Gouvernement du Québec
Ministère de
l'Environnement

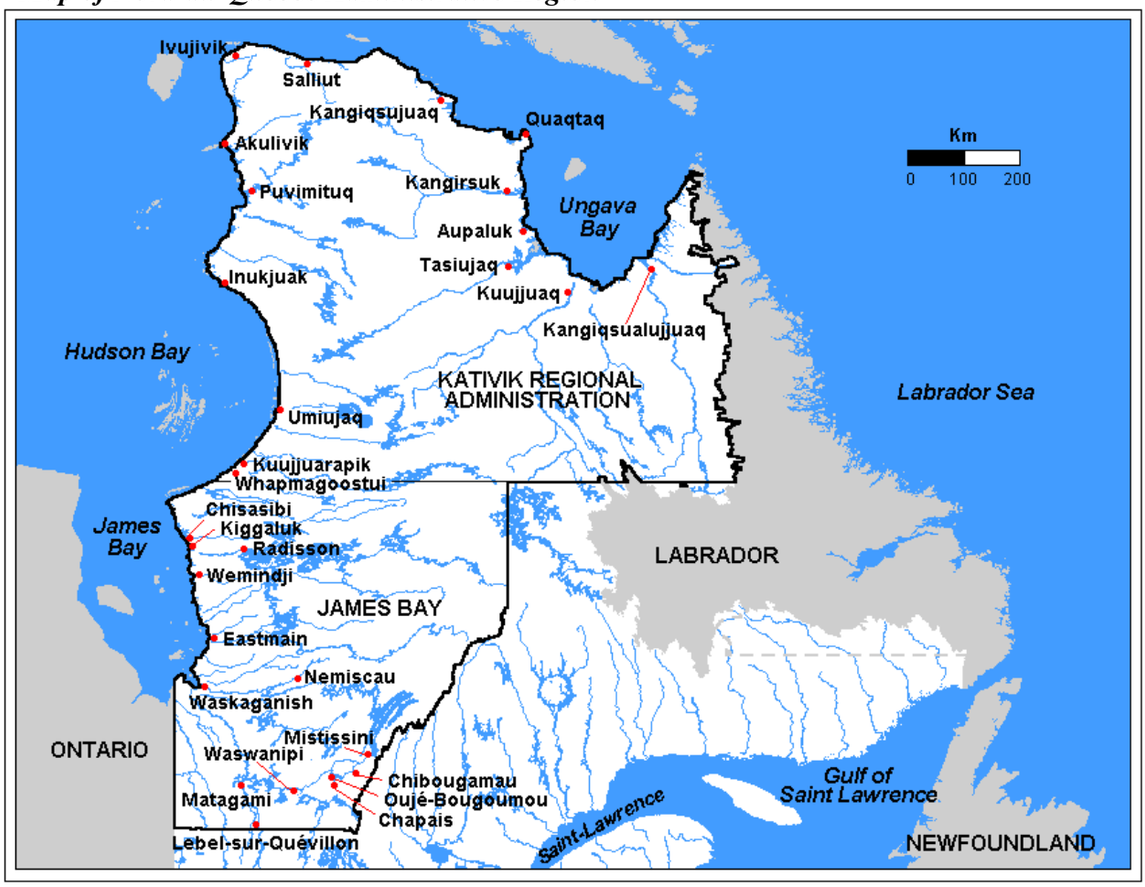
Regional Water-Resources Profile

Public Consultation on Water Management in Québec

NORD-DU-QUÉBEC

Administrative Region 10

Map of Nord-du-Québec Administrative Region



Source : Direction des écosystèmes aquatiques [Aquatic Ecosystems Branch], Ministère de l'Environnement du Québec

19 May 1999

Québec

Note to the Reader

During the December 1997 Symposium on Water Management, Premier Lucien Bouchard announced that a wide-ranging public consultation process would be undertaken to gather the views of all parties with an interest in the preservation and exploitation of water resources.

On December 16, 1998, the government decided to entrust this task to Québec's environmental hearing board, known as the Bureau d'audiences publiques sur l'environnement (BAPE). The consultation process was officially launched on January 26, 1999 by the Minister of the Environment, Mr. Paul Bégin.

The BAPE's 12-month mandate calls for public meetings to be held in every administrative region of the province and requires that the Commission's recommendations distinguish between regional concerns and water-management issues at the provincial level.

This document presents a water-resources profile for the Nord-du-Québec administrative region, and covers the following aspects: quantity and quality of water resources, water management, recreational use and tourism, direct effects on aquatic wildlife, and specific regional issues.

The document has been prepared within the framework of the consultation process in order to answer certain questions from the public or from the Commission. However, given the extremely tight deadlines applying to its preparation, it does not conform to all the formal editorial standards required for government documents and must therefore be regarded as a **working document**.

