

# STRATEGIC ENVIRONMENTAL ASSESSMENTS

- of the entire hydrocarbon option
- on Île d'Anticosti

Consultation document - Summary



## NOTICE TO THE READER

The summarised consultation document is based on the consultation paper on the overall strategic environmental assessments (SEAs) devoted to hydrocarbons and specific to Île d'Anticosti. It is thus a summary of the information in the report. Please consult the full report online for exhaustive data on the SEAs:

[hydrocarbures.gouv.qc.ca/evaluations-environnementales-strategiques.asp](http://hydrocarbures.gouv.qc.ca/evaluations-environnementales-strategiques.asp)

The consultation paper is based on 64 studies conducted by researchers and experts from all sectors (see Appendix 2 of the consultation paper) in conjunction with a Plan d'acquisition de connaissances additionnelles (PACA), which was based on knowledge assessments. The completed studies and assessments can be consulted online at:

[hydrocarbures.gouv.qc.ca/EES-bilan-connaissances.asp](http://hydrocarbures.gouv.qc.ca/EES-bilan-connaissances.asp)

[hydrocarbures.gouv.qc.ca/EES-plan-acquisition-connaissances.asp](http://hydrocarbures.gouv.qc.ca/EES-plan-acquisition-connaissances.asp)

Previous studies devoted to offshore hydrocarbon development and shale gas can be consulted online at:

[hydrocarbures.gouv.qc.ca/evaluations-environnementales-strategiques-milieu-marin.asp](http://hydrocarbures.gouv.qc.ca/evaluations-environnementales-strategiques-milieu-marin.asp)

[mddelcc.gouv.qc.ca/evaluations/Gaz-de-schiste/index.htm](http://mddelcc.gouv.qc.ca/evaluations/Gaz-de-schiste/index.htm)

[bape.gouv.qc.ca/sections/rapports/themes/gazoduc.htm](http://bape.gouv.qc.ca/sections/rapports/themes/gazoduc.htm)

Specific references such as chapter and section in the SEA consultation paper are indicated in this document to facilitate the reader's consultation of the data in the report. The references appear in the boxes in the margins of the text.

Several questions are also presented to initiate reflection among readers and individuals who are interested in submitting a brief or speaking during the consultations. The questions appear in the boxes at the end of each section.

*Ce document est également disponible en français.*

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# TABLE DES MATIÈRES

NOTICE TO THE READER .....	2
STRATEGIC ENVIRONMENTAL ASSESSMENTS .....	4
CONTEXT .....	5
THE CONSULTATIONS .....	5
CHARACTERISTICS OF THE BIOPHYSICAL ENVIRONMENTS.....	6
THE ENVIRONMENT .....	8
TECHNICAL ASPECTS.....	11
THE ECONOMY.....	15
TRANSPORTATION .....	18
THE MANAGEMENT OF SPILLS.....	20
SOCIETY .....	22
CONCLUSION .....	25



## STRATEGIC ENVIRONMENTAL ASSESSMENTS

### A strategic environmental impact assessment (SEA) is...

... a process to examine the scope and nature of the potential environmental, social and economic impacts upstream from a plan, program or policy. It is a tool recognized worldwide to take into account the principle of sustainable development.<sup>1</sup>

### An SEA is not an environmental impact assessment

The SEA must not be confused with an environmental impact statement (EIS), which focuses on a specific project in a smaller territory. The EIS is thus more detailed and less comprehensive than an SEA.

### Utility and objectives

The strategic environmental impact assessment (SEA) is used to determine decision-making methods and the conditions under which impending initiatives are carried out, where applicable, in a specific field.

The Ministère de l'Énergie et des Ressources naturelles (MERN) and the Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques (MDDELCC) have conducted two SEAs on the hydrocarbon option, one comprehensive and the other specific to Île d'Anticosti. The SEAs are intended to take stock of the state of knowledge and to acquire the information necessary to define government policy directions respecting the environmental, social, economic, technical and security issues pertaining to hydrocarbons.

The SEAs are designed more specifically to:

- ascertain the economically exploitable potential of hydrocarbons in the territory;
- address gaps in information concerning the techniques used, in particular hydraulic fracturing and offshore exploration and exploitation conditions;
- analyze environmental hazards and establish the measures to be adopted to minimize them and ensure sound management;
- examine consultation and consensus-building mechanisms that promote community acceptance and the sustainable development of territories;
- list the best practices to be implemented with the industry and local and partners;
- examine oil and natural gas needs;
- compare the risks linked to different modes of transportation.

The deliberations were conducted in light of five themes:

- the environment;
- society;
- the economy;
- transportation;
- technical questions.

### Stages in the realization of the two SEAs

- Phase 1: Production of the knowledge assessments – Completed (April 2015)
- Phase 2: Drafting of a consultation paper devoted to the two SEAs – Completed (October 2015)
- Phase 3: Consultations – Under way (November 2015)
- Phase 4: Drafting of two final reports on each SEA – Pending

<sup>1</sup> Definition of the principles of sustainable development ([www.mddelcc.gouv.qc.ca/developpement/principes.pdf](http://www.mddelcc.gouv.qc.ca/developpement/principes.pdf)).

## CONTEXT

The historical background of the government's initiatives encompasses, in particular, previous studies including:

- three SEAs, two of which focused on the possible realization of offshore hydrocarbon development and one on shale gas;
- four reports of the Bureau d'audiences publiques sur l'environnement (BAPE) on offshore hydrocarbon development and shale gas.

At the same time as the two SEAs, the government conducted a consultation on its 2030 greenhouse gas (GHG) emission targets in the perspective of the transition to a lower-carbon economy. It is also elaborating a new 2016-2025 energy policy to replace the *Québec Energy Strategy 2006-2015*. In the context of the energy policy consultation process, individuals, organizations throughout Québec and Québec, Canadian and foreign experts were able to express their opinions and make suggestions to respond to the key energy-related challenges, including the hydrocarbon option overall.

## THE CONSULTATIONS

The consultations conducted within the framework of the SEAs hinge essentially on the outcomes obtained under the Plan d'acquisition des connaissances additionnelles, whose key observations are presented in the consultation paper.

## Objectives

The consultations are intended to:

- collect, analyze and take into account the participants' concerns and expectations;
- validate the observations in the SEA consultation paper (impact, mitigation measures, observations);
- collect the participants' comments, recommendations and opinions;
- add to the final reports on the two SEAs by taking into account the comments received.

## Mechanisms

Two consultation mechanisms are planned:

- the consultation of local and regional communities and Quebecers overall;
- the consultation of the Aboriginal communities.

The consultation sessions for local and regional communities and the general public will be held in Montréal, Bécancour, Québec City, Île d'Anticosti, Gaspé, the Îles-de-la-Madeleine and Sept-Îles.

