QUEBEC'S NATURAL RESOURCES: A NATURAL SOURCE OF PROSPERITY

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TABLE OF CONTENT

PREFACE

QUEBEC'S NATURAL RESOURCES: A NATURAL SOURCE OF PROSPERITY

Launched officially on February 16 and 17, 2015, the "PROSPERITE.QUEBEC" campaign will be rolled out over the next three years. It allows all interested parties to share their experience and views. Together, we will be deploying concrete initiatives aimed at stimulating Quebecers' determination to prosper, by highlighting entrepreneurs at the helm of Quebec companies, holding business development forums and creating opportunities for people from all walks of life and all regions of the province to share their ideas about the importance of prosperity, with benefits for and contributions by one and all.

In order to encourage open dialogue and bring stakeholders together, we have decided to carry out about a dozen studies and research projects on various levers for prosperity. The findings will be released gradually over the next three years.

This is the second study in the series. It highlights the importance of so-called "traditional" natural resources in the economy. The contribution of these resources is felt in terms of jobs, exports, added value, innovation and government revenue.

Companies in the natural resource sector contribute to our prosperity in a number of ways: they raise our standard of living; they pay higher-than-average wages; they contribute to economic diversification and regional development; they drive international trade dynamics that boost our prosperity; they help reduce economic inequality.

Quebec has the good fortune to be able to count on abundant and diverse natural resources (mines, forests, energy), and the potential of these resources has yet to be fully developed. In this economic context, there are two inseparable and interdependent truths: resources are an essential economic lever for ensuring our collective prosperity; and it is important that we develop our resources responsibly, in a spirit of respect for the environment and communities.

Quebec lags behind the Canadian average when it comes to GDP and disposable income. Natural resources can help us eliminate this gap and meet citizens' quality-of-life needs in areas like health, education and social protection for the underprivileged.

Yves-Thomas Dorval
President and CEO of the Quebec Employers Council

INTRODUCTION

Quebec boasts 25% of North America's hydroelectricity, 3% of the world's freshwater reserves and numerous and diverse mineral deposits, and 45% of its territory is covered by forest. Far from being exhausted, the economic development potential offered by Quebec's natural resources remains considerable, in particular in the hydroelectricity, mining and forest sectors, to which we can add hydrocarbons, for which potential sources exist, especially on the Gaspé peninsula, in the Anticosti basin and on the Gulf of St. Lawrence and the St. Lawrence Plain. Quebec is thus doubly privileged, in terms of both the scope and diversity of its resources.

The natural resource economy comprises two inseparable and interdependent components. On the one hand, natural resources are an essential economic lever that we have to use in order to ensure our prosperity. Natural resource development feeds the entire economy and allows companies to produce, invest and innovate. It also provides consumers with access to diversified, high-quality goods and services that improve their daily lives. Natural resource development activities create thousands of jobs, stimulate regional economic development and fund a substantial share of public services through the taxes they generate, including taxes on wages.

On the other hand, natural resource development has to be responsible, respectful of the environment and communities, and ensure lasting economic development for future generations. In Quebec, the Ministère de l'Énergie et des Ressources naturelles (MERN — energy and natural resources), the Ministère des Forêts, de la Faune et des Parcs (MFFP — forests, wildlife and parks) and the Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques (MDDELCC — sustainable development, the environment and the fight against climate change) provide the necessary structure by implementing their policies and controlling economic activities in keeping with the relevant legal and regulatory frameworks. In addition, in today's world, companies are aware of the impact of their activities on the environment and are committed to applying good practices, often above and beyond those required by the regulations with which they must comply. Other jurisdictions, such as Norway and Australia, have improved their citizens' standard of living and quality of life by developing their natural resources, and, closer to home, certain U.S. states and Canadian provinces oversee resource development in a variety of ways.

This brief analysis focuses mainly on the first of the two above-indicated components, namely the economic contribution of natural resources to Quebec's prosperity. Following a short description of the main natural resource sectors, we present the changes in their relative importance in terms of economic production, jobs and exports. We then describe the sectors' contribution to prosperity, using other indicators and taking into account aspects such as demographic changes and international trade. Throughout the document, we discuss issues that affect the enterprises involved in the various natural resource sectors.

ON THE ONE HAND, NATURAL RESOURCES ARE AN ESSENTIAL ECONOMIC LEVER THAT WE HAVE TO USE IN ORDER TO ENSURE OUR PROSPERITY.
ON THE OTHER HAND, NATURAL RESOURCE DEVELOPMENT HAS TO BE RESPONSIBLE, RESPECTFUL OF THE ENVIRONMENT AND COMMUNITIES, AND ENSURE LASTING ECONOMIC DEVELOPMENT FOR FUTURE GENERATIONS.

Our analysis does not cover fishing, potable water or agrifood industry products — sectors with their own specific features and fundamental differences with the three sectors under study, which are strictly related to the land. They could be studied separately. Nuclear, solar and wind power are included in the energy figures, but are not analysed in detail due to their specific nature. Similarly, the study does not discuss the use of forest products as a source of energy, biofuels or other renewable forms of energy. These sectors, including relatively new, emerging niches with high technological and environmental potential, could be examined in future dedicated studies.

PROFILE OF QUEBEC'S MAIN NATURAL RESOURCE SECTORS

This study provides an expanded profile of three large sets of natural resource industries, namely forests, minerals and metals (mines) and energy. These categories cover both resource extraction (Table 1, left-hand column) and processing (right-hand column). For example, forestry comprises all rough timber harvesting activities (extraction), whereas pulp, paper and paperboard and wood products that are not finished products fall under the heading of natural resource processing. Support activities for mining are classified in the raw materials category, and forging falls under processing. As for energy, this sector also includes pipeline transportation of hydrocarbons, natural gas distribution and electric power transmission.

Table 1 illustrates the main sectors covered in this report. More details, according to the North American Industry Classification System (NAICS), are provided in the annex.

TABLE 1: SECTORS COVERED BY THE ANALYSIS

	EXTRACTION	PROCESSING
FORESTS	Forestry and Logging Support Activities for Forestry	Wood Product Manufacturing Paper Manufacturing
MINES	Mining and Quarrying (Except Oil and Gas) Support Activities for Mining	Non-Metallic Mineral Product Manufacturing Fabricated Metal Product Manufacturing Primary Metal Manufacturing
ENERGY	Oil and Gas Extraction Coal Mining Other Metal Ore Mining Services to oil & gas extraction Electric Power Generation, Transmission and Distribution Natural Gas Distribution Pipeline Transportation	Petroleum Refineries

FORESTS

Quebec forests cover more than 760,000 square kilometres, and over 90% of this area is public land. In 2014, the Quebec forest sector featured approximately 130 sawmills, about 30 pulp, paper and paperboard mills and some 20 panel plants.

