CHAMBRE DE COMMERCE
DU MONTRÉAL MÉTROPOLITAIN
BOARD OF TRADE OF METROPOLITAN MONTREAL

METAL PROCESSING AND GREATER MONTRÉAL:

A SUSTAINABLE AND PROMISING ALLIANCE

THE ART OF BUSINESS

A study by the Board of Trade of Metropolitan Montreal conducted in partnership with Minalliance and the Réseau de la transformation métallique du Québec and in cooperation with KPMG-SECOR.

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MESSAGE FROM THE PRESIDENT AND CEO

1 MESSAGE FROM THE PRESIDENT AND CEO

MICHEL LEBLANC

Natural resources are a tremendous wealth creation advantage for Quebec. Many investment projects in this sector are under consideration or already in development and will offer outstanding opportunities for Quebec workers and businesses. This is the context in which the Board of Trade of Metropolitan Montreal undertook to study the potential spinoffs for the metropolitan region from exploitation of natural resources.

In spring 2012, we published *Natural Resources: Leverage for the City's Growth*. At that time, we had estimated that exploitation of natural resources could generate $51.8 billion of spinoffs in the Montréal metropolitan region and the creation or maintenance of about 14,000 jobs per year over a 25-year period. Among the main conclusions of this study, we emphasized the importance of maximizing the ripple effects in the value chain, both with upstream suppliers and in downstream processing of these resources.

Wishing to pursue the analysis and discern the best ways to strengthen the economy of Greater Montréal and Quebec, the Board of Trade focused on metal processing this year. This exercise reflects the intention of the Government of Quebec to ensure that our economy obtains the maximum economic spinoffs from ore extraction in Quebec.

This study is therefore meant to be a contribution to the reflection process on the role of metal processing and its value chain in the Quebec and metropolitan economy. It presents a clear and accurate picture of this sector, from primary production to tertiary processing. It allows an understanding of the special issues and the growth opportunities, particularly for the metropolitan economy. Above all, it establishes certain priority actions in order to maximize the outlets for metal processing and thus give new impetus to the metropolitan manufacturing sector.

We are witnessing a collective realization of the importance of natural resources for our economy. Responsible and sustainable development of our resources, while taking care to understand the special conditions of each sector, is a unique opportunity to participate in global economic growth, invigorate our manufacturing sector and create wealth in the metropolitan region. If we make the right moves, this will also be a unique opportunity to strengthen our expertise and bet on the innovative capacity of our metropolis.

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2 SUMMARY

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This study is part of the reflection process initiated by several players, including the Board of Trade of Metropolitan Montreal, on the important role the metropolis can play in the development of Quebec's natural resources, more specifically in metal processing.

This metal processing study focuses on the leading metals extracted in Quebec. The metals selected were divided into two categories. The first corresponds to traditional metals (iron, ilmenite, zinc, nickel, copper niobium, gold), including one non-metallic mineral, diamond. These resources have been used for decades and have a developed global market and well-established key players. The second category comprises emerging metals. There is little or no mining of these metals in Quebec, but interesting deposits are present. It was considered relevant to analyze them, because they are prized worldwide and the processing structure has yet to be established. Aluminium is deliberately absent from this study, because similar research specific to this sector is in progress and will soon be available.

It is important to recall, from the outset, that the tonnages and production value of Quebec mines, although significant, remain relatively modest on the global scale. Even though Quebec ranked 4th in Canada in 2011 for the value of its mineral production, the value of Quebec metals for that same year was nearly 6 times lower than that of Canada as a whole and 20 times lower than that of Australia. Quebec represents and, in the immediate future, will continue to represent a supporting player in a global industry.

PRIMARY METAL PROCESSING IN QUEBEC: A WELL ESTABLISHED ACTIVITY

Quebec nonetheless has a notable primary processing industry in its territory. Primary processing is the stage of smelting and refining metals obtained from an ore and adding different substances, if applicable, to make alloys. In 2012, there were 56 active businesses in primary metal processing in Quebec, including 26 (46%) in the Montréal metropolitan region. Table 1 presents the estimated proportion of primary processing in Quebec by sector in 2012. The processing work observed is closely related to the critical and historical location factors of these activities.

Beyond common traditional issues of labour and market access, Quebec primary processors are faced with challenges specific to primary metal processing activities. Among the main challenges are their profit level in a context of industry overcapacity, their differentiated position in a global market, access to energy resources at a competitive cost, and securing their supplies of raw materials.

TABLE 1
ESTIMATED PRIMARY PROCESSING PROPORTION OF THE LEADING TRADITIONAL METALS
In 2012, in Quebec, by sector, in tonnes, by %

	TONNAGE OF CONCENTRATE EXTRACTED IN QUEBEC	TONNAGE PROCESSED* IN QUEBEC	RATIO OF EXTRACTED TONNAGE TO PROCESSED TONNAGE
Ferrous minerals (*iron, ilmenite, niobium*)	27.5 million	3.1 million*	11%**
Titanium	1 million	1.3 million	130%
Zinc	190,000	515,000	271%
Copper	105,000	770,000*	733%
Nickel	27,000	0	0%

* Includes imported concentrate and imported scrap, recycled materials and copper anodes.
** The percentage of extracted tonnage processed in Quebec increases to 49% if pelletizing activities performed in Quebec are included (13 million tonnes of pellets).
Source: KPMG-SECOR analysis

SECONDARY METAL PROCESSING: A SIGNIFICANT PORTION OF OUR MANUFACTURING SECTOR

Quebec also has nearly 2,145 secondary metal processing businesses in its territory, including nearly 900 in the Montréal metropolitan region. This is one of Quebec's leading manufacturing sectors, with nearly 6% of the Quebec manufacturing GDP. Secondary processing is the stage when raw metal is transformed into goods for a specific use, through forging, stamping, turning and other processes. These businesses rarely use only one type of metal, which makes the metal sector more complex in secondary processing. Nonetheless, it is possible to pinpoint some major trends in the activities of these companies, which are important intermediate links for several other sectors of the Quebec economy.

Access to metal has never been a hindrance to the development of secondary processing businesses, although it is true that metal prices vary during economic cycles and temporarily may affect the profitability of the secondary processors. While access to raw material is not an issue for secondary processing businesses, they nevertheless must overcome several major challenges. These challenges are similar to those of the entire Quebec manufacturing sector and include increasing their productivity, access to new markets, diversification of clientele, innovation capacity, the risk of loss of competencies with departures for retirement, and a negative perception of the industry.

TERTIARY PROCESSING: AN ACTIVITY OF THE HIGHEST IMPORTANCE FOR THE METAL SECTOR

Tertiary processing activities are important to foster the dynamism and development of secondary processing in Quebec. A large proportion of the outlets and customers of secondary processing businesses located in Quebec depend on the demand from Quebec industrial users of metal products. A multitude of industrial sectors use metal, including the transportation equipment industry and the equipment industry. However, it is difficult to track the use in tertiary processing of minerals extracted in Quebec, since the concept of traceability is not applicable in the industry and due to the proliferation of metals in fabricating metal products.

The interrelations between secondary and tertiary processing businesses are more numerous than those between primary and secondary processing. They are also more significant due to the nature of the challenges facing secondary processing businesses. Secondary metal processing opportunities will be all the greater in Quebec once the tertiary processing sector is developed and their supply chain integration efforts are achieved.

A large proportion of the outlets and customers of secondary processing businesses located in Quebec depend on the demand from Quebec industrial users of metal products.

THE METAL SECTOR IN QUEBEC: A MAJOR ECONOMIC CONTRIBUTION

The primary and secondary metal processing industry contributes greatly to the Quebec economy. The primary and secondary metal processing sectors respectively support nearly 19,749 and 55,600 direct and indirect jobs per year. Table 2 presents the current economic impacts of secondary metal processing in Quebec as a whole and in the Montréal metropolitan region.

Each additional 10% of processing tonnage in Quebec thus represents nearly $758 million of extra value added and 7,535 additional jobs.

AVENUES FOR REFLECTION: TARGETED EFFORTS ON THE SPECIAL CHALLENGES OF THE DIFFERENT SECTORS

The true potential for expansion of Quebec primary processing activities is concentrated in certain metal sectors and must focus on a few major challenges of this sector's businesses. While a very large share of the potential expansion of Quebec primary metal processing activities is located outside the Montréal metropolitan region, it will benefit nonetheless from the sector's increased dynamism.

Quebec can seriously look forward to growing its primary metal processing activities. It benefits from certain advantages to:

- expand into the titanium and lithium sectors;
- capture a little more value from iron extraction;
- and maintain its advantageous positioning in the copper and zinc sectors.

To achieve this, it will be important to pay special attention to the measures concerning investment costs, availability of competitive energy sources, access to imported materials, and specialization of Quebec facilities.

The potential also exists for expansion of Quebec secondary metal processing activities. Quebec already has many companies that are very successful in this sector on a North American and international scale. However, the success factors of secondary processing are more numerous and, in some regards, more complex. This does not only mean having a competitive product in terms of costing, but also, and above all, developing a good relationship with the customers and innovating. Since secondary processing businesses are generally smaller and are not connected to international networks, they must meet these challenges with much more limited resources. The Montréal metropolitan region already accommodates more than one third of Quebec secondary metal processing activities and would benefit from better support.

It will be important to pay special attention to the measures affecting the productivity, support, innovation and commercialization, skills development and dynamism of tertiary processing to strengthen this sector.

TABLE 2
ECONOMIC IMPACT OF METAL PROCESSING IN QUEBEC
For primary and secondary metal processing, in 2011

	PRIMARY METAL PROCESSING		SECONDARY METAL PROCESSING		TOTAL	
	QUEBEC	MONTRÉAL	QUEBEC	MONTRÉAL	QUEBEC	MONTRÉAL
Value added (in $M)	3,070	480	4,511	1,282	7,581	1,762
Number of direct and indirect jobs	19,749	3,167	55,600	15,727	75,349	18,894

Note: Although they are neighbours, the primary processing facilities of RTFT in Sorel and CEZ in Salaberry-de-Valleyfield were not included in the calculation of the spinoffs of primary processing in the metropolitan region, because they are not included in the geographic territory of the Communauté métropolitaine de Montréal. If they were included, the total number of jobs would increase to 8,955 and the value added of primary processing to $1,357 million. Secondary metal processing could include aluminium products, because these companies process more than one metal.

Source: SECOR estimates based on simulations by the Institut de la statistique du Québec

METAL PROCESSING SPINOFF MAXIMIZATION STRATEGY

To maximize the spinoffs from metal processing in the metropolitan region, a five-axis strategy is proposed.

Understand the special conditions of metal processing

This study will begin a reflection on the place of metal processing in the industrial landscape of Quebec and the metropolis. While several interesting findings emerge, additional research will be necessary to assess the potential of other natural resources, whether ores like uranium, hydrocarbons or forest products. A similar study of aluminium will be released to the public in a few months and will improve our knowledge of local processing. These studies will lead to the implementation of enlightened policies based on acquired knowledge instead of the prejudices to which the Quebec natural resources industry is victim.

Favour the emergence of a "metal culture"

Valorization of the metal trades and industrial entrepreneurship are the starting points for the emergence of a metal culture in Quebec and the Montréal metropolitan region. The aluminium industry played this hand successfully over the past few years by fostering synergies downstream and upstream from its value chain. The industrial synergies of the metal sector are occasional and limited. The deployment of a metal processing cluster or hub, bringing together both primary producers and the primary, secondary and tertiary processing businesses, would allow implementation of concerted actions that support valorization of the industry.

Establish a business environment hospitable to local processing

Public policies favouring major investment projects are a significant advantage for the processing sector. The 10-year tax holiday for $300 million projects is a key factor in an overall strategy aimed at attracting major investments. However, concrete actions are necessary in other sectors, particularly regarding royalties and mining legislation. The Mining Act and the royalty regime must be adopted promptly to reduce the uncertainty currently weighing over the mining industry and the metal sector. A balanced, stable and permanent regime is the keystone for several major investment projects.

Encourage the innovation and productivity of our processing businesses

While innovation can support commercialization efforts, it also helps improve the productivity of the sector's businesses and lets them play the right cards in a highly competitive market. Investment in high-tech equipment, revision of production processes, continuing education for employees and specialization in certain market niches are the right avenues to improve the productivity of processors in Quebec and the metropolis.

Bet on emerging metals to develop a new processing sector

Emerging metals meet a demand, particularly due to the high-tech industry. Although in its infancy, extraction of emerging metals in Quebec gives reason to anticipate a promising future in a still undeveloped sector. The opportunities in this sector must be studied to maximize our possibilities for appropriating a substantial share of the global industry engaged in processing these metals.

3 INTRODUCTION

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In April 2012, the Board of Trade of Metropolitan Montreal published *Natural Resources: Leverage for the City's Growth*. This study indicated that natural resources development, although operating primarily in the regions, has a major impact on the Montréal metropolitan region.

The metropolises are the economic engines of their regions. The Montréal metropolitan region represents 50% of the population and 50% of the Quebec economy. A large proportion of the players involved in the natural resources value chain are found in the metropolitan region and fuel the major economic spinoffs anticipated from the exploitation of these resources.

A large proportion of the players involved in the natural resources value chain are found in the metropolitan region.

3.1 COLLECTIVE AWARENESS OF THE IMPORTANCE OF NATURAL RESOURCES FOR OUR ECONOMIC GROWTH

The productive ecosystem surrounding the natural resources sector is rich and complex. Whether the suppliers of resource extraction equipment, the various professional services necessary for the sector's activities, the university research centres that fuel innovation in the processes, or the users of the raw materials that will transform them into various products, the sector's value chain provides major leverage in wealth creation.

The 2012 study addressed potential spinoffs of investments in natural resources and their operating expenditures of nearly $52 billion over a 25-year period in the metropolitan region. During the same period, more than 14,300 jobs potentially would be created or maintained. These potential major spinoffs show that the natural resources sector would benefit both "Northern" and "Southern" Quebec.

The growth of global demand, the potential economic spinoffs, and the environmental and social impacts of exploitation of natural resources contribute to collective awareness of this sector's importance and its challenges for Quebec's prosperity.

3.2 LOCAL PROCESSING OF RESOURCES: INFORMATION NECESSARY FOR AN INFORMED DISCUSSION

Deriving the most value added from the metals extracted in Quebec's territory is an important and legitimate objective. The debate around this objective must be based on concrete data and prior knowledge of the various issues of the metal processing sector. This is why the Board of Trade is initiating a reflection on the impact of this sector of the Quebec and metropolitan economy.

First of all, several questions must be asked. What metals are extracted in Quebec? What tonnage of these metals is processed locally? What are the characteristics specific to each sector? How is the metal processing value chain organized in Quebec? What place does the metropolis occupy in this industry and how are the potential spinoffs of processing organized in Quebec and in the metropolitan region? The study seeks to provide answers to these questions.

Deriving the most value added from the metals extracted in Quebec's territory is an important and legitimate objective.

The chosen metals are divided into two categories: traditional metals and emerging metals. The analysis considers emerging metals to be those for which Quebec has great extraction experience. They have been used for several decades and have a developed global market and well-established key players. Thus, iron, zinc, nickel, copper, ilmenite and niobium, which are Quebec metals extracted in large quantities, are part of this group. Used directly or indirectly by metal processing businesses, these metals have a complex but relatively well-defined value chain and are integrated into a market competitive worldwide. Although the tonnages considered are lower, gold and diamonds, which have a well-established value chain, were also considered to be traditional metals. Table 3 presents the main metals extracted from Quebec's subsoil in 2011. Not surprisingly, iron shows the highest tonnage of primary production, followed by ilmenite, zinc, nickel and copper.

The second category of metals analyzed is that of emerging metals, such as rare earths and lithium. There is little or no mining of these metals in Quebec, but interesting deposits are present. It was considered relevant to analyze them, because they are prized worldwide and the processing structure has yet to be established.

Despite the importance and the synergies of the aluminium industry in metal processing, this study does not include the analysis and impact of this industry on the Quebec metal sector. The aluminium industry is currently preparing a similar study complementary to this one. The overall picture of metal processing will be obtained by reading these two studies. The aluminium nonetheless will be presented briefly, due to its exemplary industrial ecosystem and its innovative capabilities, which should inspire the development of other metal industries in Quebec.

TABLE 3
PMAIN METALS EXTRACTED IN QUEBEC
In 2011, in tonnes of concentrate

	ORES	PRODUCTION (Tonnes of concentrate)
1	Iron ore	16,995,000
2	Ilmenite	3,000,000
3	Zinc	189,920
4	Nickel	26,791
5	Copper	20,273
6	Niobium	4,532

Note: Ilmenite concentrate contains 45% iron and 55% titanium dioxide. This concentrate is the product of primary crushing.
Source: Natural Resources Canada, interviews

Table 4 presents the mine development projects in progress in Quebec which have gone beyond the appraisal stage. It also lists the metals concerned and their potential operating date. Illustration 1 identifies the mineral development life cycle.

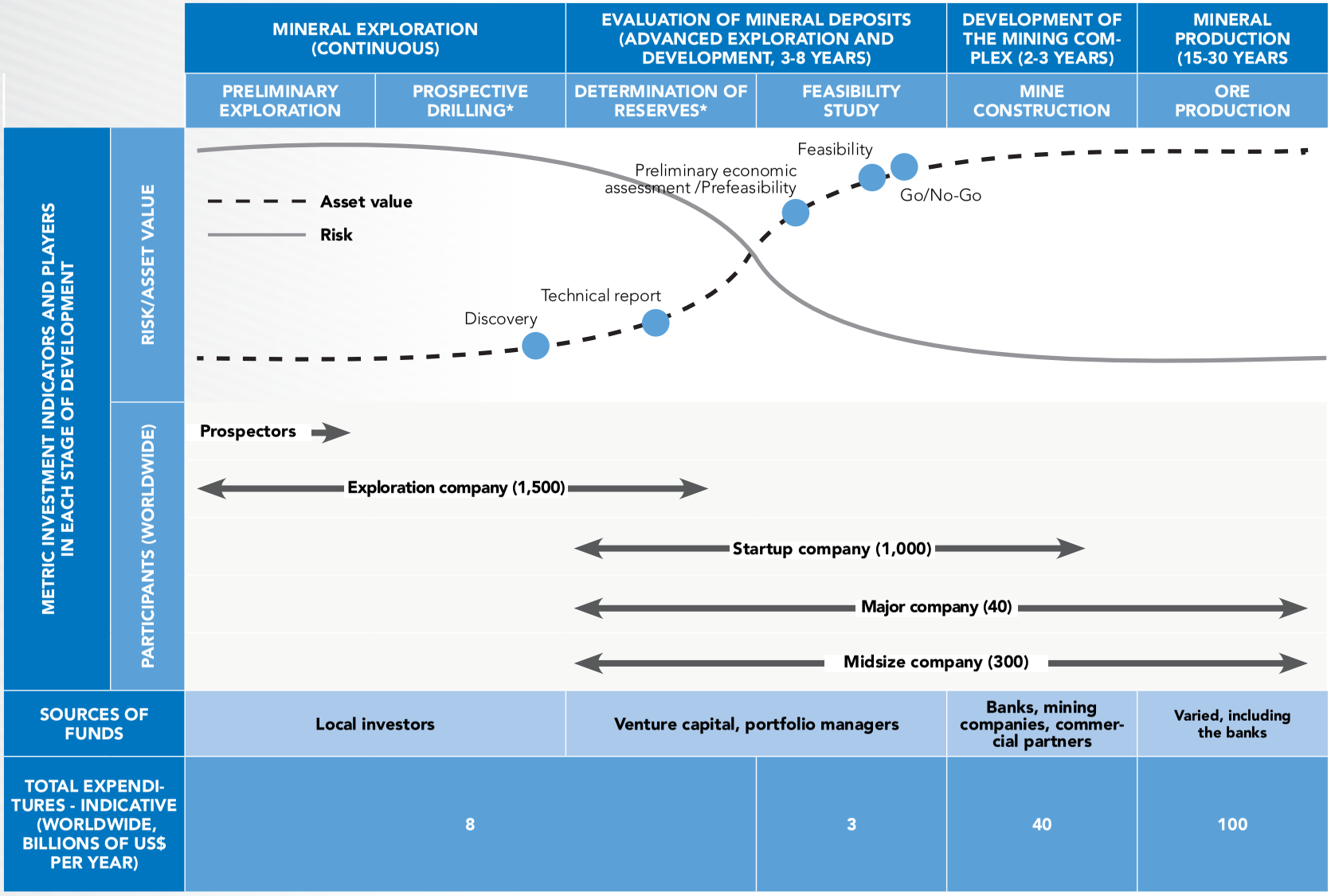
TABLE 4
MAIN MINE DEVELOPMENT PROJECTS IN QUEBEC
As of September 2012, by traditional and emerging metals, stage after appraisal

	INV. ($M)	RESERVES (MT)	ORES	PROJECT	COMPANY	STATUS	OPERATING DATE
TRADITIONAL METALS	13,000	11,000*	Iron	Lac Otelnuk	Adriana Resources/Wisco	Feasibility	2017
	4,700	2,141	Iron	KéMag	New Millenium Iron/ Tata Steel	Feasibility	End of 2016
	2,900	1,359	Iron	Hopes Advance Bay	Oceanic Iron Ore	Feasibility	2016
	1,700	12	Nickel, Copper, Cobalt, PGE	Raglan	Xstrata Nickel	Mine/ Expansion	N.A.
	1,400	12	Gold	Éléonore	Goldcorp	Development	End of 2014
	1,300	395*	Iron	Fire Lake North	Champion Minerals	Feasibility	2015
	1,100	1,066	Nickel	Dumont Nickel	Royal Nickel	Feasibility	End of 2015
	850	419	Niobium	Niobec	IAMGOLD	Mine/ Expansion	2016
	800	11	Nickel, Copper, Cobalt, PGE	Nunavik Nickel	Jien Canada	Construction	N.A.
	800	n/d	Iron	Mont Wright	ArcelorMittal	Mine/ Expansion	2012-2013
	800	23	Diamond	Renard	Stornoway Diamond Corp.	Feasibility	End of 2015
	600	152	Iron, Vanadium, Titanium	Blackrock	Blackrock Metals	Feasibility	2014
	518	0.7*	Gold	Westwood	IAMGOLD	Development	Beginning of 2013
	300	64	Iron	DSO	New Millenium Iron/ Tata Steel	Construction	End of 2012
	187	20	Gold	Joanna	Aurizon	Development	End of 2014
	158	3.7	Zinc, Nickel, Silver, Gold	Bracemec-McLeod	Xstrata Zinc/Donner Metals	Construction	Beginning of 2013
	95	8.6	Gold	Goldex	Agnico-Eagle	Mine/ Expansion	2014
	45	1.7	Gold	Vezza	North American Paladium	Development	Mid-2012
	40	0.8	Gold	Lac Bachelor	Ressources Métanor	Development	End of 2012
	N.A.	1.74	Zinc, Copper, Silver, Gold	PD1	Xstrata Zinc/Donner Metals	Feasibility	N.A.
EMERGING METALS	563	140*	Zirconium, Niobium, Beryllium	B-zone	Quest Rare Minerals	Prefeasibility	2016
	350	25*	Niobium, Tantalum	Crevier	MDN/IAMGOLD	Feasibility	N.A.
	268	27*	Lithium, Tantalum	Rose	Critical Elements Corporation	Feasibility	End of 2014
	250	25	Lithium	Whabouchi	Nesmaska Lithium	Feasibility	2014-2015
	205	17	Lithium	Québec Lithium	Canada Lithium	Construction	Beginning of 2013
	N.A.	12	Lithium	James Bay	Ressources Galaxy	Feasibility	N.A.

