a GDP application also begins with receipt of this letter. This step allows the commission to ascertain information needs and thus provide direction pertaining to the studies or assessments such as fish habitat, cultural resources, or terrain sensitivity that may be required as part of the application.

2. Overview Plan: The purpose of the overview plan is to provide as much detail about the project as possible in order to initiate project level review and consultation with First Nations, stakeholders, and government. This plan should include descriptions of proposed operating procedures and operational ground rules for the project, as well as the results of any field scouting, environmental assessments, and archaeology/cultural overview assessments. Mapping for the overview plan should show firm well locations, contingent well locations, and locations of corridors for access and pipelines including possible alternate routes.

3. Final GDP Application: The final GDP application should be a refined version of the overview plan and contain all relevant, up-to-date information about the project. This stage finalizes the project plan for the drilling season, and should include all planned wells, pipelines, facilities, and access corridors, as well as incorporating feedback from the overview plan consultation process, finalized maps, and any requested assessments such as archaeology or fish habitat.

After GDP approval, submission of individual applications such as well authorizations and pipeline applications will be required for authorization to access Crown land and to perform the works. These applications may now be processed expeditiously as they have already undergone review and consultation under the GDP.

APPLICATION REVIEW AND DECISION MAKING

The commission's Project Assessment Branch reviews applications related to oil and gas activities and pipelines, approving those applications that serve the public interest regarding environmental, economic, and social impacts. The branch works closely with proponents to ensure concerns, identified through public involvement or First Nations' consultation, are

properly addressed. The typical sequence of steps in the OGC's application review process is illustrated by fig. 4.1.

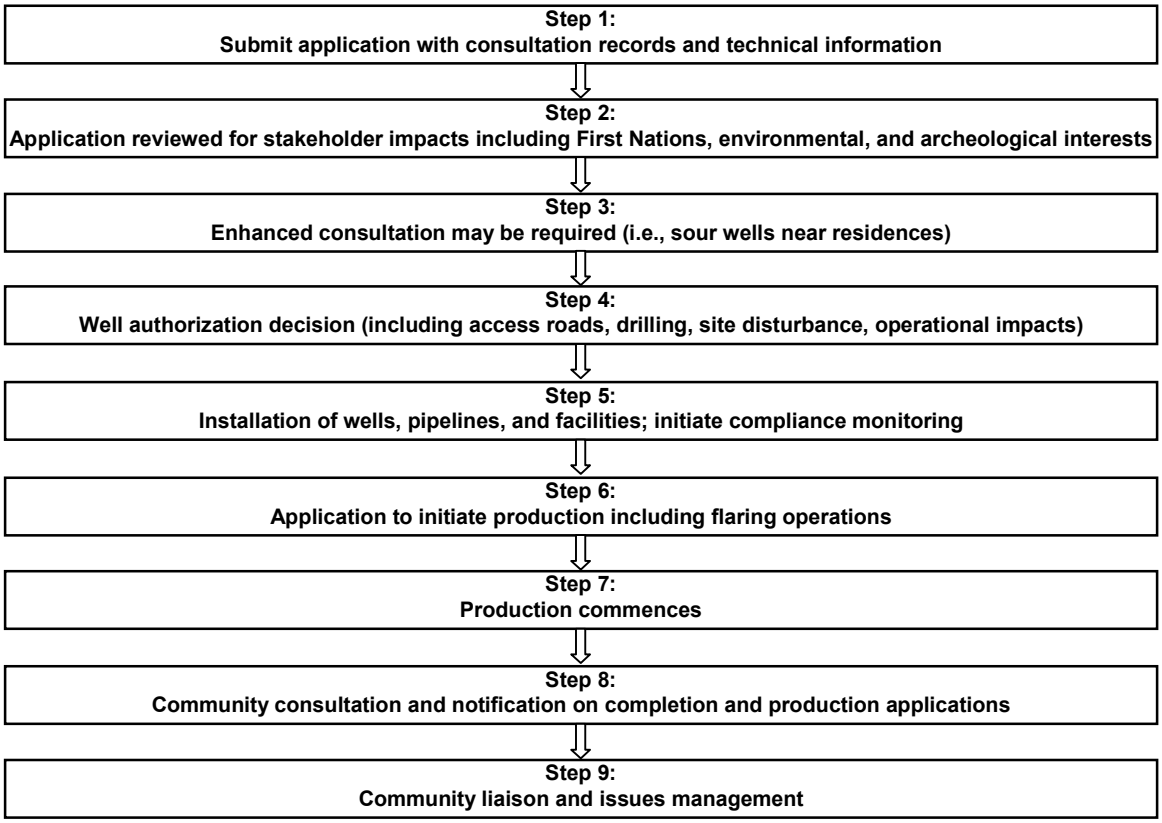

FIGURE 4.1: OGC'S NINE-STEP APPLICATION REVIEW PROCESS

ENVIRONMENTAL ASSESSMENT

Overview

Environmental assessment (EA) in Canada was first legislated in 1992 when the *Canadian Environmental Assessment Act* (*CEAA*) was passed (Boyd 2003). Over eleven years later, EA still forms an important part of land-use decision making. Boyd (2003) described the theory of EA as follows:

> EA involves gathering and evaluating information about the potential impacts of a proposed course of action, and integrating environmental and economic factors in order to produce sustainable development (149).

While EA will be an important part of offshore oil and gas development in British Columbia, there is a considerable amount of ambiguity in its application and implementation.

Both the federal and provincial governments have adopted EA processes and the assessment of offshore oil and gas projects are likely to fall under both jurisdictions. Due to this overlapping jurisdiction, it is unclear as to how both processes would be harmonized to provide for a clear decision-making process and to avoid any unnecessary duplication. Harmonization of the EA

process is also important to the Canadian Association of Petroleum Producers (CAPP), as Rankin (2004) noted, since industry is not likely to undertake any oil and gas exploration until authorization has been given by both levels of government. An overview of both the federal and provincial EA processes, EA cooperation between governments, and the status of First Nations participation in EA is presented in this section.

Federal Environmental Assessment

The federal EA process in Canada is governed by the *CEAA*, which was first passed in 1992 with recent amendments in 2003. Boyd (2003) described the purposes of the *CEAA* as follows:

> The purposes of the *CEAA* include ensuring that environmental impacts are considered before actions are taken, encouraging actions that promote sustainable development, avoiding duplication, and providing opportunities for public participation (151).

The *CEAA* applies when: the federal government proposes a physical project or activity, provides financial support to a physical project or activity, provides a license or permit to enable a physical project or activity to be carried out, or if a project is proposed on federal land (Canada 2003). In this case, since offshore oil and gas development would occur within Canadian waters, the *CEAA* will most certainly be triggered. Rankin (2004) noted that "federal lands" also include the internal waters, the territorial sea, the exclusive economic zone, and the continental shelf of Canada.

The *CEAA* sets out four types of EAs that may be carried out. Screenings are the lowest level of assessment, but generally provide only a brief analysis of the environmental and cumulative effects of a project (Canada 2003). Comprehensive studies also assess environmental and cumulative effects, but in addition consider the purpose of the project, its alternatives, and the need for a project monitoring system (Boyd 2003). Mediation and assessment by a review panel may be used if a comprehensive study determines that a project may cause significant adverse environmental effects or if environmental impacts of a project are inconclusive (Boyd 2003).

In deciding whether to approve a project, the responsible federal authority must take into account whether a project will cause "significant adverse environmental effects." Environmental effects in the federal process also include, but are not limited to, socioeconomic conditions, impacts on Aboriginal people and effects on cultural heritage. If the federal authority decides that a project may cause significant adverse environmental effects, then the authority can require the project to undertake a comprehensive study rather than merely a screening.

Another important feature of the federal legislation is the requirement for an assessment of the cumulative environmental effects of a project. Rankin (2004) noted that both screenings and comprehensive studies must assess the cumulative environmental effects of a proposed project. In comprehensive studies, consideration must also be given to:

(a) alternative means of carrying out the project that are technically and economically feasible and the environmental effects of these alternatives;
(b) the need for and requirements of a follow-up program in respect of the project;
(c) whether renewable resources that will likely be in heavy demand for the project will be able to meet present and future needs (Rankin 2004: 12).

These additional information requirements appear to strengthen the federal EA process by ensuring that any EA carried out shall have regard to the environmental impacts of a proposed project, as well as socioeconomic and cultural effects.

However, Boyd (2003) noted some weaknesses in the federal EA process. Several projects are not being assessed under the *CEAA*, such as projects proposed by certain federal organizations and Crown corporations. Boyd (2003) also observed that information and analysis in screenings is sometimes incomplete and unclear. Furthermore, the discretionary nature of the *CEAA* is considered a serious weakness (Boyd 2003). Under the *CEAA*, a project may be approved by the federal government even when an EA concludes that the project will have significant adverse environmental effects. In this case, one must question whether offshore oil and gas development will be permitted to proceed even if an EA does not recommend project approval. Boyd (2003) noted that between 1995 and 2000, about 25,000 EAs were conducted; however, 99.9% were only screened and a further 99.9% were approved. These results suggest that either virtually all federal projects subject to EA are environmentally appropriate, or the federal process favors development over the environment.

Other weaknesses of the federal EA process include the lack of clear criteria used in the evaluation of EAs, lack of meaningful public consultation, a lack of enforcement provisions, and no mandatory requirement for project monitoring programs (Boyd 2003).

Provincial Environmental Assessment

The provincial EA process is legislated by the *British Columbia Environmental Assessment Act* (*B.C. EAA*), which was first introduced in 1995 and subsequently revamped in 2002. The principles of the *B.C. EAA* include, but are not limited to:

- Access to information by all interested parties;
- Balanced decision making by government;
- Comprehensive environmental assessments;
- Consultation with all potentially affected parties; and
- Flexibility of assessment methods and procedures (B.C. EAO 2003).

The *B.C. EAA* prescribes an eight-step process a project must undertake to achieve environmental certification. The process is generally described in fig. 4.2.

The application of the *B.C. EAA* begins with the determination of whether a project is deemed to be "reviewable." A project is deemed reviewable if it is listed in the *Reviewable Projects Regulation* promulgated under the 2002 *B.C. EAA*, if the minister of Sustainable Resource Management determines the project is reviewable, or if the proponent asks B.C. EAO to consider the project as reviewable (B.C. EAO 2003). New offshore oil and gas facilities, as well as modifications to existing facilities, are included in the *B.C. EAA*'s list of reviewable projects; however, the exclusion of offshore oil and gas exploration activities from the *Reviewable Projects Regulation* introduces a significant gap in the regulatory framework. While new and existing oil and gas facilities are included in the *Reviewable Projects Regulation*, they may be removed at any time since regulations can be changed through an Order in Council (OIC). Furthermore, even if a project is included in the *Reviewable Projects Regulation,* the executive director of B.C. EAO may exclude a project from the provincial EA process. The powers of the executive director are set out in Section 10(1) of the 2002 *B.C. EAA:*

> 10(1) The executive director by order
> (a) may refer a reviewable project to the minister for a determination under section 14,
> (b) if the executive director considers that a reviewable project will not have a significant adverse environmental, economic, social, heritage or health effect, taking into account

practical means of preventing or reducing to an acceptable level any potential adverse effects of the project, may determine that
(i) an environmental assessment certificate is not required for the project, and
(ii) the proponent may proceed with the project without an assessment.