Interested groups, interveners and individuals are invited to the consultations. The public consultation, open to everyone, is the preferred means to reach interested bodies and organizations and the general public.

The Aboriginal communities in the territory under study or in boundary areas are invited to participate in the consultations. Specific sessions are planned in this respect. The consultations will take place from November 16 to 19, 2015.

Two reports will then be drafted, one for the SEA devoted to the hydrocarbon option overall and the other for the SEA specific to Île d'Anticosti, which will take into account the comments made at the consultations.

*Please consult the relevant chapters of the SEA report concerning the observations.*

# CHARACTERISTICS OF THE BIOPHYSICAL ENVIRONMENTS

From a geological perspective, onshore hydrocarbon exploration and exploitation activities are carried out in four major geological regions in the sedimentary basins in the southern portion of the province: the St. Lawrence Lowlands, the portion of the Appalachians located in the Gaspé Peninsula, and in the Bas-Saint-Laurent region and Île d'Anticosti.

In the SEAs in question, the terrestrial environments in the Gaspé Peninsula, the Bas-Saint-Laurent region and Île d'Anticosti have been characterized.<sup>2</sup> The characteristics of the environment analyzed include geology, hydrography, hydrology and ecosystems.

## The Gaspé Peninsula and the Bas-Saint-Laurent region

One of the key observations on biophysical characteristics is that the current state of knowledge does not allow us to conclude whether the volume of groundwater and surface water in the Gaspé Peninsula and the Bas-Saint-Laurent region is sufficient to satisfy hydrocarbon exploration and exploitation needs.

It should be noted that a study is under way devoted to groundwater in the drainage basin of the northeastern portion of the Bas-Saint-Laurent region. The Université du Québec à Rimouski and the Centre Eau Terre Environnement at the Institut national de la recherche scientifique are conducting the study.

However, the promoters could acquire such knowledge since they are obliged to conduct hydrogeological studies before they obtain the necessary authorization to engage in oil and gas drilling, as stipulated in Chapter 5 of the *Règlement sur le prélèvement des eaux et leur protection* (RPEP) (c. Q-2, r. 35.2).

Another observation concerns the protected areas in the Gaspé Peninsula and the Bas-Saint-Laurent region, which cover 5.5% and 1.9%, respectively, of the territory, below the 12% objective that the government set in order to approach the international protection target of 17%. The reconciliation of conservation issues and hydrocarbon exploration and exploitation licences poses a challenge.

## Île d'Anticosti

An examination of the information available highlights certain natural hazards related to soil stability, of which the industry must take account to ensure the security of its facilities.

Little is known about the hydrogeology of groundwater on Île d'Anticosti. As for surface water, it has been shown that the drainage basins of the Rivière aux Saumons and the Rivière Jupiter, respectively, could satisfy at most the needs of one of the three

multi-well drilling sites. To offset this lack of knowledge, Pétrolia announced in February 2014 the realization of a hydrogeological study on Île d'Anticosti

(Pétrolia, 2014) conducted by the Centre Eau Terre et Environnement at the Institut national de la recherche scientifique. According to the prescriptions in the RPEP, the hydrogeological study should be submitted with the application for the certificate of authorization.

The studies conducted on the water quality in rivers on Île d'Anticosti indicate that the water is of very good quality. However, were hydrocarbon exploitation to occur, it would be necessary to establish monitoring programs to focus on the impact of hydrocarbon development activities on the aquatic environment.

### Chapter 2

#### 2.2 The Gaspé Peninsula

#### 2.3 The Bas-Saint-Laurent Region

#### 2.4 Île d'Anticosti

<sup>2</sup> It should be noted that characteristics of the territory of the St. Lawrence Lowlands were provided within the framework of the SEA on shale gas and that the updating of the data was not planned. However, the information in this evaluation has been used in this process, in particular from the standpoint of the knowledge acquired, through the studies conducted to enhance understanding of the industry.

Natural resource development on Île d'Anticosti should be conditional on integrated resource management whereby initiatives are agreed upon by different users in order to ensure the environmental and economic balance of the activities that take place there. According to estimates, 36% of the territory of Île d'Anticosti would be excluded from hydrocarbon exploration and exploitation activities because of legal or regulatory constraints that concern, in particular, wildlife habitats and protected areas.

Wildlife habitats on Île d'Anticosti are characterized by abundant, diversified wildlife:

- 700 plant species, including 31 potentially threatened or vulnerable species;
- 25 wildlife species that are likely to be threatened or vulnerable;
- 5 types of habitats designated pursuant to the *Act respecting the conservation and development of wildlife* (white-tailed deer yard, water bird concentration area, heronry, a cliff inhabited by a bird colony, and muskrat habitat);
- 24 salmon rivers, including five where recreational fishing occurs.

Protected areas on Île d'Anticosti now occupy 7.6% of the territory. Five proposals are under study to increase the protected areas since the government has set a target of 12% in this respect. When projects are selected, certain sectors that are not subject to legal conservation measures should be considered as they have specific ecosystems, such as:

1. the eastern tip of the island, including the Réserve écologique de Pointe Heath and the territory immediately to the north of it;
2. the Rivière Jupiter sector;
3. the shoreline of the island, especially in the northeastern portion;
4. the entire western tip of the island.

*Do you have any additional information to suggest?*

*Do the characteristics of the environments studied reflect your knowledge of the environment?*

*Do you know other specific ecosystems that should be protected?*

## THE ENVIRONMENT

Hydrocarbon exploration and exploitation raises environmental challenges, especially the protection of water, the management of residual material and wastewater, air quality, greenhouse gas (GHG) emissions, technological and natural hazards, and the maintenance of biodiversity.

Environmental impacts usually hinge on the number of facilities, the technology used, the characteristics of potential discharges and spills but also on the characteristics specific to the receiving environments.

### Terrestrial environment

#### Impact on water and the aquatic environment

The following potential impacts on water and the aquatic environment have been inventoried:

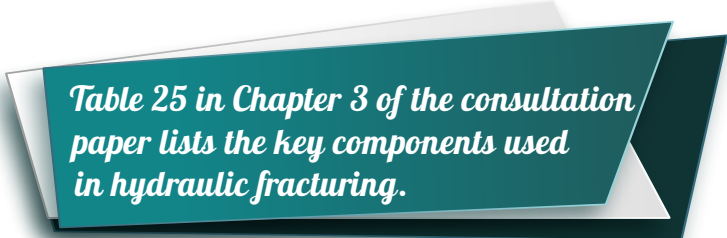
- a reduction in the quality of the surface water available that can be exacerbated during low-water periods or droughts;
- the contamination of surface water by accidental spills from various sources or increased road traffic;
- runoff and greater muddiness of water stemming from the deforestation of sites;
- the threat of habitat fragmentation and loss of biodiversity.