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1. Socio-Economic Profile of the Region

The Nord-du-Québec administrative region extends north of the 49th parallel over an area of 839,696 km^2 and is divided into three climate zones, from south to north: boreal forest, taiga, and tundra, the latter characterized by permafrost. It is surrounded to a great extent by large bodies of water, namely, James Bay, Hudson's Bay, and Ungava Bay. The region accounts for 55 % of Québec's land area, but, with about 38,400 inhabitants, it is the least populated area of the province.

Administrative Divisions (Order-in-Council 1654-97)	Population (1997)
Area north of 55th parallel	
14 municipalities made up of northern villages	8,715
Area south of 55th parallel	
• 9 Cree villages[1]	10,871
• 4 enclave towns	
◦ Chapais	2,030
◦ Chibougamau	8,664
◦ Lebel-sur-Quévillon	3,416
◦ Matagami	2,243
Municipality of James Bay	2,456

1. Data not available for the Oujé-Bougoumou community of Order-in-Council 1654-97

The James Bay and Northern Québec Agreement, signed in 1975, and the Northeastern Québec Agreement, signed in 1978, provided this region with a special framework. In practice, administrative and environmental matters are dealt with differently north (Kativik sector) and south (James Bay sector) of the 55th parallel.

The native population has occupied this region of Québec from time immemorial and mainly engages in its traditional occupations of hunting, fishing, and trapping.

The presence of non-native communities in this region is a rather recent phenomenon. Colonization led to the creation in 1935-1936 of Villebois, Val-Paradis, and Beaucanton. Development of mineral and forest resources brought about the creation, between 1950 and 1965, of the towns of Chibougamau, Chapais, Matagami, and Lebel-sur-Quévillon and of the locality of Joutel. The latter was shut down when the mining company established there ceased operations. Development in the early 1970s of some of the James Bay region's hydroelectric potential brought about the establishment of the town of Radisson and the creation of several industrial sites.

Table 1.2 : Territorial and Socio-Economic Data for the Region

Item	Data	
Total population[1] (inhabitants)	38,395	(1997)
Surface area[2] (km^2)	839,696	(1997)
Number of municipalities and equivalent territories[* 2]	47	(1998)
Number of manufacturing establishments[3]	21	(1998)
Number of mining establishments[**] in operation[4]	13	(1997)
Percentage of territory under forest cover[4](%)	15.8	(1995)
Percentage of territory under cultivation[5](%)	0,0	(1997)
Unemployment rate[2](%)	15.1	(1997)
Mean total individual income[2]($)	23,423	(1996)
Employment[2] : primary sector (%)	9.4	(1997)
secondary sector (%)	20.3	(1997)
tertiary sector (%)	70.1	(1997)

* : Equivalent territories include Indian reserves, Amerindian settlements, and unorganized territories. There are 20 in the region.
** : Includes quarries, sandpits, and peat bogs.
Sources : 1 Répertoire des municipalités du Québec 1998 [1998 Directory of Quebec Municipalities]
2 Bureau de la Statistique du Québec [Quebec Bureau of Statistics]
3 Centre de recherche industrielle du Québec [Industrial Research Centre of Quebec]
4 Ministère des Ressources naturelles [Ministry of Natural Resources]
5 Statistics Canada

Forests cover 15.8 % of the territory of the Nord-du-Québec region, with 99 % of the forested area under public ownership and 1 % in private hands. 21 manufacturing establishments and 13 mining establishments are in operation in the region.

2. Surface Water Ressources : Quantitative Profile

2.1 Rivers

The main rivers in the region are the Caniapiscau River, the Rupert River, the Rivière aux Mélèzes, the Rivière aux Feuilles, the Grande Rivière de la Baleine, the Rivière à la Baleine, and the George River. Each of these rivers drains an area of over 26,000 km^2. The watersheds of the Nord-du-Québec region are among the largest in Québec. The map below shows the boundaries of the watersheds.

Flow levels (mean, maximum, minimum) have been calculated on the basis of many years of data (20 years or more), and the following table indicates the relative importance of the rivers.