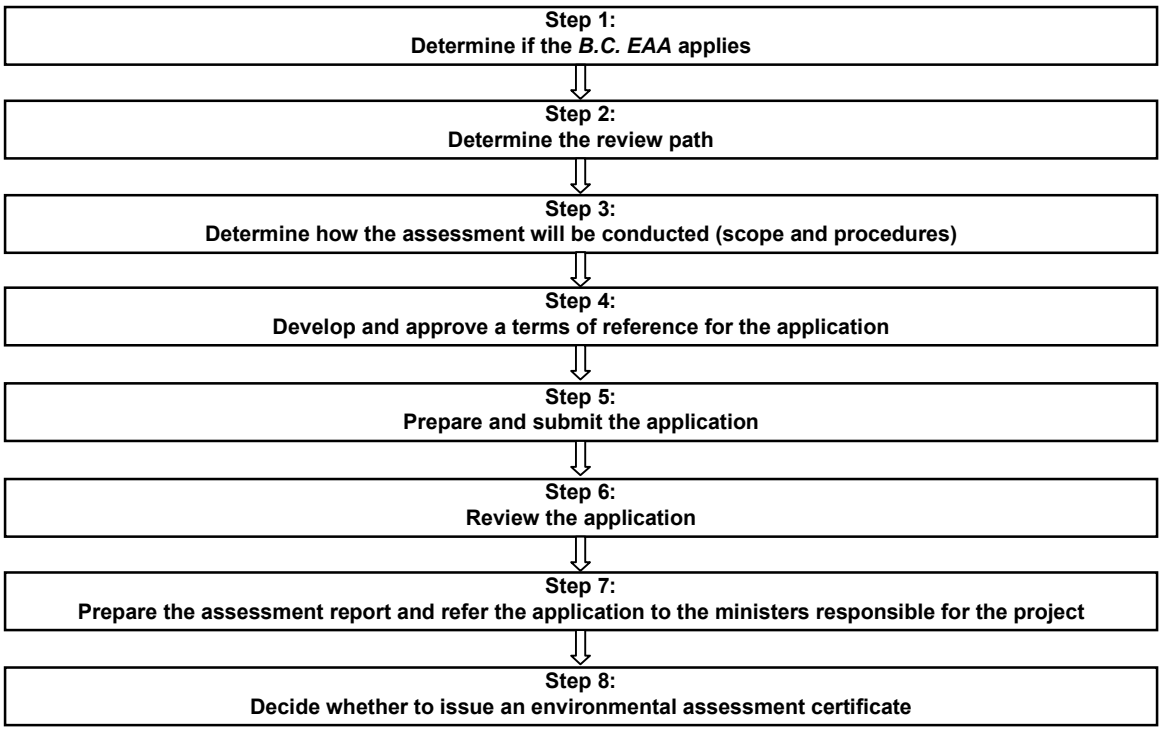

FIGURE 4.2: STEPS IN THE PROVINCIAL EA PROCESS

Once a determination has been made as to the application of the *B.C. EAA*, a review path is determined. Usually B.C. EAO manages the assessment, but the review may be referred to the minister of Sustainable Resource Management. The scope of the EA is developed through the project's terms of reference. The terms of reference document sets out the information requirements and how they will be met. The EA is then submitted, reviewed, an assessment report is prepared, and the EA is then referred to the appropriate ministers for a decision. The ministers then have 45 days to decide whether to issue an environmental assessment certificate, which usually contains project-specific conditions such as requirements for ongoing environmental monitoring (B.C. EAO 2003). The specific criteria used in the evaluation of EAs for proposed projects are not mentioned.

While the purpose of the EA process in British Columbia is to determine whether a project should proceed given its environmental impacts, Hertzog (2003) stated that no project has ever been turned down by B.C. EAO. Hertzog (2003) hypothesized that either all projects have been environmentally sound or that B.C. EAO has leaned more towards development rather than environmental protection.

The *B.C. EAA* has inadequate provisions for public participation (Boyd 2003). Under the previous *Act*, a "project committee" for each project was required, which included representatives from First Nations whose territory was within or adjacent to the proposed project (Rankin 2004). The *B.C. EAA* amendments in 2002 eliminated requirements for public participation by potentially affected parties. Other changes to the 2002 *Act* included the elimination of requirements to assess cumulative effects of a project, the need for alternatives to a project, and an introductory section that emphasizes sustainability (Boyd 2003).

The promulgation of other provincial legislation has also changed the way EAs are carried out. The *Significant Project Streamlining Act (SPSA)* was passed in the legislature in November 2003. According to West Coast Environmental Law (WCEL) (2003), this *Act*:

> . . . gives the B.C. Cabinet and individual ministers extraordinary powers to overrule provincial or local government laws, regulations or bylaws if they are perceived as being 'constraints' to development projects that the government designates as 'provincially significant' (1).

While the *SPSA* states that these new provincial powers are subject to the *B.C. EAA,* the *SPSA* weakens the review process by allowing the provincial government to override regulations governing OOGD.

In sum, the *B.C. EAA* has a number of weaknesses including:

- Inadequate provisions for public participation;
- No requirements for cumulative effects assessments;
- Incomplete EA regime with the exclusion of oil and gas exploration activities; and
- No mandatory requirement to conduct EAs of major projects such as OOGD.

Environmental Assessment Cooperation

One of the most confusing aspects of EA is the overlap of the federal and provincial processes. While it is uncertain as to which level of government would be the lead party for the offshore oil and gas EA process, Rankin (2004) pointed out that project proponents will most likely be required to receive authorization from both levels of government.

Cooperation is one way that the two levels of government have attempted to deal with the jurisdictional issues of the EA process. In 1997, the federal and provincial government signed the *Canada-British Columbia Agreement on Environmental Assessment Cooperation* in order to establish a single EA process, avoid duplication, and carry out EAs in an efficient manner when both EA processes apply. The 1997 agreement expired in 2002 and a new version of the agreement has just been signed. The new *Agreement* discusses the formulation of project work plans, the establishment of joint review panels, a process for resolving disputes, and a process for First Nations' participation (Governments of Canada and British Columbia 2004). Also, the new *Agreement* attempts to establish a process for determining the lead party in the case of a cooperative EA (Governments of Canada and British Columbia 2004). Section 12(1) describes the process:

> (a) Canada will be the Lead Party for proposed projects on federal lands where Canada has an environmental assessment responsibility;
> (b) British Columbia will be the Lead Party for proposed projects on lands within its provincial boundary, not covered under paragraph (a), where British Columbia has an environmental assessment responsibility; and

> (c) If a project is located on both federal and provincial lands and both Parties have an environmental assessment responsibility, the Lead Party will be determined by mutual agreement of the Parties.

The ambiguous nature of the wording in the *Agreement* provides little clarity to the process of EA harmonization. Rankin (2004) echoed this point of view by stating that "the application of the [new] *Agreement* to offshore oil and gas exploration and development is far from clear" (10).

First Nations and Public Consultation in Environmental Assessment

As mentioned in the discussion of the federal and provincial legislation, First Nations and public consultation in EA has taken a step backwards in recent years. In terms of the *B.C. EAA*, mandatory requirements for the establishment of a project committee and First Nations consultation have been abolished (Rankin 2004). Under the old *B.C. EAA*, "the application also required the proponent to identify First Nations outreach and consultation activities already undertaken and planned" (Rankin 2004: 11). This wording suggests that the proponent had the duty to consult with potentially affected First Nations prior to and/or during the EA process. These requirements have since been eliminated from the rewritten 2002 legislation. Furthermore, the new *Provincial Policy for Consultation with First Nations* (B.C. 2002b) does affirm the provincial government's willingness to consult with First Nations, but it is unclear as to the extent of Aboriginal involvement in the decision-making processes.

In terms of the *CEAA*, Boyd (2003) noted that the extent of public consultation in the EA process depends on the type of EA undertaken. In the case of a screening, public consultation is at the discretion of the responsible federal authority. In the case of comprehensive studies, public consultation is mandatory, but only consists of being notified of a project and being able to provide written comments (Boyd 2003). For panel reviews, the public is able to actively participate in public hearings by presenting evidence and questioning proponents (Boyd 2003). Furthermore, it is unclear as to whether or not the federal process provides more opportunities for meaningful consultation than the provincial EA process. Rankin (2004) noted that

> . . . the federal legislation makes no greater provision for aboriginal and public participation in the EA process than does the *B.C. EAA* (11).

MANAGEMENT REGIMES FOR OFFSHORE OIL AND GAS DEVELOPMENT

Atlantic Canada

The approvals process for offshore oil and gas exploration in Atlantic Canada is regulated through the Canada-Nova Scotia Offshore Petroleum Board (C-NSOPB), the Canada-Newfoundland Offshore Petroleum Board (C-NOPB), the National Energy Board, and/or provisions of the *Canadian Environmental Assessment Act*. Development in most of offshore Nova Scotia is subject to the provisions of the *Canada-Nova Scotia Offshore Petroleum Resources Accord Implementation Act* and the *Canada-Nova Scotia Offshore Petroleum Resources Accord Implementation (Nova Scotia) Act* (the *Accord Acts*). Development in offshore Newfoundland is subject to the provisions of the *Canada-Newfoundland Atlantic Accord Implementation Act* and the *Canada-Newfoundland Atlantic Accord Implementation (Newfoundland) Act* (the *Accord Acts*). C-NSOPB and C-NOPB are independent joint agencies representing the Governments of Canada and Nova Scotia, and Newfoundland and Labrador, respectively, and are responsible for management of the hydrocarbon resources (including

regulation and safe practices) in the Nova Scotia and Newfoundland offshore areas pursuant to the *Accords Acts*. C-NSOPB was established in 1987; C-NOPB in 1985.

C-NSOPB's principal responsibilities include:

- Ensuring the safe conduct of offshore operations;
- Protection of the environment during offshore petroleum activities;
- Management of offshore oil and gas resources;
- Review of industrial benefits and employment opportunities;
- Issuance of licenses for offshore exploration and development; and
- Resource evaluation, data collection, and distribution (JWEL 2001: 13-14).

C-NOPB's responsibilities include:

- The sale of interest in lands;
- The issuing of exploration licenses;
- Approvals and authorizations pertaining to exploration activities;
- The declaration of Significant and Commercial discoveries;
- The issuing of production licenses;
- Decisions relating to the commencement, continuation, and suspension of drilling and production;
- The administration of regulations; and
- The exercise of emergency powers pertaining to safety, environmental protection, and resource conservation (JWEL 2001: 14).

In fulfilling these roles, C-NSOPB/C-NOPB will often place conditions upon a development as they relate to environmental protection (requiring an environmental protection plan for each phase of a project), environmental monitoring (conducting environmental effects monitoring to validate the potential effects predictions made in environmental assessment reports), and worker safety (requirements for safety plans, conducting concept safety analyses). In addition to placing conditions on planning processes, C-NSOPB/C-NOPB will often require commitments or establish conditions regarding the design of the project (e.g., requiring specific safety design considerations be included, such as double-hulled vessels for operating in waters with pack ice and icebergs).

The *Accords Acts* are very similar, as are the development regulations, approvals, and authorizations. Both *Accord Acts* will be discussed in tandem, with any significant differences indicated. The *Accords Acts* require that prior to production from a pool or field, the operator of the pool or field must hold a valid production license, and that an approved development plan be in place. Approval of the development plan includes consideration of matters relating to the safety of operations, protection of the environment, and conservation of the petroleum resource.

A development plan provides C-NSOPB/C-NOPB with a description of all phases of the proposed offshore hydrocarbon development process associated with a proposed project. It also provides sufficient information to enable C-NSOPB/C-NOPB to conduct a public review of the proposed project activities, if such a review is deemed necessary. A development plan outlines the work that is to be done during all subsequent phases of the project, and the procedures that will be used in completing this work. Once C-NSOPB/C-NOPB has fulfilled their roles in the

project approvals process, their primary mandate is to oversee the operation and safety of the developments.

Offshore development also requires the following approvals from C-NSOPB/C-NOPB:

- Geotechnical/Engineering/Environmental Program Authorization;
- Declaration of Commercial Discovery;
- Production License;
- Operating License;
- Authorization to Install Production Installation;
- Drilling Program Authorization;
- Certificate of Fitness issued by a Certifying Authority and required by the
  - drilling unit prior to the issuance of a Drilling Program Authorization,
  - diving program prior to the issuance of a Diving Program Authorization,
  - production facility prior to the issuance of a Production Operations Authorization;
- Approval to Drill a Well;
- Production Operations Authorization;
- Diving Program Authorization; and
- Abandonment Program Authorization.

The development of offshore oil and gas projects is subject to the *CEAA*. The lead Responsible Authority is designated from among the Responsible Authorities, and is held accountable for coordinating the government and public review.