Note: The reserve data correspond to proven and probable reserves. Certain reported data (*) corresponds to the measured and indicated reserves.
Sources: Ministère des Ressources naturelles du Québec, "Investir dans le secteur minier", October 2012 (when available), business website

ILLUSTRATION 1
MINERAL DEVELOPMENT PROCESS

DETAILS OF THE 4 MAIN PHASES OF A MINING PROJECT, EXCLUDING REHABILITATION



*About 1/2000 of the exploration projects and 1/150 of the deposit evaluations will reach the construction stage.
Sources: KPMG-SECOR, *Les redevances minières au Québec*, 2012

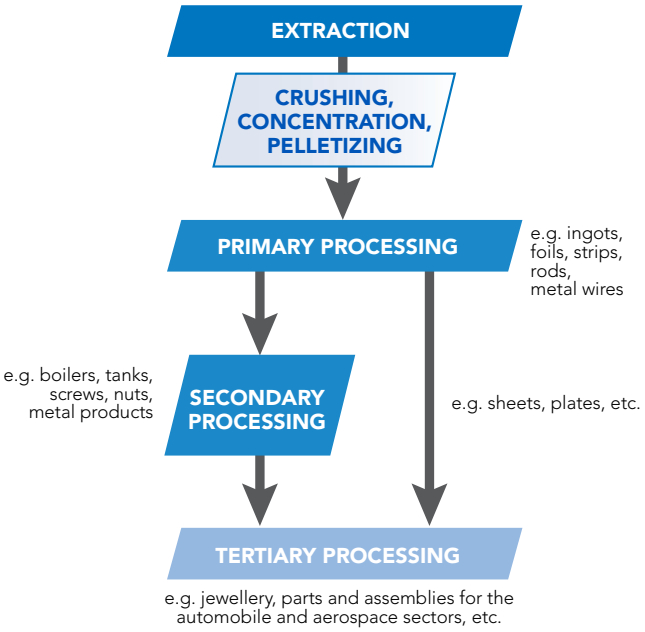
To categorize the processing types, the study is based on the North American Industry Classification System (NAICS). Before defining the processing types analyzed in this document, it is important to define the primary production sector, which is also identified as "extraction" in this study. According to the same classification system (NAICS), mining and quarrying are defined as "establishments primarily engaged in mining, beneficiating or otherwise preparing metallic and non-metallic minerals, including coal."

Primary metal manufacturing includes: "establishments primarily engaged in smelting and refining ferrous and non-ferrous metals from ore, pig or scrap in blast or electric furnaces. Metal alloys are made with the introduction of other chemical elements. The output of smelting and refining, usually in ingot form, is used in rolling and drawing operations to produce sheet, strips, bars, rods and wire, and in molten form to produce castings and other basic metal products." Note that this stage does not include ore grinding in concentrate form or its pelletization. Statistically, these two stages are part of ore mining. Nonetheless, concentrate or pellet production in Quebec represents a certain form of processing, making it possible to create value added and support jobs. We will return to this several times in this study.

Secondary processing is the stage at which raw metal is processed into goods with specific uses. Called fabricated metal product manufacturing by Statistics Canada, this subsector is defined as all "establishments primarily engaged in forging, stamping, forming, turning and joining processes to produce ferrous and non-ferrous metal products, such as cutlery and hand tools, architectural and structural metal products, boilers, tanks and shipping containers, hardware, spring and wire products, turned products, and bolts, nuts and screws." Secondary processing is distinguished from tertiary processing by the importance of metal in the final component.

Finally, tertiary processing is the stage at which the metal products resulting from secondary processing are incorporated into finished products used in various industrial sectors. At this stage, the products from the metal sector become inputs for other Quebec industrial sectors, such as aeronautics, land transportation, environmental technologies, or equipment and machinery. Thus, tertiary processing businesses are customers in the metal sector. Nonetheless, they are distinguished from the metal sector by the lesser importance of metal in the end products. The following figure synthesizes the metal processing process in Quebec.

FIGURE1
METAL PROCESSING PROCESS IN QUEBEC



Source: KPMG-SECOR

The analysis of processing of the raw materials extracted in Quebec mines has been divided into three parts. First, the study will focus on understanding what extractive and primary processing activities are currently performed in Quebec and will put them into context in relation to the rest of Canada. The proportion of metals remaining in Quebec for local processing and the proportion exported will be presented. The analysis will also deal with the main factors determining the location of primary processing activities.

The study then will present the picture of secondary and tertiary processing in Quebec. Once again, the key success factors for the establishment of a secondary processing industry will be analyzed and the issues specific to Quebec will be highlighted. The study will discuss tertiary processing particularly from the perspective of its importance for the dynamism of secondary processing in Quebec.

After painting a picture of the current state of metal processing in Quebec, the favourable opportunities and the spinoffs of metal processing in Quebec and in the Montréal metropolitan region will be presented. Finally, paths for reflection and a spinoff maximization strategy will be proposed.

4

PRIMARY PRODUCTION AND PRIMARY PROCESSING: INDUSTRIES THAT MUST DEAL WITH SPECIAL CHALLENGES

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Interest in the metals present in Quebec dates back to Jacques Cartier's discovery of America, when quartz and pyrite on the slopes of Cap Diamant were confused with gold and diamonds. A first lead deposit was discovered in 1686. Nonetheless, it would take nearly 200 years before the first lead, zinc and silver deposits were mined in Abitibi-Témiscamingue.

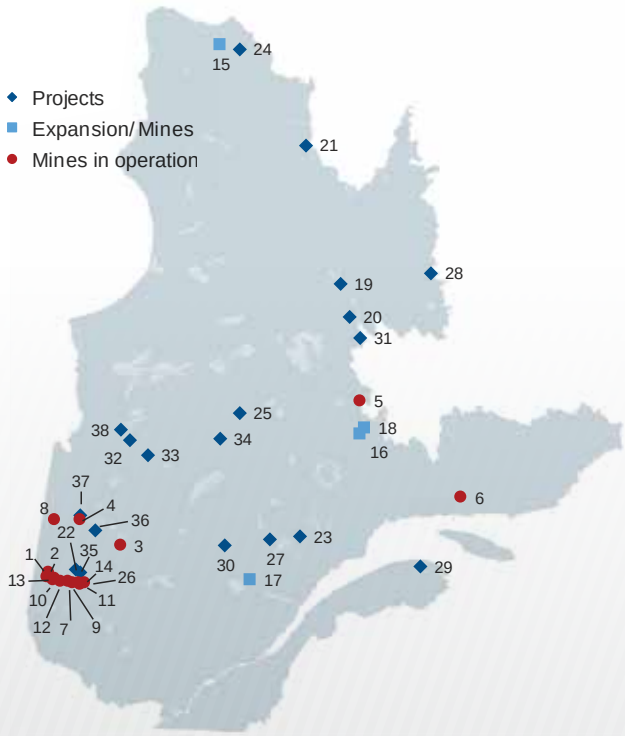
Thus, it was only in the first half of the 20th century that industrial expansion allowed the Quebec mining sector to really take flight. Today, there is no doubt that Quebec enjoys an enviable position due to its subsoil rich in natural resources. Quebec has 14 main mining production sites in its territory, 4 appraisal and expansion projects and 20 development projects.

FIGURE 2

MAIN MINING PRODUCTION SITES

In November 2012, in Quebec, mines in operation, projects in expansion and future projects

MINES IN OPERATION		EXPANSIONS		PROJECTS	
1	Mouska	15	Raglan	19	Lac Otelnuk
2	LaRonde	16	Fire Lake North	20	Kémag
3	Langlois	17	Niobec	21	Hopes Advance Bay
4	Persévérance	18	Mont Wright	22	Dumont Nickel
5	Lac Bloom			23	La Blache
6	Lac Tio			24	Nunavik Nickel
7	Canadian Malartic			25	Renard
8	Casa Bérardi			26	Goldex
9	Goldex			27	Lac à Paul
10	Lapa			28	Bzone
11	Beaufor			29	Grande-Vallée
12	Kiena			30	Crevier
13	Mouska			31	DSO
14	Lac Herbin			32	Eastmain-Rose
				33	Whabouchi
				34	Lac McLeod
				35	Québec Lithium
				36	Bracemac
				37	PD1
				38	James Bay Lithium



Sources: Natural Resources Canada, KPMG-SECOR analysis

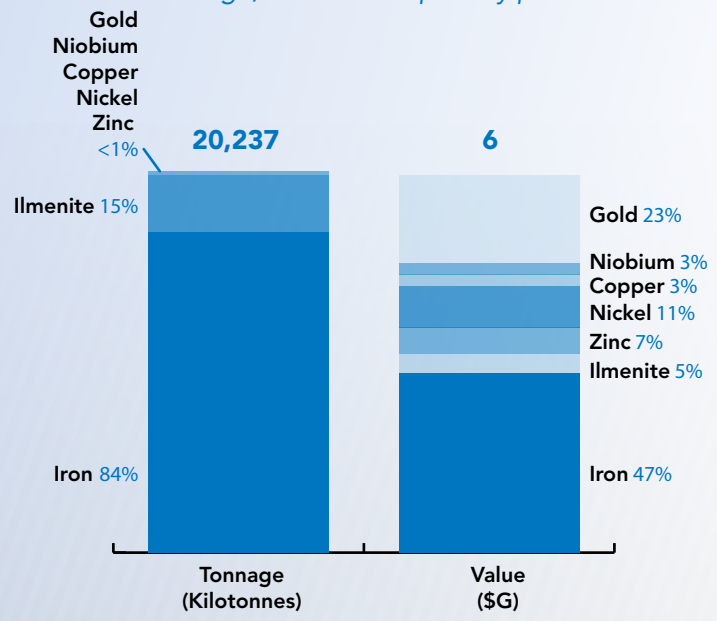
4.1 PRIMARY PRODUCTION OF TRADITIONAL METALS: WELL-ESTABLISHED INDUSTRIES

Beyond the number of mining projects, it is tonnage and the value of extracted metals that are more illustrative of the situation of Quebec primary production. Indeed, if we focus only on metallic ore production, iron and ilmenite represent nearly 99% of the total tonnage of extracted material in Quebec. Then come metals that are less significant in terms of tonnage, such as nickel, zinc and copper. Based on production value, however, the picture is different, because iron represents only 47% of total production value, followed by gold (23%) and nickel (11%). Iron accounts for 84% of the tonnage of mineral production in Quebec.

Iron accounts for 84% of the tonnage of mineral production in Quebec.

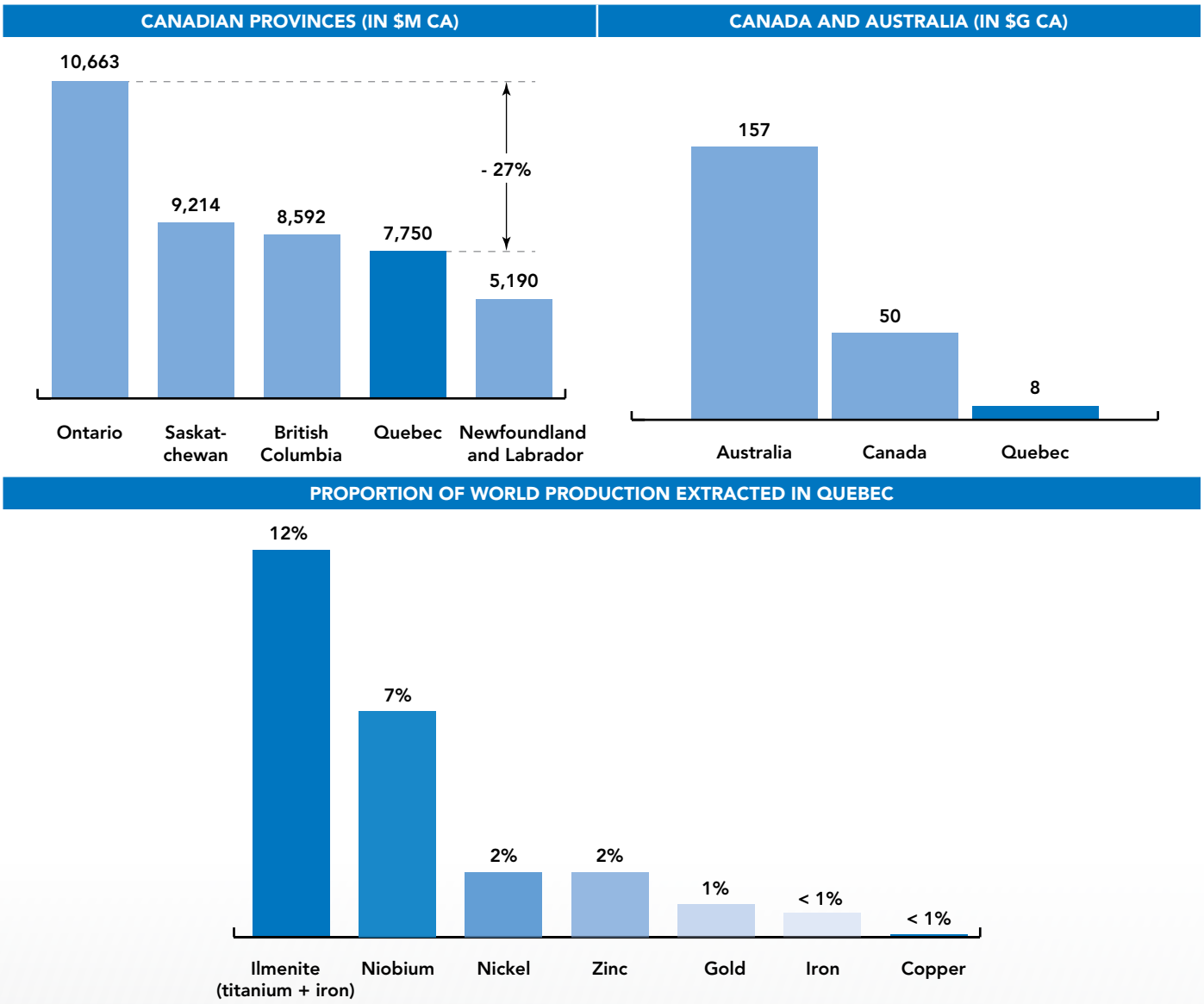
The tonnages and production value of Quebec mines, although high, remain relatively modest when compared to other Canadian provinces or countries. In 2011, Quebec ranked fourth in Canada for the value of its mineral production. Moreover, the value of Quebec metals for the same year was 6 times lower than for Canada and 20 times lower than for Australia. The relative importance of Quebec and its main traditional metals compared to the benchmark regions is presented in Figure 4. For example, we note that Quebec iron ore production, although dominant on the Quebec scale, remains very modest on the global scale, because Quebec accounts for only 0.7% of world iron production. Conversely, Quebec is a major player in ilmenite, with nearly 12% of global production of this metal.

FIGURE 3
QUEBEC PRODUCTION BY METAL TYPE
In 2011, in kilotonnes, in billions of $, in % of total tonnage, in % of total primary production value



Note: The value of ilmenite concentrate is estimated.
Sources: Natural Resources Canada, KPMG-SECOR analysis

FIGURE 4
PUTTING QUEBEC MINING PRODUCTION IN PERSPECTIVE
In 2011, compared to other comparable regions, by industry



Note: The value of the ore extracted in this figure also includes non-metallic ore.
Sources : Natural Resources Canada, Minerals Council of Australia

Traditional metals are extracted in Quebec both by big international corporations and by small businesses and consortiums of companies of various sizes. Quebec primary production (total value of $8 billion in 2011) is nonetheless concentrated in 12 companies. It is also interesting to date Quebec's relative importance for the main mining companies active in its territory. Thus, the total value of metals extracted in Quebec is equivalent to 9% of the total revenue of a company like ArcelorMittal and 12% of the total revenue of Cliffs Natural Resources or Rio Tinto.

Quebec is an auxiliary mineral producer.

It thus will be understood that these companies consider Quebec an auxiliary producer, due to its modest size on the international playing field. It is interesting to note that certain companies that are among the major players in the mining sector, such as BHP, Anglo-American, Freeport McMoran or Barrick Gold, are not present in Quebec. The following table presents the main primary production companies established in Quebec.

Mineral resources are the basis of an international market. The prices are set by the international markets and major movements of these resources are observed to the processing or "consumption" zones. These movements are also supplied by the intrafirm trade of big international companies, which are often globally integrated production chains. Obviously, this is reflected in the trade flows associated with the mineral resources extracted in Quebec. The activities of the mining companies established in its territory feed Quebec's trade flows and contribute, in particular, to the diversification of our export markets.