However, such potential impacts can be confined or further mitigated by:

- managing water use;
- collecting wastewater from gas or oil exploitation activities;
- using pipes to carry the water in order to limit road traffic;
- reusing fracturing water for subsequent fracturing;
- building a drainage ditch around sites to collect runoff.

Given the insular nature of Île d'Anticosti's territory and its fragile environment, the following suggestions are designed to limit the impacts:

- establish a centralized wastewater treatment plant that discharges treated water into the sea;
- take all of the necessary precautions to reduce to an acceptable level the risks inherent in spills and leaks in the case of hydraulic fracturing, because of the nature of the chemical inputs used;
- monitor water quality.



*Table 25 in Chapter 3 of the consultation paper lists the key components used in hydraulic fracturing.*

### Impacts on soils

Impacts on soils can be related to:

- natural earthquakes or those stemming from industrial activity such as hydraulic fracturing that can cause low-amplitude earthquakes;
- their contamination by drilling mud, fracturing fluids and backflow. Such impact can be limited through the installation of impermeable membranes on the sites.

Among the follow-up measures proposed, it has been suggested, in particular with respect to seismic events, that:

- broader knowledge be acquired of the characteristics of underground reservoirs;
- reports on seismic events be produced and the relationships between the parameters of hydraulic fracturing and seismic activity be studied;
- a seismicity surveillance program be established prior to, during and after fracturing activities.

It should be noted that in the summer of 2015 the Geological Survey of Canada installed seismographs on Île d'Anticosti.

## Air quality and noise

Part of the emissions in the air stem from the fuels such as natural gas or diesel used to drill for, extract, process and transport hydrocarbons. The compounds can contribute to increasing greenhouse gases, be toxic to human health or create environmental nuisances because of the odours they produce and the noise level that they engender.

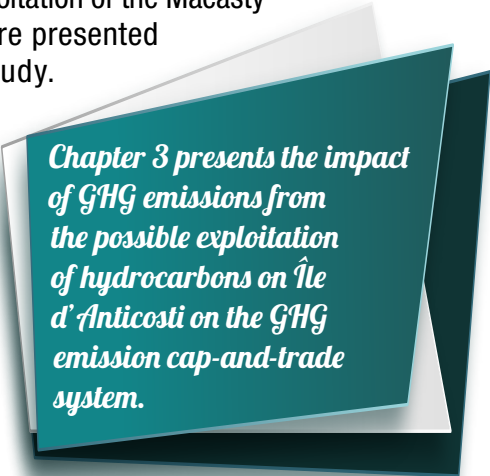
## Greenhouse gas emissions

### ÎLE D'ANTICOSTI

Preliminary estimates of the GHG emissions that could stem from the exploitation of the Macasty shale formation are presented in the AENV01 study.

The estimates hinge on the “More” scenario of the economic committee and data from the Utica shale in Point Pleasant, Ohio. Since the geological analogue indicates that the hydrocarbons on Île d'Anticosti are

mainly in gaseous form, their development assumes that they will be covered to ensure the project's profitability. Accordingly, based on the hypothesis that the infrastructure to recover gases would be in place from the outset of exploitation in 2020, annual GHG emissions would be on the order of 1.4 million tonnes of CO<sub>2</sub> equivalent during the maximum development period of the wells. By way of indication, such emissions could represent a 2% increase in relation to Québec's 2020 GHG emission targets.<sup>3</sup> The emissions must be considered as an order of magnitude and do not include emissions stemming from the transport of the hydrocarbons produced.



*Chapter 3 presents the impact of GHG emissions from the possible exploitation of hydrocarbons on Île d'Anticosti on the GHG emission cap-and-trade system.*

## OTHER GEOLOGICAL BASINS

A study was also conducted on the intensity of potential GHG emissions linked to certain structures in the Bas-Saint-Laurent geological basins (Massé structure), the Gaspé Peninsula (the Galt, Bourque and Haldimand structures), and the Gulf of St. Lawrence (Old Harry) (GENV30).

Based on the INRS study of similar geological structures (GTECO1), it was possible to estimate the intensity of GHG emissions per unit of energy produced by the structures. The intensity of GHG emissions allows for a comparison of the geological structures from the standpoint of their carbon dioxide footprint and could lead to an evaluation of absolute GHG emissions were data on hydrocarbon exploitation to become available later. In light of the information available, the Old Harry and Massé gas structures appear to emit less GHG per unit of energy produced while the other three structures (Galt, Bourque and Haldimand) appear to display average intensities of GHG emissions from the standpoint of North American shale gas and oil.

According to information in the SEAs, since there will be no exploitation in the St. Lawrence Lowlands or on Île d'Anticosti by 2020, there would be no impact on the 2020 target linked to the geological basins. The impact of possible hydrocarbon exploitation in Québec would probably affect Québec's forthcoming GHG emission reduction targets. In all cases, the industry must make a significant effort and promptly implement mitigation measures in order to reduce the GHG emissions stemming from its activities.

## Impacts on wildlife and habitats

Generally, the construction of roads and pipelines and increased road transport can damage and destroy habitats and interfere with the behaviour and life cycle of certain animals. Hydrocarbon exploration and exploitation can have numerous impacts on wildlife and wildlife habitats (Noël, 2012), such as:

- the modification, fragmentation and reduction in the size of habitats;
- the reduction of water resources;
- exposure to contaminants;
- the destruction of natural forest cover and its replacement by invasive vegetation;
- interference of the activities in the behaviour of animals resulting from the emission of dust and particles, increased noise and luminosity and the frequency of transportation.

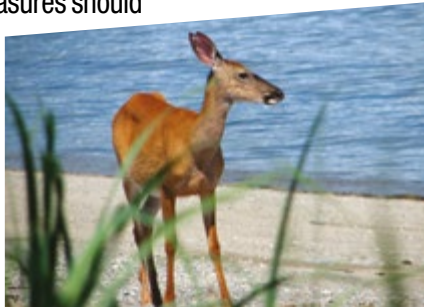
<sup>3</sup> Québec has targeted maximum GHG emissions of 68 million tonnes of CO<sub>2</sub> equivalent in 2020, a 20% reduction in relation to 1990 levels.

On Île d'Anticosti, exposure of salmon to petroleum hydrocarbons can inhibit the maintenance and long-term survival of populations affected by a major spill.

As for white-tailed deer on Île d'Anticosti, the AENV19 study did not make it possible to establish with certainty the impacts that oil and gas activities might have on its population. However, studies on other deer populations showed increases in the rate of movement and avoidance behaviour in respect of human infrastructure (indirect habitat loss).

Specific or mitigation measures should be implemented to:

- limit impacts on wildlife and flora, especially on designated species;
- protect avian species.