Table 2.1: Hydrological Data for the Principal Regional Rivers

River	Drainage area[1] ($km^{2)}$)	Mean flow (m^3/s)	Maximum flow (m^3/s)	Minimum flow (m^3/s)	Measuring Station[2]	Measurement Period
Caniapiscau	48,500	1,335.8	13,500	68.6	103702	1954-1996
Rupert, de	42,700	846.2	1,890	266	081002	1963-1996
Mélèzes, aux	41,700	604.9	7,500	23.1	103605	1965-1996
Feuilles, aux	40,900	589.9	6,780	14.9	102701	1955-1988
Grande Rivière de la Baleine	36,300	527.6	1,880	89.7	093801	1961-1996
Baleine, à la	29,800	507.7	5,730	14.7	104001	1956-1996
George	26,900	504.7	5,480	25.9	104803	1975-1996
Bell	24,200	392.0	2,200	58.6	080707	1962-1996
Waswanipi	22,200	371.3	1,980	72.2	080704	1962-1982
Arnaud	18,700	345.1	3,110	28.6	102001	1954-1983
Broadback	17,100	312.0	1,140	68.2	080801	1956-1982
Turgeon	11,200	193.9	2,120	6.82	080104	1968-1996
Nastapoca	10,400	192.4	629	51.7	095003	1974-1996
Petite Rivière de la Baleine	8,390	102.9	337	21.1	094206	1963-1996
Pontax	6,090	98.8	935	7.1	081101	1975-1996
Harricana	3,680	59.0	337	7.7	080101	1933-1996

Source : Direction du milieu hydrique [Hydrographic Branch], Ministère de l'Environnement

1. This is the drainage area measured at the measuring station and does not necessarily represent the overall watershed of the river.
2. Refer to the 1994-95 Hydrological Yearbook of the Ministère de l'Environnement for the exact locations of the measuring stations.

Note : The Ministère de l'Environnement has no quantitative data for the La Grande River.

Map 2.1: Principal WaterSheds of the Nord-du-Québec Region

2.2 Lakes

The table below lists the best-known lakes in the region and indicates their surface area and principal purposes and uses. It also includes the main hydroelectric reservoirs. The Ministère de l'Environnement's Direction du milieu hydrique [Hydrographic Branch] may be contacted for information on these lakes.

Table 2.2 : Purposes and Uses of Principal Lakes in the Region

Lake/Reservoir	Surface area (km^2)	Purpose / Use
Caniapiscau	4,275	reservoir, fishing
Robert-Bourassa (LG 2)	2,835	reservoir
LG 3	2,420	reservoir
Mistassini	2,113	largest natural freshwater lake in Quebec, fishing
Eau Claire, à l'	1,243	fishing
Opinaca	1,040	reservoir, fishing
Bienville	987.00	fishing
LG 4	765.00	reservoir
Sakami	738.00	fishing
Guillaume-Delisle	712.00	fishing, attraction: beluga, seals
Feuilles, aux	611.00	fishing
Minto	596.00	fishing
Payne	513.00	fishing
Loups Marins, des	484.33	fishing, attraction: common freshwater seal
Goélands, aux	277.13	fishing
Nantais	266.77	fishing
Faribault	248.38	fishing
Matagami	236.00	holidaying, camping

Lake/Reservoir	Surface area (km^2)	Purpose / Use
Chibougamau*	206.00	sport and subsistence fishing, planned wildlife area, disposal of mining wastes
Tasiat	206.00	fishing
Waswanipi	205.00	beach, holidaying
Opiscoteo	202.54	fishing
Opémisca	77.00	residential, holidaying, beach, fish farming project
Quévillon	48.00	drinking water supply, holidaying, camping, beach
Dorés, aux*	40.50	holidaying, camping, fishing, disposal of mining wastes
Presqu'île, de la	12.00	drinking-water supply for town of Chapais, holidaying, fish farming project
Du Cratère du Nouveau-Québec	6.50	possible Quebec provincial park (Pingaluit)
Gilman	1.60	drinking-water supply for town of Chibougamau, beach
Sainte-Lucie	0.13	

* Used for disposal of mining wastes

Source : Direction du milieu hydrique [Hydrographic Branch]et Direction régionale du Nord-du-Québec [Nord-du-Québec regional office], Ministère de l'Environnement

2.3 Dams

The Nord-du-Québec region has 296 dams and dikes. Of these, 294 are operated by Hydro-Québec and used to store water for hydroelectric production, while the other two belong to the Falconbridge mining company. They are located on the Raglan mine site and used to supply water for the mine.

Of the 296 dams and dikes, 130 are over 10 meters in height. The three highest ones are on the La Grande River and belong to Hydro-Québec. The highest is a 168-meter dike in the LG-2 development, followed by the 128-meter LG-4 dam and the 98-meter LG-3 dam.

In addition, the reservoirs making up these developments (the LG 2, LG 3, and LG 4 reservoirs), along with the Caniapiscau reservoir, are among the largest reservoirs in Quebec. In fact, their respective water volumes are 61,7 billion, 60,0 billion, 19,5 billion, and 53,8 billion cubic meters.

3. Surface Water Ressources : Qualitative Profile

3.1 Water Quality in Rivers

It should be mentioned at the outset of this section that the Ministère de l'Environnement du Québec does not have a water-quality monitoring system, like the one in Southern Quebec, in place to provide coverage of the Nord-du-Québec region or any part of it. Most of the information which follows has been obtained from reports prepared by the Société d'énergie de la Baie James (SEBJ) [James Bay Energy Corporation] or prepared for the SEBJ by various consulting firms and mainly concerns the watershed of rivers which have been harnessed for hydroelectric purposes.