The United States

The U.S. Outer Continental Shelf (OCS) is a significant source of oil and gas for the U.S.'s energy supply, and has been in production since the 1950's. Through 1995, 10.5 billion barrels of oil and 118 trillion cubic feet of natural gas have been produced from the OCS. By the end of 2002, the U.S. offshore supplied more than 25 percent of the country's natural gas production and more than 30 percent of total domestic oil production[8].

The *Outer Continental Shelf Lands Act* (*OCSLA*) requires the Department of the Interior (DOI) to prepare a five-year program that specifies the size, timing and location of areas to be assessed for federal offshore natural gas and oil leasing. It is the role of DOI to ensure that the U.S. government receives fair market value for acreage made available for leasing, and that any oil and gas activities conserve resources, operate safely, and take maximum steps to protect the environment.

The secretary of Interior has been designated by law to manage and regulate leasing, exploration, development, and production of mineral resources on the OCS through the DOI agency Minerals Management Service (MMS). Currently, MMS is operating under the recently adopted five-year program for 2002-2007 enacted by Secretary of the Interior Gale A. Norton on 1 July 2002[9]. This agency collects, accounts for, and disburses more than $5 billion per year in revenues from

[8] From the Minerals Management Service's website: www.mms.gov/offshore/; accessed 29 March 2004.

[9] From the Minerals Management Service's website: www.mms.gov/5-year/; accessed 29 March 2004.

federal offshore mineral leases, and from onshore mineral leases on federal and Indian lands[10]. The program is national in scope and includes two major programs: Offshore Minerals Management and Minerals Revenue Management. The offshore program, which manages the mineral resources on the OCS, comprises three regions: Alaska, Gulf of Mexico, and the Pacific. MMS estimates that 45.6 billion barrels of undiscovered, conventionally recoverable oil resources and 268 trillion cubic feet of undiscovered, conventionally recoverable natural gas resources remain on the federal OCS (U.S. DOI 1997b).

Overview of OCS Regulations

According to *OCSLA*, an exploration plan (EP) and its supporting information must be submitted for approval to MMS before an operator may begin exploratory drilling on a lease. An EP describes all exploration activities planned by an operator for a specific lease(s), the timing of these activities, information concerning drilling vessels, location of each well, and other relevant information.

In accordance with the *Coastal Zone Management Act* (*CZMA*), as amended, EP's requiring state review must be certified consistent with approved coastal zone management programs of states potentially affected by the exploration activities. In other words, *CZMA* provides states with the ability to veto any federal activities that are inconsistent with or harmful to the states' coastal zones. States with approved programs may take up to six months for consistency reviews but must agree with or request an extension within three months after receipt of an EP. The designated state agency implementing a state's *CZMA* program determines whether a federal program will have negative effects on the states' coastal zone. The Gulf of Mexico, Louisiana, Mississippi, Alabama, and Florida have federally approved coastal zone management programs.

Based on available information, MMS prepares a categorical exclusion review (CER), environmental assessment (EA), or environmental impact statement (EIS). These appraisals may include a geophysical report for determining the potential for the presence of deepwater benthic communities, archaeological report, air emissions data, live-bottom survey, biological monitoring plan, as well as recommendations provided by affected state(s), the Department of Defense, U.S. Fish and Wildlife Service (for selected plans under provisions of a DOI agreement), National Marine Fisheries Service, and/or internal MMS offices. MMS evaluates proposed activities for potential impacts relative to geohazards and human-made hazards (including existing pipelines), archaeological resources, endangered species, sensitive biological features, water and air quality, oil-spill response, and other uses, such as military operations, of the OCS.

If a CER determines that a proposed action is an exception to the categorical exclusions contained in regulations, then an EA under the *National Environmental Policy Act* (*NEPA*) is required. The criteria used to determine which actions are to be excluded from the *NEPA* process are: (1) the action or group of actions would have no significant effect on the quality of the human environment, and (2) the action or group of actions would not involve unresolved conflicts concerning alternative uses of available resources. An EA may also be prepared on any

[10] From the Minerals Management Service's website: www.mms.gov/aboutmms/; accessed 29 March 2004.

action at any time in order to assist in planning and decision making, or under extraordinary circumstances. An EA is routinely prepared for predetermined environmentally sensitive areas, and for proposed activities considered environmentally sensitive. If the EA indicates that approval of the plan would constitute a major federal action significantly affecting the human environment, that an existing EIS is not current, or that there is no EIS addressing the type of action under consideration, an EIS must be prepared. An EA would also identify appropriate mitigation for impacts of the proposal.

On the basis of CER, EA, or EIS findings, and the plan completeness review, an EP would be approved or disapproved, or modification of the plan would be required of the operator.

OCSLA also specifies that a development and production plan must be submitted for approval to MMS before an operator may begin such activities. Generally, an operator prepares and submits to MMS a development operations coordination document (DOCD) and, as required, supporting environmental information, archaeological report, biological report, or other environmental data determined necessary before any development and production activities are allowed to proceed. For legal purposes, a DOCD is considered to be the development and production plan for the proposed activity. This plan describes a schedule of development activities, platforms, or other facilities including environmental monitoring features and other relevant information.

After receiving a DOCD, MMS prepares a CER, EA, and/or EIS as above. As part of the review process, the DOCD is sent to the affected state(s) having an approved coastal zone management plan for consistency certification review. On the basis of CER, EA, or EIS findings and the plan completeness review, the plan would be approved or disapproved, or modification of the plan would be required of the operator.

Overview of the *National Environmental Policy Act* Process

This *Act* is the foundation of environmental policy making in the United States. The *NEPA* process is intended to help public officials make decisions based on an understanding of environmental consequences and take actions that protect, restore, and enhance the environment. *NEPA* established two primary mechanisms for this purpose:

1. The Council on Environmental Quality (CEQ) was established to advise agencies on the environmental decision making process and to oversee and coordinate the development of federal environmental policy.

2. Agencies must include an environmental review early in the planning process for proposed actions.

CEQ issued regulations in 1978 implementing *NEPA*, which include procedures to be used by federal agencies for the environmental review process.

Lease Stipulations

Lease stipulations are legally binding requirements that are made a part of every oil and gas lease document as appropriate. They are developed and implemented on a sale-by-sale basis, and are applied to individual leases based on specific instructions in the final sale documentation. Stipulations place restrictions and operating requirements on lessees that may involve protection

of environmentally sensitive organisms or communities that exist in the area covered by the lease, conflicts with other uses such as military operations, or other extractive efforts such as liquid natural gas and sand. Furthermore, these stipulations change as new information about species and communities is obtained, and the specific language of a stipulation is developed in consultation with other interested state and federal agencies.

4.3 EVALUATION OF REGULATORY REGIME FOR OOGD IN B.C.

This section evaluates the strengths and weaknesses of the current regulatory regime for OOGD in B.C. Evaluative criteria were based on international best practices assembled from the implementation theory, policy analysis, and impact assessment literature. See table 4.1 for a summary description of the evaluative criteria. Each criterion is assessed as fully met, partially met, or not met.

1. ROLES AND RESPONSIBILITIES

Principle: *Roles and responsibilities should be clearly defined.* Administrative structures and policies should provide clear guidance and distinctly outline levels of authority and responsibilities, including those relationships that require multijurisdictional collaboration (i.e., EA).

Evaluation: Overlapping federal, provincial, and First Nations' jurisdiction weave a tangled array of poorly defined roles and responsibilities. Oil and gas projects located within the low-water mark of the provincial coastline are subject to joint provincial and federal jurisdiction. First Nations' likely will have some regulatory entitlement flowing from a freestanding right to self-government, or because of their Aboriginal title, but this has not yet been determined.

Environmental assessment processes also suffer from a lack of clear roles and responsibilities. Potentially, an EA process could be delayed until the project begins construction of a producing platform, rather than during the exploration activity because this activity was excluded from the *Reviewable Projects Regulation*. Furthermore, the ambiguously worded 2004 *Canada-British Columbia Agreement on Environmental Assessment Cooperation* provides little direction on the necessary collaboration these two levels of government need to achieve. In fact, the *Agreement* even fails to adequately define the circumstances that determine which government assumes the lead agency role and triggers an EA. Clearly, jurisdictional and environmental assessment roles and responsibilities are poorly defined. Thus, this criterion is not met.

2. LEGISLATIVE BASE

Principle: *The structure of the management regime should be formally structured through legislation and regulations.* A formal structure gives decision makers the authority to carry out their roles, as well as explicitly outlining their level of authority, role, and responsibilities. This ensures that the responsibilities, timelines, processes, information requirements, and authority are transparent and clear.

Evaluation: The regulatory system for OOGD is structured in legislation. However, key aspects of the regulatory system such as when EAs are required, contents of EAs, decision criteria, and public participation are not clearly addressed in legislative frameworks. Instead, these key issues are left to the discretion of relevant authorities. Further, there is inconsistency and overlap between relevant legislation. Consequently, although there is a legislative basis for the OOGD regulatory system, the legislative basis does not provide transparency and clarity. Therefore, this criterion is only partially met.

TABLE 4.1: MANAGEMENT REGIME EVALUATION CRITERIA

BEST PRACTICE PRINCIPLE*	DISCUSSION	ASSESSMENT
1. ***Roles and Responsibilities:*** should be clearly defined.	Roles and responsibilities are not clearly defined.	Not Met
2. ***Legislative Base:*** the structure of the management regime should be formally structured through legislation or regulation.	Legislative basis exists but allows too much discretion.	Partially Met
3. ***Decision-Making Criteria and Methods:*** the decision-making process should be based on clear criteria and methods for assessing options.	There are no clear criteria for decision making and no guidelines or requirements to use adequate methodology.	Not Met
4. ***Efficiency:*** decisions should be reached in a timely manner at a reasonable cost.	Confusion over roles and responsibilities will lead to an inefficient process.	Not Met
5. ***Stakeholder Involvement:*** a framework should be in place to ensure that stakeholders are fully engaged in the decision-making process through shared decision making.	Stakeholder engagement includes some consultation, but consultation is not legally mandated and does not use principles of shared decision making.	Partially Met
6. ***First Nations:*** legal and fiduciary obligations, such as to consult and address First Nations' interests, should be fully met.	Courts provide some basis for enforcing obligations but court process is costly, lengthy, and constrained by poor definition of legal and fiduciary obligations.	Partially Met
7. ***Monitoring and Enforcement:*** the regulatory framework should clearly outline monitoring and enforcement processes, infractions, and penalties.	The current system does not provide for adequate enforcement or monitoring.	Not Met
8. ***Equity***: the decision-making process should contain a legal obligation to provide compensation to those negatively affected by the project.	No obligation is in place for compensating those negatively affected.	Not Met
9. ***Resources:*** decision-making bodies should have sufficient resources in place to ensure effective and efficient decision-making process.	Resources are not currently adequate.	Not Met
10. ***Appeal Process:*** the decision-making process should include a mechanism to allow stakeholders to appeal a decision.	Courts provide for appeal on questions of law but court process is costly, lengthy and constrained by poor definition of legal obligations.	Partially Met
11. ***Adequate Information:*** decisions should be based on adequate information.	Current information is inadequate for OOGD.	Not Met
12. ***Democratic Accountability:*** the management regime should be structured such that impartial decision-makers represent the publics' interests, and are directly, or indirectly, accountable through the democratic process to those affected by the decision.	The process is ultimately democratically accountable but important decisions reside with officials who are not democratically accountable and consultative mechanisms are inadequate.	Partially Met

*Best practices criteria are based on the following:

Bardach, Eugene. 2000. *A Practical Guide for Policy Analysis: The Eightfold Path to More Effective Problem Solving*. New York.: Chatham House Publishers of Seven Bridges Press, LLC.