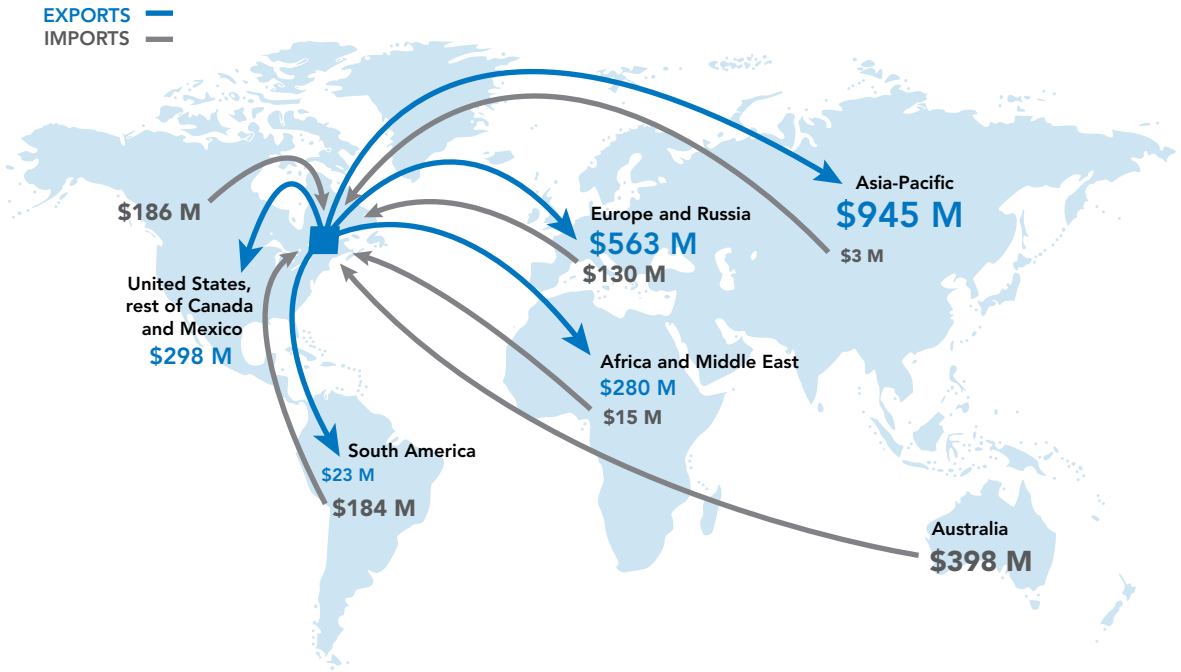
TABLE 5
MAIN MINING COMPANIES ACTIVE IN QUEBEC
In 2012, according to worldwide turnover, by metal type, according to the number of employees in Quebec

COMPANY	SALES (2011, WORLDWIDE, $G)	MAIN MINING OPERATIONS	METALS	EMPLOYEES IN QUEBEC
ArcelorMittal	93.3	FireLake Mont Wright	Iron and titanium Iron and titanium	2,000
Xstrata	33.5	Persévérance Raglan	Zinc, copper, gold, silver, Nickel, copper, PGE, cobalt	1,150
Cliffs Natural Resources	67.2	Lac Bloom	Iron and titanium	910
Rio Tinto Fer et Titane	59.9	Lac Tio	Iron and titanium	375
Nyrstar Canada	4.6	Langlois	Zinc, copper, gold, silver	290
Agnico-Eagle	1.8	LaRonde Lapa	Gold, silver, copper, zinc Gold	1,600
IAMGOLD	1.7	Mouska Niobec	Gold, silver, copper, zinc Niobium	700
Osisko	0.3	Canadian Malartic	Gold, silver	500
Aurizon Mines	0.3	Casa Berardi	Gold, silver	500
Richmont Mines	0.1	Beaufor Francœur	Gold Gold	580
Wesdome	0.1	Kiena	Gold	180
QMX Gold	< 0.1	Lac Herbin	Gold	105

Sources: Natural Resources Canada, KPMG-SECOR analysis
ArcelorMittal. Corporate site, [Online]. www.arcelormittal.com
Xstrata. Corporate site, [Online]. www.xstrata.com
Cliffs Natural Resources. Corporate site, [Online]. www.cliffsnaturalresources.com
Rio Tinto Fer et Titane. Corporate site, [Online]. www.rtft.com
Nyrstar Canada. Corporate site, [Online]. www.nyrstar.com
Agnico-Eagle. Corporate site, [Online]. www.agnico-eagle.com
IAMGOLD. Corporate site, [Online]. www.iamgold.com
Osisko. Corporate site, [Online]. www.osisko.com
Aurizon Mines. Corporate site, [Online]. www.aurizon.com
Richmont Mines. Corporate site, [Online]. www.richmont-mines.com
Wesdome. Corporate site, [Online]. www.wesdome.com
QMX Gold. Corporate site, [Online]. www.alexisminerals.com

Thus, the majority of these exports are bound for Asia-Pacific ($945 million, or about 12% of the total production tonnage) and Europe ($563 million, or 7% of total production tonnage). Quebec also imports metals to process them in its territory or to reroute them to other processing facilities in the rest of Canada. These metals mainly come from Australia ($398 million) or Peru ($32 million). Thus, Quebec is not only an exporter of its mineral resources; it already processes a portion in its territory so that it can supply some of its processing facilities even more. Figure 5 represents the consolidated import and export flows of the main metals.

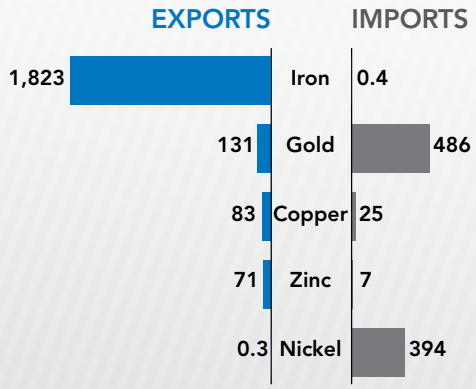
FIGURE 5
EXPORTS AND IMPORTS OF THE MAIN QUEBEC METALS
In 2010, by destination, by origin, for the main metals under study, in millions of dollars



Sources: Statistics Canada, KPMG-SECOR analysis

Quebec's trade flows vary according to metal type. The composition of Quebec primary production is explained in part by the destination or origin of these flows. Since the primary processing facilities for iron are largely established in Asia, it is not surprising to recognize that the majority of Quebec iron ore production goes to this region. The following table presents the values of the main products imported and exported in 2011. It is observed that Quebec is a net importer for gold and nickel, and a net exporter for iron, copper and zinc. In the first two cases, the high import level is explained by the entry point of these resources in Canada, namely Quebec's ports in the case of nickel, or airports in the case of gold. A large portion of these imports is bound for non-Quebec regions. Thus, metal imports also reflect the primary processing capacity of Quebec and the rest of Canada.

FIGURE 6
MAIN METALS EXPORTED AND IMPORTED
In Quebec, in 2011, in millions of dollars



Note: If bauxite and alumina exports are included, the balance of trade in raw minerals approaches equilibrium
Sources: Statistics Canada, KPMG-SECOR analysis

4.2 PRIMARY PRODUCTION OF EMERGING METALS: OPPORTUNITIES TO SEIZE

Beyond its capacity to produce traditional metals, Quebec hopes to embark on production of emerging metals in the near future. These metals include lithium (four projects in development), tantalum and other rarer metals, such as zirconium or beryllium.

Concerning lithium, Quebec could position itself among the world's top five producers of this metal. Currently, the biggest lithium producers are Australia (65,000 tonnes LCE) and Chile (about 60,000 tonnes LCE). China and Argentina also produce about 15,000 tonnes each of "raw" lithium[1]. In Quebec, the most advanced project is that of Quebec Lithium, which recently announced the start-up of production at its facilities for the beginning of 2013. The operation of this mine would allow annual production of about 20,000 tonnes of lithium carbonate over a 15-year period[2]. The company has made an agreement with the Chinese-based Tewoo Group, which will sell at least 12,000 tonnes per year of lithium carbonate. These products used in battery production will pass through the Ports of Vancouver or Prince Rupert (British Columbia). Other lithium extraction projects are in development, such as the one located in La Corne Township, 60 km north of Val-d'Or, which has the purpose of extracting lithium carbonate for the battery market. Other projects are also in development in the Chibougamau or James Bay region.

Lithium is used in a multitude of end applications, including: batteries (22%), ceramics (15%), lubricants (11%), glass ceramics (9%), glass (6%), air treatment (4%), metallurgy (4%), polymers (3%), pharmaceuticals (2%), aluminium (2%) and others (22%)[3]. Lithium batteries are distinguished from other types of batteries (nickel-based, for example), because they have a better energy density, a better power-to-weight ratio, a longer life cycle, a shorter recharge time and a greater rechargeable capacity, while operating in all seasons. The market growth of cars running on alternative energy sources thus could stimulate an increase in demand for lithium.

Quebec also plans to operate two tantalum production projects. This metal would be a secondary product of Critical Elements and IamGold, but could be extracted in higher volume in the future. The European Union considers tantalum to be one of the 14 critical minerals, due to its economic importance and its limited supply on the market. To date, three companies (Cabot in the United States, HC Starck in Germany and China Minmetals Corp. in China) share 85% of the world tantalum market. Nearly half the tantalum produced worldwide is used in the production of electronic products, such as hard drives or touch screens.

Quebec could produce nearly 37% of the world's lithium

Thus, production of these metals would allow Quebec to acquire a prominent position in the global supply chain of these resources. The figures currently available give reason to believe that Quebec would produce nearly 37% of the world's lithium. Given the potential importance that the Quebec lithium supply could acquire, the question of potential processing of these metals in Quebec is posed. The next section deals more with the question of primary processing, both for the main traditional metals and for emerging metals.

1 Roskill
2 Canada Lithium Corporation
3 Roskill

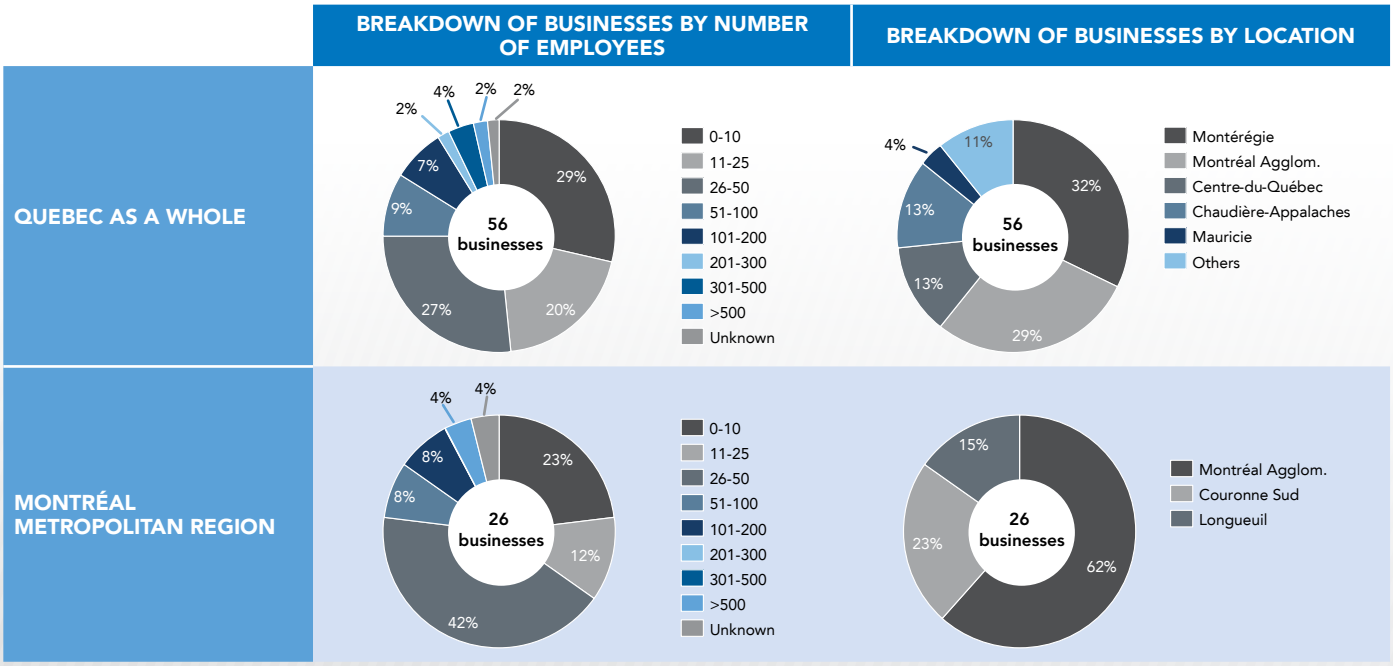
4.3 PRIMARY PROCESSING OF THE MAIN TRADITIONAL METALS: SPECIAL CHALLENGES

As we defined it in the introduction to this document, primary metal processing corresponds to the first alteration made to the concentrate or pellets of a certain type of metal. More specifically, when we talk about primary processing, we mean activities such as smelting and refining. Quebec had 56 businesses active in primary processing in 2012. Of these businesses, 49% had fewer than 50 employees and only 10% had more than 200 employees. We should note that the majority of these businesses are located near a watercourse or close to railway installations to facilitate the transport of primary processed metal products. Moreover, 26 of these 56 businesses (46%) are located in the Montréal metropolitan region.

Obviously, not all these businesses play an equally important role in the Quebec primary processing industry. Thus, two refineries (Horne and CEZ) and five smelters (RTFT, Horne, Norcast, Maggotteaux and Bibby Ste-Croix) alone represent a very large proportion of this sector's activities.

> *26 of the 56 primary metal processing businesses are located in the Montréal metropolitan region.*

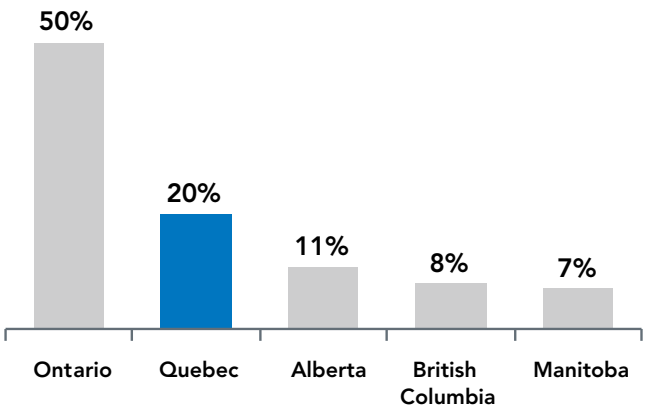
FIGURE 7
PRIMARY METAL PROCESSING ESTABLISHMENTS
In Quebec, by administrative region, for the Montréal metropolitan region, in 2012



Sources: Réseau de la transformation métallique du Québec, KPMG-SECOR analysis

When we analyze the proportion of Canadian primary processing performed in Quebec's territory, Quebec compares very advantageously to the other Canadian provinces. In mining, Ontario supports nearly 28% of Canadian jobs, while Quebec supports 18%. However, these two provinces respectively support nearly 50% and 20% of all Canadian primary processing jobs. Ontario's increased weight in primary processing is explained by the fact that most Canadian steel mills are located in this province. It should be noted that Ontario and Quebec are far ahead of Alberta, the province that ranks third in primary metal processing. Figure 8 presents the breakdown of primary processing efforts by province.

FIGURE 8
BREAKDOWN OF PRIMARY PROCESSING EFFORTS IN CANADA
In 2011, for the top five Canadian provinces, in % of total jobs related to primary processing



Note: The breakdown of primary processing efforts includes all the subparts of the NAICS Code 331, Primary Metal Manufacturing, except Code 3313 – Alumina and Aluminium Production and Processing.
Sources: Statistics Canada, KPMG-SECOR analysis

4.3.1 PRIMARY PROCESSING OF FERROUS ORES: A GLOBAL VALUE CHAIN

Quebec has four primary producers of ferrous products: ArcelorMittal, Cliffs Natural Resources, IAMGOLD and Rio Tinto. These companies operate mines in Quebec and perform initial ferrous ore processing activities in Quebec in the form of iron concentrate or iron pellets. Some companies go further in the processing chain and have smelters or even steel mills in Quebec. The following pages synthesize each company's activities and present an aggregate picture of the value of ferrous ore in Quebec.

ARCELORMITTAL CANADA	
WHO AND WHERE?	• ArcelorMittal is involved in ore extraction in the Fermont region, pelletizing in the Port-Cartier region, and primary and secondary processing in the Montréal metropolitan region. • The company's Contrecœur-Est plant operates two electric arc furnaces and a bar and wire rolling mill, mainly producing steel billets and machine wire. The Contrecœur-Ouest smelter produces billets, rebar, flat and round bars, and steel rails. The company also owns a plant fabricating flat or round steel billets in Longueuil and a metal wire drawing plant in Montréal, on Saint-Patrick Street.
HOW MUCH?	• ArcelorMittal currently extracts about 18 million tonnes of iron concentrate per year, which is sent to its Port-Cartier pelletizing plant (about 9 to 10 million tonnes) and to blast furnaces operated by Dofasco, the company's subsidiary in the Hamilton region. • The Fermont ore is bound to ArcelorMittal's internal customers in Quebec, Ontario or the Cleveland region. The balance of this ore is shipped by freighter to Europe or emerging markets. • ArcelorMittal's two Quebec smelters produce about 1.2 million tonnes of steel per year from iron and recycled steel pellets. A $20 million expansion project is under study to increase ArcelorMittal's steel production in Quebec. • At the beginning of January 2013, ArcelorMittal sold 15% of ArcelorMittal Mines Canada to an Asian consortium, including the South Korean steel producer POSCO and the Taiwan-based China Steel Corp. for $1.1 billion.
FOR WHOM?	• ArcelorMittal's primary processing products are sold to steel traders, construction companies, rebar manufacturers, companies in the automobile market, welding rod manufacturers, and its own steel mills in Quebec and in the rest of the world.

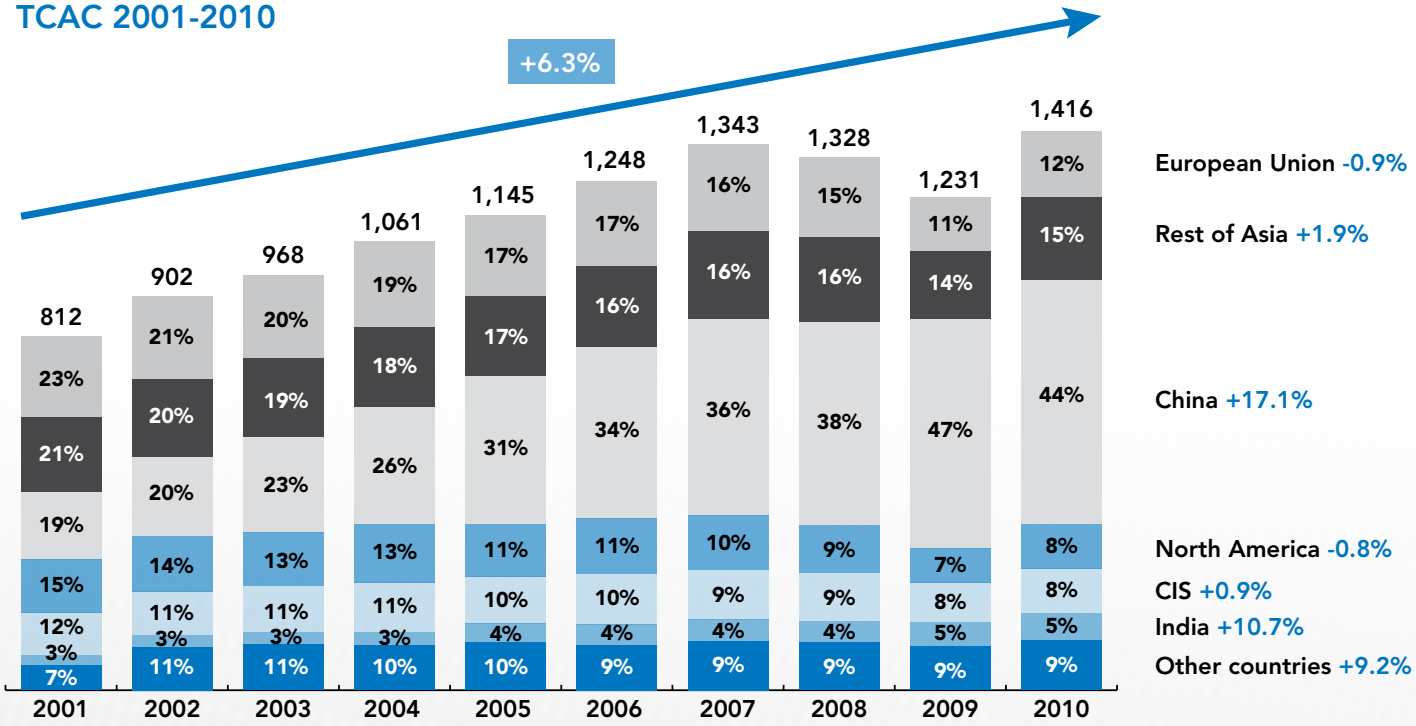
CLIFFS NATURAL RESSOURCES	
WHO AND WHERE?	• Cliffs Natural Resources operates two iron mines in the Labrador Trough, one of them in Quebec (Bloom Lake) and the other in the Labrador region (Wabush). The company holds 100% of the interests in the Wabush Mine and 75% of the interests in the Bloom Lake Mine, purchased from Consolidated Thompson in 2011. Each of these mines has a concentrator. • After concentrating the iron ore, a portion of the extracted ore (3 to 4 million tonnes) is shipped by train to Pointe-Noire near Sept-Îles for processing into iron pellets, while the rest is exported as concentrate.
HOW MUCH?	• Cliffs has a production capacity of nearly 8 million tonnes of iron concentrate at its Quebec mine and about 5 million tonnes at its Labrador mine. • The Pointe-Noire pelletizing plant absorbs the majority of the Wabush ore, while the ore from Bloom Lake is shipped by sea to Asian steel mills.
FOR WHOM?	• After this processing, the iron pellets are sent to processing plants located in the Great Lakes region of Ontario, to the United States and to other international destinations (mainly to Asian steel producers). • The slowed growth in China has had repercussions for Cliffs' activities in Quebec. Due to the falling price of iron, Cliffs had to postpone Phase 2 of the Bloom Lake mine expansion.
IAMGOLD	
WHO AND WHERE?	• Quebec niobium has been extracted since 1976 from the Niobec Mine, now held by IAMGOLD. Niobec operates an underground mine in the Chicoutimi region and a concentrator and a converter on the mine site.
HOW MUCH?	• The Niobec Mine extracts nearly 1.8 million tonnes of ore per year, which is then routed to the company's concentrator to obtain about 6,700 tonnes of niobium oxide. Until 1994, this concentrate was sold to ferroniobium processing companies in Europe, India, Japan and the United States. • Since 1994, Niobec has operated a converter, allowing commercial production of ferroniobium from the mine site. Thus, nearly 7,500 tonnes of ferroniobium is produced annually by IAMGOLD.
FOR WHOM?	• Ferroniobium is then marketed directly to the steel industry for use in the production of steel alloys. Steel containing niobium resists corrosion and is lighter. • These alloys are used mainly by the construction industry (29%) in the design of bigger, lighter and thinner structures. They are also used in the pipeline industry (24%), the automobile industry (24%) and stainless steel fabrication (10%).
RIO TINTO FER ET TITANE	
WHO AND WHERE?	• Rio Tinto Fer et Titane (RTFT) operates an ilmenite mine in the Havre-Saint-Pierre region and a metallurgical complex in the Sorel-Tracy region.
HOW MUCH?	• In good years and bad, RTFT produces nearly 3 million tonnes of ilmenite ore at Havre-Saint-Pierre, including nearly 2.75 million tonnes that remain in Quebec. Once this ilmenite concentrate is crushed, most of it is routed to the Sorel facilities, where the company processes ilmenite to extract iron and titanium dioxide. • A small portion of the extracted ilmenite concentrate leaves Quebec to be sold as flux to steel mills in Europe and the Middle East, which allows extension of the life of the refractory materials when the blast furnaces reach the end of their life cycle. • Finally, RTFT also ships nearly 400,000 tonnes of ilmenite sand from Madagascar to Sorel, thus processing an ore from an international source in Quebec.
FOR WHOM?	• From the Madagascar ilmenite sand, RTFT extracts iron to produce pigs for small Quebec, American and European smelters. Most of this ore is reused for secondary processing at RTFT's facilities to fabricate steel billets. • A portion of the billets will be shipped to Ontario for processing as steel wire, while the balance is reprocessed into steel powder in Quebec for sale on the European and Middle Eastern markets. This powder will mainly be used by automobile manufacturers. • The company also produces titanium oxide from ilmenite concentrate. Titanium dioxide is not included in the iron ore value chain, but nonetheless is processed as slag and titanium pigment. Depending on the titanium dioxide concentration, this titanium powder will then be sold to companies in the aviation, military, medical or paint and coatings sectors. The document returns to this in the next section, devoted exclusively to titanium.