The forest industry is a driving force for economic development and a source of diverse spin-offs in the places where it is present. Wood is a renewable natural resource, and the development of this industry is aligned with both economic and environmental imperatives. In 2014, companies in forestry generated a combined annual turnover of $15.7 billion. The sector also provides about 61,000 direct jobs and 100,000 indirect and induced jobs, for an annual payroll of $3.1 billion. It is one of Quebec's main exporters, selling $8 billion in products abroad annually. The United States housing market is the main export market for softwood lumber and deciduous appearance wood products. The forest sector also contributes to the development of 250 Quebec municipalities, including over 100 that depend entirely on it, as well as to the vitality of Montréal, where forest company head offices spend nearly $200 million a year. According to estimates, each cubic metre of harvested wood generates $60 in tax and incidental tax revenue for the Government of Quebec (including royalties) and $30 for the Government of Canada. Quebec forest industry practices are governed by a legal and regulatory framework that a Yale University study[1] describes as one of the world's most rigorous, and are among the best in any country. A good example is the ecosystem-based forest management methods, designed to recreate conditions similar to natural disturbances.

IN 2014, COMPANIES IN FORESTRY GENERATED A COMBINED ANNUAL TURNOVER OF $15.7 BILLION. THE SECTOR ALSO PROVIDES ABOUT 61,000 DIRECT JOBS AND 100,000 INDIRECT AND INDUCED JOBS, FOR AN ANNUAL PAYROLL OF $3.1 BILLION.

Since 2013, Quebec has developed a forest management model aimed at better, more sustainable management of the province's forest heritage and at creating wealth for communities. Despite the government's good intentions, this model has generated certain difficulties for companies, especially in terms of supply costs. Contrary to popular belief, Quebec forests' potential for sustainable production is underexploited. Over 50 million cubic metres of wood authorized for harvesting — equivalent to two years of felling — were not harvested between 2008 and 2013. While the U.S. real estate and financial crisis and the decline in global newsprint demand are partially responsible for this situation, the Quebec forest industry's competitiveness remains a critical factor, among other reasons due to the cost of logs in Quebec. Uncertain supply is one of the sector's key issues. Quebec's forest cover is not disappearing; to the contrary, it has increased slightly since 1979.[2] It is also important to keep in mind that if we do not harvest the forest's natural product, Nature will take care of destroying forest surpluses, without recovering the social and economic benefits.

1 http://www.fpac.ca/publications/2004_HowCanadaCompares.pdf
2 Rapport du Forestier en chef http://forestierenchef.gouv.qc.ca/images/stories/BAFD/accueil/bilan_2000-2008.pdf

MINES AND MINERALS

The mines and minerals sector is another pillar of Quebec's economic development, especially in northern regions. Despite the perceived image of unbridled mining development in Quebec, there were just 31 operating mines in 2013: 5 base metal mines, 15 gold mines, 5 ferrous metal mines and 6 industrial mineral mines. There are also hundreds of other sites where construction materials such as stone, sand, gravel and cement are extracted or produced. Operating mines occupy just 0.005% of the territory of Quebec.[3]

Historically, the value of Quebec mineral shipments grew consistently from 1989 to 2005, at an average rate of 2% per year. As of 2005, propelled by a sharp increase in metal and mineral prices, the value of mineral shipments grew at an average annual rate of 11%, for an increase of close to 160% over a 10-year period.

Quebec mineral shipments added up to $8.7 billion in 2014, the highest level since the historic peak of $8.5 billion in 2011.[4] Ore-bearing minerals accounted for 77% of the total value of mineral shipments by substance group, industrial minerals made up 12% and construction materials accounted for 11%. Four regions of Quebec were responsible for 88% of mineral shipments in 2013, namely Côte-Nord, Abitibi-Témiscamingue, Montérégie and Nord-du-Québec.

IN 2013, THE QUEBEC MINING SECTOR EMPLOYED ABOUT 88,000 PEOPLE, INCLUDING 18,000 IN MINING AND QUARRYING AND MINING SUPPORT ACTIVITIES.

The mining sector's economic spillovers are considerable in terms of investments, jobs and wages. Following nine years of growth and an all-time high of $5.1 billion in 2012, mining investments declined for two years in a row in Quebec, to $3.2 billion in 2014. Almost all of these investments are concentrated in three mining regions, namely Nord-du-Québec ($1.6 billion), Côte-Nord ($0.8 billion) and Abitibi-Témiscamingue ($0.8 billion). As we pointed out in our first study on prosperity, thanks to the presence of highly productive resource industries, the local economy of these regions is proportionally higher than the regions' demographic weight in Quebec. Thus any decline in shipments has a significant socioeconomic impact for the communities concerned.

In 2013, the Quebec mining sector employed about 88,000 people, including 18,000 in mining and quarrying and mining support activities. The lion's share of jobs in the mining sector was generated by processing industries. Close to 14,000 people were employed in non-metallic product manufacturing, 16,000 worked in primary metal manufacturing and 40,000 worked in fabricated metal product manufacturing.[5]

3 http://www.azimut-exploration.com/fr/presentations/AZIMUT_Les%20Mines_au_Quebec_1_Oct_2013p.pdf

4 Unlike the figure for 2011, the amount for 2014 is preliminary.

5 CANSIM, table 281-0024.

New Quebec legislation regarding mines and mining royalties

The debate on mining royalties has received extensive coverage over the past few years. On the heels of a mining royalties forum, the Government of Quebec presented its new mining tax regime in May 2013. It is based on five fundamental principles: all mining corporations must pay royalties; Quebecers must benefit more extensively from mining operations; there have to be more jobs in the processing sector; exploitation of mining resources has to be more responsible; and the regime has to be more transparent.

More tangibly, two major changes were implemented: all mine operators must now pay a minimum royalty and a progressive mining tax scale based on operator profit margin was introduced. The new regime is one of the most demanding in Canada. It should also be noted that the new Mining Act requires that a financial guarantee be submitted along with the rehabilitation and restoration plan to cover the anticipated cost of completing the work required under such plan. A restoration plan now has to be approved before a mining lease is granted. In addition, the financial guarantee has been increased to 100% of the restoration costs for the entire site and must be paid within two years following approval of the restoration plan.

ENERGY

Electricity is by far the leading type of energy produced in Quebec.[6] In 2014, electric power production totalled 200 terawatt-hours. Ninety-seven percent of this energy was produced by hydroelectric generating stations and 99% of it was renewable. Electricity is also the most widely used energy in Quebec, accounting for 40% of total energy consumption in 2014.