British Columbia. 2002(b). *Provincial Policy for Consultation with First Nations.* Victoria: Queen's Printer.
Calbick, K.S. 2003. *The Use of Program Theory for Identifying and Evaluating 'Best Practices' for Implementing Land-Use Policies*. Master's of Resource Management, School of Resource and Environmental Management, Simon Fraser University, Burnaby, B.C.
Council of the Haida et al. v. Minister of Forests et al. [2000] B.C.S.C. 1280.
Doyle, D., and B. Sadler. 1996. *Environmental Assessment in Canada: Frameworks, Procedures & Attributes of Effectiveness: A Report in Support of the International Study of the Effectiveness of Environmental Assessment*. Ottawa: Canadian Environmental Assessment Agency.
Elliott, James. 1997. *Tourism Politics and Public Sector Management.* New York: Routledge.
Gilpin, Alan. 1995. *Environmental Impact Assessment: Cutting Edge for the Twenty-First Century*. Cambridge: Cambridge University Press.
Gunton, Thomas. 1991. Crown-land Planning in British Columbia: Managing for Multiple Use." In *Our Living Legacy: Proceedings of a Symposium on Biological Diversity,* ed. M.A. Fenger, E.H. Miller, J.A. Johnson, and E.J.R. Williams, pp. 275-293. Victoria: Royal British Columbia Museum.
Innes, J.E. and David E. Booher. 1999. Consensus Building and Complex Adaptive Systems. *American Planning Journal* 65 (4): 412-423.
International Association for Impact Assessment. 1999. *Principles of Environmental Impact Assessment Best Practice*. Fargo, ND: International Association for Impact Assessment.
Joseph, C.T.R.B., T.I. Gunton, and J.C. Day. 2004. *Evaluation of the B.C. Strategic Land Use Planning Implementation Framework*. Master's of Resource Management, School of Resource and Environmental Management, Simon Fraser University, Burnaby, B.C.
Lasswell, H.D. 1971. *A Preview of Policy Sciences*. New York: Elsevier.
Mazmanian, Daniel A., and Paul A. Sabatier. 1989. *Implementation and Public Policy*. Lanham, Md.: University Press of America.
Sadar, M.H. 1996. *Environmental Impact Assessment. 2nd ed.* Ottawa: Carleton University Press.
Taku River Tlingit First Nation v. Ringstad et al. (Norm Ringstad, in his capacity as the Project Assessment Director for the Tulsequah Chief Mine Project, Sheila Wynn, in her capacity as the Executive Director, Environmental Assessment Office, The Minister of Environment, Lands, and Parks, The Minister of Energy and Mines and Minister Responsible for Northern Development). [2002] B.C.C.A. 59.
Weimer, David, and Aidan Vining. 1998. *Policy Analysis: Concepts and Practice, 3rd ed. .Upper Saddle River, N.J.:* Prentice Hall PTR.
Wood, Christopher. 1995. *Environmental Impact Assessment: A Comparative Review*. New York: Wiley.

3. DECISION-MAKING CRITERIA AND METHODS

Principle: *The decision-making process should be based on clear criteria and methods for assessing options.* The decision-making process should be transparent using clear decision-making criteria, sound methods of analysis, and decision rules that clarify how decisions will be made.

Evaluation: Many jurisdictions specify the criteria and types of analytical methods such as multiple accounts evaluation or cost-benefit analysis that must be used in assessing options and formulating recommendations. B.C., for example, has comprehensive multiple account guidelines that are used to assess land use options and public investments. Currently, there are no decision criteria or evaluation methods specified to guide the decision-making process for OOGD. Thus, this criterion has not been met.

4. EFFICIENCY

Principle: *Decisions should be reached in a timely manner at reasonable cost.* The decision-making process should not be constrained by lengthy appeal processes, or delays, due to the lack of a clear decision-making framework or blurred roles and responsibilities. The process should be effective in the sense that outcomes should be consistent with goals and objectives, implementable, and in the public interest.

Evaluation: The current legal and jurisdictional uncertainty over regulation of OOGD means that decisions are unlikely to be reached in a timely manner at reasonable cost. Litigation, conflicting policies, and overlapping processes pose a significant obstacle to efficient project management. Thus, this criterion is not met.

5. STAKEHOLDER INVOLVEMENT

Principle: *A framework should be in place to ensure that stakeholders are fully engaged in the decision-making process through shared decision making.* Sound decisions must be based on the values, objectives and risk assessments of those stakeholders affected by the decision. Therefore, stakeholders need the opportunity to participate effectively in decision making. An effective stakeholder process delegates responsibility for assessing options and developing recommendations to stakeholder tables that engage in consensus-based negotiations to reach agreement. This process, termed shared decision making by the B.C. government, results in decisions that are more likely to be in the public's best interest by addressing the concerns of all affected parties.

Evaluation: Stakeholders include the federal, provincial, and First Nations governments, federal and provincial agencies, industry (fishing, logging, tourism), nonconsumptive users (recreationists), regional communities, proponents, nongovernmental agencies, environmentalists, and the broader public. The mandate of the various federal and provincial review processes is to solicit viewpoints of stakeholders, and to this end, they have heard submissions from individuals and groups in coastal and northern communities. Thus, the public has been involved to some extent in the decision regarding lifting the moratorium. Furthermore, provincial policy, solidly based on case law, reaffirms the requirement to meaningfully consult First Nation communities. However, current processes, which are restricted to soliciting stakeholder comments, fall far short of the requirement for meaningful stakeholder engagement reflected in the principles of shared decision making. Thus, this criterion has been only partially met.

6. FIRST NATIONS

Principle: *Legal and fiduciary obligations, such as to consult and address First Nations' interests, should be fully met.*

Evaluation: Aboriginal people have a legal right to make decisions about the use of land that is subject to Aboriginal title. The offshore area of Haida Gwaii proposed for OOGD has been claimed by the Haida Nation, while the Haisla, Heiltsuk, and Tsimshian Nation, which have similar claims, are working through the treaty process. Neither the federal or provincial governments have recognized or acknowledged Aboriginal title claims to the ocean territory. However, the B.C. government developed a First Nations consultation policy based on several

B.C. and Canada Supreme Court rulings specifying that governments must undertake meaningful consultation with First Nations. Significantly, First Nations have expressed their worries about how lifting the moratorium on OOGD may affect their way of life.

The province's EA process requires "consultation with all potentially affected parties" (B.C. EAO 2003), but as discussed earlier, the EA process has considerable ambiguity. The requirement for consultation with First Nations under EA processes may be over-ridden by the *Significant Project Streamlining Act*. The mandate of OGC is to "encourage the participation of First Nations and aboriginal peoples in processes affecting them" (s. 3, *Oil and Gas Commission Act)*. Neither this encouragement, nor the EA process, provides any assurances the province will meet its legal and fiduciary obligations to consult and address First Nations' interests. The courts, however, provide a last, albeit costly, means to enforce legal and fiduciary obligations to First Nations. Thus, this criterion is only partially met.

7. MONITORING AND ENFORCEMENT

Principle: *The regulatory framework should clearly outline monitoring and enforcement processes, infractions, and penalties.* An effective monitoring and enforcement strategy, based on principles of adaptive management, ensures environmental, economic, and social goals are achieved during all phases of offshore oil and gas activity. Compliance monitoring processes and penalties for noncompliance should be clearly outlined, and results made available to all interested parties.

Evaluation: Currently, an agency has not been designated or created for monitoring and enforcing offshore oil and gas activities. However, the existing managerial mandates and structures are likely to be extended to include the offshore environment. Thus, monitoring and enforcement efforts for offshore oil and gas activities will likely mirror the efforts of OGC's Compliance and Enforcement Branch, which has well defined and clear timelines, compliance milestones, and noncompliance penalties. However, in the event of a catastrophic failure, such as a spill that would likely cause large amounts of oil to impact the coastline, the current stipulation of remedial actions within one day is probably not sufficient to protect the ecological integrity of the West Coast.

Since 2000, federal and provincial agencies have combined efforts to scrutinize the compliance level achieved by the oil and gas industry in B.C. This ongoing annual inter-agency review includes the provincial Ministry of Water, Land, and Air Protection (WLAP), OGC, provincial Ministry of Forests, Land and Water B.C., and the federal Fisheries and Oceans Canada. The 2003 report prepared by OGC and WLAP reviewed specific activities in the target areas of special waste, water usage, sewage management and disposal, and stream crossings. This report stated that despite a 15% increase in noncompliant stream-crossing activities, the terrestrial oil and gas industry in B.C. was achieving increased compliance rates over the last three years from 79% major compliance in 2001 to 86% major compliance in 2003 (B.C. OGC and WLAP 2003: 3).

Effective and clear operational models for monitoring and enforcing terrestrial oil and gas activities are in place that could be adapted for offshore oil and gas operations. However,

currently there are no such regulatory systems developed for OOGD in B.C. Thus, this criterion is not met.

8. EQUITY

Principle: *The decision-making process and outcomes should contain a legal obligation to provide compensation to those negatively affected by the project*.

Evaluation: The current management regime does not assure equity or compensation throughout the process. OGC and the EA processes have no mechanism for compensating stakeholders left worse off by a decision or project. While the approval of projects may or may not include agreements with First Nations regarding employment and/or revenue sharing as compensation for impinging on their Aboriginal rights or title (as provided for by the *Delgamuukw v. British Columbia* decision), OGC has no specific requirement for such agreements. The OGC public consultation process also raises the question as to whether stakeholders have been given an equal opportunity to participate in the decision-making process. Thus, this criterion is not met.

9. RESOURCES

Principle: *Decision-making bodies should have sufficient resources in place to ensure an effective and efficient decision-making process.* Sufficient resources include adequate financial and human resources to carry out project evaluation and monitoring, as well as adequate support for stakeholders to participate in the decision-making process.

Evaluation: Should the moratorium be lifted, OGC would reasonably be provided with the resources to carry out the review and approval process for offshore oil and gas projects. However, sufficient resources to fill the information gaps identified by the two science panel reports, and adequately conduct a review as well as manage OOGD, have not currently been provided. Also, the current processes used in B.C. have no mechanism to provide adequate resources for stakeholders to participate in decision-making and management processes. On the other hand, the federal government does make available some financial support for stakeholders to participate in an EA process. The federal participant funding program "was created to help concerned citizens and organizations participate in the environmental assessment of projects being assessed by a comprehensive study, mediator or review panel" (Canada 2003: 28). A certain amount of funding is allocated to each comprehensive study, mediation, or assessment by a review panel (Canada 2003); however, Boyd (2003) noted that financial resources provided under this program are minimal. Furthermore, no such program exists through the provincial EA process. Therefore, the current management regime needs to improve its funding mechanisms if stakeholders are to be comprehensively engaged in decision-making and management processes. Thus, this criterion has not been met.

10. APPEAL PROCESS

Principle: *The decision-making process should include a mechanism to allow stakeholders to appeal a decision.* If decisions breach procedural requirements, prescribed guidelines, or goals and objectives, then stakeholders should be afforded the right to challenge such decisions. The appeal process should be efficient and narrowly defined to eliminate delays to the decision-

making process. Moreover, the appeal board or tribunal should have sufficient expertise to render such decisions.

Evaluation: Stakeholders can appeal regulatory decisions to the courts on questions of law and jurisdiction. However, the appeal process to the courts is constrained by the lack of clear criteria contained in legislation and the lengthy and costly nature of court appeals. No special tribunal exists to provide an expeditious and effective appeals process. Therefore, this criterion is only partially met.

11. ADEQUATE INFORMATION

Principle: *Decisions should be based on adequate information to make a decision*. Adequate scientific and technical information regarding the potential environmental and socioeconomic impacts of offshore oil and gas development must be available. Such information should be subject to rigorous scrutiny by the management regime before a decision is made.

Evaluation: Numerous scientific reports have documented environmental and technological matters related to OOGD in British Columbia. However, despite the research completed to date, large information gaps remain. For example, the British Columbia Science Review Panel (Strong et al. 2002) noted that the cumulative impacts of offshore oil and gas activities on marine ecosystems, and on marine mammals in particular, have not been comprehensively researched. The Federal Expert Panel (RSC 2004) identified seventeen categories of science gaps that need to be filled prior to offshore oil and gas development, including but not limited to space-time distributions of mammals and fish, the impacts of oil spills, and areas or critical species habitat. A number of other gaps are identified in chapter two of this report. The magnitude of potential environmental, social and economic impacts associated with offshore oil and gas development remains uncertain. Clearly, the current management regime does not have adequate information to decide on potential offshore oil and gas projects in British Columbia. Therefore, this criterion is not met.