## Residual materials

The industry must establish a system to manage, treat and reuse residual materials on Île d'Anticosti.

## The marine environment

Offshore hydrocarbon exploration and exploitation facilities use inputs and energy and can discharge contaminants stemming, for example, from drilling and hydraulic fracturing.

## Impact on the aquatic environment

The possible presence in the Gulf of St. Lawrence of hydrocarbon exploration and exploitation facilities, especially in the Old Harry exploratory target sector, could affect benthic habitats on the site such as soft coral, sponges and certain fish such as cod, redfish and Canadian plaice.

The installation of a pipeline or a gas pipeline to transport hydrocarbons to a distribution site could also have a local impact on such habitats.

To elaborate criteria respecting the quality of wastewater flowing into the sea, it would be necessary to acquire knowledge on:

- the toxicity and persistence of certain compounds used as inputs in fracturing.

## Residual materials

Discharges into the sea of drilling residues can have potential impacts on environments such as:

- the establishment of a turbidity plume in the water column;
- the establishment of hypoxic and anoxic zones;
- the toxicity on organisms of the compounds in drilling residues;
- the bioaccumulation in organisms of certain metals and hydrocarbons;
- the burial of the benthic community through the deposit on the seabed of sediments;
- the displacement of mobile benthic organisms.

## Light and noise

Light pollution can affect seabirds attracted by light sources and cause birds to collide with structures. Certain species of plankton and pelagic fish can also be attracted by light sources and be exposed to more extensive predation on the water's surface.

Noise emissions, especially from seismic surveys, can also have various impacts on fish and marine mammals, behavioural reactions, the masking of other sounds, avoidance behaviour, stress or hearing loss.

*What are the most significant potential impacts to be considered and are they properly covered by the two SEAs?*

*What mitigation measures aimed at limiting environmental impacts strike you as indispensable?*

*How do you perceive the restoration of the sites once exploitation is completed?*

## TECHNICAL ASPECTS

Within the framework of the SEAs, geological structures that display hydrocarbon potential in the Bas-Saint-Laurent region (the Massé site), in the Gaspé Peninsula (the Bourque, Galt and Haldimand sites) and on Île d'Anticosti (the Macasty shale formation) and in the Gulf of St. Lawrence (Old Harry) were considered when studies were conducted on the technical aspects of hydrocarbon exploration and exploitation (Figure 1).

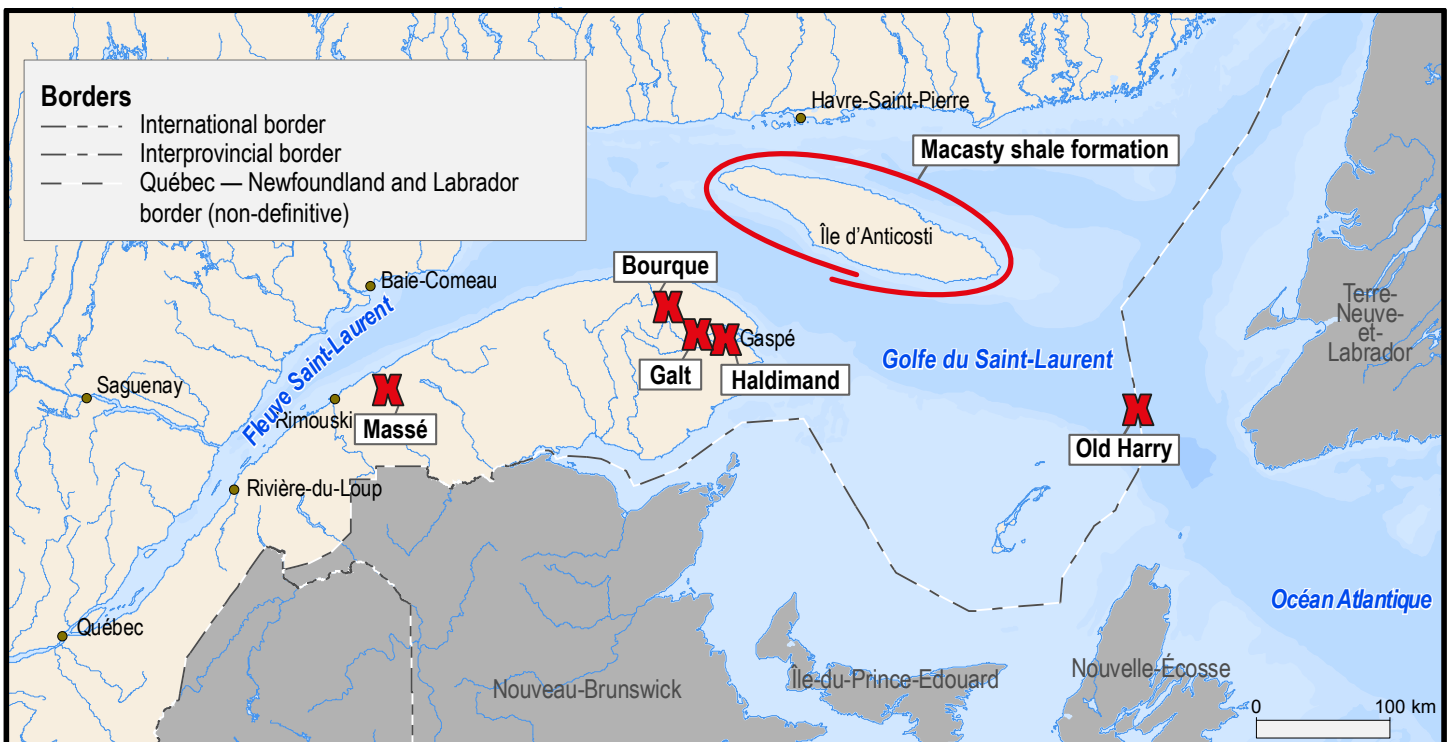
Geological analogues were defined for each of these structures. In particular, they make it possible to determine the technical, economic and regulatory issues and good practices with respect to hydrocarbon exploration and exploitation in terrestrial and marine environments established by different countries and territories and recognized organizations.

*Table 35 in Chapter 4 presents the analogues.*

The analysis of good practices took into account several factors to ensure the security of individuals and property, environmental protection and the optimum recovery of resources.

Because the good practices defined in respect of different technical aspects covered by the studies were numerous, only the technical aspects that are subject to proposals aimed at a major revision of existing regulations are presented in this document.

**Figure 1: Geological structures studied within the framework of the SEAs**



### Sources

Data	Organization	Year
Spatial organization	MERN	2015
Old Harry and joint hydrocarbon management zone	MERN	2015

### Production

Ministère de l'Énergie et des Ressources naturelles  
 Direction générale de l'information géographique  
 Note: This document is not legally binding.