Half of this electricity was used by industry. Quebec population are well aware of Hydro-Québec's huge contribution to Quebec's economic and social development since the 1960s. With 20,000 employees, the government-owned utility accounts for about 4% of the province's GDP. In 2014, Hydro-Québec paid a record dividend of $2.5 billion to the Quebec government, on top of $656 million in water-power royalties. Net electricity exports added up to $1.5 billion. The utility also purchased $3.1 billion in goods and services from companies located across Quebec and devoted $31 million to community investments.

The share of oil (38%) was slightly lower than that of electricity, with three-quarters being used for transportation. Natural gas and biomass made up 14% and 7%, respectively, of total energy consumption, with industry as the main user in both cases. All told, fossil fuels accounted for close to 52% of the total.

Moreover, according to federal government data, the Gulf of St. Lawrence and surrounding regions could contain recoverable reserves of 39 billion cubic feet of gas and 1.5 to 2 billion barrels of oil[7] — potentially, enough to meet Quebec's needs for close to 20 years. Forty-three billion barrels of oil could lie beneath Anticosti Island.[8] The Galt oil field, near Gaspé, contains over 330 million barrels of oil-initially-in-place, about 15% of which could be recovered. It is important to note that the oil discoveries on the Gaspé Peninsula and Utica shale gas discoveries are proven energy resources. There are currently two moratoriums in Quebec on oil and gas activities. The first moratorium prohibits exploration and extraction in the St. Lawrence River and Estuary, and is permanent. The second prohibits exploration and extraction in the Gulf of St. Lawrence and Chaleur Bay; it will be maintained until an appropriate management framework has been implemented and all of the criteria for protecting the marine environment are in place.

MOREOVER, ACCORDING TO FEDERAL GOVERNMENT DATA, THE GULF OF ST. LAWRENCE AND SURROUNDING REGIONS COULD CONTAIN RECOVERABLE RESERVES OF 39 BILLION CUBIC FEET OF GAS AND 1.5 TO 2 BILLION BARRELS OF OIL — POTENTIALLY, ENOUGH TO MEET QUEBEC'S NEEDS FOR CLOSE TO 20 YEARS.

Like all developed societies, Quebec wants to reduce its hydrocarbon consumption and diversify its sources of energy with a view to shifting to renewable and green energy or, if applicable, energy offering optimum performance and efficiency to meet needs. The government has implemented concrete measures in this area in recent years. Financial assistance programs have been established in the business, residential and transportation electrification sectors. According to various scenarios, oil consumption will nevertheless remain substantial for the coming decades. Regardless of the orientations retained in the future energy policy, hydrocarbons will continue to have a major place in Quebec's energy mix

6 The other type of energy produced locally comes from biomass (fuel wood and forest waste).
7 « Gestion des hydrocarbures : Ottawa et Québec progressent », La Presse, October 14, 2014. http://hydrocarbures.anticosti.com/imports/medias/documentations/2015-05-21-mai-rapport-sproule.pdf
8 see also http://hydrocarbures.gouv.qc.ca/faq.asp.

and economy. These sources of energy have numerous advantages that make it difficult to replace them for certain uses.[9] Fossil fuels also have non-energy uses, as raw materials for a wide array of goods such as chemical fertilisers and plastics,[10] which, depending on the end use, contribute in a major way to citizens' quality of life.

Hydrocarbon development in Quebec would have considerable economic spin-offs. It would create expertise, direct, high-quality jobs and employment with Quebec suppliers. Exploration alone would generate a large number of direct jobs with exploration companies, in addition to numerous jobs with their suppliers. Extraction activities would create employment and economic spin-offs in the target regions, and the government would receive substantial revenues in the form of royalties and direct and indirect taxes. These revenues could be reinvested wisely in developing means of transportation and technologies that would allow us to reduce our dependence on oil.

According to government sources, the economic impact of the Anticosti project could add up to $45 billion over a 30-year period, in the form of royalties, taxes and profits generated by equity investments.[11] These revenues could help Quebec reduce its public debt and Quebecers' tax burden, or be used to fund various expenditures deemed essential.

In addition, extraction of oil and gas resources would allow Quebec to reduce its trade deficit, a non-negligible share of which is due to hydrocarbon imports. On average, Quebec imports 350,000 barrels of crude oil per day and refines it into different petroleum products. In 2013, the net value of hydrocarbon imports was about $18 billion. Hydrocarbons from Africa (particularly Algeria and Nigeria) accounted for the largest share of these imports. Other major sources of oil imports are the United States, Eastern Canada, Kazakhstan and the North Sea.[12]

It could thus be more efficient to extract oil in Quebec instead of importing it from thousands of kilometres away, from countries that, in some cases, are exposed to major geopolitical tensions or are less vigilant than us regarding the environment.

9 Commission sur les enjeux énergétiques 2013 : « De la réduction des gaz à effet de serre à l'indépendance énergétique du Québec ». Document de consultation.

10 HEC Montréal, Chaire de gestion du secteur de l'énergie. L'état de l'énergie au Québec, 2015.

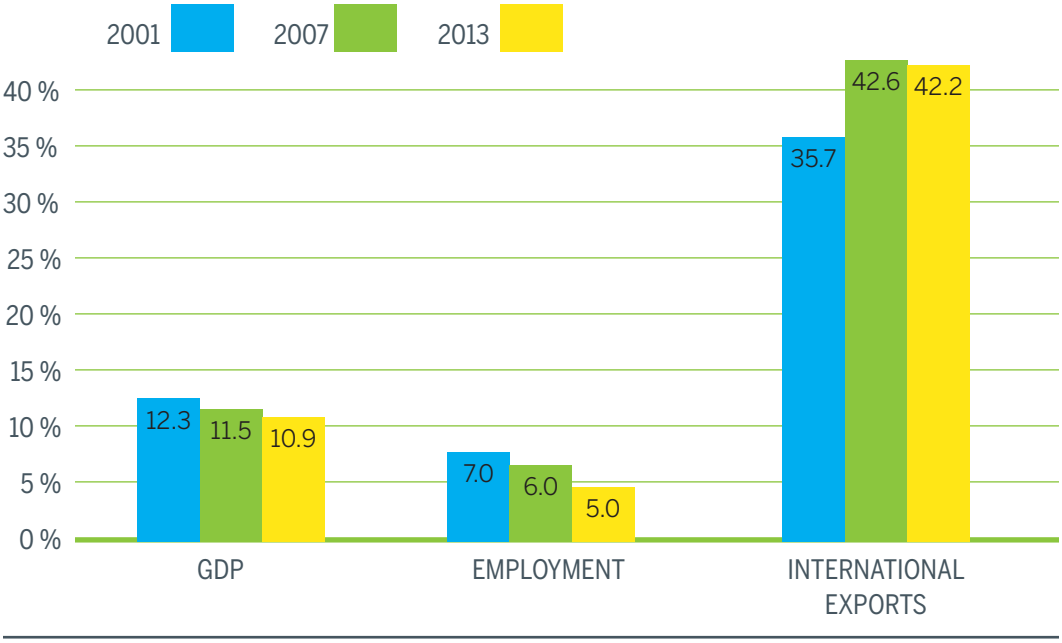
11 https://www.premier-ministre.gouv.qc.ca/actualites/communiques/details.asp?idCommunique=2380

12 According to the Ministère de l'Énergie et des Ressources naturelles (MERN), the United States replaced Algeria in 2014 as the number-one source of Quebec crude oil imports.