Source: KPMG-SECOR from interviews and secondary research on companies.

In North America, the Great Lakes region is the historical steel production centre, both for Canada and the United States. However, this historical location has been affected by a major shift of global steel production zones. Following considerable investments in the construction of steel mills in certain emerging countries, the North American and European facilities have lost their relative importance and are much less utilized, even in absolute terms. For example, it is estimated that the North American steel mills today are at nearly 75% of their production capacity[4]. In other words, the North American steel mills just barely cover their fixed costs. In Canada, there are still a few steel mills in the Great Lakes region of Ontario and, to a lesser extent, in Quebec, British Columbia and Alberta. Given the substantial investments required for construction of a new steel mill, it can be expected that a new construction project will not be seen in North America until the existing facilities reach maximum capacity. Moreover, investments in the steel mill sector have not grown in North America in the past several years.

As Figure 9 illustrates, China has seen the strongest growth of primary metal processing investments over the past ten years. It is observed that the demand in India is also growing, but China nonetheless represented a very large share of the market and of global investment growth up to 2010. Conversely, the European Union and North America have seen their investments in this sector diminish.

FIGURE 9
INVESTMENTS IN PRIMARY PROCESSING INFRASTRUCTURE
2001-2010, in millions of tonnes, in %



Source: World Steel Association

4 Estimate form interviews conducted within the context of this study.

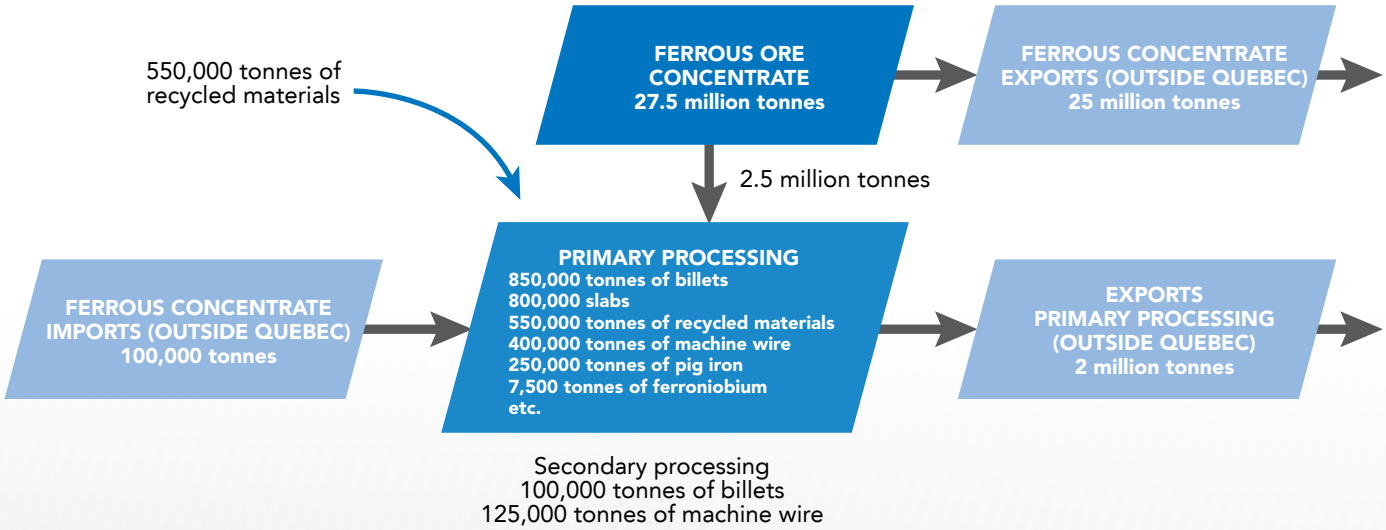
As indicated above, Quebec has processed a portion of its ferrous mineral since the creation of Sorel Forges in 1939. Nonetheless, Quebec cannot disregard the steel industry's global value chain. A large proportion of Quebec ore leaves the province for the Great Lakes region (Ontario or United States), Asia and Europe, where it is processed by the major steel mills that dominate the steel market. Nonetheless, it is estimated that nearly 2.5 million tonnes of ferrous ore concentrate and 550,000 tonnes of scrap metal were processed in Quebec in 2012 out of a total of 27.5 million tonnes of extracted concentrate, representing about 11% of the total concentrate produced. The percentage of extracted tonnage processed in Quebec increases to 49% if the pelletizing activities carried on in Quebec are included (13 million tonnes of pellets). Figure 10 presents the consolidated inbound and outbound tonnages of iron ore in Quebec.

Quebec processes nearly 11% of the ferrous ore extracted from its soil.

FIGURE 10

ESTIMATE OF PRIMARY PRODUCTION AND PRIMARY PROCESSING OF FERROUS ORE IN QUEBEC

In 2012, in tonnes



Note 1: Estimated concentrates for 2012 (in tonnes): 18 million ArcelorMittal; 8 million Cliffs; 1.5 million Rio Tinto for iron only; 6,700 Niobec. Imported iron ore comes from ilmenite sand from Madagascar, which contains 25% iron and 75% titanium.

Note 2: The differences between processing stages are due to losses due to the metal concentration in the original ore and the metal concentration needs for the projected use.

Sources: Industry Canada, interviews with primary sector and primary processing companies, KPMG-SECOR analysis

4.3.2 PRIMARY PROCESSING OF TITANIUM: AN INDUSTRY TO DEVELOP

As presented in the previous section, the ilmenite extracted in Quebec by Rio Tinto Fer et Titane is rich in iron. This ore is also rich in titanium, because nearly 55% of the ilmenite concentrate is composed of that element. Titanium is extracted by flotation of the ilmenite concentration during primary processing. It is then recovered in liquid form and poured into a wagon for bulk cooling.

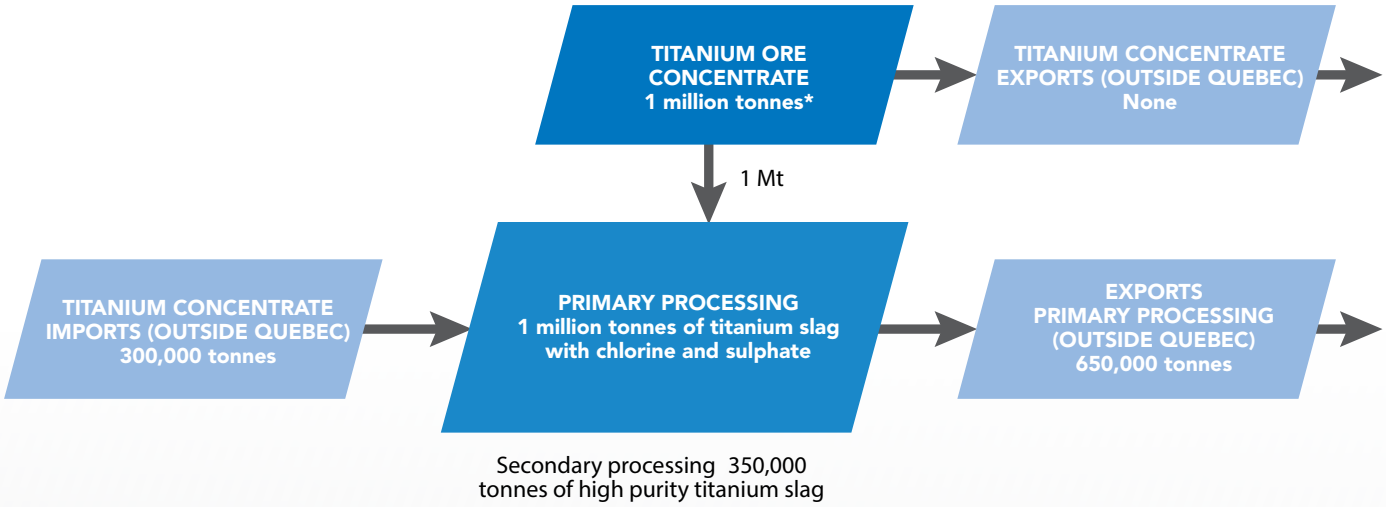
About 60% of this metal is resold in bulk form to titanium pigment producers, which allows production of white finishes at lower cost. It serves as a colouring or opacity agent in paints, plastics, paper, etc. and the world's most widely used white pigment. The rest (40%) of the titanium dioxide produced by Rio Tinto Fer et Titane undergoes secondary processing to convert it into a highly concentrated slag[5] containing about 95% titanium dioxide. It is mainly sold to pigment producers, who use a chloride process, and to titanium metal producers.

Quebec also imports ilmenite sand from Madagascar beaches to extract titanium in Quebec. One hundred tonnes of sand contain about three tonnes of titanium. The sand imported from Madagascar allows production of nearly 300,000 tonnes of titanium concentrate. Thus, during primary processing, RTFT produces about one million tonnes per year of titanium slag with chlorine and sulphate. Part of this slag is exported in bulk, while the rest is sent to secondary processing to produce high purity titanium slag.

FIGURE 11

ESTIMATE OF PRIMARY PRODUCTION AND PRIMARY PROCESSING OF TITANIUM DIOXIDE IN QUEBEC

In 2012, in tonnes



* RTFT produces about one million tonnes of ilmenite concentrate from its Havre-Saint-Pierre mine. The rest is ferrous ore.

Note: The differences between processing stages are due to losses due to the metal concentration in the original ore and the metal concentration needs for the projected use.

Sources: Industry Canada, interviews with primary sector and primary processing companies, KPMG-SECOR analysis

5 Slag is a solid waste obtained from molten titanium. The slag forms a supernatant layer on the molten metal.

4.3.3 PRIMARY PROCESSING OF NICKEL: LATE EXTRACTION

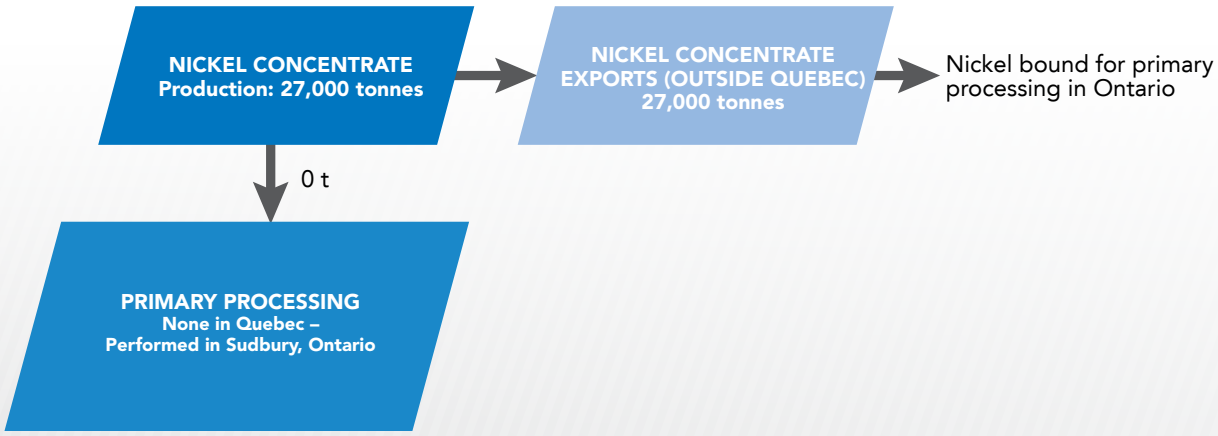
The vast majority of Quebec nickel is produced at Xstrata's Raglan Mine. The Xstrata Nickel facilities include four underground mines, a concentrator, a power plant, a freshwater supply source and fuel tanks. These facilities allow crushing, grinding and processing of the ore into nickel-copper concentrate. Xstrata is currently planning an expansion of its Raglan facilities at a cost of US$530 million[6].

In 2011, the Raglan Mine produced 27,000 tonnes of nickel concentrate and employed 850 full-time workers[7]. Once processed, the nickel-copper concentrate extracted from the Raglan Mine is transported a hundred kilometres by truck to Deception Bay, where it is stored. This concentrate is then shipped by sea to the Port of Quebec, and then by train to the Xstrata Nickel smelter in Sudbury. The location of the nickel processing facilities is explained by the history of Canadian nickel production. Ontario has produced nickel in the Sudbury region since 1929, while Quebec has operated the Raglan Mine only since 1997.

In Sudbury, Quebec nickel is smelted and transformed into matte (70,000 tonnes of nickel matte in 2011), a mixture of nickel and mineral sulphides from smelting. The nickel matte is then sent back to the Port of Quebec by train. From there, it is shipped by sea to Norway, where the Kristiansand refinery separates and recovers the pure metals by a chlorine leaching and electrolytic extraction process. The metals are then distributed for separate purification, refining and forming. The nickel is then sold in the form of cathodes and crowns for several uses, including high-nickel alloys, superalloys, weakly alloyed steels, casting alloys, electroplating and electroforming. A similar situation prevails in the case of the activities of Canadian Royalties, from which the nickel extracted from the Nunavik Nickel project is routed to the Norilsk Nickel smelter in Finland.

Nickel is mainly used in stainless steel production, which consumes about 66%[8]. The other applications include the other types of alloys and superalloys (24% of consumption), such as heat-resistant steel, electroplating (8%) and chemical components such as batteries (3%). These are then integrated into automobile, electronics and construction industry products. Figure 12 presents the Quebec nickel value chain.

FIGURE 12
ESTIMATE OF PRIMARY PRODUCTION AND PRIMARY PROCESSING OF NICKEL IN QUEBEC
In 2012, in tonnes



Sources: Industry Canada, interviews with primary sector and primary processing companies, KPMG-SECOR analysis

6 Xstrata, Annual Report, 2011.
7 Xstrata, Annual Report, 2011.
8 London Metal Exchange – Nickel, official site, [Online]. www.lme.com/nickel.asp

4.3.4 PRIMARY PROCESSING OF ZINC: A MAJOR REFINERY ON MONTRÉAL'S DOORSTEP

Quebec zinc extraction mainly occurs at the Perseverance Mine. Located near Matagami and operated by Xstrata, this mine will end its life cycle in March 2013, according to the estimates. To continue fabricating zinc products at its Salaberry-de-Valleyfield refinery, Xstrata will begin commercial mining of the Bracemac-McLeod deposits, also located in the Matagami region. Zinc is also extracted by Agnico Eagle at its La Ronde gold mine and by Nyrstar at the Langlois mine near Lebel-sur-Quévillon. According to our information, the zinc extracted by these two players is exported to Manitoba, British Columbia and Europe.

The tonnage of zinc extracted in 2011 by Xstrata was close to 190,000 tonnes of concentrate[9]. After crushing in the Matagami concentrator, almost all this concentrate is shipped to the Salaberry-de-Valleyfield refinery, the 8th biggest zinc refinery in the world and the second biggest in Canada, for processing as refined zinc products. The Salaberry refinery was inaugurated in 1963. Because of its metallurgical properties, a tiny portion of the zinc concentrate leaves Quebec for refining out of province.

Under the terms of an agreement between Xstrata Zinc and the CEZ refinery, Xstrata must supply all the zinc concentrate used by the refinery, up to a limit of 550,000 tonnes per year[10]. Thus, since the Perseverance Mine's production is insufficient, CEZ imports a portion of the zinc ore necessary for the plant's production. Quebec zinc exports are thus offset by Xstrata's higher zinc imports from its other mines located in Ontario, Australia or Peru. In 2012, the refinery is producing at maximum capacity and has a very limited capacity to increase its production.

The CEZ refinery produces zinc in three main forms: 56-pound zinc ingots (30%), 2,400-pound jumbo ingots (58%), zinc shot (10%), and zinc powder (1%). Whether in the form of shot or ingots, zinc allows galvanizing of steel used in the automobile and construction industries. In all, 63% of CEZ zinc is consumed by galvanized steel production in the automobile industry[11], while 15% of the zinc is used in the chemical industry, 12% in the electronic equipment sector and 10% in the construction industry.

CEZ products are delivered by truck, train and ship to the refinery's main customers, North American steel mills that use zinc in their galvanized steel production. Since American zinc production is relatively low, Quebec's proximity becomes a strategic advantage for the primary zinc processing industry. This is reflected in the segmentation of CEZ sales; CEZ sells nearly 70% of its zinc in the United States, as opposed to 20% in Ontario and 10% in Quebec.

Quebec processes nearly twice as much zinc as it extracts.

One of the byproducts of zinc refining is sulphuric acid. It is stored in vats on the plant site and then shipped by train, truck or seaway to chemical fertilizer industry customers[12]. Finally, CEZ also produces between 2,000 and 2,500 tonnes of copper wafers. These wafers are rerouted to the Quebec primary copper processing industry, namely the Horne smelter.