12. DEMOCRATIC ACCOUNTABILITY

Principle: *The management regime should be structured such that impartial decision-makers represent the publics' interests, and are directly, or indirectly, accountable through the democratic process to those affected by the decision.*

Evaluation: Decision-making authority over OOGD ultimately resides with elected officials who are democratically accountable and who are provided with information to assist in decision making. However, much of the decision making over OOGD is delegated to civil servants that cannot be held directly accountable through the democratic process and who are not sufficiently constrained by clear criteria. The process also lacks adequate stakeholder involvement based on the principles of shared decision making, which is necessary to ensure democratic accountability. Therefore, this criterion is only partially met.

EVALUATION SUMMARY

The results of the evaluation of the current OOGD management regime, summarized in table 4.1, show that seven of the evaluative criteria are not met, five are only partially met, and none are

fully met. Assigning fully met criteria a score of '1', partially met criteria a score of '0.5', and not met criteria a score of '0' yields a total of 2.5 out of a possible 12. Overall, the existing regulatory regime scored a performance rating of only 21%. The management regime for OOGD, therefore, is seriously deficient. Some of these deficiencies such as a lack of a monitoring and enforcement regime, inadequate resources, inadequate information, and lack of clarity in OOGD jurisdiction are understandable given the existence of the OOGD moratorium. The other deficiencies, however, are more fundamental inadequacies of the general system of evaluating and managing large resource projects. In any event, all these best practices criteria need to be met, and all the deficiencies addressed.

4.4 MORATORIA ON OFFSHORE OIL AND GAS IN NORTH AMERICA

MORATORIA IN THE UNITED STATES

Concern over of OOGD intensified in the U.S. with the blowout of an offshore oil well in 1969 of the coast of Santa Barbara, California. Subsequently, California obtained the right to prohibit OOGD through the Coastal Zone Management Act (Holing 1990). In 1982, the U.S. Congress imposed a moratorium through a budget control measure on OOGD off California. This Congressional moratorium was gradually extended to cover offshore oil and gas activities in certain areas along the eastern and western seaboards, Alaska, and the Gulf of Mexico (U.S. DOI 1997b). The OCS planning areas subject to the moratorium are:

- North, Mid- and South Atlantic;
- Eastern Gulf of Mexico;
- Washington-Oregon;
- North Aleutian Basin; and
- Southern, Central and Northern California (U.S. DOI 1997b).

A moratorium on exploration and development activities, including the leasing of offshore lands, was established for parts of the OCS to assuage concerns raised by coastal communities regarding the negative impacts of OOGD (U.S. DOI 1997b). Congress reimposes this moratorium annually, through the national budget negotiation process, by limiting the funds to conduct lease sales.

In 1989, former President George Bush, in response to growing public concerns over OOGD in California and Florida requested the National Academy of Sciences (U.S. NAS) to assess impacts of OOGD. The National Academy of Sciences produced several reports, which concluded that there were serious and unknown impacts associated with OOGD (U.S. NAS 1989; U.S. NAS: Physical Oceanography Panel 1990; U.S. NAS: Ecology Panel 1992; U.S. NAS: Socioeconomics Panel 1992). The concerns were so serious that President Bush issued an executive order in 1990 establishing a moratorium on oil and gas exploration and drilling activities in northern and central California, southern California, southwest Florida, the North Atlantic, and Washington-Oregon (U.S. DOI 1997b). In 1998, former President Bill Clinton extended the moratorium to 2012 with his own executive order[11]. The moratorium decision was based on the following reasons:

- Scientific and technical information regarding resource potential, environmental effects, and socioeconomic impacts is inadequate;
- Areas included under the moratorium are characterized by high environmental sensitivity;
- OOGD should be located in existing areas or in areas with the greatest potential for resource extraction;
- Costs and benefits of other energy sources must be assessed before deciding to develop offshore oil and gas; and
- The moratorium may be subsequently reviewed should the president determine that national security requires development in these areas (U.S. White House Office of the Press Secretary 1990).

[11] www.cleanoceanaction.org/TakeAction/Oil&Gas/Oil&GasFactSheet.htm; accessed 12 April 2004.

MORATORIA IN CANADA

Nova Scotia

The Georges Bank moratorium was instituted in 1988 through the *Canada-Nova Scotia Accord Act* (Canada 1999). The moratorium was sought in response to public concern over the potential impacts of OOGD on the Georges Bank fishery and related environmental resources (Canada 1999). The moratorium was intended to be in effect until 1 January 2000 (Canada 1999). In 1995, the federal and provincial governments established the Georges Bank Review Panel (GBRP) to assess the socioeconomic and environmental impacts of offshore oil and gas development through a comprehensive public review process (Canada 1999). In 1999, the GBRP submitted its report to both governments with the recommendation that the moratorium be extended (Canada 1999). This recommendation was based on, but not limited to, the following:

- The large proportion of the public participating in the review process recommended extending the moratorium;
- The Georges Bank is an area of exceptional ecological value;
- The fishery has great economic, social, and cultural significance;
- The available information on the impacts of seismic surveys is generally sparse;
- The hazards drilling muds and other discharges present to marine life; and
- The benefits of offshore oil and gas exploration are limited (Canada 1999).

On 22 December 1999, the federal and provincial governments extended the Georges Bank moratorium until 31 December 2012, based on the GBRP findings (Canada 1999).

British Columbia

Since1959, the B.C. government has prohibited OOGD. The B.C. prohibition was temporarily lifted between 1967 and 1969 to allow for the drilling of several exploratory wells. In 1972, the federal government imposed a moratorium on offshore oil and gas development off the coast of British Columbia (Canada 1986). In 1984, the federal and provincial governments established the West Coast Offshore Exploration Environmental Assessment Panel (WCOEEAP) to conduct a public review of the environmental and socioeconomic impacts of lifting the moratorium (Canada 1986). The panel "was asked to develop recommendations on the terms and conditions under which petroleum exploration could proceed in a safe and environmentally responsible manner" (Canada 1986: 1). In 1986, the WCOEEAP released its report, recommending that exploratory drilling should only be permitted if a number of terms and conditions were first met. These conditions included, but were not limited to:

- Restrictions on proximity of drilling to terrestrial areas;
- Requirements for additional information on potential impacts prior to drilling;
- Requirements for First Nations participation and consultation;
- Provisions for an ongoing environmental management structure; and
- Provisions for a compensation program applying to all losses and damages resulting from routine operations and oil blowouts (Canada 1986: 1-2).

In 1989, due to the *Exxon Valdez* disaster in Alaska and increasing public pressure, the British Columbian government placed a moratorium on offshore oil and gas development within provincially controled offshore regions (Hertzog 2003). Interest in OOGD was renewed in 2001, when the provincial government started exploring the option of lifting the moratorium for the second time (Hertzog 2003). For OOGD to occur, each level of government needs to review and rescind its respective moratorium.

PROVINCIAL MORATORIUM REVIEW PROCESS

The provincial moratorium review consists of two processes, both of which have been completed. The first process was a government review undertaken by a committee, comprised of six members from the provincial liberal caucus and referred to as the Offshore Oil and Gas Task Force (OOGTF). The committee, mandated to seek public opinion on OOGD, held public hearings in nine coastal communities: Port Hardy, Masset, Skidegate, Bella Bella, Bella Coola, Terrace, Kitimat, Kitkatla, and Prince Rupert. OOGTF received more than 150 oral presentations and almost 130 written submissions. The committee concluded in its report of 15 January 2002 that "before the government decides upon a final course of action, the public would like to see the following issues addressed" (B.C. OOGTF 2002: 12):

- Resolution of ownership of offshore resources;
- Estimates of the quantity of offshore resources;
- Processes for involvement of First Nations;
- Assessment of environmental impacts; and
- Assessment of economic and social impacts.

The second provincial process created a three person scientific panel, referred to as the British Columbia Scientific Review Panel (B.C. SRP), chaired by Dr. David Strong from the University of Victoria and included Dr. Patricia Gallagher, from Simon Fraser University, and Dr. Derek Muggeridge, Dean of Science at Okanagan University College. The panel was mandated to identify:

- The scientific and technological considerations relevant to OOGD;
- Further research that should be undertaken to advance the state of knowledge on scientific and technological considerations relevant to OOGD;
- Any government actions required prior to a decision on whether to remove the moratorium; and
- Specific conditions or parameters that should be established as part of a government decision to remove the moratorium.

The panel finished its report on 15 January 2002 in approximately 10 weeks, which is a relatively short time to complete such a complex study examining the wide range of issues encompassed by OOGD in British Columbia. Also, given the time constraints, the panel did not undertake any original research. In its literature review (Strong et al. 2002), the panel made the following observations:

> While B.C. is unique in the particular combination of components of its marine ecosystem, resources and coastal heritage, most of these can be found individually or in combinations in other areas of offshore production…Nevertheless, any offshore activities in British Columbia, at least in the inland waters between the Queen Charlotte and Vancouver Islands, would be near-shore activities, and any adverse environmental impacts would be quickly felt in coastal communities and habitats (i).
>
> Although the risks of direct impacts on marine ecosystems may be small, there is a poor understanding of potential long-term cumulative impacts on marine ecosystems of oil and gas spills or discharges from production activities, or of the impact of seismic explorations on marine mammals in particular and the ecosystem in general. These potential impacts may be of very low probability but may be catastrophic in the short term and carry serious and possibly irreversible consequences in the long term (i).

> Although the region is subject to intense storms as well as seismic activity, present engineering knowledge, technology, industry practice, and regulatory regimes can ensure that structures necessary for drilling and production activities are constructed to survive any foreseeable natural threats and to operate within acceptable standards (i).
>
> Offshore hydrocarbon exploration and development cannot be undertaken without impacts on the environment (38).
>
> However, significant gaps remain in a number of scientific and technical areas that would be of special relevance to British Columbia if the government should decide to revise the current blanket moratorium policy and signal its willingness to consider offshore exploration and development (41).
>
> It is of a similar concern that the public sector capacities to regulate the range of activities that might ensue from such a policy (lifting the moratorium) appear to be deficient (41).
>
> The evidence suggests that at the present there is insufficient capacity for the research, assessment, monitoring and management needed to provide an adequate baseline knowledge framework for ocean and coastal policy-making (44).

B.C. SRP identified four issues requiring resolution before any development should be allowed to proceed:

1. Development of an integrated federal-provincial regulatory framework.
2. Negotiation of an accord providing for revenue sharing between the Canadian, B.C. and First Nations governments.
3. Identification of sensitive areas requiring special protection from development.
4. Development of capacity to build baseline data, analysis of ecosystems, and risk assessment, and evaluation of development options.

The terms of reference of B.C. SRP did not require a recommendation on the merits of the existing moratorium. Nor did the limited assessment based on a review of existing literature on natural science issues provide the basis for an informed decision on whether the moratorium should be lifted. Nonetheless, the panel stated:

> There is no inherent or fundamental inadequacy of the science or technology applied in an appropriate regulatory framework, to justify retention of the B.C. moratorium (Strong et al. 2002: 51).

The ambiguous wording of this conclusion makes it prone to misinterpretation. It should not be inferred from the B.C. SRP conclusion that lifting of the moratorium is justified. Instead, B.C. SRP is stating that there is no **fundamental** inadequacy of the **science or technology** applied in an **appropriate** regulatory framework to justify retaining the moratorium (emphasis added). In other words, B.C. SRP implicitly acknowledged that there may still be good reasons for maintaining the moratorium including:

- Important factors not related to science and technology such as economic and social impacts, risk assessment, institutional weaknesses, and public values that were not assessed by B.C. SRP; and
- An inappropriate regulatory framework.

Indeed, B.C. SRP's own conclusions that there are significant gaps in knowledge, that impacts could be catastrophic, that existing regulatory structures are deficient, and that a number of

preconditions need to be met before OOGD can proceed suggest that lifting the existing moratorium would be premature and ill-conceived. Given that the recommendation on the moratorium was outside the terms of reference of B.C. SRP, and many key factors that need to be taken into account in a decision on the moratorium were excluded, it is perhaps surprising that B.C. SRP included its statement on the moratorium in the report.