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# The terrestrial environment

## Seismic surveys

Seismic surveys make it possible to investigate sectors that might contain hydrocarbon reservoirs. The surveys can be carried out with a minimum of environmental impacts by mitigating certain hazards such as:

- the propagation of invasive aquatic species through the preventive cleaning of surface equipment;
- deforestation related to the surveys using vibrator trucks to produce a signal;
- the protection of structures and sources of drinking water by imposing separation distances and by limiting explosive charges.

## Drilling

The technical aspects studied concerning drilling include activities related to well drilling, completion with or without fracturing, different types of trials, remedial measures, the closing and dismantling of facilities, site restoration, and follow-up and control during the initial and subsequent work.

The specific aspects pertaining to separation distances and fracturing stimulation are presented below.

*Please refer to section 4.3.1 for all of the good practices pertaining to onshore drilling.*

## SEPARATION DISTANCES

The RPEP adopted in 2014 by the MDDELCC sets prescriptive separation distances<sup>4</sup> until they are revised in 2017. The revision of the regulation would make it possible to take into account the hypotheses in the GTECO2 study and any other scientific evidence that would warrant reviewing the separation distances.



## FRACTURING STIMULATION

Fracturing stimulation consists in increasing the permeability of rock surrounding a borehole in order to optimize the recovery of hydrocarbons. The activity can be carried out with small or large volumes of fluids. Several types of fluids, to which are added chemical additives, can be used for fracturing, e.g. water, liquefied (gelled) propane gas or carbon dioxide. The injection under pressure of such fluids fractures the rock, thus increasing its permeability.

It should be noted that water and sand account for 99% of the fluids used to engage in hydraulic fracturing.

<sup>4</sup> A fracturing operation in a well destined for oil or natural gas exploration or exploitation is prohibited less than 400 m below the base of an aquifer that is set at 200 m below the surface of the ground. If the requisite hydrogeological study shows that the water in the aquifer contains more than 4 000 mg/l of dissolved solids, the base of the aquifer may be lower.  
The regulation also prohibits fracturing at less than 500 m from a water intake for human consumption or food processing.

Under the *Regulation respecting petroleum, natural gas and underground reservoirs*, the GTEC03 study suggests:

- not limiting the volume of fluids injected into water in order to take into account hydraulic fracturing operations carried out with fluids other than water;
- defining the volume for each well and not by fracturing state in a given horizontal (or vertical) well;
- taking into account the risks of induced seismicity;
- demanding a specific high-volume hydraulic fracturing permit in addition to the permit for the completion of a well that should be accompanied by the methodology used for fracturing operations.

The technical committee's deliberations also indicate that surface water or water unfit for human consumption should be preferred to supply water for fracturing activities.

*Please refer to section 4.3.2 for all of the good practices pertaining to offshore activities.*

## The marine environment

The GTEC07 study indicates that it is possible to carry out hydrocarbon exploration and exploitation work using good practices, in particular such as those now used on the Grand Banks of Newfoundland.

However, meteorological and oceanographic conditions in the Gulf of St. Lawrence can pose additional technical challenges when drilling occurs. It is for this reason that the GTEC07 and GTEC09 studies were conducted to determine the specific physical conditions in this environment to target the good practices to be considered to ensure the security of property and individuals, environmental protection and the optimum recovery of hydrocarbons.



These studies propose that the following additional work be carried out:

- a detailed study of the need for protocols and environmental measures in the event of spills;
- a detailed study of the physical aspects specific to the Old Harry sector;
- a study of the impact assessment related to the presence of icebergs in the Old Harry sector;
- the compilation and analysis of data to evaluate currents in the Old Harry sector;
- an analysis of the life cycle of hydrocarbon exploration and exploitation activities overall;
- an assessment of requirements pertaining to the presence of ice cover in order to optimize the periods allowed for drilling;
- the analysis and evaluation of drilling mud that can be used during drilling in an environmental protection perspective;
- the establishment of a long-term program aimed at collecting annual data on the physical environment specific to the Gulf of St. Lawrence.

*What oversight would be necessary to develop resources that require fracturing?*

*What other technical aspects should be considered?*

*What should a long-term monitoring program of the physical environment in the Gulf of St. Lawrence contain?*

## THE ECONOMY

Québec's hydrocarbon option now comprises:

- several prospecting companies with head offices in Québec;
- companies that support activities offering goods and services (drilling, geophysical surveys, helicopters, and so on), located principally in the Montréal and Québec City regions;
- the Suncor refinery in Montréal and the Valéro refinery in Lévis, which account for nearly 20% of Canadian output of refined petroleum products;
- Gaz Métro and Gazifère, natural gas distribution companies that distribute roughly 6 billion m<sup>3</sup> of natural gas per year;
- companies that transport hydrocarbons by ship, train and pipeline;
- several petrochemical companies.

The oil and petroleum products market contribute \$2.1 billion to Québec's GDP.

At this time, there is no commercial hydrocarbon production in Québec. Oil and natural gas supplies are entirely imported from producing provinces and states, i.e. Canada, the United States and elsewhere in the world. At present, such supplies account for 53% of Québec's energy balance. Possible hydrocarbon production in Québec would have a positive impact on Québec's trade balance.

### The resource's commercial potential

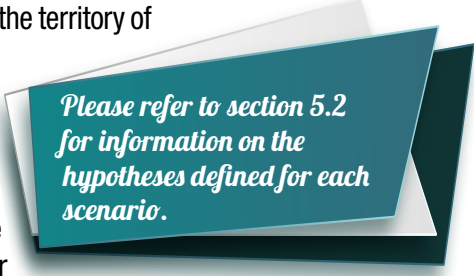
The current state of knowledge of Québec's geological basins known for their hydrocarbon potential is still incomplete. It does not make it possible to establish their commercial exploitation potential.

To this end, additional exploration work and initiatives to acquire geoscientific knowledge must be carried out to measure and confirm such potential. Should the need arise, techno-economic studies and economic assessments of deposits will subsequently determine the economically exploitable resource according to existing economic, technical and regulatory conditions.

## Production scenarios

While commercial potential has not been demonstrated, the knowledge available has been inferred to evaluate different development scenarios for the hydrocarbon option for the territory of Île d'Anticosti.

Three development scenarios have been elaborated based on plausible hypotheses in order to model and quantify the repercussions and impacts that possible development of the hydrocarbon option might engender from a social, environmental, economic and technical standpoint and its impact on infrastructure.



