



# Profiles of the region

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OBSERVATOIRE DE L'ABITIBI-TÉMISCAMINGUE

## Mineral Ressources

**For nearly a century, Abitibi-Témiscamingue has been considered an important mining region. Exploration and exploitation make the region one of the main mining areas in Quebec in regards to investments, exploited mines, and employment. Recently, the rise in gold and base metal prices, stimulated by international demand, has sparked a renewal in exploration activities.**

The mining industry in the region has traditionally been characterized by underground mining of precious and base metal deposits. Its expertise in this area is recognized as being world-calibre. In September 2005, Abitibi-Témiscamingue and Northern Quebec counted ten operating mines, which represent all of the precious and base metal mines of the province.

The mining activity of the region depends mainly on the operation of five gold mines: Doyon, Mouska, Sigma, Beaufor, and Donald J. LaRonde. In Northern Quebec, Géant-Dormant, Joe Mann, and Troilus exploit precious metals for the most part, whereas Copper Rand 5 000 and Raglan concentrate on base metals.

### The mining industry

#### ... affected by recent closures

In the last five years, about a dozen mines have ceased operations in the region and in Northern Quebec. The mines in question are Joubi, Gallen, Francœur, Kiena, Bousquet 2, Sigma Lamaque, Bouchard-Hébert, Louvicourt, Langlois, Selbaie, and Bell-Allard. According to present estimates, the Joe Mann mine should cease its operations in 2006.

#### ... encouraged by promising sites

Up to now, work has continued at the Casa Berardi project, to the north of La Sarre, with the aim of starting up operations before the end of 2006. The Goldex mine in Val-d'Or should begin production in 2008. The Langlois mine (to the north-east of Lebel-sur-Quévillon) could start operating again in 2006. Other advanced projects in Abitibi-Témiscamingue are worth watching: East-Amphi, Lapa,

### So that we speak the same language

The mining industry, also known as the minerals and metals sector, includes mineral exploration, metal mines (copper, nickel, gold, silver, zinc, etc.), non-metal mines (asbestos, potash, salt, etc.), stone quarries, sand and gravel pits, oil sands mining operations, and manufacturing establishments such as foundries, refineries, and steel mills. In the present document, the term mining industry refers more specifically to mineral exploration, metal mines, and primary metal industries (foundries).

LaRonde II, Kiena, Croinor, Lac Herbin, and West Ansil. In the North, there are Expo Ungava, Renaissance, and Eleonore.

### ... sitting on a golden egg

According to the latest data available (2003), the value of the regional mineral production totalled more than \$619M, which represents 17 % of the total value of Quebec's mineral shipments (3.6 billion dollars). With \$308.6M in 2003, gold production constitutes half of the total production value for Abitibi-Témiscamingue. The regional gold production also represents 68 % of the entire production in Quebec, thus ranking first in the province. Furthermore, the region supplies 47 % of the zinc (2nd rank), 64 % of the copper, and 71 % of the silver production value for Quebec.

### ... lacking skills in some fields

The region has little or no expertise in the mining of industrial minerals, diamonds, and some rare metals (tantalum, lithium, palladium, etc.). In regards to industrial minerals, the region has only one silica and limestone producer (Temisca Inc.), two companies that produce architectural stone (Les Pierres du Nord and Groupe Polycor Inc.), and some sand and gravel producers.

### ... focused on the primary metal industry

The primary metal industry is centralized at the Horne smelter located in Rouyn-Noranda. In addition to casting copper into anodes, the smelter processes copper and precious metal-bearing recyclable materials coming from the Americas, Europe, and Asia.

**This abridged version of the mineral resources' profile was elaborated in february 2006 and will eventually be up-dated. Refer to the tab Publications of our web site to obtain the most recent versions or if you wish to consult the integral edition in french : [www.observat.qc.ca](http://www.observat.qc.ca)**

## The geological potential

### A territory where resources abound... in depth

The future of the mining industry depends on mineralogical discoveries. Although part of the rock has been intensively prospected during the last century, the region still has tremendous potential in precious metals, notably in depth.

### Precious and base metals

This is particularly the case for the various geological formations of the region. Among the most important and known ones is the Cadillac-Larder Lake fault which is a constant source of surprising discoveries, for example LaRonde II, Lapa, Pandora, Westwood, Zone J, or O'Brien-Kewagama. The Porcupine-Destor fault, in the Duparquet sector, shows a high gold-bearing potential, in depth as well. The Blake River geological formation, to the north-west of Rouyn-Noranda, is another sector that shows a high potential for precious and base metals. The Témiscamingue soil contains interesting indications of gold in the area surrounding Belleterre.