FEDERAL MORATORIUM REVIEW PROCESS

On 28 March 2003, the Canadian government announced a process to review issues regarding OOGD. The objectives are to:

1. Identify science gaps related to possible OOGD off the B.C. coast.
2. Hear the views of the public regarding whether or not the moratorium should be lifted.
3. Consult with First Nations to ensure that their interests are fully explored.

Reflecting the competing jurisdiction, the Canadian government initiated two processes that largely duplicated ones recently completed by the B.C. government. These federal approaches consisted of a panel of scientific experts and a consultation process.

Federal Scientific Review Panel: The first process was creation of a federal expert panel (FEP), whose chair, Dr. Jeremy Hall, was appointed on 5 July 2003. FEP was managed under the independent auspices of the Royal Society of Canada (RSC) and completed its report in February 2004.

The mandate of FEP was:

- Identify gaps in scientific knowledge that need to be filled before a decision is made with respect to the moratorium;
- Provide a work plan to fill any scientific gaps; and
- Identify sensitive zones requiring protection from any OOGD and other zones requiring special management measures.

Like the provincial scientific panel, FEP completed its report in a relatively short time and relied on existing knowledge. FEP (RSC 2004) made a number of observations including:

> . . . the rugged nature of the seabed (in the QC [Queen Charlottes]) poses several potential hazards to oil and gas activities: slope instability, moving sediment, shallow gas, and active faulting (xi).
>
> The QCB [Queen Charlotte Basin] is an area of current earthquake activity. A fault movement would endanger the integrity of seabed structures cutting across the fault surface and could destabilize sediments (xi).
>
> Wind and sea conditions in the QCB are among the most severe in Canada (xi).
>
> As of November 2003, sixteen marine species in the QCB were listed by COSEWIC [Committee on the Status of Endangered Wildlife in Canada] as endangered, threatened or a species of special concern (xii).
>
> Except for commercially valuable species, the distribution of most marine species (and therefore the areas of critical habitat) in the QCB remains poorly known (xi).
>
> Any fish or marine mammal within a couple of metres of an air gun detonation would be killed or suffer permanent hearing damage. Farther away, effects are more variable, but some marine mammals and fish change behavior, with largely unassessed consequences for survival of individuals or populations in the presence of air gun detonations (xii).

> The probability of major spills or blowouts has been declining over the last two decades of oil extraction and transport. Such an event could still occur (xiii).
>
> The QCB is largely an enclosed basin, so any oil spill originating within it is likely to be caught up in the internal circulation eddies, until it reaches the shore, probably within a few days. Negative impacts can be expected on mammal, fish and invertebrate populations (xiii).

FEP identified 17 categorical scientific gaps that need to be filled prior to OOGD.

1. Identification of valuable species
2. Identification of unstable areas
3. Measure of currents, winds, and waves
4. Earthquake monitoring
5. Impact assessment of acoustic propagation
6. Space-time distributions of fish
7. Identification of confined spawning areas for critical fish species
8. Space-time distribution of mammals
9. Impacts of seismic activity on diving birds
10. Baseline information on benthic fauna and habitat
11. Oil spill trajectories
12. Impact of oil spills on landfalls
13. Seasonal variation in species populations along shorelines
14. Proposed marine protected areas
15. Critical species close to shore
16. Areas of critical habitat
17. Identification of coastal zone buffers for drilling

FEP recommended:

1. Create a body of key stakeholders to advise government on OOGD
2. Fill the scientific gaps by completing a number of baseline and monitoring studies
3. Identify protected areas and exclusion zones

FEP did not recommend lifting the moratorium. Instead, the panel reached the conclusion that

> . . . provided an adequate regulatory regime is put in place, there are no scientific gaps that need to be filled before lifting the moratoria on oil and gas development (RSC 2004: xix).

This is perhaps the most confusing and misinterpreted finding by FEP. The panel emphasized that a number of conditions need to be met prior to OOGD proceeding, which is in effect maintaining a moratorium on OOGD. The problem is that FEP did not clearly specify a sequence for filling these information gaps. Instead, FEP assumed that the fifteen-year period between lifting the moratorium and production would provide sufficient time to fill all these gaps without any specific timetables. FEP also argued that lifting the moratorium would enhance the ability to fill scientific gaps. This argument is dubious, given that there is nothing preventing government from funding the studies to fill these gaps while the moratorium is in place. Indeed, governments are already funding some of the necessary research. Most importantly, FEP excluded important factors such as legal, social, regulatory, economic, public values, risk profiles, and other issues that need to be taken into account in assessing whether the moratorium should be lifted.

Federal Consultation Process: The second process initiated by the federal government after the completion of the scientific report is a public hearing process to assess public views on OOGD. A separate, special component of this process will be conducted specifically with First Nations. This process, chaired by the former chair of the National Energy Board, runs from January to June 2004.

EVALUATION OF OOGD WEST COAST MORATORIUM REVIEW PROCESS

This section evaluates the OOGD review process based on the best practices criteria used to evaluate the current OOGD management regime (see table 4.1 sources). Because the moratorium review is only a subcomponent of a larger regulatory process, only some of the best practices criteria in table 4.1 are relevant. Relevant criteria for the moratorium review are summarized in table 4.2. Each criterion is assessed as fully met, partially met, or not met.

TABLE 4.2: OOGD MORATORIUM REVIEW PROCESS EVALUATIVE CRITERIA

BEST PRACTICE PRINCIPLE	DISCUSSION	ASSESSMENT
1. ***Clear Decision-Making Criteria:*** the decision-making process should be based on clear criteria and adequate methodology such as multiple accounts analysis to evaluate projects.	The moratorium review process has not set clear criteria or used adequate evaluation methodology to determine whether the moratorium should be lifted.	Not Met
2. ***Stakeholder Involvement:*** a framework should be in place to ensure that stakeholders are fully engaged in the decision-making process through a process of shared decision making.	Stakeholder involvement is limited to submission of briefs. Stakeholders are not engaged in the moratorium review process through a process of shared decision making.	Partially Met
3. ***First Nations Partnership:*** a framework should be in place to provide a government to government partnership between First Nations and the federal and provincial government to manage the moratorium review process.	No framework exists for a partnership with First Nations. Both the federal and provincial governments have designed and implemented their moratorium review processes unilaterally.	Not Met
4. ***Adequate Information:*** decisions should be based on adequate information.	There is a consensus that there are significant information gaps in understanding impacts of OOGD. Therefore, there is insufficient information to assess the merits of the moratorium.	Not Met

1. Clear Decision-Making Criteria

Principle: *The OOGD review process should be based on clear criteria and methods for assessing options.* The decision-making process should be transparent using clear decision-making criteria, sound methods of analysis, and clear rules that clarify how decisions will be made.

Evaluation: Decision-making and evaluation criteria have not been stated by either the federal or provincial governments. The adequacy of scientific information has been the only evaluation

criterion used to date in the OOGD review process. However, both the federal and provincial processes failed to define what constitutes "adequate science." Furthermore, after FEP and B.C. SRP found inadequacies in scientific information related to OOGD, both reports concluded without providing sufficient rationale that the inadequacies in science did not justify the retention of the moratorium. Accordingly, the review process does not provide clear decision-making criteria or evaluation methods. Consequently, this criterion has not been met.

2. Stakeholder Involvement

Principle: *A framework should be in place to ensure that stakeholders are fully engaged in the decision-making process through shared decision making*. Sound decisions must be based on the values, objectives, and risk assessments of those stakeholders affected by the decision. Therefore, stakeholders need the opportunity to participate effectively in decision making. An effective stakeholder process delegates responsibility for assessing options and developing recommendations to stakeholder tables that engage in consensus-based negotiations to reach agreement. This process, termed shared decision making by the B.C. government, results in decisions that are more likely to be in the public's best interest by addressing the concerns of all affected parties.

Evaluation: The review of the moratorium includes stakeholder consultation. However, the stakeholder consultation is limited to comment and the comment process has been separated from the scientific reviews. Stakeholders have not been provided with adequate resources to participate in the moratorium review and the participation has not met the best practice principles of public involvement. Consequently, this criterion has been only partially met.

3. First Nations Partnership

Principle: *A framework should be in place to provide a government to government partnership between First Nations and the federal and provincial government to manage the moratorium review process.* First Nations are a legitimate level of government that has a basis in law for some control over resource development. Therefore, involving First Nations governments in a partnership with the federal and provincial government is a requisite of a sound management process.

Evaluation: Despite efforts by First Nations to be involved in the management of the moratorium review process, no framework exists for a partnership with First Nations. Both the federal and provincial governments have designed and implemented their moratorium review processes unilaterally.

4. Adequate Information

Principle: *The management regime should have adequate information to make a decision.* Adequate scientific and technical information regarding the potential environmental and socioeconomic impacts of offshore oil and gas development must be available. Such information should be subject to rigorous scrutiny by the management regime before a decision is made.

Evaluation: While environmental information on the impacts of OOGD is available, the information is inadequate. Further, the OOGD review process has excluded important information on the socioeconomic impacts of OOGD, jurisdictional issues, and systematic

assessment of public preferences. Consequently, the review process needs to be restructured in order to ensure that adequate information is collected and rigorously analyzed.

Concluding West Coast Moratorium Review Process Evaluation Remarks

According to this evaluation of the moratorium review process, summarized in table 4.2, only one criterion of the three is partially met, while three are completely unmet; thus, the process has significant deficiencies. Assigning fully met criteria a score of '1', partially met criteria a score of '0.5', and not met criteria a score of '0' yields a total of 0.5 out of a possible 4. Overall, the moratorium review process receives a performance rating of 13%.

4.5 EVALUATION OF MORATORIUM

This section evaluates the necessary conditions that must be in place before lifting the moratorium. Evaluative criteria were assembled from the research team's prior experience, and are supported by the key recommendations advanced by WCOEEAP (Canada 1986: 29). See table 4.3 for a summary description of the evaluative criteria. Each criterion is assessed as fully met, partially met, or not met.

TABLE 4.3: MORATORIUM EVALUATION CRITERIA

CRITERIA	PRINCIPLE	ASSESSMENT
1. ***Adequate Understanding of Impacts:*** there must be an adequate understanding of environmental, social, and economic impacts prior to lifting the moratorium.	Both scientific review panels identify significant information gaps that must be filled before OOGD can proceed.	Not Met
2. ***Interest from Proponents:*** project proponents must be ready and willing to develop offshore oil and gas resources.	Project proponents consider B.C. OOGD a lower priority in their development plans and will only consider OOGD if jurisdictional conflicts between First Nations and other governments are resolved.	Not Met
3. ***Stakeholder and First Nations Support:*** a decision to lift the moratorium should have broad stakeholder support.	Some key stakeholder groups and First Nations are opposed to lifting the moratorium at this time and without further analysis.	Not Met
4. ***Comprehensive Evaluation of Costs and Benefits:*** there should be a high probability that the benefits of OOGD exceed costs based on a comprehensive multiple accounts and benefit/cost analyses as prescribed in provincial government guidelines.	No multiple accounts or benefit-cost study has been done to determine that there are net benefits from OOGD.	Not Met
5. ***Adequate Planning and Management Structures:*** adequate planning and management structures should be in place prior to any decision lifting the moratorium.	Evaluation of the current planning and management structures show that none of the best practice criteria are met and the process is therefore deficient (see table 4.1).	Not Met

1. ADEQUATE UNDERSTANDING OF IMPACTS

Principle: *An adequate understanding of impacts must be acquired prior to lifting the moratorium.* Before the moratorium on OOGD in British Columbia is lifted, decision-making bodies must have an adequate understanding of the environmental and socioeconomic impacts of such activities.