*Please refer to section 5.2 for information on the hypotheses defined for each scenario.*

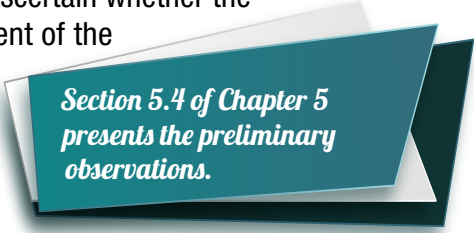
In the "More" scenario, it is estimated that a maximum of 712 platforms could be built over a period of 50 years for a total of roughly 6 800 wells, not all of which would be active simultaneously and each of which would have a 25-year production life. The "More" scenario, which covers 34% of the island's area and represents the most extensive potential development zone of the three scenarios, was used as an input in several other studies that complement the PACA.

The second or "Less" scenario, is based on the same development hypotheses as the "More" scenario but covers a smaller potential development zone representing 21% of the island's area. No additional study uses this scenario.

The third or "Optimized" scenario covers an area equivalent to the "Less" scenario but is based on different development hypotheses. This scenario was used to evaluate the project's potential financial profitability. It estimates that a maximum of 445 platforms could be built over a period of 50 years for a total of roughly 4 155 wells. During peak production, natural gas would account for 77.5% of hydrocarbon output and oil, for 22.5%, i.e. 246 billion cubic feet of gas and 12.3 million barrels of oil. Exploitation activities, especially on the island, would likely produce up to 113% of Québec's current natural gas consumption. Moreover, they could contribute more than \$2 billion annually to Québec's GDP.

## Cost-benefit analysis

A cost-benefit analysis for the territory of Île d'Anticosti was conducted to ascertain whether the possible development of the hydrocarbon option offers a genuine gain in value for the economy and Québec society overall.



*Section 5.4 of Chapter 5 presents the preliminary observations.*

## Economic spinoff

The development scenarios suggest that possible hydrocarbon production in the territory of Île d'Anticosti might be profitable in addition to generating considerable economic spinoff over the useful life of the project. A number of unknown factors persist and major investments would be necessary to build the requisite infrastructure such as ports, housing for workers, pipelines, plants, and so on.

The main economic spinoff engendered by hydrocarbon development activities includes royalties, taxes and the direct and indirect jobs created.

At present, the hydrocarbon royalty regimes are included in the *Regulation respecting petroleum, natural gas and underground reservoirs*. From the standpoint of commercial hydrocarbon production, the question of royalty regimes warrants consideration.

## Development of the Québec economy

Québec possesses certain competitive advantages and drawbacks from the standpoint of attractiveness as a place to carry out hydrocarbon development activities. The market and the capital required to successfully complete projects depends on the global context. It is nevertheless possible for the government to play an extensive role in extraction activities in order to maximize spinoff for Quebecers. It has been noted that most of the states in which hydrocarbon extraction activities are carried out have equity participations in the sector.

Competition is also keen as regards markets to be captured. While oil and natural gas liquids are more extensively negotiated on an international market, natural gas in a gaseous state is mainly negotiated at the continental level. Accordingly, Québec production of oil or natural gas liquids would find takers on various markets insofar as the output was sold at a competitive (market) price. However, outlets for natural gas are facing keen North American competition and access to the market could be difficult, especially because of the need to connect to gas pipeline networks.

## Suppliers

There is development potential among Québec suppliers to seek part of the Canadian hydrocarbon sector market, whether or not extraction occurs in Québec.

## Manpower

According to the GECN06 study, Québec has a complex industrial structure, qualified workers, a creative entrepreneurial network, and cutting-edge training centres. Based, in particular, on expertise acquired in the mining sector, possible hydrocarbon production in particular could likely promote the development of an industrial structure encompassing the entire array of suppliers of goods and services.

Moreover, the manpower pool seems sufficient to satisfy demand. As for training programs, several of them could immediately satisfy the industry's "basic" needs while other programs, especially at the university level, would require updating to adequately meet the industry's cutting-edge demands. It should be noted that, following the example of the mining sector, jobs in the hydrocarbons sector are specialized jobs with average earnings above \$100 000.

*Might other development scenarios have been studied? What would they imply?*

*Should the government adopt new hydrocarbon royalty regimes? What should the regimes' priorities be?*

*In a context where natural gas is the main resource on Île d'Anticosti, should we contemplate some degree of self-sufficiency from the standpoint of gas supply?*

## TRANSPORTATION

The development of the hydrocarbon option will engender additional transportation and infrastructure needs. The transport of hydrocarbons includes risks and inherent challenges, especially for the security of individuals and property and as regards environmental protection. This SEA considers such challenges.

Road and rail transport and pipelines are the main onshore modes of hydrocarbon transport. Ships or pipelines ensure the transport of hydrocarbons by river and sea. Studies devoted to prevention, preparation and intervention measures in the event of major accidents are under way and include, in particular, cross-border pipelines.

### Potential infrastructure to process and transport hydrocarbons

In order to elaborate scenarios concerning the processing and transport of hydrocarbons, projects presenting situations for the development of hydrocarbons similar to the conditions on Île d'Anticosti were analyzed.

*Table 51 in Chapter 6 presents the similar projects.*

It should be noted that the analysis of additional road infrastructure needs was not available when the consultation paper (ATRA02) was written.

The analysis subsequently allowed for the elaboration of four potential scenarios that differ essentially through needs for additional transportation infrastructure:

1. establishment of a gas separation plant and a liquefaction plant on Île d'Anticosti;
2. reliance on a floating liquefied natural gas vessel (FLNGV) equipped with a gas separation plant and a liquefaction plant anchored on Île d'Anticosti;
3. establishment of a gas separation plant and a liquefaction plant on the continent (Côte-Nord or Gaspé Peninsula) connected to an undersea pipeline;
4. establishment of a gas separation plant on Île d'Anticosti connected by undersea pipeline to the continental transport network.

*See section 6.2 for a description of the requisite infrastructure.*



It should be noted that each scenario includes a pipeline network that must be established on Île d'Anticosti to convey the hydrocarbons to the infrastructure indicated. It should also be noted that, in all of the scenarios, liquid hydrocarbons (oil and liquid natural gas) would be transported by ship from Île d'Anticosti.

The scenarios hinge, in particular, on the hypotheses defined under the "More" scenario and the environmental constraints specific to Île d'Anticosti and the Gulf of St. Lawrence.

Air transport of individuals could also be an important component of hydrocarbon exploration and exploitation on Île d'Anticosti. Indeed, several similar projects studied indicate that when local manpower is insufficient to satisfy demand or lacks the requisite skills, the fly-in fly-out (FIFO) method accompanied by a housing complex could be contemplated.

According to the ATRA01 study, environmental constraints on Île d'Anticosti do not hamper the infrastructure scenarios contemplated if mitigation measures are established. However, such infrastructure must comply with the approval processes in force. The market targeted for products and by-products will also affect the scenario chosen. The cost of the scenarios is estimated at between \$12 billion and \$17 billion, including the cost of drilling platforms.