ECONOMIC IMPORTANCE OF NATURAL RESOURCES

Indicators such as gross domestic product (GDP), jobs created or supported and investment projects are useful for illustrating the various ways in which natural resources are part of our economic life. Natural resource development activities evolve over the years and vary depending on the three major categories of resources, and this suggests some comparisons.

CHART 1: IMPORTANCE OF NATURAL RESOURCES TO THE QUEBEC ECONOMY (% OF GDP, EMPLOYMENT, EXPORTS)



Sources: CANSIM tables 379-0030 and 281-0024 and Industry Canada, Trade Data Online. Compiled by the authors.

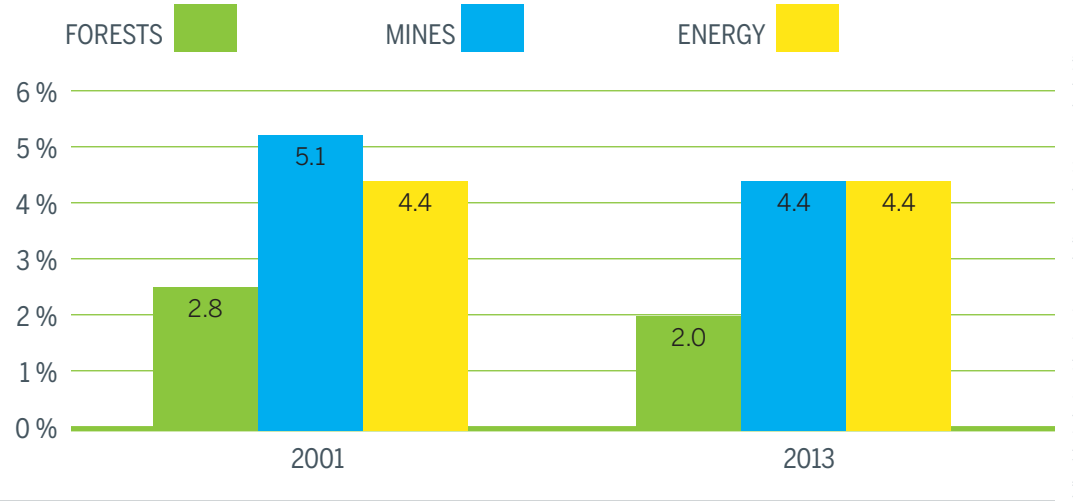
Overall, natural resources account for about 11% of GDP, 5% of employment and 42% of exports. There has been a relative decline in natural resources' importance to the Quebec economy in recent years, given the long-term trend towards expansion of the service sector and negative growth in the primary and secondary sectors (Chart 1). Hence, their share of GDP shrank from 12.3% in 2001 to 10.9% in 2013.[13] Nevertheless, natural resource exports grew significantly over the same period, from 35.7% to 42.2% of total exports.

OVERALL, NATURAL RESOURCES ACCOUNT FOR ABOUT 11% OF GDP, 5% OF EMPLOYMENT AND 42% OF EXPORTS.

In April 2015 the Quebec government announced that it was reviving its "Plan Nord" which, among other things, focuses on responsible development of natural resources in northern Quebec as a way of creating wealth for Quebecers. Plan Nord offers major opportunities and challenges for the natural resource sector, especially forestry and mining. The Quebec forest industry harvests over 50% of its wood in the Plan Nord territory. Plan Nord will also require a considerable energy supply.

A number of investment projects have been announced by the forest industry in 2015, including the Uniboard project at its Val-d'Or particle board and thermally fused laminate facility ($53 million) and Cascade's biorefining project at its Norampac–Cabano plant ($26 million.)[14] Seventeen mining projects are at the development stage in 2015, for a total of over $22 billion in investment expenditures. Some of these projects should get under way in 2016, while others will not begin until 2019.[15] They include the Labrador Trough–Lac Otelnuk iron ore mining complex, which will require an investment of $13 billion. In the energy sector, two major electricity projects are currently under way in the Côte-Nord region, namely the Romaine hydroelectric complex ($6.5 billion) and its connection to the transmission grid ($1.3 billion).[16] Elsewhere, Junex Inc. is investing $22 million in its Galt project, which is well advanced.

CHART 2A: IMPORTANCE OF NATURAL RESOURCE SUBSECTORS TO THE QUEBEC ECONOMY (% OF GDP)

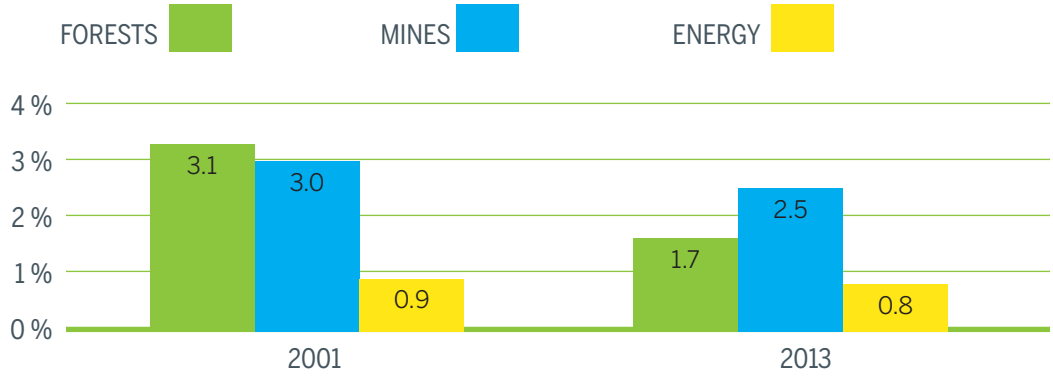


Source: CANSIM table 379-0030. Compiled by the authors.

13 Real GDP (chained dollars) by industry at basic prices, excluding product taxes and subsidies.
14 Conseil de l'industrie forestière du Québec (CIFQ).
15 « Industrie minière : cap sur de nouvelles filières », Les Affaires, April 25, 2015.
16 Commission de la construction du Québec (CCQ).