Evaluation: Significant uncertainty still exists with respect to environmental and socioeconomic impacts of OOGD in British Columbia. While potential environmental impacts have been assessed, there remain significant gaps in understanding that make it difficult to make an informed decision on the moratorium. FEP and B.C. SRP both outlined a number of

information gaps. For example, B.C. SRP (Strong et al. 2002) noted that the cumulative impacts of offshore oil and gas activities on marine ecosystems, and on marine mammals in particular, have not been comprehensively researched. FEP (RSC 2004) identified seventeen categories of science gaps that need to be filled and this report has identified an additional nine knowledge gaps. Consequently, this criterion is not met.

2. INTEREST FROM PROPONENTS

Principle: *Project proponents must be interested in developing offshore oil and gas resources*. Prior to lifting the moratorium, decision makers must ensure that interest from oil and gas development companies is sufficient. Interested proponents should be consulted in order to identify key interests and concerns.

Evaluation: Project proponents are providing some support for OOGD in British Columbia. Shell Canada holds the majority of the leases on the West Coast and the company has expressed some interest in developing offshore resources. However, Shell has stated that offshore exploration is not a high priority for the company in B.C., but rather a long-term strategic growth option. Shell also has indicated that the industry needs a clear regulatory framework prior to undertaking any OOGD. In a presentation to the B.C. Natural Gas Symposium in May 2003, Shell stated the "industry needs clarity, certainty, [and] transparency on 'rules of the game' before undertaking significant investments" (Shell Canada Limited 2003: 15). The company has also expressed concerns related to the support for offshore development from affected First Nations. The company has stated OOGD needs a pragmatic and focused process involving First Nations, one that is based on meaningful consultation (Shell Canada Limited 2003). Given the reluctance of project developers to proceed with OOGD, this criterion is not met.

3. STAKEHOLDER AND FIRST NATIONS SUPPORT

Principle: *A decision to lift the moratorium should have broad stakeholder support.* All major stakeholders, including project proponents, First Nations, coastal communities, public interest groups, as well as the general public should support OOGD prior to any decision to lift the moratorium.

Evaluation: Many key stakeholders do not support lifting the moratorium on OOGD. Coastal First Nations are uncertain as to the impacts, benefits, and costs of developing offshore resources and, consequently, are opposed to lifting the moratorium. Many public interest groups do not support lifting the moratorium. The level of general public support for OOGD is also uncertain. In 2002, OOGTF solicited and reported on opinions of British Columbia residents on OOGD. OOGTF observed that many key stakeholders were not prepared to support OOGD at this time (B.C. OOGTF 2002). Consequently, this criterion is not met.

4. COMPREHENSIVE EVALUATION OF COSTS AND BENEFITS

Principle: *There should be reasonable certainty that the benefits of OOGD exceed costs based on comprehensive multiple accounts and benefit-cost analyses.* Prior to any decision to lift the moratorium, an independent, detailed study analyzing the benefits and costs of offshore oil and gas development must be completed. The analysis should determine whether OOGD would provide a net benefit to British Columbians.

Evaluation: Currently, no multiple accounts or benefit-cost analyses have been completed for OOGD in British Columbia. While the federal and provincial governments have promoted the socioeconomic benefits of offshore development, a comprehensive study evaluating these potential benefits has not been completed. Accordingly, a comprehensive understanding of the benefits and costs of OOGD in B.C. must be developed before deciding to rescind the moratorium. Consequently, this criterion is not met.

5. ADEQUATE PLANNING AND MANAGEMENT STRUCTURES

Principle: *Adequate planning and management structures should be in place prior to any decision lifting the moratorium.* Prior to lifting the moratorium, an appropriate planning and management regime should be established, through consultation with stakeholders, by the federal and provincial governments.

Evaluation: The results of the evaluation presented in this report (table 4.1) show that the current OOGD management regime is seriously deficient. The results show that seven of the evaluative criteria are not met, five are only partially met, and none are fully met. The federal and provincial governments have not yet established a suitable planning and management regime for OOGD in British Columbia. Consequently, this criterion is not met.

CONCLUDING MORATORIUM EVALUATION REMARKS

None of the criteria used to evaluate lifting the moratorium are even partially met. Therefore, the necessary conditions that would enable lifting the moratorium on offshore oil and gas activities in B.C. are not established.

4.6 OVERALL INSTITUTIONAL ARRANGEMENT CONCLUSIONS

This chapter evaluates the jurisdictional issues surrounding OOGD in B.C., the current regulatory system, and the moratorium review process used for the West Coast, as well as evaluating the conditions necessary for lifting the moratorium. In summary,

1. Jurisdiction over OOGD is unclear, with overlapping responsibilities between the Canadian, B.C., and First Nations' governments. Federal, provincial, and First Nations levels of government need to negotiate tripartite agreements for all actions regarding OOGD. These arrangements should include management priorities, shared responsibilities, and revenue sharing.
2. The current regulatory regime of OOGD is deficient. The current regulatory regime for OOGD does not fully meet any of the 12 international best practices criteria for sound resource management.
3. The federal and B.C. scientific panels provide useful information for assessing the consequences of OOGD. Both studies, however, by their own admission, exclude crucial information necessary for assessing the merits of the current moratorium and therefore do not provide the basis for making an informed decision on whether the moratorium should be lifted.
4. Overall, the current process for reviewing the moratorium is deficient. None of the four best practice criteria for the moratorium review are met. The key deficiencies of the moratorium review process include: inadequate engagement of stakeholders, no partnership with First Nations, lack of clear decision rules and decision-making criteria, and inadequate information.
5. None of the necessary conditions that need to exist before consideration can be given to lifting the moratorium are in place. The key deficiencies are: inadequate understanding of impacts arising from OOGD, concerns from proponents to pursue OOGD, strong opposition from some stakeholders to developing the offshore resources, lack of a comprehensive multiple accounts or cost-benefit analysis to assess potential net benefits flowing from OOGD, and deficient planning and management structures.

CHAPTER 5: CONCLUSIONS

Based on the review, the following conclusions are made.

1. Jurisdiction over OOGD is unclear, with overlapping responsibilities between the Canadian, B.C. and First Nations governments.

2. The current regulatory regime for OOGD is deficient. The regulatory regime for OOGD does not meet any of the 12 international best practices criteria for good resource management.

3. The federal (RSC) and B.C. scientific panels (B.C. SRP) have produced useful reports for assessing the consequences of OOGD. Both studies, however, by their own admission, exclude crucial information necessary for assessing the merits of the current moratorium and therefore do not provide the basis for making an informed decision on whether the moratorium should be lifted.

4. The argument in the RSC and the B.C. SRP that lifting the moratorium would enhance the ability to fill gaps in information about the QCB is without merit. This information could and should be collected and analyzed while the moratorium is in place.

5. Lifting the moratorium in B.C. would be counter to decisions in the United States and Canada (Georges Bank), which led to extensions of moratoriums based on extensive reviews that documented concerns over environmental risks of OOGD.

6. Overall, the current process for reviewing the moratorium is deficient. None of the four best practice criteria for the moratorium review are met (table ES.4). The key deficiencies of the moratorium review process include: inadequate engagement of stakeholders, no government-to-government partnership with First Nations, inadequate information, and inadequate delineation of decision-making criteria.

7. Although technological improvements and better management practices can mitigate and reduce the risk of some impacts, there is a consensus in the RSC, B.C. SRP, and this report that OOGD would have negative impacts on the environment. These negative effects could be severe to catastrophic depending on the occurrence of events such as major oil spills. Further, the QCB is particularly vulnerable to impacts because of the nature of currents and regional ecological conditions.

8. There is a consensus in the RSC, B.C. SRP, and this report that there are significant gaps in knowledge regarding impacts of OOGD and understanding of regional ecological conditions where more information is required to properly assess impacts of OOGD. In total, 26 scientific knowledge gaps are identified.

9. The economic and social impacts of OOGD have not been adequately assessed. Economic impacts on growth would be small and would be constrained by several factors. It is likely that fewer than 200 direct jobs would be created in the operational phase, and many of these

jobs would be taken by skilled workers from other regions and countries. Ultimately, the jobs would disappear as the resource is exhausted. Although there is some capacity to increase regional economic impacts by benefit planning, this is constrained by technology and NAFTA.

10. OOGD is higher cost and riskier than conventional oil and gas development. Consequently, OOGD would be more cyclical and would generate less rent and royalty revenue to government than more conventional oil and gas development. The low rent generation of OOGD would further reduce potential economic benefits.

11. The role of oil and gas development in B.C.'s energy policy needs to be assessed in light of Canada's Kyoto commitments. Alternative energy strategies based on renewable and green technologies may produce greater economic benefits with fewer environmental costs.

12. None of the five conditions or tests necessary to justify removal of the B.C. moratorium has been met (table ES.7). The five gaps include:
    - Inadequate understanding of the environmental, social, and economic impacts;
    - Opposition from some key stakeholder groups and First Nations;
    - Reluctant project proponents (proponents have preconditions that have not been met);
    - A deficient regulatory regime; and
    - Failure to demonstrate with reasonable probability that the benefits of OOGD exceed the costs.

    Therefore, it is concluded that the current moratorium on B.C. OOGD should be maintained.

13. The decision on whether to undertake OOGD is based on public values and attitudes towards risk. Scientists can help identify risks and tradeoff, but they can not determine whether to lift the moratorium and proceed with OOGD. The decision on whether to proceed or not proceed with OOGD can only be made by stakeholders and governments through a comprehensive process of shared decision making based on best practice guidelines. The principal finding of this report is that the moratorium review process is deficient and the information necessary for making an informed decision has not been collected or analyzed.

    Therefore, it is concluded that the process for reviewing the B.C. moratorium and assessing management options for OOGD be restructured to include:
    - **A shared decision-making partnership between First Nations, the federal government, the B.C. government;**
    - **Greater engagement of stakeholders to assess management options for OOGD;**
    - **A research program to provide adequate information, comprehensive multiple accounts evaluation of costs and benefits, and clear decision criteria to assess management options for OOGD.**

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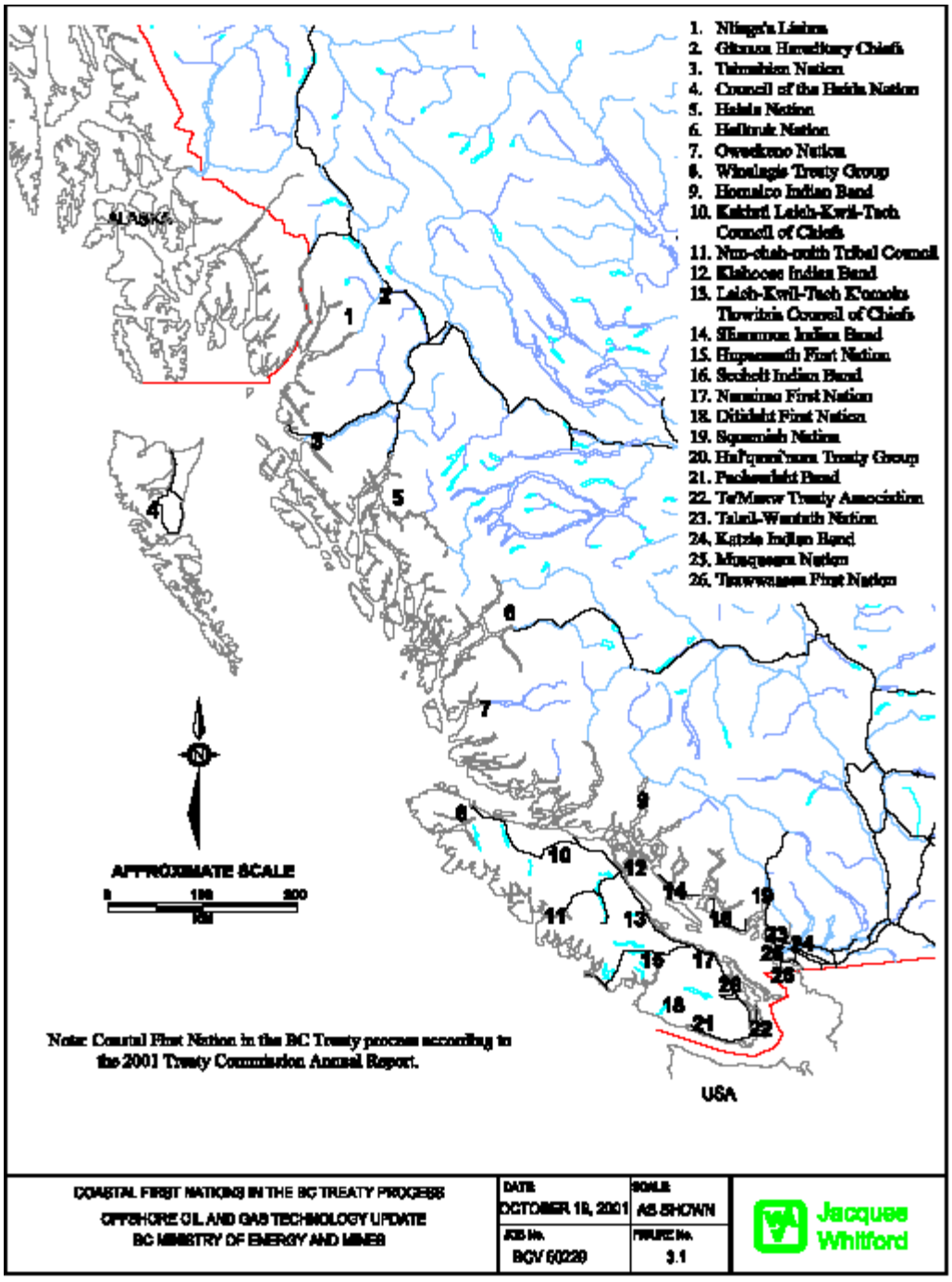
APPENDICES