Hydroelectric development programs in the Nord-du-Québec region made possible numerous studies and the establishment of a water-quality tracking program by the promoter of these developments, Hydro-Québec. From the very beginning of the 1970s, sampling programs made possible an assessment of water-quality conditions. The water quality is high thanks to low levels of anthropic pressure on aquatic environments. In the sector which was the main object of study, it is the priming of the reservoirs built in the drainage basin of the La Grande River as well as the diversion of the Eastmain, Opinaca, and Caniapiscau rivers in particular which have had a major impact on water quality.

Indeed, the hydraulic character of the area has been modified, with concomitant effects on the physico-chemical and biological parameters of the ecosystems involved. The priming of reservoirs involves flooding of vegetation and forest soils. This injection of significant amounts of organic material into aquatic environments and its subsequent decomposition consume dissolved oxygen and release minerals and nutrients such as phosphorus, as well as carbon dioxide (CO_2). This gas acidifies the water and inhibits the microorganisms which break down organic materials, slowing down the decomposition process. Nevertheless, the studies carried out to follow up on water-quality levels report that the environments which underwent physical modifications between 1981 and 1984 had already returned by 1987 to water-quality levels comparable to those of surrounding natural environments. A new equilibrium is achieved after a transition period of greater or lesser duration (10 to 15 years) depending on the size of the flooded areas, on shoreline erosion, and on the subsequent magnitude of the tidal range.

3.2 Specific Water-Quality Issues

3.2.1 Mercury Contamination of Fish

The main water-quality issue raised by the priming of hydroelectric reservoirs is the increase in levels of bioavailable mercury and its progression through the food chain. In a natural ecosystem, mercury of geological or anthropic origins finds its way into the aquatic environment in a slow process linked to erosion and to run-off in the drainage basin. When reservoirs are primed, mercury is released into the aquatic environment at an accelerated rate as a result of complex bio-geo-chemical processes. Bacterial decomposition of submerged organic material (vegetation and forest soils) results in the production of methyl mercury, which will be absorbed all the way up the food chain. This bacterial methylation process causes a rapid increase in levels of bioavailable mercury. The increase in levels of bioavailable mercury to which aquatic wildlife is exposed depends on many factors: the land area flooded, the duration of flooding, flowing-through time, volume of water, the proportion of shallow areas (where biotransfer levels are greatest), water quality, the tributary system of the flooded area, the dynamics of fish populations, etc.

The creation of reservoirs has led to an increase in total mercury concentrations in fish as a result of bioaccumulation. By the very nature of this process, piscivorous species show higher mercury concentrations than non-piscivorous, bottom-feeding, or plankton-eating species. The same applies to piscivorous mammal and bird wildlife species. Depending on the fish species and reservoir in question, the maximum mercury concentrations range from 3 to 7 times higher than those encountered in the natural environment. In the case of non-piscivorous fish species (lake whitefish, longnose sucker), the mean mercury concentration in the natural environment falls below the 0.5 mg/kg limit for fish products being brought to market. In the case of piscivorous fish (lake trout, pike, walleye), on the other hand, this limit is often exceeded.

It has been observed in reservoirs in the La Grande River region that mercury levels in non-piscivorous fish stop increasing 4 to 5 years after priming and return to normal levels (similar to those in natural lakes) after 10 to 15 years. For piscivorous fish species, mercury levels peak after 9 to 13 years and begin to drop noticeably after 14 to 15 years.

Data on mercury levels in fish collected at the La Grande complex as well as in other reservoirs in the Canadian Shield and in Finland show that a return to levels similar to those in natural habitats takes place 15 to 25 years after priming for non-piscivorous species and 20 to 30 years after priming for piscivorous species.

It has also been observed that mercury is exported downstream of reservoirs by particulate matter (organic matter, plankton, insects, small fish) passing through the turbines or floodgates. Because of this export process, mercury levels also increase in fish species found downstream from reservoirs.

For example, mercury levels in different fish species in various sectors of northern Quebec lie in the following ranges:

Species	Outside Reservoirs (1990 to 1993)	In Reservoirs[1] (1993 à 1995)
Lake whitefish	0.05 mg/kg to 0.36 mg/kg	0.21 mg/kg to 0.29 mg/kg
Longnose sucker	0.07 mg/kg to 0.30 mg/kg	0.34 mg/kg to 0.39 mg/kg
Northern pike	0.30 mg/kg to 1.81 mg/kg	2.07 mg/kg to 4.16 mg/kg
Walleye	0.30 mg/kg to 1.41 mg/kg	1.56 mg/kg to 2.25 mg/kg

1. The reservoirs considered were LG 2 (Robert-Bourassa), LG 3, LG 4, Opinaca et Caniapiscau.

In order to avoid the harmful effects of mercury on health, people who eat fish should follow the recommendations of the « *Guide de consommation du poisson de pêche sportive en eau douce* » [Guide to Consumption of Freshwater Sport Fish] produced by the Ministère de l'Environnement et de la Faune and by the Ministère de la Santé et des Services sociaux [Ministry of Health and Social Services].