Natural resource sectors have not all grown at the same pace (Chart 2a). While the relative size of the forest and mining sectors in the economy shrank by 0.8 and 0.7 percentage points, respectively, there was no change in that of the energy sector. This stability may be explained, among other things, by the fact that electric power production, transmission and distribution account for over 90% of the Quebec energy sector, and the market is not particularly volatile. The availability of hydroelectricity is a significant competitive advantage in terms of energy supply for the sectors covered by our analysis, especially processing activities. It is also an environmental plus.

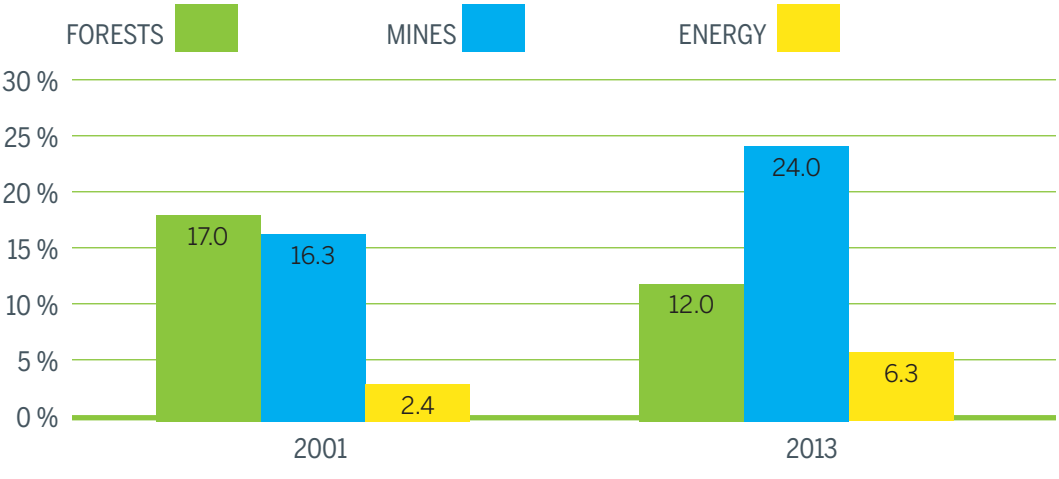
CHART 2B: IMPORTANCE OF NATURAL RESOURCE SUBSECTORS TO THE QUEBEC ECONOMY (% OF EMPLOYMENT)



Source: CANSIM table 281-0024. Compiled by the authors.

From the point of view of employment, jobs in the forest sector shrank from 3.1% to 1.7% of total jobs in Quebec between 2001 and 2013 (Chart 2b). There was also a half-point decline in the mines and minerals sector over the same period. The percentage of jobs in the energy sector remained almost unchanged.[17]

CHART 2C: IMPORTANCE OF NATURAL RESOURCE SUBSECTORS TO THE QUEBEC ECONOMY (% OF EXPORTS)



Source: Industry Canada, Trade Data Online. Compiled by the authors.

17 The figures for employment in the energy sector have to be interpreted with caution, as they do not include natural gas distribution (NAICS code 2212) or pipeline transportation (NAICS 486). In addition, data are not available for the groups of classes and classes: NAICS code 212 includes 2121 and 21229.

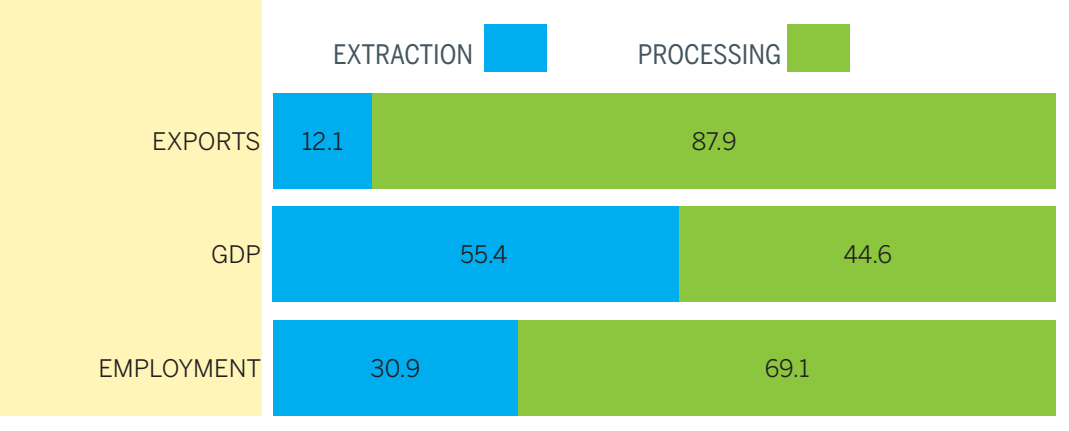
Mining sector and energy exports as a percentage of total exports have been growing since 2001. In 2013, they reached 24% and 6.3% of total exports, respectively (Chart 2c). The relative weight of forest sector exports,[18] however, shrank from 17% to 12% over the same period. This decline can be explained by factors such as the housing market crisis in the United States and the ensuing recession, and the global decline in newsprint demand. We also — or perhaps above all — need to mention the reduction of about 30% in allowable cuts in Quebec.

Contrary to what some people believe, natural resource processing contributes in a major way to the Quebec economy. In terms of production, the respective contributions of extraction and processing are 55% and 45%. As for employment, processing accounts for more than two-thirds of natural resource jobs, compared with a bit less than a third for extraction. The majority of natural resource exports, all sectors combined, are processed products (88% in 2013). For example, a large percentage of energy exports consists of oil products processed by Quebec refineries.

CONTRARY TO WHAT SOME PEOPLE BELIEVE, NATURAL RESOURCE PROCESSING CONTRIBUTES IN A MAJOR WAY TO THE QUEBEC ECONOMY.

The natural resource extraction and processing sectors remain an important aspect of our economy. Indeed, their share of international trade is much greater than their economic weight or their impact in terms of jobs, and this contributes significantly to our prosperity. In addition, natural resource processing activities in Quebec are as important as extraction activities.