*Table 53 in Chapter 6 presents the detailed costs.*

It should be noted, in particular, that under scenario 2 (the floating liquefied natural gas vessel), the ATRA01 study recommends:

- an examination of the federal and provincial legal and regulatory context;
- an examination in greater depth of the financial models contemplated for its purchase and operation;
- a demonstration of maritime constraints such as ice, winds, tides, and so on in the Gulf of St. Lawrence.



With regard to the onshore pipelines planned in the four scenarios, the preliminary document received in conjunction with the GTVS01 study indicates that the Régie du bâtiment du Québec (RBQ) ensures control over the construction, monitoring and maintenance of reservoirs and provincial pipelines carrying refined petroleum products but not natural gas and crude oil. Since they are not subject to control by the RBQ, provincial pipelines carrying crude oil and their storage tanks are not subject to any inspection. It is suggested that the legislative and regulatory framework be amended to ensure that the transport and storage of crude oil by provincial pipeline are subject to rigorous technical standards from the standpoint of measures respecting prevention, preparation and intervention in the event of a major accident.



The ATRA01 study also recommends conducting a specific study on the technical and economic feasibility of the pipeline contemplated in scenario 4, because of cost differences.

## Multimodal platforms

In conjunction with the transportation committee, the good practices observed in Québec related to the management of multimodal platforms were pinpointed along with possible avenues for improvement.

The good practices include, in particular:

- the sharing by facilities located in the same geographic region of equipment and staff to more effectively deal with emergencies;
- the computerization of control rooms in order to automatically alert key individuals during emergencies.

The possible avenues for improvement include:

- the tightening of the compliance and monitoring control process respecting emergency plans by means of validation by designated inspectors;
- the production of guides that summarize all of the requirements and standards governing the design of loading bays.

*Were the hydrocarbon option to be developed in Québec, in your opinion, which aspects of the transport of hydrocarbons should be documented first?*

*Which method of onshore or offshore transportation should be preferred?*

*Should the government invest in the development of such infrastructure in order to make profitable the investment and ensure use of the infrastructure by various stakeholders, including civil society?*

## THE MANAGEMENT OF SPILLS

### Terrestrial environment

#### Impacts of spills

The impacts of accidental oil spills are usually related to the contamination of soils and groundwater, odours, and the threat of explosions or fires. Spills in aquatic environments can be problematical because of the rapid dispersal of hydrocarbons in watercourses.

#### Requirements respecting risk assessment

According to the AENV15 study, the regulations applied by the MDDELCC or the MERN do not at present contain any requirement respecting risk assessments and emergency plans as regards hydrocarbon exploration and exploitation activities.

On the other hand, the Lignes directrices provisoires sur l'exploration gazière et pétrolière (MDDELCC, 2014b) stipulate that from the outset of the work, the holder of an authorization from the MDDELCC must apply the emergency environmental measures plan elaborated in collaboration with local authorities when an incident occurs that is likely to undermine the environmental, security or human health.

The MERN specifies the conditions and obligations to which are subject oil and natural gas exploration and underground reservoirs on land on Île d'Anticosti that is reserved for the State in the order of the Minister of Energy and Natural Resources of June 30, 2014. One such obligation stipulates that the holder of a prospecting licence must submit, prior to commencing work, an emergency measures plan.

The AENV15 study suggests specifying in Québec regulations the objectives to be attained and the norms to be met from the standpoint of technological risk analysis and emergency measure planning.

# The marine environment

## Impacts of spills

Different sources can cause hydrocarbon spills in the Gulf of St. Lawrence. Tankers pose the greatest threat bearing in mind the quantities of hydrocarbons that they transport, although the compartment design of ships (10 000-tonne compartments) and the obligation to build double hulls reduces the risk of major leaks.

According to the GENV24 study, the research conducted several years after an accidental spill in a cold environment showed that:

- the adverse impact on fauna and flora persists several years after major petroleum hydrocarbon spills;
- it can take wildlife and plant species several years to re-establish themselves after a petroleum hydrocarbon spill;
- long-term follow-up of the species affected by a petroleum hydrocarbon spill is necessary to assess all of the impacts and the potential for the restoration of the environment.

The impact of accidental petroleum hydrocarbon spills, except for fueling, and the impact of the intervention methods used to clean contaminated environments have been little studied as regards birds and mammals.

## Intervention methods

There are two types of intervention, i.e. mechanical methods and specific methods.

### MECHANICAL METHODS

The intervention now carried out by the Eastern Canada Response Corporation (ECRC) and the Canadian Coast Guard (CCG) is confined to mechanical methods.

According to the ECRC and the CCG, the recovery by mechanical methods of hydrocarbons when spills occur in the winter is facilitated because ice tends to contain the hydrocarbons. However, recovery work during this period is hampered by ice and monitoring of the oil slick poses a problem from the viewpoint of the state of knowledge.

### SPECIFIC METHODS

The AENV13 study presents different “specific” methods, especially chemical dispersants and their ecotoxicological impacts. The authors suggest, bearing in mind the particularities of Québec’s aquatic environments, that additional knowledge be acquired concerning the physical and chemical aspect of the contaminants and products linked to specific methods.

Such knowledge might facilitate decision-making concerning reliance on chemical dispersants in the waters of the estuary and the Gulf of St. Lawrence. In the case of a favourable stance, it is suggested that a pre-approval mechanism be adopted for certain offshore zones where dispersants may be authorized.

## Governance

The GTVS02 study focused on the offshore regulations in force and the roles and responsibilities of the organizations concerned. The authors suggest:

- better publicizing the *Régime de préparation et d’intervention en cas de déversement et d’intervention maritime* to make the municipalities and individuals aware of the operation and efficacy of the Canadian regime governing hydrocarbon spills by ships;
- heightening awareness among municipal civil protection officials of the province-wide emergency plan;
- establishing a process to discuss with the municipalities the question of offshore hydrocarbon spills;
- broadening access by the municipalities to detailed analyses of the risks and impacts of an offshore hydrocarbon spill;
- supporting the municipalities concerned by the possible impacts of an offshore hydrocarbon spill in order to consider such risks in their emergency plans.

*Do you believe that the scenarios contemplated with respect to the transport of hydrocarbons sufficiently attenuate the risks stemming from a spill? What additional precautions should be contemplated?*

*What might the Québec government do to enhance the security of onshore exploitation activities? Of offshore activities?*

*What do you think of the natural hydrocarbon mitigation measures compared with the “specific” measures to manage hydrocarbons that may engender ecotoxicological impacts on marine ecosystems?*

## SOCIETY

The challenges and social impacts anticipated through hydrocarbon development in Québec have been studied, in particular from the standpoint of participation by the Aboriginal peoples, social acceptability and the impacts anticipated by Île d’Anticosti residents with respect to the possible launching of the hydrocarbon industry on the island.