9 Ministère des Ressources naturelles, Gouvernement du Québec, 2012.

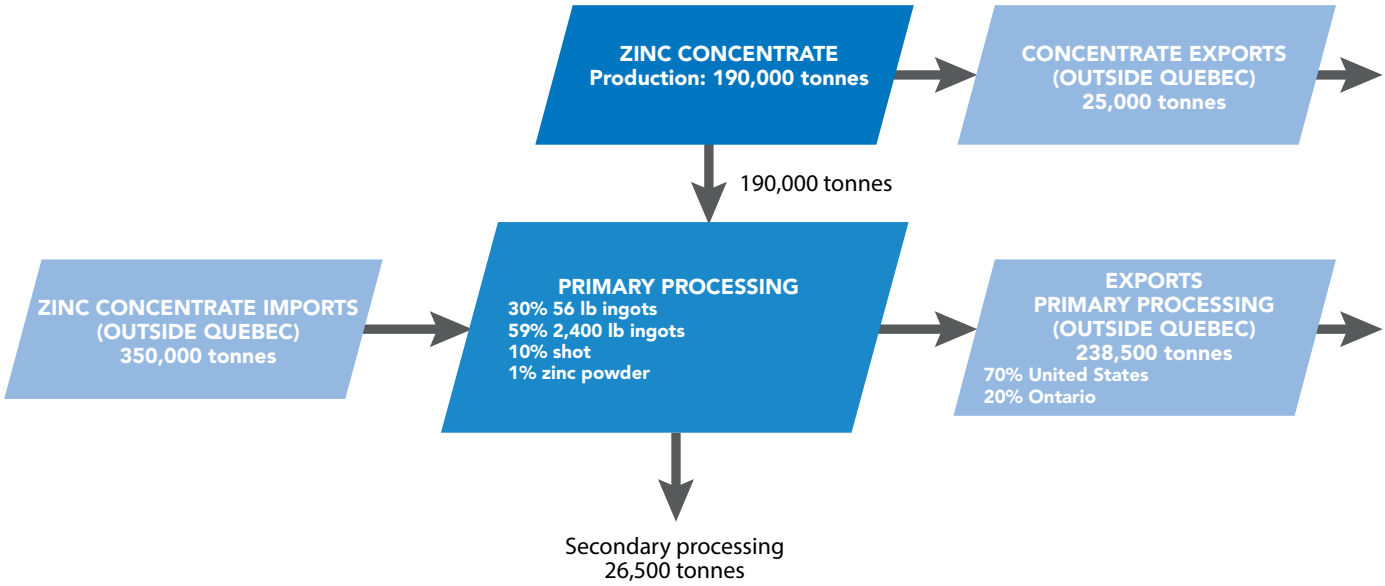
10 Noranda Income Fund, 2012.

11 Noranda Income Fund, 2012.

12 Noranda Income Fund, 2012.

Since Quebec has a major refinery, it can process a larger share of zinc than is extracted in its territory. Figure 13 presents the zinc value chain in Quebec.

FIGURE 13
ESTIMATE OF PRIMARY PRODUCTION AND PRIMARY PROCESSING OF ZINC IN QUEBEC
In 2012, in tonnes



Note: The differences between processing stages are due to losses due to the metal concentration in the original ore and the metal concentration needs for the projected use.
Sources: Industry Canada, interviews with primary sector and primary processing companies, KPMG-SECOR analysis

4.3.5 PRIMARY PROCESSING OF COPPER: NECESSARY IMPORTS

Today, copper is extracted in Quebec as a byproduct of other extraction activities. Thus, the Perseverance Mine (Xstrata Zinc) produces nearly 49,000 tonnes of copper concentrate. However, the copper ore extracted in Quebec is insufficient to supply the Horne smelter satisfactorily. Thus, the Horne smelter, built in 1926 when Rouyn-Noranda was in the midst of a copper mining boom, also procures its copper from other Quebec mines, including Agnico Eagle, which contributes nearly 41,000 tonnes of concentrate per year. These concentrates have a copper content of 20%.

Xstrata also ships concentrate to Horne from its Kidd Miner in Timmins, Ontario (140,000 tonnes), its Strathcona Mill in Sudbury (135,000-140,000 tonnes) or its zinc mine in New Brunswick (35,000 tonnes). The company also resorts to third parties to complete its inputs, such as ore from the Vale Mine in Sudbury (140,000 tonnes) or the Hudson Bay Mine (40,000-45,000 tonnes), or copper from Nevada (70,000 tonnes). In all, the smelter processes nearly 600,000 tonnes of copper concentrate. The imported concentrates have a copper content of 26%.

The Horne smelter stands out for its highly flexible production. Thus, it has a good capacity to receive a wide range of products. In addition to imported concentrate, it uses 100,000 tonnes of copper from recycled materials annually. This recycled copper mainly comes from pipes and scrap from machining operations (58%) and recycled electronic equipment (42%). These recycled materials contain nearly 22% copper.

With an annual processing capacity of 800,000 tonnes, the Horne smelter operates at close to its maximum capacity and produces nearly 200,000 tonnes of copper anodes. Metal quality is very important in the operation of this smelter and an increase in the metal supply could not necessarily translate into a production increase. The company nonetheless is evaluating the possibility of increasing its recycled metal processing capacity of about 100,000 tonnes.

Once copper is processed into anodes at the Horne smelter, it is shipped by train and by road to the CCR processing plant located in Montréal-Est. This plant also belongs to Xstrata. In 2011, the CCR refinery used the copper anodes produced at the Horne smelter and also imported nearly 70,000 tonnes of copper anodes (99% copper content) from the Vale and Altonorte Smelters located outside Quebec to produce nearly 264,000 tonnes of copper cathodes[13]. Figure 14 presents primary production and primary processing of copper in Quebec.

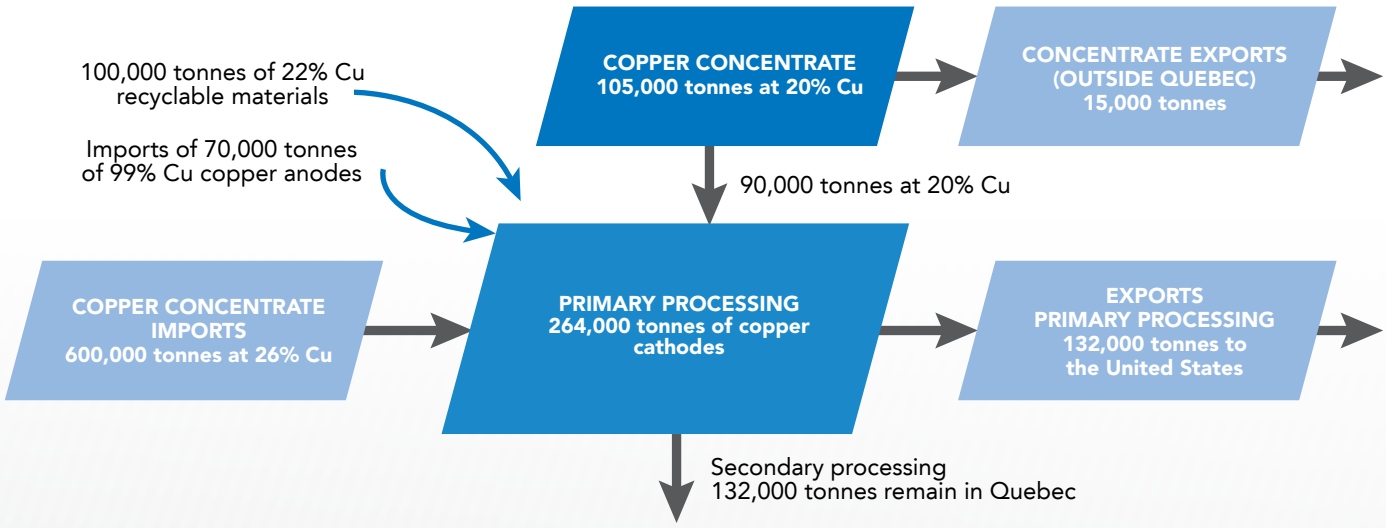
Quebec processes seven times more copper than it extracts.

Nearly 40% of the high purity copper produced is sold to Nexans, located in Montréal, which fabricates machine wire for export to the United States. This machine wire is reprocessed into copper winding wire for generators and engines. The rest of the CCR refinery's production is exported to the United States.

The biggest user of copper is the electronics industry, which consumes 42% of the tonnage to produce cables, engines, conductors, transformers, etc. Construction is also a major consumer, with 28% of the tonnages produced, which are used in the production of copper pipes, window components, roofing, shingles, etc. The last third goes to the transportation industry (12%), general consumer goods (9%) and industrial machinery (9%)[14]. Copper is then used in automobile parts, tanks, joints, conductors, utensils, chains, pins, tools, etc.

We should note that the CCR plant's production also allows recovery of nearly 400 ounces of gold and 1,000 ounces of silver per year. These precious metals are then sold on the London Bullion Exchange.

FIGURE 14
ESTIMATE OF PRIMARY PRODUCTION AND PRIMARY PROCESSING OF COPPER IN QUEBEC
In 2012, in tonnes



Note 1: The 105,000 tonnes of copper concentrate extracted in Quebec have an average copper content of 20%. Thus, it is estimated that nearly 21,000 tonnes in copper units are extracted in Quebec. Total imports of raw materials correspond to 243,000 tonnes of copper or 92% of Quebec cathode production.

Note 2: The copper cathode production capacity of the Quebec facilities is in the vicinity of 360,000 to 370,000 tonnes, but the Quebec facilities are not operating at maximum capacity, due to a lack of market demand.

Note 3: The differences between processing stages are due to losses due to the metal concentration in the original ore and the metal concentration needs for the projected use.

Sources: Industry Canada, interviews with primary sector and primary processing companies, KPMG-SECOR analysis

13 Xstrata Copper, 2011

14 The Geological Society of America

4.3.6 PRIMARY PROCESSING OF GOLD: A UNIQUE PROCESSING STRUCTURE

In Quebec, Abitibi is the main gold-producing region. However, discoveries of high-content gold deposits are decreasing and mining of low-content deposits has begun. In 2011, the 10 Quebec gold mines supplied 28 tonnes of gold, 1% of world production. Among the leading players in Quebec gold mining are Osisko, Agnico Eagle and Aurizon Mines.

According to the available information obtained, all the gold extracted is shipped to the Royal Canadian Mint refinery in Ottawa. A portion of the refined gold is used to make coins. The largest portion, gold ingots, is then sold to Canadian and international banks. After this sale to the banking institutions, the gold returns to the processing chain and is used in the jewellery industry, in particular, but also in the electronics and high technology sectors.

The processing structure for gold thus is distinguished from that of the industrial metals already discussed, and that of diamonds, presented in the next section.

4.3.7 PRIMARY PROCESSING OF DIAMONDS: INCONCLUSIVE LOCAL PROCESSING EFFORTS

Despite the absence to date of diamonds extracted in Quebec, several efforts have been deployed to develop diamond processing activities in Quebec's territory. In 1998, the Montréal jeweller and cutter Cohenor created the Matane diamond cutting centre in the hope of eventually establishing an international diamond centre there. Following this failure, several other attempts were made to establish a diamond processing industry. The last of these attempts led to the closure of the Diarough plant in 2008.

The low level of success encountered by the establishment of a primary diamond processing industry in Quebec is explained by the failure to achieve several cutting and polishing success factors. Among them is the cost of local labour. Over the past few years, cutting and polishing have been concentrated in low-wage emerging countries, due to the intensive labour involved in this activity. Beyond the cost, Quebec did not have skilled labour experienced in cutting and polishing, lacked specialized financing for diamond cutting shops, and had limited access to raw diamonds.

With the beginning of diamond mining in their territory, Ontario and the Northwest Territories made efforts to establish a diamond processing industry in their territory. These efforts required government intervention, because Canada does not have natural advantages for this type of activity. It is still too early to establish a definitive assessment of the measures taken by these two territories, but the net benefits to date appear to be very limited.

4.3.8 SUMMARY OF THE PRIMARY PROCESSING ACTIVITIES FOR THE MAIN TRADITIONAL METALS

Quebec processes several of the metals extracted in its territory. The level of processing for each industry is established according to the primary processing facilities available in Quebec and critical and historical factors of location of these activities. Thus, Quebec not only processes almost all the zinc and copper extracted in its territory, but also imports these metals to supply its processing facilities. A similar situation is observed for ilmenite processed into titanium, because Quebec imports Madagascar sand to process it in its territory.

On the other hand, no nickel processing activity is observed in Quebec. This activity historically has been concentrated in Ontario due to the size and importance of that province's deposits. In the case of iron, the location of the steel mills in the Great Lakes region also explains why processing is performed mainly in Ontario. However, in this case, Quebec has steel mill activities, supplied by scrap steel and relying on power density technology. Table 6 summarizes the local processing percentages according to the industry concerned.

TABLE 6
ESTIMATE OF THE PROPORTION OF PRIMARY PROCESSING OF THE MAIN TRADITIONAL METALS
In 2012, in Quebec, by industry, in tonnes of concentrate, in %

	CONCENTRATE EXTRACTED IN QUEBEC	TONNAGE PROCESSED* IN QUEBEC	RATIO OF EXTRACTED TONNAGE TO PROCESSED TONNAGE
Ferrous minerals (*iron, ilmenite, niobium*)	27.5 million	3.1 million*	11%**
Titanium	1 million	1.3 million	130%
Zinc	190,000	515,000	271%
Copper	105,000	770,000*	733%
Nickel	27,000	0	0%

* Includes imported concentrate, as well as imported scrap, recycled materials and copper anodes.
** The percentage tonnage extracted and processed in Quebec increases to 49% if the pelletizing activities performed in Quebec are included (13 million tonnes of pellets).
Source: KPMG-SECOR analysis

4.4 PRIMARY PROCESSING OF EMERGING METALS: OPPORTUNITIES FOR THE METROPOLITAN REGION

Canada Lithium recently announced the start-up of its Quebec Lithium production sites and its processing plant near Val-d'Or. Their operations will increase gradually over the first quarter of 2013 until their maximum capacity is reached in the second quarter. Quebec thus is on the verge of inaugurating its first lithium carbonate plant. Other companies, like Nemaska Lithium, are also planning to develop primary lithium processing facilities. The company is currently assessing the possibility of establishing a lithium carbonate and lithium hydroxide production site in the Salaberry-de-Valleyfield region. Beginning in 2013, Quebec will proceed with primary processing of the lithium extracted in its territory. When other projects develop, secondary processing activities could emerge.

Beginning in 2013, Quebec will proceed with primary processing of the lithium extracted in its territory.

On the other hand, Quebec does not have any facility allowing primary processing of tantalum or zirconium. Nonetheless, these metals could offer interesting development potential in the future, because their demand is growing fast due to their use in the high technology industry. The metropolis, with its strong presence of industries in this sector, could benefit from this proximity of emerging resources.

4.5 THE MAIN ISSUES OF THE PRIMARY PROCESSING SECTOR

Beyond traditional labour and market access issues, Quebec primary processes are faced with certain challenges specific to the primary metal processing segment.

On the Canadian and international level, Quebec remains a modest-size mineral producer that must integrate into the processing chains of a global market. Thus, the majority of the iron ore extracted in Quebec is shipped to the international markets, and especially to Asia, Europe and the Great Lakes region, where the industry's primary processing capacity is established, due to its proximity to the major purchasers of the metal processing industry. For titanium, zinc and copper, however, Quebec has succeeded in making a place in the global market.

For primary processing, the long-term return on investment in facilities, securing supplies and flexibility of production tools are major competitive factors in the industry.

- **Profitability of primary processing facilities in an overcapacity environment.** No new metal processing facility has been developed in Canada in many years, and the construction of the last Canadian steel mill in the Nanticoke region of Ontario dates back to 1980 (Lake Erie Works). In Quebec, the last major primary processing infrastructure project, the construction of the Sidbec Dosco mill (now owned by ArcelorMittal, in Contrecœur), dates back to 1964. In the past 10 years, the essential incremental processing capacity has been built in emerging countries.

  Due to the underutilization of the main North American steel mills, it appears difficult to change the current picture of Quebec primary processing for iron. Indeed, few companies will be able to justify the addition of extra primary iron processing capacity in a North American industry operating at about 75% of its capacity, with its essential additional demand concentrated in Asia.

  This dichotomy between growing global demand and underutilization of North American processing facilities is also observed for other metals. Today, a Horne smelter is built every eight months in China, while the majority of the existing nickel, copper and zinc processing facilities are operating at between 65% and 90% of their total capacity in North America.

  If Quebec today is able to process metals in its territory and remain competitive internationally, this is mainly because the capital costs of its primary processing facilities have been depreciated. Quebec primary processing companies have offset their remoteness and their higher general costs with much lower depreciation expenses. Since the construction of new facilities does not have this advantage, this makes it more difficult, and even impossible, for Quebec companies to remain profitable or to show a return on investment interesting enough to justify the financial effort. As we will see later, the case of titanium is an exception to this rule.

- **Securing the supply of raw materials.** Quebec extraction of copper, zinc and titanium cannot meet the demand of domestic facilities. Quebec imports ore from Ontario, the United States or other regions. In other words, wherever Quebec processes more metals than it extracts, it must resort to external sources to supply its primary processing facilities and allow them to continue operating. The same is true for other region. Ontario imports Quebec nickel from Raglan, because its local production is insufficient to supply the Xstrata nickel refinery.

  Also, if Rio Tinto has decided to build local ilmenite processing facilities, this is because Quebec plays a major role in this industry on the global scale. The same situation has occurred with Niobec in the niobium industry. Where Quebec plays a leading extraction role (e.g. ilmenite, niobium and soon lithium), the primary processing opportunity becomes more favourable. However, the advantage of the proximity of a world-quality deposit is not enough to guarantee the presence of primary processing.

> *[...] the long-term return on investment in facilities, securing supplies and flexibility of production tools are major competitive factors in the industry.*

The metallurgical quality of a metal also influences its processing site. Thus, depending on the metal's copper, zinc or iron content, it becomes more or less profitable to process it in Quebec. The fit between the mineral qualities of the raw material and the availability of a certain type of processing infrastructure will determine whether the extracted metal can be processed or not in Quebec.

The Quebec industry must stand out from its international competitors, particularly if the product's main destination markets are remote. Quebec then must build competitive advantages on these production costs and thereby on the energy and capital costs that are generally components of major primary processing costs.

The Quebec primary processing facilities must have access to raw materials from out of province. It is important to be prudent in incentives for processing, because an escalation of local processing obligations in several territories could ultimately be harmful for Quebec.

It is important to be prudent in incentives for processing, because an escalation of local processing obligations in several territories could ultimately be harmful for Quebec.

- **The challenge of competitiveness of an auxiliary producer in the global market.** Historically, Quebec was able to develop primary processing facilities, where it played a key role in the global supply of raw materials. If Rouyn-Noranda has a copper smelter, this is because the Abitibi region has long been one of the world's copper capitals. However, Quebec today plays a minor role in the copper industry. The Horne smelter maintains its operations due to its well defined positioning in this industry. Its highly flexible production allows it to process copper and recycled materials that no other copper smelter in the world is capable of accommodating. This niche positioning allows the Horne smelter to stay in operation, using metal that could not be processed elsewhere.

Nonetheless, where Quebec plays the role of small producer, it will be difficult to play a strong hand and be competitive on a global scale, because of its remoteness from the markets. Since Quebec is not located advantageously in relation to the current major metal markets, this activity will be maintained by developing a distinctive positioning. To develop such positioning, a flexible production system is essential.

4.6 PRIMARY PROCESSING CAPACITY AFTER EXTRACTION OF ADDITIONAL TONNAGES

Quebec is currently pursuing several metal deposit expansion and appraisal projects. Thus, it is justified to ask whether these additional capacities could represent a favourable opportunity for Quebec to develop processing of its mineral resources.

Table 7 evaluates the international competitiveness by industry of Quebec primary processing facilities. This analysis is based on five main axes:

- access to a labour pool;
- the existence and current use of production facilities;
- access to markets outside Quebec;
- differentiation of Quebec production;
- economic viability of new facilities.

This table shows that the development of new Quebec primary processing facilities appears to be more interesting in industries such as titanium, lithium and copper. This is explained by the important role Quebec plays as an extractor in the first two cases. For copper, the niche positioning resulting from the flexibility of the Horne smelter's production system allows Quebec to remain competitive, due to recycling of copper-based electronic parts.

The desired processing level in Quebec must be determined according to the companies' competitiveness in a given metal processing sector. Thus, certain industries are more attractive than others, due to Quebec's relative importance in this industry or its ability to deliver a differentiated product. The competitiveness of Quebec primary processing products and the ability to generate a return on investment will have an impact on the economic viability of the facilities. The cost of energy is also an increasingly important factor, because the relative low cost of Quebec hydroelectric power is now in competition with more affordable thermal energy sources. It appears unrealistic to envision an automatic and uniform increase of primary processing tonnages in Quebec's metal industries, because some of them are not competitive enough.

It appears unrealistic to envision an automatic and uniform increase of primary processing tonnages in Quebec's metal industries [...].