CHART 3: IMPORTANCE OF RESOURCE EXTRACTION INDUSTRIES COMPARED WITH RESOURCE PROCESSING INDUSTRIES IN QUEBEC (% OF GDP, EMPLOYMENT, EXPORTS)

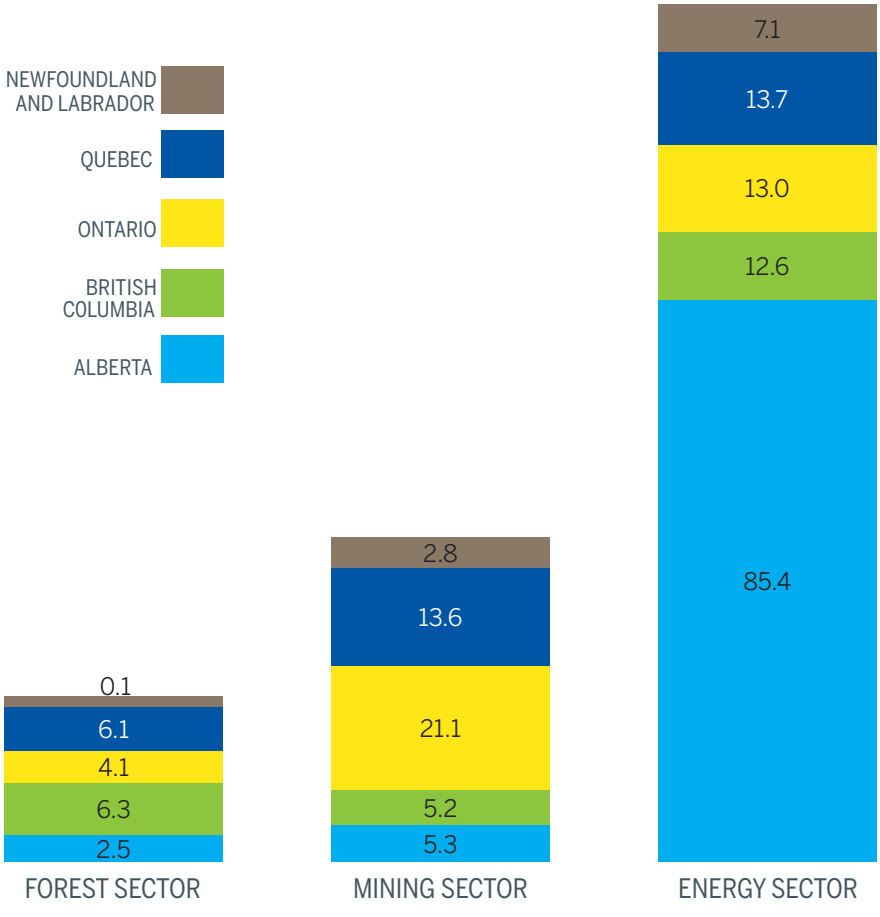


Sources: CANSIM tables 379-0030 and 281-0024 and Industry Canada, Trade Data Online. Compiled by the authors.

18 There are no figures for total exports for the industries covered by NAICS codes 1153, 21311A, 21311B, 2212 and 486.

Now let's look at how Quebec's natural resource sectors compare with the corresponding sectors in selected Canadian provinces.

CHART 4: REAL GROSS DOMESTIC PRODUCT (GDP) AT BASIC PRICES, 2013 (IN BILLIONS OF DOLLARS)



With $6.1 billion of real GDP at basic prices, Quebec's forest sector is second only to that of British Columbia ($6.3 billion) among the Canadian provinces. Quebec is also second in the mines and minerals sector ($13.6 billion), after Ontario ($21.1 billion) but ahead of Alberta and British Columbia. Alberta's energy sector ($85.4 billion) is by far the largest in Canada. Once again, Quebec ranks second ($13.7 billion), followed by Ontario ($13 billion), British Columbia ($12.6 billion) and Newfoundland and Labrador ($7.1 billion). It should be noted, however, that Quebec and Ontario are not home to any significant oil or gas production.

The ranking is quite different in terms of share of GDP of the individual provinces. Quebec's forest sector accounts for 2% of its GDP — higher than in the rest of Canada, other than British Columbia, where it adds up to 3.2% of GDP. When considered from this viewpoint, Quebec's mining sector is larger than those of Ontario, British Columbia and even Alberta, but much smaller than that of Newfoundland and Labrador, where mining accounted for an average of 10% of the provincial economy between 2009 and 2013. In the energy sector, Quebec outstrips Ontario (2.2%) and is second to British Columbia (6.4%). All of these provincial mining sectors are small, however, when compared with Alberta and Newfoundland and Labrador, where the sector is responsible for almost 30% of GDP, thanks to the highly developed oil and gas industry in these provinces. (See the Appendix for chart illustration.)

CONTRIBUTION OF NATURAL RESOURCES TO PROSPERITY

Natural resource development contributes to our prosperity in a variety of ways. A number of historical and empirical studies highlight this contribution and describe the experience of various countries.

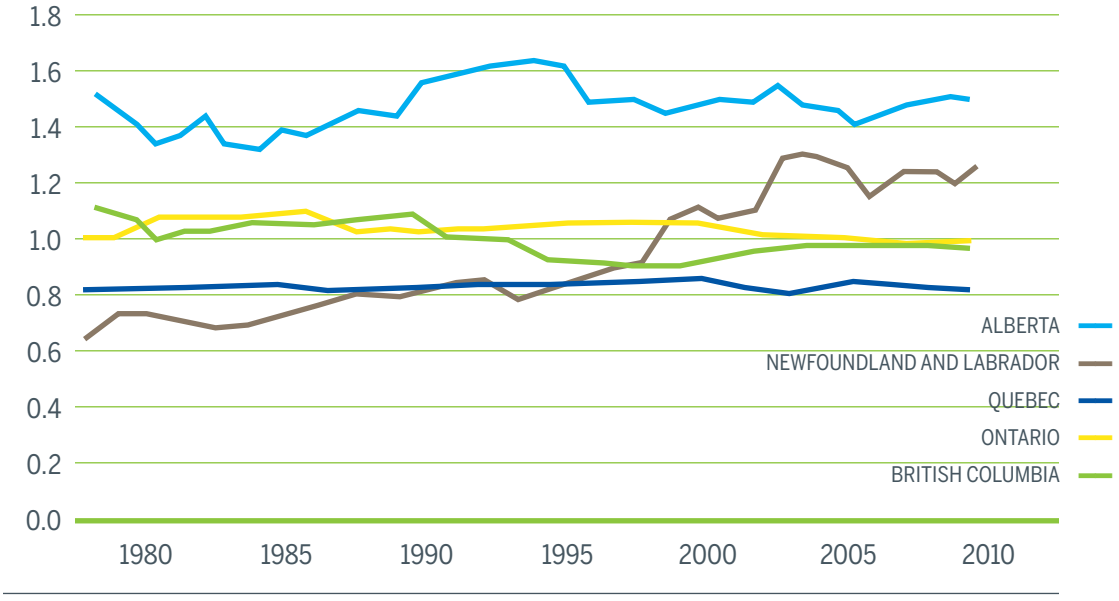
Natural resource development contributes to a higher standard of living

In Quebec, GDP per worker in the natural resource sector is substantially higher than the per-worker amount for industry in general (estimated at $88,200 in 2013). The figure was 16% higher in the forest sector ($102,200) and 75% higher in the mines and minerals sector ($154,400).[19] These sectors are thus highly productive.