### Rare metals and diamonds

Although Abitibi-Témiscamingue has not been explored much for rare metals (lithium, beryllium, tantalum, niobium, etc.), the La Motte, La Corne, and Simard Lake sectors showed interesting results after some exploration was conducted in the area. As for diamonds, some traces have been discovered in the Notre-Dame-du-Nord sector.

### The lively forces of exploration

◆ In 2004, among the 72 companies that managed exploration projects in the region, 59 were junior exploration companies, 12 were senior companies, and only one originated from the public sector.

◆ The diamond drilling services of the region are recognized worldwide.

◆ More than 40 % of the some 110 mining equipment manufacturers listed in Quebec are located in the region. Mining equipment manufacturers are mainly small enterprises active mostly in traditional niches (service and equipment providers). The presence of small and medium-sized regional enterprises in foreign countries has expanded.

## Mineral exploration... a token of the future

In 2004, Quebec experienced its most active year for mineral exploration since the end of the 1980s. The value of exploration and deposit appraisal expenditures reached a peak of \$227M. In Abitibi-Témiscamingue, exploration expenditures totalled \$84.9M, which is the highest sum since 1997. The region's performance in 2004 was twice that of 2003, when exploration expenditures were up to \$44M. This growth is attributable to the good performance of off-mine-site exploration and appraisal. Off-mine-site expenditures, which generally ensure new deposit discoveries and exploration in the long term, reached \$59.3M in 2004, thus representing 70 % of all exploration and appraisal expenditures. This represents an 80 % increase in comparison to 2003. On-mine-site exploration and appraisal expenditures increased twofold, going from \$11.1M in 2003 up to \$25.5M in 2004, which is another encouraging sign.

**Present circumstances seem to favour the mineral industry, as long as the United States and China maintain their high demand for mineral products, thus contributing to the upward pressure on prices.**

### Small players, big players

Of the \$85M invested in exploration by companies, \$59M are attributable to senior companies (70 %), \$24.7M to junior exploration companies (29 %), and barely \$1.2M to the public sector (1 %). Expenditures of small companies increased by 55 %, whereas those of senior companies increased twofold in 2004.

### The gold rush

In 2004, exploration and appraisal expenditures for precious metals reached \$69.8M, which represents 82 % of the entire region's expenditures and 52 % of Quebec's expenditures. Benefitting from twice the spending, precious metals still rank first as the most explored metals in the region. The region is ahead of Northern Quebec with a 46 % share of Quebec's expenditures for gold. With an increase of 47 %, exploration and deposit appraisal expenditures for base metals reached \$13.4M in 2004 in Abitibi-Témiscamingue. Diamonds rank third with a little more than \$1.4M expenditures for the region in 2004.

### The top of the list

Northern Quebec and Abitibi-Témiscamingue are the main beneficiaries of Quebec's exploration and appraisal expenditures. With \$130.4M and \$84.9M respectively, the total spending for these two regions represents 95 % of Quebec's total expenditures in 2004.

### Exploration and appraisal expenditures (\$), Abitibi-Témiscamingue and Northern Quebec, 1997 to 2004

	Exploration and Appraisal Expenditures (\$)					
	Abitibi-Témiscamingue			Northern Quebec		
	Off-mine-site	On-mine-site	Total	Off-mine-site	On-mine-site	Total
<b>1997</b>	23,086,058	57,994,534	81,080,592	63,153,765	3,102,948	66,256,713
<b>1998</b>	18,638,836	54,634,571	73,273,407	52,002,714	3,660,401	55,663,115
<b>1999</b>	10,827,758	34,564,764	45,392,522	48,853,148	3,713,320	52,566,468
<b>2000</b>	12,488,022	15,916,810	28,404,832	49,660,951	8,013,787	57,674,738
<b>2001</b>	16,502,491	15,042,336	31,544,827	47,320,333	13,567,608	60,887,941
<b>2002</b>	23,946,242	15,599,693	39,545,935	46,663,444	15,434,647	62,098,091
<b>2003</b>	32,822,588	11,119,585	43,942,173	69,314,901	8,254,839	77,569,740
<b>2004</b>	59,328,441	25,563,397	84,891,838	120,066,765	10,314,159	130,380,924

Source: Service de l'imposition et des données minières, Ministère des Ressources naturelles et de la Faune, October 27, 2005 update.

## The mining labour force

The mining industry, that is to say mines and industries providing services relative to exploration and mining operations, generated about 4,500 direct jobs in Abitibi-Témiscamingue in 2004, which corresponds to 7 % of the total labour force. Regional mining jobs represent a third of all exploration and exploitation jobs in the province. In comparison, the share of jobs in mining operations is 17 times higher than in Quebec (0.4 %). On the whole, about 7,200 direct, indirect, and spin-off jobs, which correspond to 11 % of the regional labour force, are dependent on mining industry activities. The wage bill for the region's mining labour force amounted to over \$145M in 2004.