3.2.2 Lake Acidity

As far as acid precipitations are concerned, the region has been relatively unaffected by acidification. Of the 228 lakes examined to date in the Nord-du-Québec region, only 2.2 % suffer from acidification, principally in the southern portion of the region. In addition, 8.8 % of the lakes examined are in a transition state and the remaining 89 % are non-acid.

3.3 References

James Bay Mercury Committee, 1997. *Report of activities 1994-1995* , Montréal, 44 pp.

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Société d'énergie de la Baie James and Groupe-conseil Entraco Inc., 1995. *Rapport synthèse : Suivi écologique des milieux affectés par l'aménagement du complexe hydroélectrique La Grande, Phase II (1987-1995), Secteurs Brisay, Laforge 1 et Laforge 2: Qualité de l'eau, poissons et mercure* [Summary Report : Ecological Follow-Up on Habitats Affected by Development of the La Grande Hydroelectric Complex, Phase II (1987-1995), Brisay, Laforge 1, and Laforge 2 Sectors: Water Quality, Fish, and Mercury], Montréal, 91pp.

Société d'énergie de la Baie James and Groupe-conseil Entraco Inc., 1996. *Suivi de la qualité de l'eau des milieux affectés par l'aménagement du complexe hydroélectrique La Grande, Phase II (1986-1996), Secteurs la Grande-2-A et La-Grande-1* [Follow-Up on Water Quality in Habitats Affected by Development of the La Grande Hydroelectric Complex, Phase II (1986-1996), La-Grande-2-A and La-Grande-1 Sectors], Montréal, 37 pp. and annexes.

4. Profile of Groundwater Resources

4.1 Utilization

About 14 % of the region's population, or over 5,300 people, depend on groundwater sources for their water supply, and 38 % of these obtain their water from individual wells. This latter population lives south of the 55th parallel.

Only 120 wells have had drill logs produced and entered into the ministère de l'Environnement's Système d'informations hydrogéologiques (S.I.H.) [Hydrogeological information system] for the territory as a whole. All of these wells are located in the municipality of James Bay, just north of the Abitibi-West RMC, in a quadrilateral 20 kilometers by 20 kilometers. In addition, there are several hundred surface wells along with wells for which drill logs have not been produced or for which data have not yet been entered. There are thus an estimated 500 wells scattered throughout the region.

5. Municipal Profile

5.1 General Profile

Without implying that they are necessarily distinct, we will consider the sectors north and south of the 55th parallel separately.

5.1.1 Management of Water-Supply Systems

North of the 55th Parallel

The harsh climate and the physical features characterizing the territory above the 55th parallel, such as permafrost conditions and the concentration of Inuit villages along the Hudson Bay and Ungava Bay shorelines, make drinking-water supplies a major public issue.

The drinking-water supplies for all Inuit villages are taken from surface-water sources (rivers, streams, or lakes). To be on the safe side, a number of villages use two sources of water supply, for several reasons: freeze-up of one source in winter, reduced flow in summer, elevated salinity and turbidity levels at certain times of the year, and contamination.

Installation of underground systems to deliver drinking water to users is practically impossible due to the presence of permafrost, and the distribution system has had to be adapted to the conditions of this particular environment. Water is thus delivered to each residence by tank trucks which fill up directly from the watercourse or from a reservoir located in the village. Only Kuujjuarapik has a piped water supply, which is owned by the Société immobilière du Québec; it is located near the 55th parallel.

Of the 14 Inuit villages, only Aupaluk, Kangiqsujuaq, and Umiujaq do not chlorinate their water before distribution. Chlorination is usually carried out at the pumping station before the water is stored in the reservoir.

South of the 55th Parallel

The situation below the 55th parallel is similar to that in southern Québec, but with certain particularities.

All nine of the Cree communities in the James Bay territory are equipped with a drinking-water distribution system; five of these (serving 6,774 residents) draw their water from surface sources, and four (serving 3,212 residents) rely on groundwater supplies. Six of the nine systems are equipped to chlorinate their water, and three are not.

The towns of Chapais, Chibougamau, Lebel-sur-Quévillon, and Matagami, as well as the localities of Radisson, Miquelon, and Desmaraisville, are equipped with drinking-water distribution systems; five of these (Chapais, Chibougamau, Lebel-sur-Quévillon, Matagami, and Radisson) draw their water from surface sources and serve 17,583 residents, while two (Miquelon and Desmaraisville) rely on groundwater supplies and serve 66 residents. Only the Miquelon and Desmaraisville systems are without water treatment.