TABLE 7
COMPETITIVENESS OF QUEBEC PRIMARY PROCESSING

	ACCESS TO A LABOUR POOL IN QUEBEC		USE OF EXISTING PRODUCTION FACILITIES		ACCESS TO MARKETS OUTSIDE QUEBEC		DIFFERENTIATION OF QUEBEC PRODUCTION		ECONOMIC VIABILITY OF NEW FACILITIES	
	PERF.*	COMMENTS	PERF.	COMMENTS	PERF.	COMMENTS	PERF.	COMMENTS	PERF.	COMMENTS
IRON	👍	• Although certain occupations are in great demand (engineers, metallurgists, welders), the industry has the necessary labour.	👍	• The leading Quebec steel mills are operating at maximum capacity.	👍	• The distance from the market is offset by the depreciated capital costs due to the age of the Quebec facilities. • Quebec is a major player in the niobium industry.	👎	• Commodity market for steel.	👎	• Overcapacity of primary processing facilities. • Niobec, which has a stronger niche positioning, is evaluating an expansion project.
TITANIUM	👍		👍	• The leading Quebec steel mills are operating at maximum capacity.	👍	• Quebec is a major player in the titanium industry.	👎	• Commodity market.	?	
NICKEL	👍		N.A.	• No primary processing facility.	N.A.	• No primary processing facility.	👎	• Commodity market.	👎	• Industry overcapacity.
COPPER	👍		👍	• The Horne smelter is near its maximum capacity.	👍	• The distance from the market is offset by the depreciated capital costs due to the age of the Quebec facilities.	👍	• The Horne smelter exploits a niche in the commodity market.	?	• The Horne smelter is evaluating a copper tailings processing expansion project.
ZINC	👍		👍	• The CEZ refinery is near its maximum capacity.	👍	• The distance from the market is offset by the depreciated capital costs due to the age of the Quebec facilities.	👎	• Commodity market.	👎	• Industry overcapacity.
GOLD	👍		N.A.	• No primary processing facility.	N.A.	• No primary processing facility.	👎	• Commodity market.	👎	• Industry overcapacity.
LITHIUM	👍		👍	• Canada Lithium is on the first of starting primary processing of lithium.	👍	• Quebec could become a major player in the lithium industry.	👎	• Commodity market.	?	• Presence of lithium battery manufacturers in Quebec.
DIAMOND	👎	• A good diamond cutter requires 10 years of practice at unattractive wages.	👎	• Quebec has a few diamond cutting tables in the Matane region.	👍	• Quebec should make a place for itself among diamond wholesalers. A portion of the production could be sold to local jewellers.	👍	• A premium could be paid for the notion of "Canadian diamond".	👎	• The cost of Quebec labour is too high for the province to be competitive.

*Performance
Source: KPMG-SECOR

5
SECONDARY AND TERTIARY METAL PROCESSING

5 SECONDARY AND TERTIARY METAL PROCESSING

The natural resource producing countries are seeking to expand the processing activities in their territory to capture more value added. However, secondary processing activities also respond to location factors, which can favour or not favour their siting near metal production zones.

Quebec has a large number of secondary metal processing businesses. Most of them (88%) are businesses with fewer than 50 employees, and only 3% have more than 200 employees. In territorial terms, the largest concentration of these businesses is in the Montérégie region (24%).

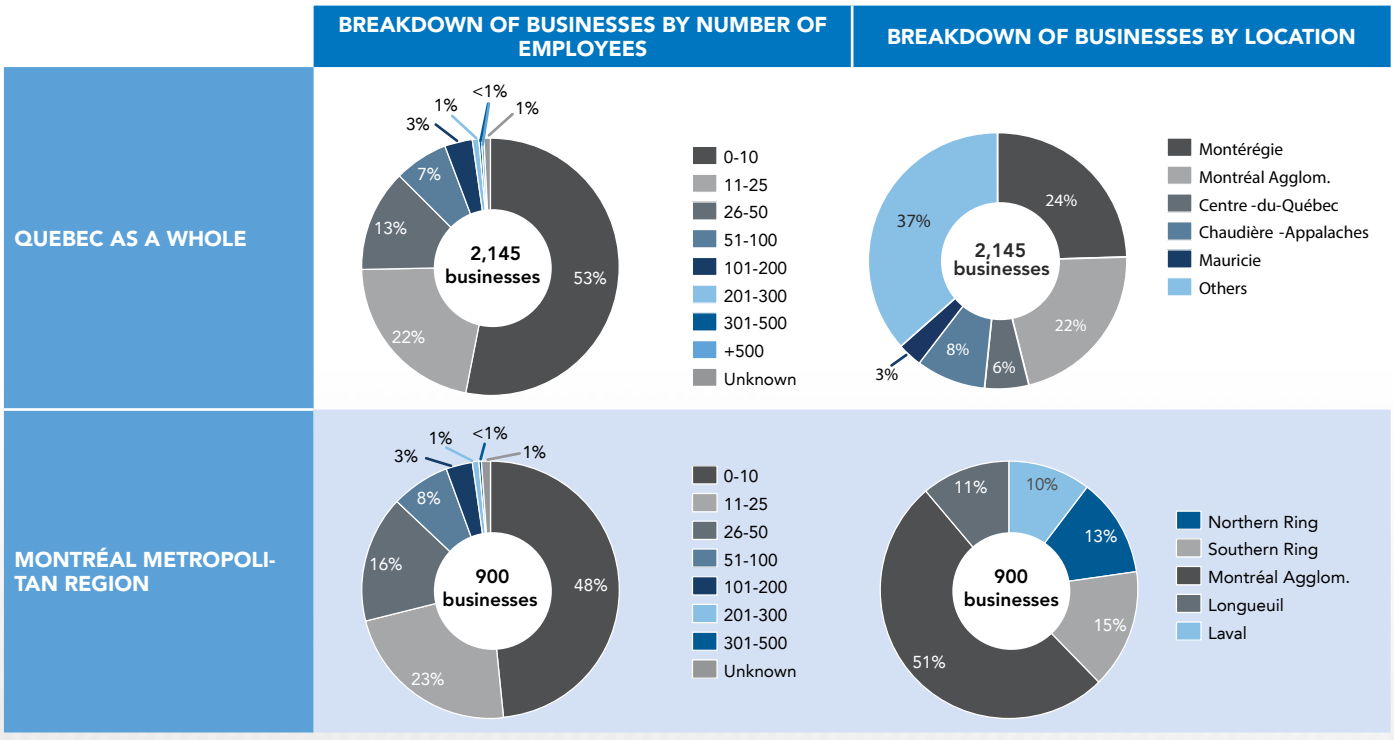
The Montréal metropolitan region accounts for 42% of the total number of secondary processing businesses, with 900 businesses out of a total of 2,145. The businesses in the Montréal metropolitan region have size segmentation similar to those present in the rest of Quebec.

The Montréal metropolitan region accounts for 42% of the total number of secondary processing businesses, with 900 businesses out of a total of 2,145.

FIGURE 15

QUEBEC SECONDARY PROCESSING ESTABLISHMENTS

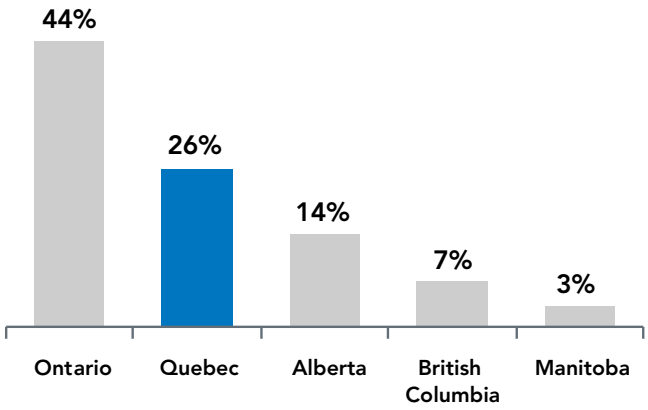
In Quebec, by administrative region, in the Montréal metropolitan region, in %, in absolute numbers



Sources: Réseau de la transformation métallique du Québec, KPMG-SECOR analysis

Quebec businesses represent a large proportion of the manufacturing jobs in secondary processing across Canada. They rank second with 26% of Canadian manufacturing jobs in secondary processing, behind Ontario, which accounts for nearly half of all secondary processing in Canada. This difference is partially explained by the proximity of Ontario businesses to the main automobile industry purchasers in the United States. Figure 16 illustrates the Canadian secondary metal processing industry.

FIGURE 16
BREAKDOWN OF CANADIAN SECONDARY PROCESSING EFFORTS
In 2010, by province, in % of total secondary processing jobs

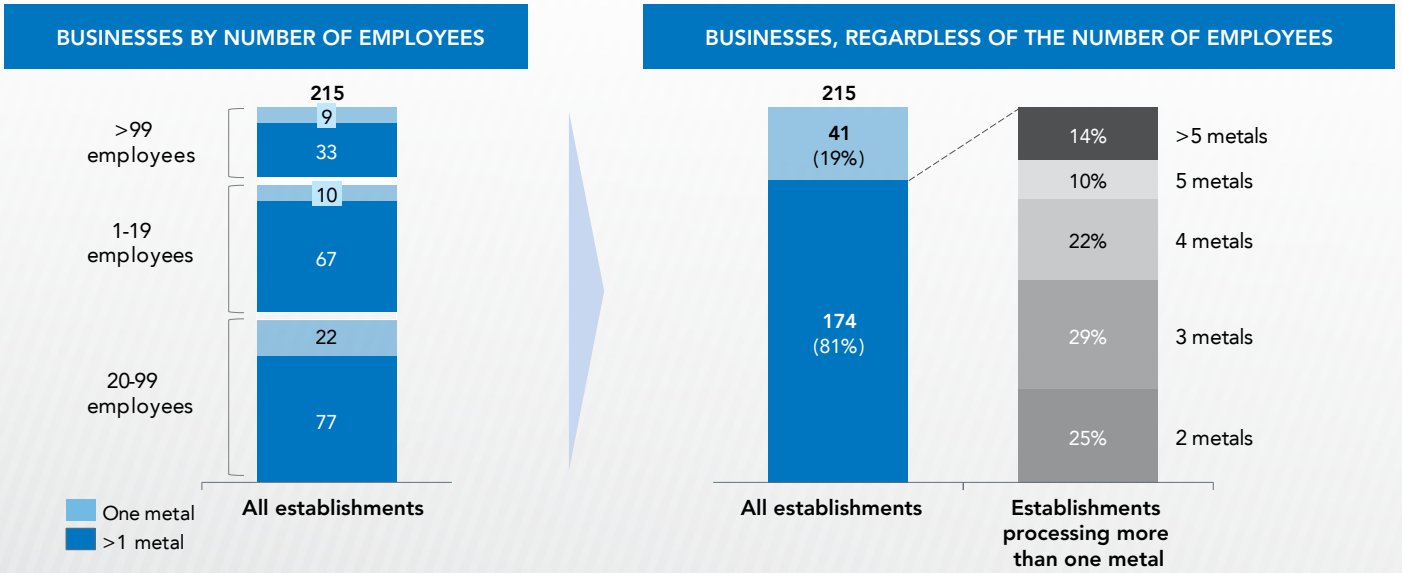


Sources: Statistics Canada, KPMG-SECOR analysis

5.1 PRODUCTS OF SECONDARY METAL PROCESSING IN QUEBEC

Quebec secondary metal processing businesses produce a wide variety of goods. Producing these goods requires a steel base, which then can be galvanized with other metals, such as zinc. This base can also be combined with other metals in the development of a more sophisticated product. Thus, following the example of Montérégie metal processing businesses, Quebec's secondary metal processors rarely use a single type of metal, which makes the secondary metal processing industry more complex. Figure 17 illustrates this situation.

FIGURE 17
USE OF METAL BY METAL PROCESSING BUSINESSES
In 2010, in Montérégie



Sources: E&B Data 2010 survey, KPMG-SECOR analysis

Secondary metal processing businesses are the intermediate links for several Quebec economic sectors. The metals used in secondary processing are rarely used in manufacturing of finished products, but rather in fabricating intermediate products, as illustrated in Figure 18. This proliferation of inputs, both in secondary and tertiary processing, makes the principle of traceability in the metal sector difficult, and even impossible.

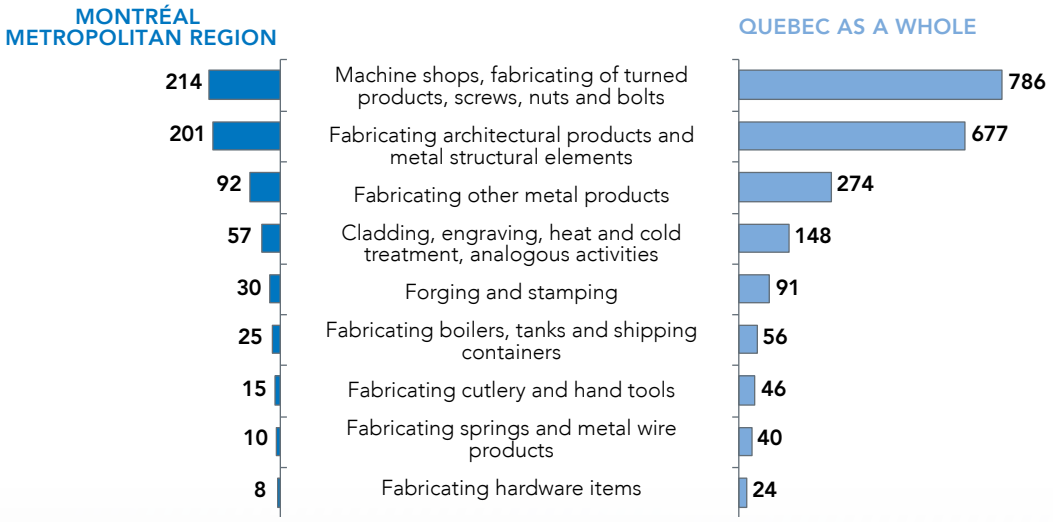
These businesses serve nearby markets as a priority, which is why tertiary processing performed in Quebec is important.

Secondary metal processing businesses are the intermediate links for several Quebec economic sectors.

FIGURE 18

QUEBEC SECONDARY PROCESSING ESTABLISHMENTS BY TYPE OF ACTIVITY

In Quebec, in the Montréal metropolitan region, in absolute numbers



Sources : E&B Data 2010 survey, KPMG-SECOR analysis

5.2 TERTIARY PROCESSING AND ITS CONTRIBUTION TO THE METAL INDUSTRY

Tertiary processing activities are necessary for the dynamism and development of the metal industry, particularly businesses active in secondary processing. A large proportion of the outlets for secondary processing businesses located in Quebec depends on the demand of Quebec industries using metal products. A multitude of different industrial sectors use metal. The main industries include the transportation equipment industry (particularly the aeronautics sector) and the equipment industry (particularly the mining sector).

Thus, the importance of the tertiary processing market can be determined by the breakdown of secondary processing jobs dedicated to production of goods for this market. Transportation (49%), machinery (44%), construction and civil engineering (36%) and energy production (19%) are the main tertiary processing markets. Note that a job may serve more than one sector.

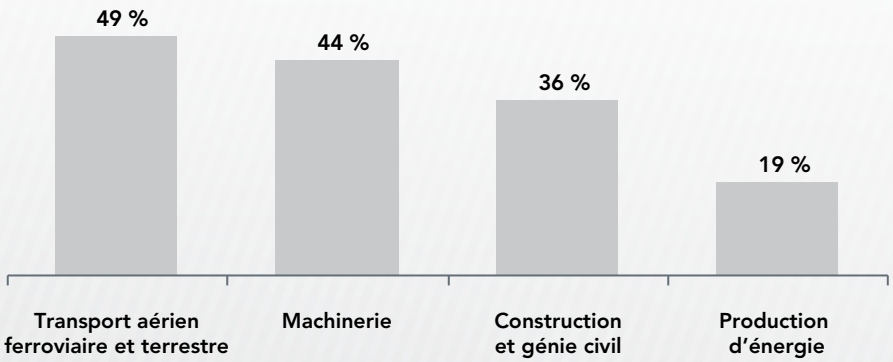
Metal is an important component of the end products made by the companies in the transportation equipment sector. The Quebec aeronautics industry is world-class and one of the world's main hubs in the field. Quebec already has a base of noteworthy activities in the production of railway equipment, buses, trucks and certain components for the automobile industry.

Although it is less known, the Quebec machinery industry is also an active requisitioner of metal products. Quebec has made an interesting place for itself in certain industrial machinery niches, particularly for the mining sector and the primary metal processing sector.

The energy sector also historically has been an engine of the demand for secondary and tertiary metal products. Traditionally, this demand has been concentrated in certain parts or components for hydroelectric projects. However, metal products from the Quebec tertiary processing industry are also found in the nuclear power, gas and petrochemical industries and, more recently, in the wind energy industry (parts and components for wind turbine projects).

The absolute and relative dynamism of Quebec tertiary processing thereby becomes necessary for the development and growth of secondary metal processing businesses. The commercial efforts of the secondary processors are closely related to the growth outlook of the tertiary processors. This situation has been even more noticeable in the past few years, because Quebec secondary processors are seeking to diversify their customer markets. Thus, in a survey conducted in 2010, the secondary metal processors were thinking of developing the alternative energy sector further so that they are less dependent on the machinery, construction and civil engineering, and transportation equipment sectors. The processors were still counting on a nearby market and intended to take advantage of Quebec investments in industries such as wind energy, electric cars or green technologies. If this study had been repeated in 2012, one could have expected a shift of future markets to projects in the mining sector, which were less known and publicized at the time.

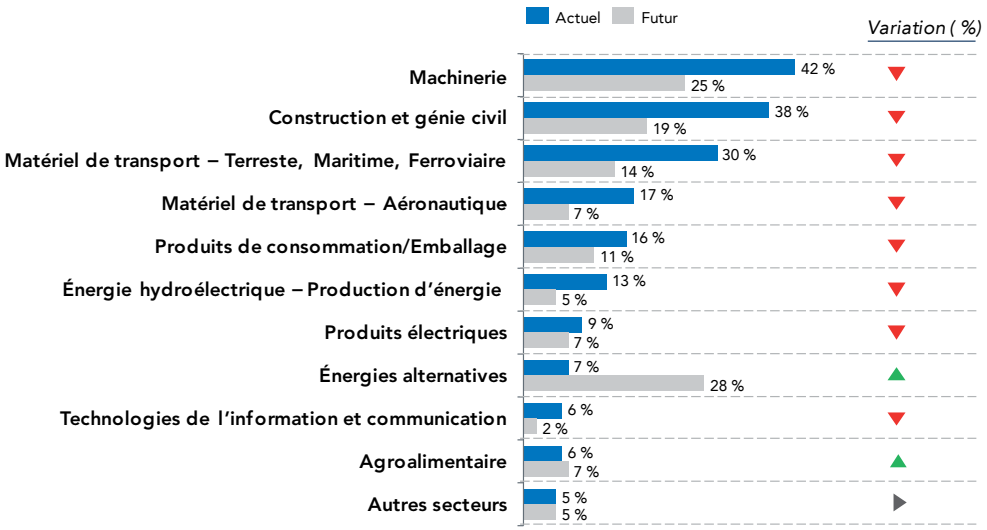
FIGURE 19
JOBS SUPPORTED, BY MARKET
In 2010, in Quebec



Source: E&B Data 2010 survey

The interrelationships between secondary and tertiary processing businesses are more numerous than those between primary and secondary processing and more significant due to the nature of the challenges facing secondary processing businesses. The favourable opportunities for development of secondary metal processing in Quebec will be even greater once the tertiary processing sector is developed and once efforts at integration into tertiary supply chains are achieved.

FIGURE 20
COMPARISON BETWEEN THE CURRENT AND FUTURE METAL PROCESSING MARKETS
In 2010, in Montérégie, % of businesses that declared they served or wanted to serve a specific industrial sector



Sources: E&B Data 2010 survey, KPMG-SECOR analysis

5.3 THE CHALLENGES FACING METAL PROCESSING BUSINESSES IN QUEBEC

The secondary processing businesses are categorical: access to metal has never hindered their development, although it is true that the metal prices vary during economic cycles and may hurt their profitability temporarily. Tertiary processing businesses are not included in this section, because the diversity of this industry's sectors multiplies the specific challenges of each sector.

- **Access to markets becomes an important criterion for secondary processing companies when choosing investments.** Most metal processing companies have developed by focusing on local customers or purchasers. The shift of part of the production of these major purchasers to Asia or elsewhere in the world makes Quebec companies less competitive when they have to secure high-tonnage contracts or when transportation costs play a major role. The same is true of access to the automobile markets south of the Quebec border.

  Several companies questioned for this study mentioned that they were considering the possibility of carrying out part of their expansion outside Quebec to get closer to their customers. This is especially the case for companies in the Montréal metropolitan region, which indicated that they are not operating at their maximum capacity. Finally, it is interesting to note that companies in the regions seem to be performing better, because their products are intended more for the mining sector, one of the most dynamic local users.

- **Diversification of clientele.** For many small Quebec businesses engaged in secondary metal processing, the concentration of clientele is an issue, because some of them have only a few customers. Limiting the risks, growing and diversifying are especially different for these businesses. This is even truer when these small businesses seek to extend their clientele outside Quebec.