**In 2004, the mining sector of Abitibi-Témiscamingue provided one job out of 14; in goods and services industries, the mining sector provided one job out of four.**

### Coming to terms with ageing

In 2001, almost 14 % of the mining operation labour force was under 30 years old, 64 % were between 30 and 49 years old, and 23 %

were over 50 years old. In the entire labour force, these figures amount to 24 %, 56 %, and 20 % respectively. The proportion of young people working in mining operations is less than in the whole labour force in Abitibi-Témiscamingue (24 %). Among workers 55 years old and up—those likely to retire by 2010—most belong to the skilled trades group (electricians, blasters, and underground production miners).

### Worried about recruitment

During the last decade, mine closures and the transfer of mining exploration and exploitation activities to other places have resulted in a decline in the number of experts in the region. Problems linked to the recruitment of a skilled labour force are due to a vast number of factors. There is a broad consensus among all involved that the industry has a bad name in society in general and that this image problem has repercussions, notably on student recruitment in programs related to the mining sector.

### More and more technology-oriented

Since the mining industry is more and more knowledge-based, it employs a labour force which is often highly skilled and able to use advanced technology. According to the Association minière du Québec (AMQ), over 85 % of the mining labour force uses advanced technologies such as electronics, robotics, and telecommunications.

### Foreseeing promising career outlooks

Employment prospects in the mining industry are especially interesting for workers with technical or professional qualifications. Both Emploi-Québec and Service Canada see the prospects for the following occupations as acceptable, indeed even favourable: geologists, geochemists and geophysicists, mining engineers, land surveyors, geology technologists and technicians, construction millwrights and industrial mechanics, heavy equipment operators, and underground production miners.

### Mining labour force division in Abitibi-Témiscamingue, 2001

	All industries	Mining operations	
		Number	%
<b>Abitibi</b>	11,530	475	10.4 %
<b>Abitibi-Ouest</b>	9,295	415	9.1 %
<b>Rouyn-Noranda</b>	18,910	1,560	34.3 %
<b>Témiscamingue</b>	8,255	75	1.6 %
<b>Vallée-de-l'Or</b>	20,240	2,025	44.5 %
<b>Région</b>	68,230	4,550	100.0 %

Source: Statistics Canada. 2001 Census. Compilation: Observatoire de l'Abitibi-Témiscamingue.

## Challenges in the area of training

In Abitibi-Témiscamingue, like everywhere else in Quebec, training courses related to earth sciences experienced recruitment problems at the beginning of this century due to low industry output. With the renewal in exploration, they are regaining in popularity. In 2004-2005, vocational training welcomed 55 students to the DEP in metallurgy and 73 to the DEP in mines and on-site work. At the Cégep de l'Abitibi-Témiscamingue, 36 students were registered in mineral technology (51 in 2005-2006). Finally, 42 were progressing in the electromechanical engineering degree at the Université du Québec in Abitibi-Témiscamingue (UQAT).

### The ABCs of training

The Centre national des mines, located in Val-d'Or, is mandated to train Quebec students in the following programs: operation of mineral processing machinery, ore extraction, and diamond drilling. In the metallurgy sector, the Centre de formation professionnelle Lac-Abitibi offers two programs in welding. In addition to these programs, two DEPs (vocational diplomas) are available: construction machinery mechanics (La Sarre), and industrial and maintenance mechanics (Amos).

In order to meet the demands of the mining industry, the Commission scolaire de l'Or-et-des-Bois has developed a modular program for mine workers (Formation modulaire du travailleur minier—FMTM) that it offers exclusively. This program is intended mainly for mine workers, mechanics, electricians, geologists, and engineers working in underground mines.

The Cégep de l'Abitibi-Témiscamingue offers mineral technology, which includes geology, exploitation, and metallurgy courses. Other related training is also available: civil engineering, industrial maintenance, and industrial electronics.

At the Université du Québec in Abitibi-Témiscamingue, the engineering department offers undergraduate and graduate training programs: a certificate in mining electromechanics, an electromechanical engineering degree, a D.E.S.S. (Diplôme d'études supérieures spécialisées) in mining engineering, graduate degrees in mineral engineering and engineering. Other graduate and postgraduate training programs can also be related to the mining industry (a masters in biology and a PhD in environment).

## Mining innovation... essential

New exploration technologies and exploitation techniques have been developed in order to increase underground mine productivity while improving occupational health and safety and environmental results.