Table A.2 in the Annex provides data on the type of domestic water supply for the region.

5.1.2 Municipal Wastewater Management

North of the 55th Parallel

Wastewater management is a major environmental concern, and the issue resembles that of drinking water: permafrost conditions make it difficult and costly to install an underground wastewater collection system. In addition, the harsh climate limits the effectiveness of pond-treatment systems. While a few villages (e.g., Quaqtaq and Kangiqsujuaq) are equipped with acceptable treatment systems adapted to the environment, generally speaking, residential wastewater reservoirs are emptied daily by tank trucks and the wastes are transported outside the village to be dumped directly onto the ground or into shallow pits, and no treatment is undertaken.

South of the 55th Parallel

As far as wastewater purification is concerned, all of the Cree communities are connected to municipal sewerage systems. However, there is still one community dumping its untreated wastes directly into Hudson Bay. The other communities treat their wastes in aeration ponds or use the biological-disk system.

92 % of the population of the municipality of James Bay and of the towns of Chapais, Chibougamau, Lebel-sur-Quévillon, and Matagami are also connected to municipal sewerage systems. Within the framework of water-purification programs such as the *Programme d'assainissement des eaux* (PAEQ) and the *Programme d'assainissement des eaux municipales* (PADEM), the Québec government and municipalities are putting over $13.7 million into building municipal wastewater purification infrastructures. As a result of this investment, 83 % of the population connected to a sewerage system was treating its wastewater as of 31 December 1998. The relevant data are provided in table A.3 in the Annex.

Some municipalities and localities did not participate in PAEQ or PADEM and dump their untreated wastewater directly into the environment. The town of Chapais is one example. The town of Matagami did not participate in PAEQ but treats its wastewater in oxidation ponds.

5.2 Specific Issues

North of the 55th Parallel

The fact that drinking water is distributed by tank trucks represents a high risk of contamination due to the large number of intermediaries in the distribution chain.

See section 5.1.2 with respect to wastewater management issues.

South of the 55th Parallel

Some Cree families are still reluctant to use treated tap water, claiming that chlorination gives it a bad taste; they therefore tend to obtain their drinking water from natural sources.

Some communities located on the shores of James Bay and Hudson Bay, such as Whapmagoostui and Eastmain, have had problems with brine finding its way into their drinking-water intake. Uranium levels above the established standards are also being encountered more and more frequently in the territory, in particular north of Matagami and in the LG-4 and Brisay sectors.

See section 5.1.2 with respect to wastewater management issues.

6. Industrial Profile

6.1 General Profile

Primary Sector

Nord-du-Québec region ranks third among Québec regions in mining production. Like the Abitibi-Témiscamingue region, which produces a comparable range of substances, it suffers from the pollution generated by mining activity. The main focus of mining in the area is the operation of gold and nickel mines, as well as polymetallic mines (copper-gold and zinc-silver).

The mining industry uses vast quantities of water. Used mainly in the enrichment of ores, this water comes from either a « fresh » source (e.g., a watercourse) or from the recirculation of used water (e.g., from the waste dump). Keeping minesites dry requires pumping of groundwater. The drop in the water table which results in the area affected by mining operations may sometimes cause supply problems, but only on a temporary basis.

The main water-related problems are acidification caused by acid-producing waste dumps and heavy-metal contamination.

According to data from the Ministère de l'Environnement, the region has 27 mine-waste dumps covering a total of 1,725 hectares. Almost 67 % of these dumps are considered inactive because they are no longer used for dumping mine wastes, and 39 % of these contain wastes which are potential acid producers. These waste areas are distributed as follows:

Table 6.1 : Active Mine-Waste Dumps in the Nord-du-Québec Region

Number	Area (ha)	Acid-generating	Basic	Neutral	Restored area (ha)
9	1,009	5	3	1	3

Effluents from active dumps are subject to controls and must satisfy the standards set out in mining directive 019 from the Ministère de l'Environnement. The compliance rate improved greatly from 1989 to 1993 and has stayed above 97 % since 1993.

Table 6.2 : Inactive Mine-Waste Dumps in the Nord-du-Québec Region

Number	Area (ha)	Acid-generating		Restored area (ha)
		Number	Area (ha)	
18	716	7	316	227

Mining operations in times past left major scars on the landscape and greatly affected wildlife and water quality in certain lakes and watercourses, notably Watson Lake and the Plamondon and Kistabiche rivers (when the Poirier mine was in operation).

Four of the 18 inactive dumps have undergone complete restoration, for a total restored area of 186 hectares, consisting of two acid-generating dumps covering 15 hectares and two dumps considered neutral covering 171 hectares. It should be noted that the waste dump at the Poirier mine (acid-generating), which covers 41 hectares, is currently undergoing a major program of restoration work and is included in the restored area shown in table 6.2. Restoration of inactive

dumps is a slow process and the work to be done is often costly. There are few restoration programs planned for upcoming years, despite the fact that acid mine drainage (AMD) is a particularly glaring problem.