- **The *Buy American* clause.** After the local market, the American market remains the main outlet for Quebec metal products. Yet the *Buy American* clause requires American municipalities and States to use steel and iron products made in the United States. The industry expects to have to reckon with an increase in the percentage of American content in the near future, which could again have an impact on its ability to export and the possible dislocation of certain activities of Quebec businesses to the United States.
- **The metal processing sector is conservative and is struggling to innovate.** The Quebec metal processing industry is struggling to renew itself and develop new products and services that allow it to differentiate itself and stand out. During interviews, several successful businesses mentioned that, while they do not stand out by the cost of their product, they have a real competitive advantage due to their reputation, service, product quality, product life cycle or after-sale service.
- **Retirements jeopardize the transfer of technical competencies.** Although it is true that metal processing businesses are faced with a tightening of the labour supply in the skilled trades, none of them told us that they were short of labour to deliver their projects. This could be explained by an ability of businesses to reorganize their production processes based on the available competencies and greater productivity. Nonetheless, several businesses questioned expressed their concern about replacement of the most experienced people in their organization over the next 5 to 10 years, especially with regard to technical competencies.
- **The perception of the metal processing industry.** Quebec secondary metal processing companies seem to be faced with an image problem. The metallurgist's trade no longer has drawing power, especially when it is in competition with high-tech jobs that are more attractive to the new generation of workers. It also seems that municipalities are not always receptive to the establishment of metal processing companies in their territory, fearing potential environmental, visual or noise pollution.

5.4 EXAMPLES OF SUCCESSFUL METAL PROCESSING COMPANIES

The following pages present two companies that have successfully navigated the metal processing industry and point out the lessons that the sector as a whole can learn from them. The study also presents a smaller secondary processing business with challenges similar to those of the sector as a whole. Finally, it focuses on a company midway between secondary and tertiary processing, which has been able to develop a market niche.

VELAN: QUALITY AND INNOVATION, FROM GENERATION TO GENERATION

Velan was founded in 1950 after its founder, A.K. Velan, arrived in Canada. He had the idea of producing a new type of steam trap and filed a first patent for the company in 1953. With this innovative quality product, the company started to go international in 1954, the year when Velan opened a factory in the United Kingdom. Today, the company has nearly 1,800 employees divided among its 15 production sites and 4 distribution centres around the world.

Over the years, Velan has built its success on innovation, the quality of its products and an excellent relationship with its customers. The company has developed a relationship of trust both with its customers and distributors and with its suppliers, developing a network that lets it stay in contact with the most accurate market information possible. This acute knowledge of the market allowed Velan to develop a wide range of industrial valve products and serve several sectors, such as thermal and nuclear power plants, the oil and gas sector, the marine sector, the mining sector, etc.

Due to the great sensitivity of valve products for its customers, Velan has ensured that it is recognized worldwide for its products' quality and durability. Today, the company is preapproved as a preferred supplier by the major customers in each industry its serves. The company also holds all the main approvals certifying the quality of its products.

Aware of the importance of controlling its costs, the company relies on the efficiency of its operations to remain a leader in automated production. Velan is also optimizing its supply and production chain to make the right product at the right time, as efficiently and profitably as possible. Thus certain more specialized products will be made in North America, while mass production will be done where the labour costs are more advantageous.

Finally, although the company has made several acquisitions in the past few years, it has ensured the stability of its executive team. This has let it stay the course, adopting an optimum balance of organic growth and external growth. This structure allows the company to take advantage of good opportunities offered by fast-growing economies, while maintaining a solid foundation.

KEY POINTS: VELAN

OVERVIEW OF THE COMPANY

Year of founding: 1950

Location: Montréal

Number of employees: 1,800, including 870 in Quebec

Revenue: $440 M

Products: industrial valves, steam traps

Services: distributors and maintenance shops worldwide

Velan relies on customer proximity

Customer markets and location

- Thermal, nuclear and cogeneration power plants, oil and gas, refining and petrochemicals, chemical and pharmaceutical products, LNG facilities and cryogenics, shipbuilding, HVAC, mines, water and wastewater, pulp and paper
- 15 production plants worldwide, 4 distribution centres

Main challenges

- Financial context of the difficult global economy
- Operational efficiency in a commodity market
- Remains on the cutting edge of innovation and in the vanguard of the industry

KEY MOMENTS

Differentiation criteria

- Irreproachable products in terms of quality
- Major technical, R&D, manoeuvring test and stress analysis facilities.
- Capacity to respond to special requests/projects
- Close customer relationships, so that it can stay on the cutting edge of market trends and customer needs

Pillars of the corporate strategy

- Developing internationally in high-growth markets
- Procurement to optimize production costs
- Innovating to stay ahead of customer requests
- A stable management model allowing international centralization

Product innovation/R&D

- Partnerships with national and international research centres
- Partnership with the customers
- Acquisition of companies with many specialist engineers

Sources: Literature review, Velan. Corporate website, [Online]. www.velan.com

CMP ADVANCED MECHANICAL SOLUTIONS: OPERATIONAL EXCELLENCE AT THE CORE OF PROFITABILITY

CMP was founded in 1969 by Hans Zimmerman, then a welder with ABB. Like many small businesses in the secondary metal processing sector, CMP began by performing small jobs for his former employer. The business took flight in 1990 when it obtained contracts to make metal enclosures containing electronic telecommunications parts for Nortel.

The business relationship between Nortel and CMP developed so well that during the 2000s, Nortel represented nearly 70% of CMP's sales and one of its factories produced only for this customer. When Nortel went out of business in 2009, CMP lost over two thirds of its sales. This is when the company established a real revenue diversification strategy.

Within the space of six months, due to the resilience of its family management team, CMP implemented revenue diversification and operational efficiency strategies. The company also added the services of an external firm to target the most promising development markets for the company. The company diversified into the railway, national security, industrial equipment, medical equipment, automobile and other sectors.

Beyond mere diversification, CMP also ensured that it met the quality criteria of the major purchasers, particularly by obtaining the necessary standards and certifications. The company also seeks to remain highly flexible so that it can absorb new orders quickly. For this purpose, CMP adopted advanced equipment in machining and metal processing and renews this equipment every three years. The company also innovates by using production support systems for its employees.

CMP today has nearly 350 employees and is seeking to establish a niche by developing more complex products

which can generate additional margins. These products are made in American and Canadian plants. CMP also produces parts at its plant in Guadalajara, Mexico to benefit for potential additional cost savings offered by emerging economies. Following the recent loss of a contract, the company today is seeking to diversify its revenue sources even further and is working on the development of international partnerships to support its growth.

KEY POINTS: CMP ADVANCED MECHANICAL SOLUTIONS

OVERVIEW OF THE COMPANY

Year of founding: 1969

Location: Châteauguay

Number of employees: 500

Revenue: not disclosed

Products: metal enclosures and precision machining

Services: electromechanical design, manufacturing and integration services

Customer markets and location

- Medical industry, ATM machines, industrial, national security, light rail, transportation, energy and electricity, telecommunications
- Head office and design in Châteauguay, Binghamton (New York State), Guadalajara (Mexico)

Main challenges

- Diversify the clientele and secure long-term contracts (rare in the industry)
- Develop international partnerships

KEY MOMENTS

Differentiation criteria

- Manufacture complex niche products on the largest possible scale
- A level of expertise and just-in-time delivery that justify slightly higher prices
- Use the company's resources to identify cost reductions at customers

Pillars of corporate strategy

- Renew the production equipment every three years
- Diversify revenue sources and associate with major prime contractors to generate growth
- Great flexibility in production and prototyping

Product innovation/R&D

- Implementation of Visual Knowledge System, which allows rapid creation of electronic or paper versions of visual instruction files with the effect of increasing labour productivity and flexibility

Sources: Interview, Literature review

USINAGE QUENNEVILLE: INVESTING TO INCREASE PRODUCTIVITY AND REDUCE COSTS

Usinage Quenneville is a secondary metal processing business, located in Salaberry-de-Valleyfield, on the doorstep of the Montréal metropolitan region. Founded in 1903 and bought out in the 1980s by the Demers family, the business was not spared by the 2008 financial crisis and lost several of its customers in the heavy machinery and transportation sectors when they moved their operations out of Quebec.

After this turbulent period, the firm entered a stabilization phase, which allowed it to refocus its activities around five major axes: fabrication and machining, mechanical welding, mechanical welded assembly, maintenance and repair, assembly of machined components, and smelter equipment sales. The so-called traditional activities of Usinage Quenneville (maintenance and repair of industrial parts) now represent nearly 40% of its sales, and precision machining and assembly activities account for nearly 60% of its revenue.

Usinage Quenneville, which has nearly 45 employees, is currently preparing for its growth and is on the verge of making several major investments to modernize its production equipment in order to optimize its costs and continue its growth. To date, the firm has counted on the establishment of partnerships with other major purchasers to develop its sales within and outside Quebec.

After obtaining a major contract from Bombardier, Usinage Quenneville has been able to rely on this multinational to perfect its capacity to deliver products that meet all the needs of the major purchasers, particularly regarding quality requirements. The firm has emphasized innovation of its processes to reduce its production costs constantly while improving the quality of its products.

KEY POINTS: USINAGE QUENNEVILLE

OVERVIEW OF THE COMPANY

Year of founding: 1903

Location: Salaberry-de-Valleyfield

Number of employees: 45

Revenue: not disclosed

Products: fabricating and machining, mechanical welded assembly, maintenance and repair, assembly of machined parts and distribution of machinery parts bound for aluminium smelters

Customer markets and location

- Heavy, chemical, metallurgical, food, heavy equipment and machinery, rubber and railway industries
- 95% of the company's sales are in Quebec

Main challenges

- Diversify the revenue sources
- Meet the quality standards of the "tier one" producers
- Flexibility of the production apparatus and just-in-time production

KEY MOMENTS

Differentiation criteria

- Superior quality and just-in-time delivery, allowing the company to meet the needs of "tier one" producers
- Assemble subcomponents for major prime contractors

Pillars of the corporate strategy

- Lower production costs while constantly improving the quality of the company's products
- Be able to deal with more complex, higher volume problems
- Establishment of a Quality Department

Innovation

- Focused on the production process to give the customers the benefit of cost savings

Sources: Interview, Literature review

SPECTRA PREMIUM: BE IN THE "TOP 3", OR GET OUT OF AN INDUSTRY SEGMENT

Spectra Premium was founded in 1989. The company, which had nearly 25 employees at the time for sales of $2 million, made nearly 95% of its sales in Canada. Today, with nearly 1,300 employees, its sells more than 20,000 different products to the automobile industry. After listing on the stock exchange in 1997, it carried out a dozen acquisitions that allowed it to extend its market and its product line to become a key player in automobile replacements parts in North America. In 2012, Spectra Premium made the majority of its sales outside Quebec and established its position in the OEM parts market, especially for fuel supply systems and steel fuel tanks.

Spectra's development was possible due to a good understanding of the company's business environment. Access to information allowed the company to adapt continuously to its customers' demands. While the company was built on a very precise service offering, it was able to stand out from its bigger competitors by knowing its customers better and arriving on the market with the right product three to six months ahead of the others. For example, Spectra Premium will produce steel tanks for the Volt, Chevrolet's electric car. The Spectra Premium team has adopted the objective to become part of the "top 3" in its industry segment... or get out. This attitude forces

the company to stay in the vanguard to differentiate itself and remain competitive. The company is also developing partnerships with research centres to keep it on the technological cutting edge. Like other Quebec companies, Spectra's entrepreneurial spirit allows it to adapt quickly to changes in demand. Despite its success, the company today is considering the location of its future investments. Since the automobile market is in the Great Lakes region, it is becoming increasingly complicated for Spectra Premium to stay competitive, due to the cost of transportation of its products.

KEY POINTS: SPECTRA PREMIUM

OVERVIEW OF THE COMPANY

Year of founding: 1989

Location: Boucherville, Quebec

Number of employees: 1,300, including 1,175 in Quebec

Revenue: $315 M

Products: 20,000 different products, including steel fuel supply systems and heat transfer systems for automobiles, spare parts and OEM parts.

Services: technical support, online ordering.

Customer markets and location

- Automobile industry (United States, Canada)
- Engineering and sales office in Windsor, Ontario allows maintenance of a close relationship with builders
- Exports from 4 plants in Canada for the spare parts market
- 2 warehouses in the United States

Main challenges

- Competition from manufacturers with low production costs
- Effect of the exchange rate on exports
- Risk of American protectionism

KEY MOMENTS

Differentiation criteria

- **Niche market not previously developed** (new and replacement fuel tanks and oil pans).
- Deployment of an **economic watch process** to take advantage of market opportunities (first on the market) and achieve continuous improvement.
- Listing on the stock exchange in 1997 allowed it to raise funds to make about thirty acquisitions.

Pillars of the corporate strategy

- Be in the "top 3" or emerge from a market segment.
- Continuously develop innovative automobile and industrial parts in anticipation of the market's needs

IInnovation in products/service

- Invested in R&D to provoke changes in the market (steel fuel tanks versus plastic)
- Small flexible and profitable product lines, even for low volumes
- Partnership with research centres (e.g. CRIQ)

Sources: Interview, literature review

6

CONTRIBUTION AND ECONOMIC SPINOFFS OF THE QUEBEC METAL INDUSTRY

6 CONTRIBUTION AND ECONOMIC SPINOFFS OF THE QUEBEC METAL INDUSTRY

Quebec already processes a significant quantity of metals in its territory, and this industry makes a major contribution to the Quebec economy.

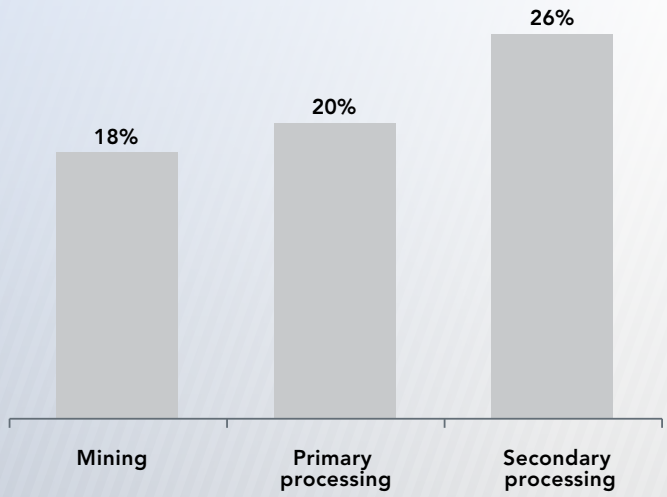
6.1 THE PLACE OF THE METAL INDUSTRY IN THE QUEBEC MANUFACTURING SECTOR

The Quebec metal industry represents a large proportion of Canadian industry. In fact, Quebec ranked second in Canada in 2011 in terms of manufacturing jobs, whether in mining, primary metal processing or secondary processing, with 18%, 20% and 26% respectively of the Canadian total.

In 2011, the primary and secondary metal processing sectors accounted respectively for 56 and 2,145 jobs in Quebec. These businesses provided parallel support to 9,749 jobs in the primary metal processing sector and 40,216 jobs in the secondary metal processing sector. Thus, the metal industry already occupies an important place in Quebec's manufacturing fabric. The primary and secondary metal processing sectors thus ranked 6th and 10th respectively among Quebec's leading manufacturing industries according to the GDP and 2nd and 16th in terms of employment. The sector's relative importance becomes even greater when primary and secondary metal processing are combined.

[...] the metal industry already occupies an important place in Quebec's manufacturing fabric.

FIGURE 21
PROPORTION OF JOBS RELATED TO MINING, PRIMARY PROCESSING AND SECONDARY PROCESSING IN QUEBEC
In % of jobs, Quebec share in Canada



Sources: Statistics Canada, KPMG-SECOR analysis

From 2007 to 2011, the Quebec metal processing industry experienced an evolution similar to that of the Quebec manufacturing sector as a whole. The metal processing sector did not escape the recent upheavals, which led to a global geographical redeployment of the manufacturing sector.

> *The metal processing sector did not escape the recent upheavals, which led to a global geographical redeployment of the manufacturing sector.*

TABLE 8
RELATIVE IMPORTANCE OF THE PRIMARY AND SECONDARY METAL PROCESSING SECTOR

In Quebec, as a proportion of the processing sector as a whole, in millions of $ of GDP, in number of jobs

	GDP		JOBS	
	VALUE	RANK	VALUE	RANK
Food manufacturing	5,262.3	1	57,344	1
Transportation equipment manufacturing	5,016.2	2	35,500	3
Alumina and aluminium production and processing	3,937.0	3	9,090	17
Chemical manufacturing	2,836.1	4	21,618	9
Machine manufacturing	2,764.6	5	29,658	4
Secondary metal processing	**2,675.6**	**6**	**40,216**	**2**
Paper manufacturing	2,404.0	7	25,057	7
Plastic and rubber products manufacturing	2,241.9	8	26,870	6
Wood products manufacturing	2,209.0	9	26,964	5
Primary metal processing	**1,970.0**	**10**	**9,749**	**16**

Sources: Statistics Canada, KPMG-SECOR analysis

6.2 THE TOTAL ECONOMIC CONTRIBUTION OF THE QUEBEC METAL INDUSTRY

The overall economic contribution of the metal processing industry to the Quebec economy must also account for the impacts resulting from its purchasing in Quebec. Considering the Quebec goods and services supply chain, the contribution in total employment by the primary metal processing and secondary metal processing sectors amounts to 19,749 and 55,600 full-time equivalent employment years. In addition, these activities annually contribute nearly $7.6 billion of value added to the Quebec GDP, i.e. $3.1 billion for primary processing and $4.5 billion for secondary processing. Finally, the average wages and salaries for direct and indirect jobs in the Quebec primary and secondary metal processing sector are $56,548 and $43,726 respectively. In comparison, the average annual salary in Quebec was $41,040 in 2012[15].

[…] these activities annually contribute nearly $7.6 billion of value added to the Quebec GDP.

TABLE 9
ECONOMIC IMPACT OF METAL PROCESSING **IN QUEBEC**
For primary metal processing and secondary metal processing, in 2011

	PRIMARY METAL PROCESSING	SECONDARY METAL PROCESSING	TOTAL
Value added (in $M)	3,070	4,511	7,581
Number of jobs (direct and indirect)	19,749	55,600	75,369

Note: Secondary metal processing could include aluminium products, because these companies process more than one metal.
Source: KPMG/SECOR estimates based on simulations by the Institut de la statistique du Québec

On the Quebec-wide scale, the metropolis makes a significant contribution to the economic impact of the primary and secondary metal processing sectors. The Montréal metropolitan region accounts for nearly 25% of Quebec's metal processing activities (over 37% based on the territory of the greater metropolitan region). The following table synthesizes the value added in terms of GDP and the number of jobs represented by the primary and secondary metal processing sector in the Montréal metropolitan region.

TABLE 10
ECONOMIC IMPACT OF METAL PROCESSING **IN THE MONTRÉAL METROPOLITAN REGION**
For primary metal processing and secondary metal processing, in 2011

	PRIMARY METAL PROCESSING	SECONDARY METAL PROCESSING	TOTAL
Value added (in $M)	480	1,282	1,762
Number of jobs (direct and indirect)	3,167	15,727	18,894

Note: Although they are neighbours, the primary processing facilities of RTFT in Sorel and CEZ in Salaberry-de-Valleyfield were not included in the calculation of the spinoffs of primary processing in the metropolitan region, because they are not included in the geographic territory of the Communauté métropolitaine de Montréal. If they were included, the total number of jobs would increase to 8,955 and the value added of primary processing to $1,357 million. Secondary metal processing could include aluminium products, because these companies process more than one metal.
Source: SECOR estimates based on simulations by the Institut de la statistique du Québec

15 Institut de la statistique du Québec

The Montréal metropolitan region accounts for nearly 25% of Quebec's metal processing activities.

Moreover, assuming that Quebec's industrial structure remains unchanged and that Quebec has the capacity to produce more metal products by primary and secondary processing in its territory, each 10%[16] increase in primary and secondary metal processing activities in Quebec would have an impact of around $758 million dollars on the Quebec GDP, or 7,535 additional jobs.

For the secondary processing sector, each 10% increase in secondary processing activities would be equivalent to the activity of about 55 typical businesses in this sector, i.e. SMEs with fifty employees.

[…] each 10% increase in secondary processing activities would be equivalent to the activity of about 55 typical businesses in this sector.

TABLE 11

IMPACT OF A **10% INCREASE IN METAL PROCESSING**

For primary metal processing and secondary metal processing, in 2011

	PRIMARY METAL PROCESSING		SECONDARY METAL PROCESSING		TOTAL	
	QUEBEC	MONTRÉAL	QUEBEC	MONTRÉAL	QUEBEC	MONTRÉAL
Value added (in $M)	307	48	451	128	758	176
Number of jobs (direct and indirect)	1,975	317	5,560	1,527	7,535	1,844

Note: Although they are neighbours, the primary processing facilities of RTFT in Sorel and CEZ in Salaberry-de-Valleyfield were not included in the calculation of the spinoffs of primary processing in the metropolitan region, because they are not included in the geographic territory of the Communauté métropolitaine de Montréal. If they were included, the total number of jobs would increase to 713 and the value added of primary processing to $108 million. Secondary metal processing could include aluminium products, because these companies process more than one metal.