New airborne geophysical exploration technologies have been developed to target deeper mineralizations while minimizing environmental impacts. We are thinking here about the MEGATEM or VTEM technologies, which can cover vast territorial areas at little cost and, like MEGATEM for instance, can discover mineralized bodies at depths of over 250 metres. For ground surveys, the mineral exploration industry is resorting to new tools such as TITAN 24 or InfiniTEM, which can investigate up to a depth of 500 metres. Mineral exploration also calls upon geochemical technologies and new data integration platforms (3 D ground models), such as the gOcad technology. In addition to offering exploitation and mineral processing services, the **Unité de recherche et de service en technologie minérale (URSTM)** is working on geophysical applications and 3 D modelling in partnership with the **Service géologique du Nord-Ouest**.

Paste backfill is one of the new technologies that is the most widely used in operating underground mines. The UQAT and operating mines possess international expertise in this field. The **Laboratoire Télébec Mobilité de recherche en communications souterraines sans fil (LRCS)** is conducting research projects in order to improve occupational health and safety (locating underground workers and automating dangerous activities). These projects should yield promising results in a few years from now. The **CANMET Experimental Mine**, which is dedicated to research and development, is conducting various research projects, for example, developing drilling and non-explosive techniques for rock fragmentation, replacing diesel motors in underground mining vehicles by hydrogen motors, or developing equipment less harmful to workers' health (such as the jacklegs' new handles).

With the passing years, environmental problems created by mine tailings have provided the opportunity more and more often to transform a negative impact into something positive. When it comes to mining and the environment, Abitibi-Témiscamingue is favourably positioned as a recognized leader. In this field, innovation has come mainly from the bonds the UQAT has forged with the mining milieu and its partners through the **NSERC-École Polytechnique-UQAT Industrial Research Chair in Environment and Mine Waste Management, the Canada Research Chair in the Restoration of Abandoned Mine Sites, the Canada Research Chair on Integrated Management of Acid Mine Waste by Means of Filling, and the Unité de recherche et de services en technologie minérale (URSTM)**. Through these different channels, Abitibi-Témiscamingue benefits from a highly-trained labour force.

## A quick guide to the mining field

Operating mines and companies (September 2005)	
<b>Abitibi-Témiscamingue</b>	Richmont Mines Inc. Agnico-Eagle Mines Limited Cambior Inc. Cambior Inc. Century Mining Corporation
<b>Northern Quebec</b>	Cambior Inc. Campbell Resources Inc. Inmet Mining Corporation Falconbridge Limited Campbell Resources Inc.
<b>Value of mineral shipments (2003)</b>	
Abitibi-Témiscamingue	\$619,178,000
Northern Quebec	\$743,968,674
Quebec	\$3,662,041,674
<b>Diamond drilling costs (per metre drilled)</b>	
Abitibi-Témiscamingue	\$35,417,130 (\$71.91)
Northern Quebec	\$50,583,563 (\$95.58)
Quebec	\$88,821,597 (\$83.91)
<b>Active mining titles (November 2004)</b>	
Abitibi-Témiscamingue	28,296
<b>Exploration and appraisal expenditures (2004)</b>	
Abitibi-Témiscamingue	\$84,891,838
Northern Quebec	\$130,380,924
Quebec	\$227,171,676
<b>Most advanced exploration projects</b>	
Langlois	Breakwater Resources Ltd
Casa Berardi	Aurizon Mines
Corner Bay	Campbell Resources Inc.
East Amphi	Richmont Mines Inc.
Francœur	Richmont Mines Inc.
Persévérance	Falconbridge Limited
Goldex	Agnico-Eagle Mines Limited
Lapa	Agnico-Eagle Mines Limited
Westwood	Cambior Inc.
Kiena	Wesdome
Croinor	Malartic-Sud
<b>Number of jobs (LSF)</b>	
2004	4,500

## The right terminology

**Exploration expenditures** represent all field activities carried out to perform the first delineation of a deposit to establish its potential economic value (tonnage and grade) and to justify further and more detailed work.

**Deposit appraisal expenditures** represent all field activities (shaft and adit sinking) carried out to bring a delineated deposit to the stage of detailed knowledge required for a production feasibility study to support a production decision.

**Off-mine-site expenditures** represent field activities on deposits that are not located on a mine site that is in production or committed to production.

**Senior company:** Mining company with more than \$50M in assets.

**Junior company:** Company whose main activity is mineral exploration and that is subject to public and private financing. Junior companies include prospectors. The developing "junior" company owns a direct interest, alone or conjointly, in a mining property working to start production.