To illustrate the contribution of natural resource development to a higher standard of living in various provinces, we have calculated the changes in the ratio of provincial GDP as a share of the Canadian total compared with each province's demographic weight in Canada. This ratio illustrates changes in each province's economic weight, taking into account the province's demographic weight within Canada. For example, a province that generates 10% of Canada's GDP but that is home to only 5% of Canadians would have a ratio two times higher than a province with the same percentage of GDP but a population corresponding to 10% of the Canadian total. The economic weight of the first province would thus exceed its demographic weight.

19 Per-worker GDP is calculated by dividing real GDP at basic prices by the number of jobs. Although we cannot do this calculation for the energy sector, as certain data are confidential, we can say with near certainty that the situation is similar in this production sector.

CHART 5: RATIO OF PROVINCIAL GDP AS A SHARE OF THE CANADIAN TOTAL COMPARED WITH THE PROVINCE'S DEMOGRAPHIC WEIGHT IN CANADA



Source: CANSIM tables 384-0038 and 051-0001.

It comes as no surprise that the ratio for Alberta was systematically higher than 1:1 between 1980 and 2013, given the strong contribution to the province's economy of the oil industry and extraction of other natural resources. This reflects Alberta's relatively greater wealth. As for Ontario, British Columbia and Quebec, the ratios have been relatively stable since the early 1980s, with Quebec's economic weight being lower than its demographic weight.

There has been a remarkable change in the ratio for Newfoundland and Labrador, which has risen substantially since the late 1990s, outstripping the ratios for Quebec (in 1998) and Ontario (in 2002). On the heels of the collapse of the cod-fishing industry in the early 1990s, Newfoundland and Labrador experienced record unemployment and a population exodus. At the turn of the 21st century, however, there was a dramatic shift in the province's economy, with increased natural resource production, primarily in the petrochemical sector. As a result, there has been a decline in unemployment, the population has begun growing again and the government has chalked up record budget surpluses for a number of years.

The above chart also shows that the ratios of the two oil-producing provinces have varied more than those of the provinces without oil. This shows the close connection with ups and downs in this natural resource sector. It goes without saying that there is an impact on companies operating in the sector in question and the governments of Alberta and Newfoundland and Labrador, highlighting the importance of a long-term strategy for managing public revenues from natural resources and a processing and diversification strategy. Some countries, like Norway for instance (see box), have understood this.

The Norwegian example

Norway harmoniously combines natural resource development with effective environmental policies. The discovery of North Sea oil changed the country's economy. Today, Norway is the world's eighth-largest oil producer (20% of GDP). The oil sector accounts for 30% of public revenue and a quarter of the economy's value added. Over the past few decades, oil has fuelled the growth of the public sector, which now accounts for 44% of GDP. Since 1970, the number of jobs has doubled in the education sector and jobs in health and social services have quadrupled.

Norway has managed to soften the impact of terms-of-trade fluctuations by opting for a prudent policy of saving and converting into public capital almost all of the profits derived from oil. The government set up a sovereign wealth fund in 1990 with a view to preparing the country for the post-oil period, avoiding economic deindustrialization and promoting the development of other industries such as the oil and gas industry supplier sector. According to analysts, the Government Pension Fund (commonly referred to as the Oil Fund) is well run. Norway has established a clear division between the Ministry of Finance, which owns the Fund, and the Central Bank, which manages it. The Fund is also governed by budgetary rules. First, all oil revenue is paid into the Fund, which invests it exclusively in foreign assets. The asset mix has to consist of 60% stocks, 35 to 40% fixed-interest securities and up to 5% real estate. Second, Norway's structural budget deficit and, by extension, the maximum amount that can be withdrawn from the Fund, may not exceed 4% of the total value of the Fund for a given fiscal year.

Norway is also seen as a precursor when it comes to equity participation in private corporations. In 1972, the government created Statoil, asking private enterprises to contribute their expertise in exchange for oil contracts. It has encouraged Statoil to innovate by taxing profits and, at the same time, offering a fairly generous array of tax assistance measures for R&D. This approach has been fine-tuned over the years. One of the main changes was the merger of Statoil and Norsk Hydro, aimed at optimizing the government's leeway in a context of international competition.

Norway has managed to combine oil extraction with sustainable development. It has implemented a number of tax measures, including carbon taxes, a tradable emissions quota system and emissions-reduction agreements. It has invested its petrodollars in order to create and support globally competitive industries. The country's oil and gas industry supplier sector, for example, is the country's second largest export sector. Policies are also in place to protect and preserve sectors such as fishing and forestry, as well as local communities and the environment. Lastly, Norway's oil wealth has not destroyed the country's egalitarian spirit.

Workers in natural resource industries earn more than the average

Greater wealth creation in the natural resource sectors, as described above in terms of GDP per worker, has a positive impact on wages in these industries (Table 2). Natural resource workers earn an average of 6% (forests) to 100% (mining, oil and gas extraction) more than the average earnings in the other sectors of the economy. It should also be noted that workers in natural resource sectors generally enjoy generous retirement plans.

TABLE 2: AVERAGE EARNINGS IN CERTAIN NATURAL RESOURCE SECTORS, 2014 (CURRENT DOLLARS)

	AVERAGE ANNUAL EARNINGS	DIFFERENCE COMPARED WITH OTHER SECTORS OF THE ECONOMY
Forestry, logging and support	46,300	+ 6.2%
Mining, quarrying and oil and gas extraction	86,500	+ 98.4%
Utilities[20]	80,300	+ 84.2%
All other industries	43,600	-

Sources: CANSIM tables 281-0044 and 281-0042 and authors' calculations. Earnings include overtime.

In addition to benefiting companies and workers, this prosperity has a positive impact for governments and regional economies in places where natural resource development projects are deployed.

20 Includes the following NAICS codes: 2211 (Electric Power Generation, Transmission and Distribution), 2212 (Natural Gas Distribution) and 2213 (Water, Sewage and Other Systems).

Natural resource development contributes to economic diversification and regional economic development

Natural resources benefit enterprises directly involved in developing them, along with suppliers in areas like professional and technical services, consulting engineering and construction. Natural resources are also essential inputs for numerous processing industries. They thus contribute to development not only in rural regions close to extraction projects, but also in urban centres home to various other industries. In many cases, related activities are generated in areas such as energy efficiency, environmental services and process optimization.