Source: SECOR estimates based on simulations by the Institut de la statistique du Québec.

16 This 10% figure was chosen solely for illustration. Thus, if metal processing were increased by 20%, these figures would be multiplied by two. If it were increased by 30%, they would have to be multiplied by three, etc.

7

ALUMINIUM, AN EXEMPLARY INDUSTRIAL ECOSYSTEM

7 ALUMINIUM, AN EXEMPLARY INDUSTRIAL ECOSYSTEM

The aluminium industry has been established in Quebec for over 100 years. More than 90% of Canadian primary aluminium production capacity comes from Quebec. Some will be rightly surprised at the absence of this industry in our study. The reason is simple: the industry will publish its own study of aluminium processing in a few months. We therefore decided to concentrate our study on other metal ores to complement the study on aluminium that will be available in the spring.

Three main companies are active in Quebec in the aluminium sector: Rio Tinto Alcan, Alcoa Canada and Aluminerie Alouette. More than $3 billion is spent annually in Quebec by these three aluminium smelters. They have 9 aluminium production plants and employ over 11,000 people. In 2011, raw aluminium was Quebec's leading export, with a value of $5.6 billion. Alumina imported to Quebec to produce aluminium had a value of about $1.4 billion, 1.7% of total Quebec imports. Canada is the world's third biggest aluminium producers and the Quebec industry currently procures over 90% of Canadian production capacity.

The presence of major aluminium smelters has allowed the development of a Quebec-wide industrial ecosystem composed of research centres, excellence centres in the major engineering firms, equipment manufacturers and processing SMEs. The Aluminium Association of Canada estimates that about 4,500 Quebec businesses supply the aluminium smelters and that over 1,850 businesses process aluminium. Over 600,000 tonnes of aluminium per year are already processed in Quebec, the equivalent of Aluminerie Alouette's production.

To strengthen its competitiveness and accelerate its development, the industry is currently deploying an industrial cluster that mobilizes all players in the sector, in every region of Quebec.

As shown in our study N*atural Resources: Leverage for the City's Growth,* aluminium has a developed market of industrial users. The Montréal and Montérégie regions respectively accounted for 22% and 27% of the 1,850 processors counted at the time. In the hypothesis of increased exploitation of natural resources, as envisioned in this study, we estimate that the investments and their operating expenditures would result in $4.7 billion in potential spinoffs in the metropolitan region over a 25-year period.

This development is not without challenges, and the cost of energy remains at the core of the competitiveness of Quebec aluminium smelters. Even though they are among the least energy-consuming smelters in the world and use green energy, hydroelectricity, they must compete with the big Chinese and Middle Eastern aluminium smelters. These competitors benefit from advantageous energy costs, and even zero energy costs, due to the gas and coal reserves present in their territories.

While the differentiation of Quebec aluminium due to the environmental characteristics of its production may prove to be an interesting avenue to stay competitive, increased processing in Quebec will allow the industry to stand out by favouring innovation in processes and products. The future aluminium cluster will create leverage that will favour the visibility, development and recognition of Quebec expertise in aluminium processing.

To supply the possible sources of use of aluminium in various processes, the industry can count on several research centres, particularly the global excellence centres of engineering firms such as SNC-Lavalin, Hatch and Bechtel, the Aluminium Technology Centre of the National Research Council Canada, and REGAL, which represents the majority of Quebec university researchers in the field. This link between research and industry is an important source of innovation and competitiveness.

Upstream from production, Quebec and the metropolitan region have built an enviable reputation. Our major engineering firms are recognized internationally for their aluminium expertise. Other sectors benefit from the presence of the big aluminium smelters in Quebec: the metropolitan region alone includes about 1,300 aluminium industry suppliers.

In short, the aluminium industry represents an exemplary industrial ecosystem, which should inspire the metal industry as a whole. Although the challenges and characteristics of the other industries may be different, the sector-based structure and the industrial issues of the aluminium sector and the rest of the metal industry present similarities.

8

AVENUES FOR REFLECTION ON MAXIMIZATION OF INDUSTRY SPINOFFS

8 AVENUES FOR REFLECTION ON MAXIMIZATION OF INDUSTRY SPINOFFS

8.1 AVENUES FOR STRENGTHENING PRIMARY PROCESSING ACTIVITIES

The true potential for expansion of Quebec primary processing activities is concentrated in certain metal industries and must focus on a few major challenges of this sector's businesses. While a very large share of the potential expansion of Quebec primary metal processing activities is located outside the Montréal metropolitan region, it will benefit nonetheless from the sector's increased dynamism.

Quebec can seriously look forward to growing its primary metal processing activities. It benefits from certain advantages to:

- expand into the titanium and lithium sectors;
- capture a little more value from iron extraction; and
- maintain its advantageous positioning in the copper and zinc sectors.

To achieve this, it will be important to pay special attention to the measures concerning investment costs, availability of competitive energy sources, access to imported materials, and specialization of Quebec facilities.

[…] pelletizing can significantly grow the activities performed in Quebec and thus should be considered as primary iron processing for the purposes of the C2I program.

- **Growing the profitability of new investments in expanded capacity.** Primary processing activities are capital intensive. The initial investments to establish a new facility or increase the capacity of an existing facility are heavy. Even though the capital cost is currently low and the companies active in primary processing are generally big, they have limited overall financial capacity and put all their investment projects in competition with each other. It is thus important for the initial cost and recovery of the initial investment to be competitive. This also applies to bigger investments in maintenance of existing capacity. Quebec has adopted various measures over the past few years, some of them in the last budget, to provide incentives for major investment projects. These measures are part of the desired strategy, although they are still temporary and have limits. In particular, two adjustments should be considered to make these measures even more attractive, particularly the last kick-start measure, the 10-year tax holiday (C2I) for investments of $300 million or more. First of all, the minimum investment of $300 million may prove too high for some primary processing project. This risks being the case for the activities of new metal industries or certain projects in the copper and zinc sectors. On the other hand, by not considering pelletizing to be a processing activity, Quebec is depriving itself of an incentive to grow the economic value generated in its territory. Pelletizing is not an activity that automatically comes with iron extraction, and there is even a tendency for some international customers to procure iron concentrate instead of pellets. Yet pelletizing can significantly grow the activities performed in Quebec and thus should be considered as primary iron processing for the purposes of the C2I program.

- **Improvement of the availability of competitive energy sources.** Primary metal processing not only is demanding in terms of capital but is generally energy intensive. Quebec historically has relied on metal processing activities that call for electrolytic processes or that involve major electrical energy needs (such as aluminium, titanium, metal scrap recycling, or zinc). Conversely, Quebec has been placed at a disadvantage for metal processing operations that require thermal energy (such as steel smelters). Access to large blocks of power at Rate L has been much more difficult and uncertain in Quebec in the past few years. Quebec must continue to rely on its electrical advantage if it wishes to grow its primary metal processing activities and increase its production capacity. In addition, the thermal disadvantage is fading in part with the improvement of the gas and oil distribution networks. Projects are under study to improve Quebec access to these energy sources even more. These projects should be analyzed carefully

and undogmatically, because they are the key to the expansion of primary processing in Quebec.

- **Maintenance of good access to imported raw materials.** Quebec must avoid adopting a closed or restricting approach to processing of metals extracted in its territory. Three of the five major traditional metal industries depend on a large supply from outside Quebec. The maximum use of existing production capacity and the use of raw materials compatible with the recipes or processes adopted by the companies are crucial to the competitiveness of primary processing activities. What is important is not necessarily to increase the locally processed tonnage of metals extracted in Quebec, but rather to increase the overall processing tonnage in Quebec, regardless of the source of the metal. Quebec must avoid establishing processing "quotas" for extracted metals and instead seek to facilitate the growth of processing activities in Quebec.

> *Quebec must continue to rely on its electrical advantage if it wishes to grow its primary metal processing activities [...]*

> *Quebec must avoid establishing processing "quotas" for extracted metals and instead seek to facilitate the growth of processing activities in Quebec.*

- **Specialization of Quebec primary processing facilities.** Even though increasingly sophisticated products and alloys exist, the North American steel industry historically has been slow to integrate new processes and technologies that allow it to improve its productivity. Thus, several wholesalers mentioned that they deal with Japan when they are looking for special steels, due to a lack of supply on the North American market. The primary metal processing sector in Quebec must opt for a niche positioning and target specialized segments so that it develops a competitive advantage. However, the points already discussed, particularly the profitability of the initial investments and access to energy, will remain prerequisites for the development of niche primary metal processing products.

Can the metropolitan region benefit from the establishment of such an environment for primary metal processing? The development of the lithium industry in Salaberry-de-Valleyfield, the growth of pelletizing capacity in Northern Quebec and the increase in copper refining capacity in Rouyn-Noranda seem, at first glance, to offer no advantages for the Montréal metropolitan region. However, the opposite is true. Many of the strategic suppliers of these projects are located in the region (professional services, logistics and transportation, equipment) and the head offices of most of the companies concerned are established there. In addition, the metropolis is recognized as an innovation hub, with its many universities and research centres, apart from the fact that these projects can reinforce the entire metropolitan ecosystem of industrial materials.

> *[...] these projects can reinforce the entire metropolitan ecosystem of industrial materials.*

8.2 AVENUES FOR STRENGTHENING SECONDARY PROCESSING ACTIVITIES

The potential also exists for expansion of Quebec secondary metal processing activities. Quebec already has many companies that are very successful in this sector on a North American and international scale. However, the success factors of secondary processing are more numerous and, in some regards, more complex. This does not only mean having a competitive product in terms of costing, but also, and above all, developing a good relationship with the customers and innovating. Since secondary processing businesses are generally smaller and are not connected to international networks, they must meet these challenges with much more limited resources. The Montréal metropolitan region already accommodates more than one third of Quebec secondary metal processing activities and would benefit from better support.

For this purpose, it will be important to pay special attention to the measures affecting the productivity, support for innovation and commercialization, and skills development.

- **Increase productivity.** Secondary metal processing companies operate in an extremely competitive environment. Costs remain and will remain an important factor in the degree of dynamism of this activity in Quebec. The level and evolution of productivity of the Quebec manufacturing sector have been lower than those observed for several competitors over the past few years. Moreover, the secondary metal processing sector has not performed as well as the rest of the Quebec manufacturing sector. This situation must be reversed, because all the sector's other challenges will be difficult to meet if the businesses are unable to perform better on this front. In particular, the secondary metal processing sector must invest even more in automation and digitization of its production processes. These investments are essential not only to reduce the pressure on costs, but to survive the anticipated labour shortages and innovate more regarding products and processes. The manufacturing sector of the Montréal metropolitan region has been severely affected in the past few years, and efforts must be made to assist the secondary processing companies in achieving productivity levels that will let them stand out. In this spirit, measures facilitating or incentivizing investments in Quebec must be encouraged.
- **Improve support for innovation/commercialization.** Innovation regarding products and processes is one of the main success factors for businesses, and the metal processing sector is no exception. Even though business executives recognize this, and despite many efforts by government agencies, this capacity for innovation and for commercialization of innovation remains a weak link for the metal processing sector and midsize companies. Most companies have trouble identifying organizations that could assist them in their innovation process. Furthermore the actions taken by companies are often insufficient or insufficiently targeted to real development potential. It is therefore important for these companies to be supported better and for their integration into the innovation networks to be facilitated. In this regard, inspiration can be drawn for experiences like those of CRIAQ, Alcoa Innovation or mobilizing projects that include components for integrating SMEs into industrial research efforts geared to commercialization of results. The major sector-based strategies in industries such as aeronautics, electric vehicles, renewable energy or environmental technologies must also ensure that there is a place for small and medium enterprises. The same attention is required for policies intended to facilitate exports and internationalization of Quebec companies. The metropolis must also take advantage of its creative environment fostering innovation within its nine university institutions. As shown in our survey during the latest *Rendez-vous du Savoir*[17], collaboration between universities and businesses has not reached its full potential and efforts in this direction will be necessary.

[…] measures facilitating or incentivizing investments in Quebec must be encouraged.

17 BOARD OF TRADE OF METROPOLITAN MONTREAL, *University-Industry Collaboration: Researchers Weigh In*, 2012.

Most companies have trouble identifying organizations that could assist them in their innovation process.

- **Develop competencies.** The problem of labour and competency development concerns all economic sectors in Quebec, but is more acute for some, including the metal industry. The sector's image, combined with its technical needs, accentuates the medium-term succession problem for the businesses active in this industry. The sector's downturn over the past few years has mitigated the immediate impact, but the availability of competencies will reemerge within three to five years, especially if an effort is made to foster this sector's development. Some of the training needs identified can be met through short-term training. Considering that the main need expressed is for acquisition of trade competencies and that the businesses in the sector mainly prefer the journeyman formula to train their personnel, there is reason to believe that workplace apprenticeship programs are one of the solutions to consider in fostering competency development. However, obstacles to this type of training will have to be eliminated, particularly the lack of time and personnel to organize the training, and the replacement of the people to be trained without slowing down production[18]. The metropolis can take advantage of its status as a host city to favour the integration of immigrants into the work environment in order to meet this specific challenge.

- **Consolidate the links between secondary and tertiary processing.** The products made by the Quebec metal processing sector are used by a number of Quebec manufacturers, whether in transportation equipment, industrial machinery, electronic components or energy equipment. The Quebec manufacturing industry and some of its subsectors have been supported over the years by various sector-based strategies. The more the tertiary processing sector will be developed in Quebec, the greater the growth opportunities will be for secondary processing. To be able to seize these opportunities, however, it will be necessary to deploy efforts to integrate metal products of Quebec secondary processing companies into the supply chains of the tertiary processors. Although the use of multiple metals in finished products makes their traceability difficult, efforts can be made to favour a larger proportion of Quebec metals in tertiary processing products.

The more the tertiary processing sector will be developed in Quebec, the greater the growth opportunities will be for secondary processing.

The metropolitan region could benefit from an improvement of the support structure for secondary metal processing businesses. The region's businesses have slightly underperformed those in the rest of Quebec over the past few years[19]. Also, the main supporting organizations likely to be solicited by these efforts carry out all or part of their activities in the Montréal metropolitan region[20].

18 Study on recruitment and training needs in the industrial metal production sector 2012 by PERFORM
19 Analysis based on interviews conducted for this study.
20 In particular, Centre de recherche industrielle du Québec, Investissement Québec, EDC, Sous-traitance industrielle Québec, etc.

9

A FIVE-AXIS STRATEGY TO MAXIMIZE THE METAL INDUSTRY'S SPINOFFS IN THE METROPOLITAN AREA

9 A FIVE-AXIS STRATEGY TO MAXIMIZE THE METAL INDUSTRY'S SPINOFFS IN THE METROPOLITAN AREA

9.1 UNDERSTAND THE SPECIAL CONDITIONS OF METAL PROCESSING

As we explained in the introduction, this study begins a reflection on the place of metal processing in the industrial landscape of Quebec and the metropolis. While several interesting findings emerge, additional research will be necessary to assess the potential of other natural resources, whether ores like uranium, hydrocarbons or forest products. A similar study of aluminium will be released to the public in a few months and will improve our knowledge of local processing. These studies will lead to the implementation of enlightened policies based on acquired knowledge instead of the prejudices to which the Quebec natural resources industry is victim.

This study shows that Quebec processes a large proportion of the metals extracted in its territory. There may seem to be a distortion when discussing the iron industry, but when the other industries are analyzed (titanium, copper and zinc), Quebec is a relatively important player. Each industry has its own characteristics, which should encourage the adoption of specific industrial policies rather than an integrated policy affecting the sector as a whole.

The study shows that Quebec is an auxiliary producer for several mining industries. This reality requires a broader reflection on the development of the metal industry, starting with the royalty regime. While it is obvious that companies must pay their fair share, a negative signal must not be sent to the extracting companies that assure part of the supply of the local processing industry and that are the starting point of a value chain that must be developed. The adoption of natural resources "nationalism", under which mining companies would be compelled to process their ores locally, could prove harmful for the Quebec industry, which uses a large proportion of imported metals to make up for the lack of local resources. The imposition of processing quotas is not the path to follow. It is also essential to question the relevance of addressing the extracting companies when the time comes to promote local processing. Most of the major corporations in the sector already have an integrated value chain, and the smallest businesses do not have the necessary tools to go into metal processing without jeopardizing their business model. Instead, it is necessary to work with the processing industry and allow it to develop so that it can appropriate additional market shares.

9.2 FAVOUR THE EMERGENCE OF A "METAL CULTURE"

Valorization of the metal trades and industrial entrepreneurship are the starting points for the emergence of a metal culture in Quebec and the Montréal metropolitan region. The aluminium industry played this hand successfully over the past few years by fostering synergies downstream and upstream from its value chain.

The industrial synergies of the metal sector are occasional and limited. The deployment of a metal processing cluster or hub, bringing together both primary producers and the primary, secondary and tertiary processing businesses, would allow implementation of concerted actions that support valorization of the industry.

Better concerted action by stakeholders would also make it possible to tackle the metal industry's image problem. Involving the value chain would allow more effective representation activities and would illustrate this sector's importance for the Quebec and metropolitan economy. In the past few months a closer relationship has been developed between the mining and metal organizations. These interactions should be encouraged and increased.

9.3 ESTABLISH A BUSINESS ENVIRONMENT HOSPITABLE TO LOCAL PROCESSING

Public policies favouring major investment projects are a significant advantage for the processing sector. The 10-year tax holiday for $300 million projects is a key factor in an overall strategy aimed at attracting major investments[21]. If improvements can be made, particularly regarding the eligibility of investment projects in iron pelletizing facilities, this is a step in the right direction.

However, concrete action is required in other areas, particularly in terms of royalties and mining legislation. The Mining Act and the royalty regime must be adopted as soon as possible to eliminate the uncertainty that currently hangs over the mining industry. A balanced, stable and sustainable regime is the keystone to many major investment projects.

Regarding the primary processing industry, it will be essential to ensure that it benefits from sufficient energy at competitive costs. To avoid dislocation of primary processors, Quebec must maintain its electrical advantage over competitors that benefit from a growing thermal advantage.

Efforts must be made by the supporting organizations to reach the secondary processing businesses and support them in their commercialization and internationalization strategies. To this effect, the opportunities for meetings between these stakeholders will have to be multiplied. The sector-based supporting organizations then become key intermediaries to define the industry's needs and respond to them adequately, whether in training, labour, market development or best manufacturing practices. A dynamic tertiary metal processing sector will be necessary for the efforts to commercialize Quebec secondary processing products.

21 This tax holiday does not apply to gold and silver smelting or refining.

9.4 ENCOURAGE THE INNOVATION AND PRODUCTIVITY OF OUR PROCESSING BUSINESSES

While innovation supports commercialization efforts, it also improves the productivity of the sector's businesses and lets them play the right cards in a highly competitive market. Innovation and commercialization are vitally important for secondary processors. Commercialization of innovative products will make it possible to meet several challenges, including access to markets, customer diversification and specialization of the Quebec industry.

As the example of successful companies in the sector has shown, investment in high-tech equipment, revision of production processes, revision of production processes, continuing education for employees and specialization in certain market niches are the right avenues to improve the productivity of processors in Quebec and the metropolis. This is especially true, given that the sector benefits from the presence of research centres, technology transfer centres and local suppliers in automation and robotization.

Again based on the example of the aluminium industry, the metal industry could develop a closer relationship with the research centres. The National Research Council Canada has established its Industrial Materials Institute in Boucherville. In addition, Quebec university institutions and researchers are well represented among the recipients of research funds in mineral or materials sciences. Some research teams are also present in companies established in Quebec. Once again, measures must be taken to foster synergy with these key players of the innovation ecosystem.

9.5 BET ON EMERGING METALS TO DEVELOP A NEW PROCESSING SECTOR

Emerging metals meet a growing demand, particularly due to the high-tech industry. Canada Lithium recently announced the start-up of its Quebec Lithium production site and its processing plant near Val-d'Or. On the metropolitan region's doorstep, Nemaska Lithium is currently evaluating the possibility of establishing a lithium carbonate and hydroxide production site in the Salaberry-de-Valleyfield region. Beginning in 2013, Quebec will proceed with primary processing of the lithium extracted in its territory. As other projects develop, secondary processing activities could emerge.

Although in its infancy, extraction of emerging metals in Quebec gives reason to anticipate a promising future in a still undeveloped sector. The opportunities in this sector must be studied to maximize our possibilities for appropriating a substantial share of the global industry engaged in processing these metals. The synergies between this sector and the high-tech industry in the Montréal metropolitan region can be advantageous.

At the core of its valorization strategy for the natural resources sector, the Board of Trade of Metropolitan Montreal will mobilize the various stakeholders in order to maximize the spinoffs from metal processing. We must seize this opportunity to position the industry as an indispensable hub of growth and wealth creation in the metropolitan region.