Secondary Sector

As far as the secondary sector is considered, there are very few industrial and manufacturing establishments in the Nord-du-Québec region: about 20 or so according to 1998 data from the Ministère de l'Industrie et du Commerce.

However, the presence of one major industry should be noted, namely, in ***the pulp and paper sector***, Norkraft Quévillon Inc., located in Lebel-sur-Quévillon. Like other pulp and paper mills in Québec, this firm is subject to sectoral waste-discharge standards under the *Regulation respecting pulp and paper mills*. It has therefore installed a wastewater treatment system (primary and biological) in order to satisfy regulatory requirements; this has made possible a significant reduction in the impact of wastes on the receiving body of water. In 1996, the volume of effluents discharged into the Quévillon River averaged 75,000 m^3 per day. The mill's water intake is located in Lake Quévillon, while the wastewater discharge outlet is on the Quévillon River. In addition, under section IV.2, pertaining to industrial depollution attestations, of the *Environment Quality Act* and under the *Regulation respecting industrial depollution attestations*, firms which discharge their effluents into the environment are required to develop and gradually implement depollution plans intended to satisfy additional standards based on the receiving body of water. There will also be an economic incentive to reduce the quantities of contaminants discharged into the environment, because of pollution fees imposed by the regulation. These fees will take effect after the issuing of the industrial depollution attestations, expected to take place in the 1999-2000 fiscal year. These fees are based on the quantities of contaminants discharged rather than on the volume of water drawn or discharged. There is therefore no direct incentive to reduce the volume of water used.

Most of the other establishments are also involved in the forest sector. In ***the wood-products sector***, there are four major sawmills which generate large quantities of solid waste (bark, sawdust) every year which are deposited in ligneous-waste dumps. The Nord-du-Québec region has 12 major ligneous-waste dumps, leachwater from which can have varying effects on water quality in watercourses or in the groundwater. In fact, this leachwater may contain various contaminants, in particular phenols and resinic acids. Seven of these dumps are considered inactive because they are no longer used for dumping wastes, and five of these have undergone restoration. In total, the situation for the Nord-du-Québec region is as follows:

- Number of active ligneous-waste dumps : 5
- Number of inactive ligneous-waste dumps : 7, with 5 of them restored and 2 not restored.

The construction a few years ago of a cogeneration plant in Chapais has made possible the elimination of a portion of the ligneous wastes from one of the sawmills. In addition, projects are underway to assess the possibility of using the biological sludge from the Norkraft Quévillon mill's wastewater treatment system as fertilizer for agricultural use or for the restoration of ligneous- or mine-waste dumps.

6.2 Specific Issues

North of the 55th Parallel

Industrial-pollution problems are almost non-existent above the 55th parallel. Mining projects, which usually discharge their effluents into the aquatic environment, are required to introduce specific modifications to their operations; we may cite the example of the Raglan mine, where wastes are transported by truck to a dump where they are incorporated into the permafrost. It is also important to mention the many abandoned mine exploration sites situated on the shores of bodies of water. Barrels of fuel or waste oil are often found there in large numbers and constitute a pollution risk for the adjacent waters.

Because the Inuit villages are concentrated along the shores of Hudson Bay and Ungava Bay and are not accessible by road, each village has its own harbour infrastructure, often very unsophisticated, for the transport of foodstuffs and oil. It is, of course, activities related to the transport and storage of petroleum products which present the greatest environmental risk.

South of the 55th Parallel

Unlike the area above the 55th parallel, the James Bay territory lends itself to the establishment of mining and forest industries. Also, Lake Chibougamau and Lake aux Dorés receive the final effluents from mine sites, which may have an impact on their water quality. With respect to Lake Sainte-Lucie, complaints have been put forward concerning possible contamination by leachwater from a sawdust pile at the Barrette-Chapais sawmill. Residents of this sector complain of reduced fish catches in the lake and in the downstream of the river.

7. Agricultural Profile

7.1 General Profile

The Nord-du-Québec region has barely ten or so agricultural operations, all of them located in the Val-Paradis, Villebois, and Beaucanton sectors. Thus, we may consider the environmental impact related to agricultural activity to be minimal north of the 55th parallel and quite minimal within the James Bay territory.

8. Wildlife and Recreational/Touristic Profile

8.1 Wildlife Profile

8.1.1 Sport Fishing

With respect to recreation and tourism activity, the existence of numerous bodies of water in the Nord-du-Québec region makes possible a significant level of economic activity related to sport fishing. Based on a survey on sport fishing in Québec carried out in 1996, the number of fishing-days in Nord-du-Québec is estimated at 340,000. This activity is carried out on public lands, on one of the region's wildlife reserves (AMC, Assinica), or using the services of outfitters without exclusive fishing rights. The most sought-after species are walleye, lake trout, Arctic char, brook trout, and salmon. The latter species is the object of particular interest in the north as well as in southern Québec given the significant reduction in catches observed in recent years.