APPENDIX A: CONVERSION FACTORS

1 tonne = roughly 7.3 barrels

1 barrel = roughly 160 litres = roughly 134 kg

APPENDIX B: COASTAL FIRST NATIONS IN THE B.C. TREATY PROCESS



APPENDIX C: HEILTSUK NATION POSITION STATEMENT

10 January 2002

PRESENTATION TO THE NORTHERN CAUCUS TASK FORCE ON OIL AND GAS
Prepared by Philip Hogan for the Heiltsuk Tribal Council

Hello. My name is Philip Hogan and I am an elected member of the Council. I have been asked by the Chief Councilor to speak to you today on behalf of the Tribal Council. For your information I will be presenting you with a written submission to ensure that the points we wish to make are clearly communicated.

We understand that you are representatives of the provincial government and that you are interested in talking about oil and gas exploration and development in our territory. We have much to say about this. We are glad that you have chosen to come here to meet us and trust that you will listen to our concerns

I must state that the Heiltsuk do not consider this meeting to be consultation, and it certainly does not fulfill the obligation of the province to 'consult' with the Heiltsuk on this matter.

First I must tell you, our history tells us of how we came to be in this place. The Heiltsuk have lived in here since time immemorial and have aboriginal title and the right to self-determination, including the right to manage our affairs. We have never surrendered these rights or our title to anyone. We have stories and history that tells us of our rights to these territories. There is no question in our minds as to who the rightful owners of this place are. Our territory is a matter of public record and includes waters to the west of here out to international waters.

The areas offshore are an important part of Heiltsuk territory, providing resources and habitat for many of the species that we rely upon for our food, social, societal and economic needs. The Heiltsuk have been utilizing these areas since the earliest history of our people.

The Heiltsuk have been trying to discuss our wishes regarding our territory with the government for many years. During the McKenna-McBride Royal Commission our chiefs and leaders spoke of our rights, we endeavored to resolve our concerns but there was no will on behalf of Canada or British Columbia to deal with us in a reasonable or just manner. We have always been concerned: about our land and have continued to work towards a relationship that allows us to live-in a just and fair way with our neighbors. To date this has not been attained. The Heiltsuk have been negotiating and working to try to attain a decent treaty that makes a just and lasting relationship of respect with Canada and B.C. for more than twenty years. We recently suspended our involvement in the B.C. Treaty-making process because it is not currently making reasonable offers and has present conditions that are unacceptable at this time to the Heiltsuk.

As discussed above, the Heiltsuk have aboriginal title to Heiltsuk lands and maintain the rights to manage these lands under the laws and customs handed down to us from our ancestors. We believe that we have jurisdiction over our lands and reject the province's and the federal government's claims that they have title and sovereignty to the areas within Heiltsuk territory. We are aware that this is an ongoing discussion that will not be resolved here today. We also

must remind you that, even within the Canadian legal system the Heiltsuk have recognized rights and can expect some protection under the law.

There are a range of aboriginal rights that have been recognized through case law. Since 1982, Aboriginal and treaty rights have been protected in the Canadian Constitution. The Heiltsuk are recognized as a First Nation and enjoy the protection of these rights. There is not the time to thoroughly discuss these rights and related issues here. This type of discussion has been undertaken elsewhere, and at other times. We can surely discuss them in more detail at a future date. The nature of case law is that it is constantly evolving and building upon previous cases as new cases set precedence.

A case that is important to the discussion is the Delgamuukw decision. One of the concrete findings of the Delgamuukw decision is the duty of government to discuss planned developments with First Nations. The case says that the government must do more than mere consultation, in some cases even obtain consent when reviewing proposed developments. This is the first time that we are aware of that the province has come to talk to the Heiltsuk, despite the fact that some of the area being proposed for oil and gas exploration and development is within Heiltsuk territory. In your letter, you state that you expect to receive input from concerned individuals and groups on this issue.*

It is clear from the Delgamuukw decision that you are legally obligated under Canadian law to involve First Nations in all decisions made in relation to their lands. To date you have not done so with the Heiltsuk in regards to the oil and gas exploration and development that you are here to discuss today. As we stated earlier this meeting today does not meet the standards required to discuss such a critical issue. So we would remind you that while it is fine for you to go and seek public input, we are not merely part of the public but are a First Nation with right that you must respect.

The Heiltsuk continue to rely heavily upon resources from the marine environment as a part of their way of life. Many resources from the marine environment are utilized for food and sustenance, as well as for cultural purposes. The outer coast is particularly rich and diverse in the resources that are available and harvested by the Heiltsuk. In addition to the food value associated with this harvest are cultural and social values connected to the history and practice of harvesting in these areas.

Commercial activity among the Heiltsuk has been mainly associated with marine harvest and transport in the past couple of generations. Commercial harvest of marine resources by the Heiltsuk is of paramount importance to the Heiltsuk economy. In recent years the fishing industry has experienced severe and harmful changes but remains the largest non-governmental employer for the Heiltsuk. The Heiltsuk Tribal Council has invested millions of dollars into the fishing industry, running a fish processing plant. The community members have invested large sums of capital into fishing boats, gear and licenses. A significant portion of the Community Development Society Loan portfolio is associated with fishing and marine harvest.

The Heiltsuk are one of very few First Nations that have been recognized by the Canadian Legal system as having commercial aboriginal rights. This is doubtless due to the time and cost facing First Nations that assert such rights, and the nature of case law that has been evolving

significantly during the past twenty-five years. The R.v.Gladstone case recognized that the Heiltsuk have a commercial aboriginal right to harvest herring spawn. This right is practiced in the outer coast portion of Heiltsuk territory and is a major economic activity for the Heiltsuk.

There is a major portion of the Heiltsuk who are unemployed or underemployed. It is estimated that at any given time between 50-60% of the population of Waglisla is dependent upon Social Assistance [Mavis Carpenter - Director Social Development. pers. Comm.] This is unacceptable and very damaging to our people. The people who are on Social Assistance receive fairly low benefit rates, especially considering the high cost of food in Bella Bella. As a matter of survival, SA recipients, as well as many others, require food harvest to survive. All Heiltsuk continue to use food resources harvested from Heiltsuk territory, and this forms a very real economic benefit in addition to providing cultural and social benefits.

Like most First Nations, the Heiltsuk demographic trends show significant growth. The rate of population growth is substantially more than the Canadian average and will mean a much larger population in the near future. The Heiltsuk population of registered members is currently 2069[Heiltsuk Tribal Council - membership department, November 27, 2001], and is predicted to double within the next twenty years.

In regards to Offshore Oil and Gas exploration and development, the Heiltsuk have been involved in this discussion for at least thirty years. The Heiltsuk decided during these discussions that they supported a moratorium on offshore oil and gas development and were opposed to this type of development within Heiltsuk territory. We have not changed our position and maintain our view that there should not be oil and gas exploration or development in our territory under the current circumstances.

As part of their concerns relating to oil and gas exploration and development, the Heiltsuk Tribal Council commissioned a report on the topic by renowned scientist Dr. Orr. The report, titled *"Oil in Marine Ecosystems: Potential Risks"*** was published in the Heiltsuk Occasional Papers Issue 41 and be viewed on the Heiltsuk Website at www .heiltsuk.com. This paper identifies a number of environmental concerns that arise from possible oil and gas exploration and development. Some of the concerns raised are negative impacts on the environment from seismic testing, from oil spills, and from chemical effects related to even small amounts of oil in the environment. Our intention is not to enter a detailed discussion of all these-6 points at this point in time, only to mention that we have serious concerns.

The exploration and development of oil and gas resources offshore pose threats to the Heiltsuk by endangering the marine environment upon which the Heiltsuk rely for commercial and subsistence harvest. We must not put at risk the resources we rely on for our survival. We are concerned about potential negative impacts on the resources that we rely on and must protect these resources for future generation of Heiltsuk people. As we mentioned earlier, the demographic trends predict a large increase in our population. These people will also require access to marine resources for their economic, social and sustenance needs.

In this presentation, we have indicated some of the critical uses that the Heiltsuk make of our territory. We cannot afford to place these values and reliance on the resources at risk without jeopardizing our very existence.

If this discussion is to be carried further then a serious dialogue between the Heiltsuk Nation and the Province needs to occur. The nature of this discussion needs to be a thorough and meaningful with adequate time and resources to address Heiltsuk concerns and to answer questions. Assessing the full range of social and environmental impacts from the possible development of oil and gas resources in Heiltsuk territory would require full involvement of the Heiltsuk. Should you wish to pursue the discussion further we would be prepared to meet with you to discuss how such an evaluation could be conducted. This does not mean that we have changed our minds but we do expect you to conduct yourselves in the manner prescribed by your own laws if you intend to pursue this matter.

In conclusion, we must emphasize a number of key points to you.

1. - The Heiltsuk Nation has unextinguished aboriginal title to our territory. The government does not have the unencumbered right to allocate resources in Heiltsuk territory prior to resolving some form of mutually acceptable relationship.

2. - The Heiltsuk Tribal Council does not support removing the existing oil and gas moratorium nor does it support oil and gas exploration and development within Heiltsuk territory at this point.

3. - The Heiltsuk Tribal Council does not regard this meeting, nor any other provincial activity to date, as fulfilling the obligations described in Delgamuukw for the Province, to meet with the Heiltsuk and discuss the concerns of the Heiltsuk regarding the proposed activity [engaging in offshore oil and gas exploration and development within Heiltsuk territory]. The Province is legally obligated to enter into discussions with the Heiltsuk to discuss proposed developments in Heiltsuk territory.

4. - The Heiltsuk reliance upon the marine environment is a fundamental and defining factor in our culture, identity, and economy. The potential harm proposed by offshore oil and gas is a real and significant threat to our way of life.

5. - The Heiltsuk Tribal Council has serious concerns regarding the safety and advisability of engaging in offshore oil and gas exploration and development.

6. - Should the government wish to discuss the proposed offshore oil and gas exploration and development the Heiltsuk would expect rigorous and detailed study, with the full involvement of the Heiltsuk, of the social and environmental impacts on the Heiltsuk and Heiltsuk territory as part of the preparation for discussions.

We are glad to have this opportunity to discuss this serious matter with you. We hope that we have impressed upon you the grave concerns that we have for the matter at hand.

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*Letter of November 16, 2001 to Chief Councilor Robert Germyn ftom Blair Lekstrom, MLA.
** Heiltsuk Occasional Papers: A Journal on Social, Cultural & Environmental Issues. Heiltsuk Tribal Council. Waglisla, B.C. Spring 2001 Issue #1.