### The territories and their uses

In order to clearly delineate such challenges and their impacts, an inventory of uses and the determination of sensitive areas were carried out in the onshore portions of the Bas-Saint-Laurent region and the Gaspé Peninsula, the Québec portion of the Gulf of St. Lawrence including the Îles-de-la-Madeleine and the three easternmost RCMs in the Côte-Nord region. They were also conducted for the territory of Île d’Anticosti. The key observations are indicated below.

*Please refer to sections 8.2 and 8.3.*

- Onshore, the territory is covered by one or two components and forest predominates.
- Offshore, the territory presents in places up to 12 types of uses or constraints.
- On Île d’Anticosti, forests, structured wildlife territories and conservation areas are widespread.

### The Aboriginal peoples

Several Aboriginal communities are located in regions where natural resource development is economically significant and many Aboriginal peoples maintain a way of life closely linked to the territory. Accordingly, the Aboriginal communities are essential stakeholders in natural resource development and their involvement takes several forms.

Different models to promote participation by the Aboriginal peoples in natural resource development are applied across Canada. The GSOC02 study made it possible to examine experience outside Québec concerning participation by the Aboriginal communities in natural resource development activities.

Four complementary mechanisms to facilitate participation by the Aboriginal peoples in the development of the territory were studied: consultations, Impact and Benefit Agreements, the sharing of royalties, and support for Aboriginal entrepreneurship. The study revealed the following good practices:

*Please refer to section 8.4.*

- consult the Aboriginal peoples by means of distinct, adapted mechanisms;
- foster their participation in the elaboration of policies or consultation directives of concern to them by agreeing, in particular, on the outcome of the consultation;
- elaborate guidance tools for promoters to facilitate their contacts with the Aboriginal communities within the framework of their projects;
- establish inclusive mechanisms such as Impact and Benefit Agreements (IBAs) and mechanisms to share royalties and promote Aboriginal partnerships;
- structure the IBAs to foster their complementarity with the consultation process and make them more transparent;
- ensure that the Aboriginal communities benefit from income derived from economic activities, in particular through the sharing of royalties;
- contribute to Aboriginal entrepreneurship by making accessible the necessary capital and guidance resources.

According to the study, the mechanisms should ideally be an integral part of a comprehensive strategy aimed at fostering partnerships with the Aboriginal peoples in natural resource development. Such a strategy should be elaborated in close collaboration with the main Aboriginal organizations in the province to ensure its legitimacy.

## Social acceptability

Social acceptability is central to the success factors of natural resource development projects.

*Please refer to section 8.5.*

The reasons that opponents of natural resource development projects often invoke are linked to concerns about the environment, public health or security, or to questions pertaining to values or ideology.

The GSOC3 study focused on five energy projects, especially from the standpoint of territorial governance.

It has made it possible to establish factors that have had a greater influence on the social acceptability processes related to the projects such as those linked to:

- social concerns: respect for the environment, civil protection, including the coordination and implementation of rules and adequate emergency measures, road maintenance, monitoring and control of the quality of drinking water and the inherent costs for the municipality of projects;
- territorial governance: the model for establishing the option, recognition of development and territorial planning tools, the level of social cohesion in the community, government oversight that is deemed to be satisfactory, and the elaboration of agreements between the promoters and local communities (municipalities and RCMs).

The study also made it possible to establish several avenues to be explored, depending on the stakeholders concerned, to promote greater social acceptability of the projects were the government to decide to pursue the development of the hydrocarbon option. In particular, mention should be made of the following factors:

- the government: structure the processes for negotiations concerning conditions for access to property and hydrocarbons transport and exploitation activities based on the principles of sustainable development, accompanied by the strictest possible regulatory mechanisms and stringent environmental measures;
- municipal bodies: elaborate zoning plans that establish favourable zones, zones that are favourable under certain conditions or unfavourable zones;
- promoters: satisfy the expectations of host communities concerning their needs and concerns.

## Impacts anticipated by Île d'Anticosti residents

By means of an empirical process, the ASOC01 study made it possible to take stock of the Île d'Anticosti community such as it perceives itself and to describe the main impacts anticipated with regard to the possible establishment on the island of the hydrocarbon industry.

Île d'Anticosti residents are proud of their territory and are fond of their quiet, safe living environment. Entrepreneurs are socially invested there and resourcefulness is well developed.

Moreover, legislation and regulations are not well adapted to the local context and while services there are satisfactory they are declining. The social structure is undergoing constant change and demographics is an important social issue, bearing in mind the island's dwindling, ageing population. Life on Île d'Anticosti is significantly shaped by the seasons and isolation and social and economic development there is perceived as a striking need.

*What role should promoters and different levels of government play in the development of the hydrocarbon option?*

Based on the scenarios to establish drilling platforms presented in Île d'Anticosti on May 7, 2015, the participants in the ASOC01 study expressed concerns about the impact that the establishment of the hydrocarbon industry on the island might have. The following table presents some of the preliminary observations.

*Please refer to section 8.3 for the entire array of anticipated impacts.*

*Under what conditions do you believe that onshore hydrocarbon exploitation is acceptable? Offshore exploitation?*

*Under what conditions could hydrocarbon development become a factor for regional development?*

*How should civil society be involved in the process of planning, elaborating and carrying out hydrocarbon development projects?*

**Table 1: Preliminary observations according to the ASOC01 study**

Positive impacts	Negative impacts
<b>Health and well-being</b>	
Possible enhancement of health services	A reduction in the feeling of individual security
A potentially livelier town	Impacts on physical and mental health
	The possible appearance of problems related to drugs or alcohol under the fly-in fly-out scenario
<b>The quality of the living environment</b>	
Revitalization of the town of Port-Menier	The appearance of environmental nuisances and contamination of the natural environment
	A lack of preparation and time to adjust to rapid population growth
<b>The economy and material well-being</b>	
A possible increase in the resident population	Negative impacts on hunting and fishing activities
Economic prosperity	The inability of local businesses to offer competitive wages
Economic diversification	The transition from a services-based economic model to a model centred on the primary sector
<b>Families and the community</b>	
The maintenance of the school and the opening of the day care centre	The departure of certain residents
The dilution of social tensions	The weakening of solidarity among residents

## CONCLUSION

The consultation phase concludes a significant initiative devoted to taking stock of and acquiring knowledge on all facets of the two SEAs. The time has come to focus on Quebecers' concerns and suggestions to round out the process launched in May 2014. In addition to the online information session that will be webcast and the consultations, an online blog is available on which individuals can ask questions and make comments. The findings of the consultations will be taken into account and will underpin the final overall SEA report and the report devoted to Île d'Anticosti.



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