8.1.2 Commercial Fishing

Some commercial fishing activity is carried on in the region, albeit at marginal levels. For example, Arctic char is fished in the Kangiqsualujjuaq sector. In the past, whitefish and sturgeon were also fished commercially in the Waswanipi sector.

8.1.3 La pêche de subsistance

In addition to those related to sport and commercial fishing, fish catches also include the subsistence-fishing catch. All these types of fishing activity fall under chapter 24 of the James Bay and Northern Quebec Agreement.

8.2 Water-Based Activities

As mentioned earlier, many bodies of water in Nord-du-Québec region are used for sport fishing. Some are used for vacationing. In addition, the reservoirs and large bodies of water are used to some extent for powerboat excursions.

The region's watercourses serve as transport routes for native peoples engaging in their traditional activities.

ANNEX

Table A.1 : Inventory of Dams, by Type of Use and by Ownership

Table A.2 : Type of Domestic Water Supply

Table A.3 : Municipal Wastewater Management by Sewerage Systems

TABLE A.1 : INVENTORY OF DAMS, BY TYPE OF USE AND BY OWNERSHIP

Use	Number of dams	%
Agriculture	0	0
Flood control	0	0
Pond	0	0
Wildlife	0	0
Hydroelectricity	294	99.3
Fish farming	0	0
Water intake	2	0.7
Flow regulation	0	0
Fire reservoir	0	0
Historical site	0	0
Vacationing	0	0
Other	0	0
Unknown	0	0
REGIONAL TOTAL	**296**	**100**
Type of ownership	**Number of dams**	**%**
Private firm (compagny, SME, club, golf course, seminary)	2	0.7
Hydro-Québec	294	99.3
Municipal	0	0
Private (individual et lake association)	0	0
Public	0	0
Public-MEF	0	0
Orphaned	0	0
REGIONAL TOTAL	**296**	**100**

Reference : Preliminary data relating to dams 1 meter or higher on natural watercourses and obtained from a land inventory prepared by the Ministère de l'Environnement et de la Faune in the summer of 1998, Direction de l'hydraulique du ministère de l'Environnement.

TABLE A.2 : TYPE OF DOMESTIC WATER SUPPLY IN THE NORD-DU-QUÉBEC REGION

Sector	DRINKING WATER SUPPLY SYSTEMS[1]			TYPE OF WATER SUPPLY[2]					
	Number of municipalities, localities, or native communauties served (population)	Number of water supply systems		Surface water		Groundwater			
		Total	With water treatment	Population	%	Water supply system		Individual wells	
						Population	%	Population	%
North of 55th parallel	14	14	12	8,715	100	0	0	0	0
South of 55th parallel	16	16	11	24,357	82.1	3,279	11.0	2,044	6.9
REGIONAL TOTAL	**30**	**30**	**23**	**33,072**	**86.1**	**3,279**	**8.6**	**2,044**	**5.3**

1. Excludes private, institutional, and corporate-owned systems as well as individual systems.
2. Excludes private, institutional, and corporate-owned systems.
3. The systems considered to be municipal are those of the municipalities of Chapais, Chibougamau, Lebel-sur-Quévillon, and Matagami and of the localities of Radisson, Miquelon, and Desmaraisville.

Source : Système informatisé eau potable municipale [Municipal Drinking-Water Information System] of the Ministère de l'Environnement (January 1999 data).

TABLE A.3 : MUNICIPAL WASTEWATER MANAGEMENT BY SEWERAGE SYSTEMS IN THE NORD-DU-QUÉBEC REGION

Sector	Number of municipalities with sewerage systems	Population connected to sewerage system		Population connected to sewerage system and treating its water as of 31/12/98 [2]		Population connected to sewerage system and treating its water as of 31/12/99 [3]		Investments (PAEQ and PADEM) [4]
		Population	%[1]	Population	%	Population	%	
South of the 55th parallel[1]	5	17,252	92	14,323	83	14,323	83	$13,747,275
REGIONAL TOTAL	**5**	**17,252**	**92**	**14,323**	**83**	**14,323**	**83**	**$13,747,275**

1. The municipalities included here are those of James Bay, Chapais, Chibougamau, Lebel-sur-Quévillon, and Matagami (18,809 inhabitants).
2. Stations in breaking-in phase or in operation as of 31/12/98.
3. Stations under construction or in operation as of 31/12/98.
4. PAEQ : Programme d'assainissement des eaux du Québec
   PADEM : Programme d'assainissement des eaux municipales

Référence : MAM [Ministry of Municipal Affairs] data bank, 07/01/99