When a company decides to invest in a natural resource development project, there is usually a substantial economic impact for the local economy. During the construction phase, large amounts are devoted to design and development studies, roads and buildings, and purchases of equipment, machinery, vehicles and supplies, as well as for subcontracting technical and professional services. Following this phase, expenditures are focused on operations, including production, supervision, maintenance, equipment, supplies and repairs. As far as possible, local workers are recruited to meet manpower needs, especially during the construction phase. A good example would be the James Bay Cree whose employment rate went from 46% in 2001 up to 55.2% in 2006.[21]

WHEN A COMPANY DECIDES TO INVEST IN A NATURAL RESOURCE DEVELOPMENT PROJECT, THERE IS USUALLY A SUBSTANTIAL ECONOMIC IMPACT FOR THE LOCAL ECONOMY.

One way of using all of these economic data is to create input-output tables that highlight the different exchanges of goods and services between economic players. The Quebec Intersectoral Model created by the Institut de la statistique du Québec (ISQ) uses an input-output table to assess the economic impact of projects involving investment, operating and current consumption expenditures, by determining how demand for goods and services spreads between the production sectors directly and indirectly involved. Table 3 shows the economic impact of $100 million of production in certain natural resource sectors. It should be noted that employment does not include induced jobs.

21 Descôteaux David (2015), The Cree and the Development of Natural Resources, Montreal Economic Institute, http://www.iedm.org/files/note0315_en.pdf

TABLE 3: IMPACT FOR QUEBEC OF $100 MILLION OF PRODUCTION

	Forestry and logging	Mining and oil and gas extraction	Utilities[22]	Petroleum and coal product manufacturing
Manpower (person-years)	760	420	270	60
ECONOMIC IMPACT IN THOUSANDS OF 2012 DOLLARS				
GDP (market prices)	75,200	76,000	95,800	6,400
Imports	24,800	24,000	4,200	93,700
Quebec public revenue	11,500	7,900	4,500	850
Taxes	4,100	3,600	2,300	400
Incidental taxes (QPP, HSF, CSST, QPIP)	7,400	4,300	2,200	500
GDP/total expenditures ratio	75%	76%	96%	6%
Public revenue/GDP ratio	15%	10%	5%	13%

Source: *Institut de la Statistique du Québec, Direction des statistiques économiques et du développement durable.*
The ratios may not correspond to the quotient, as the figures have been rounded.

In the forest sector, each $100 million dollars of production spawns an estimated 760 full-time jobs, adds $75 million to Quebec's GDP (the difference is covered by imports) and generates $11.5 million in tax and incidental revenue for Quebec. A hundred million dollars of production in the mining sector would create a total of 420 jobs, increase GDP by $76 million and add $8 million to the Quebec government's coffers.

This being said, we have to stress that, regardless of whether or not a project is profitable, any activity generates economic spin-offs, as it involves expenditures or resource consumption. The net economic contribution of natural resource development activities thus depends not on the scope of the related expenditures, but on the added value that is generated above and beyond these expenditures — which is considerable in the cases at hand. In any event, local workers and businesses benefit substantially from natural resource development activities.

22 Includes the following NAICS codes: 2211 (Electric Power Generation, Transmission and Distribution), 2212 (Natural Gas Distribution) and 2213 (Water, Sewage and Other Systems).

Trade gains contribute to raising real income

An in-depth study by Baldwin and Macdonald (2012)[23] on the growth of Canada's resource economy from 1870 to 2010 describes the positive effects of resource exports, with a particular focus on the concept of terms of trade (TOT) and the distinction between national production and national income.

The study begins by pointing out that TOT determines the number of imports that each export can purchase. When TOT rises, exports can be exchanged for more imports, raising real incomes and boosting domestic spending. An improvement in TOT is thus desirable, as it has an immediate positive impact on a country's prosperity. For example, Canada exports mainly resources and imports mostly manufactured products. When resource prices rise and manufactured product prices fall, Canadians can buy more imports for the same volume of exports. In this type of situation, gross national income can grow without any increase in national production and, by extension, GDP. This being said, there is no guarantee of a systematic increase in the TOT of natural resource exporting economies or a systematic decline in the TOT of countries that export mainly manufactured products, or even that the prices of these two types of goods will rise and fall inversely.

Over the period in question, cumulative real gross national income (GNI) grew by 18% more than GDP. [24] Initially, during the long period from 1870 to 1920, there was a positive increase in this differential. Later, the two world wars generated spurts of growth, which were subsequently offset by economic slowdowns. The more recent expansion (since the 1970s) of the petroleum and resource sectors has increased the differential. Despite sharp — and normal — fluctuations in TOT, the long-term contribution has been positive and significant, enabling growth of real income.

The example of Australia

Australia has enjoyed more than two decades of uninterrupted annual growth. Between 1992 and 2014, the Australian economy chalked up an average annual growth of 3.2%,[25] inflation and unemployment remained low and the terms of trade were significantly higher than their long-term trend. This situation may be explained by the structural reforms deployed in the 1980s and the sharp rise in Asian demand, particularly in China, for Australian mineral and energy resources.

23 Baldwin, John R., and Ryan Macdonald (2012): Natural Resources, the Terms of Trade, and Real Income Growth in Canada: 1870 to 2010. Economic Analysis (EA) Research Paper Series, Statistics Canada.

24 Gross national income (GNI) is defined as the sum of value added by all residents of a nation (GDP), plus any tax revenue (minus subsidies) not included in output, plus income received from abroad such as employee compensation and property income. It is a measurement of real production that can be consumed and invested.

25 International Monetary Fund, World Economic Outlook Report, April 2015. Calculations by the authors. By comparison, Canada registered annual growth of 2.6% over the same period.

Reduce risk and maximise wealth stemmed from natural resources

Natural resource activities have to be governed by economic policies that are efficient — i.e., flexible and adapted to the real-life dynamics of resource extraction and processing. At the same time, policies have to be responsible, which means that they have to be aligned with the principles of sustainable development and respect for the environment.

It should be pointed out that the natural resource industries have to deal with major variations in raw material prices (see chart in box). Changes in relative prices — exchange rates, oil prices, metal prices, etc. — mean winners and losers. Quebec's natural resource development policy therefore has to be accompanied by measures designed to soften the impact of these variations and ensure that the overall economy is not excessively vulnerable to external ups and downs.

First, the main economic prescription for maximizing wealth creation from natural resource development activities consists in combining these activities with a strict and efficient institutional and regulatory framework ensuring resource ownership rights, responsible conduct, and respect for the environment and sustainable development principles. The framework would also create a stable, predictable environment for companies interested in investing in Quebec's natural resources.

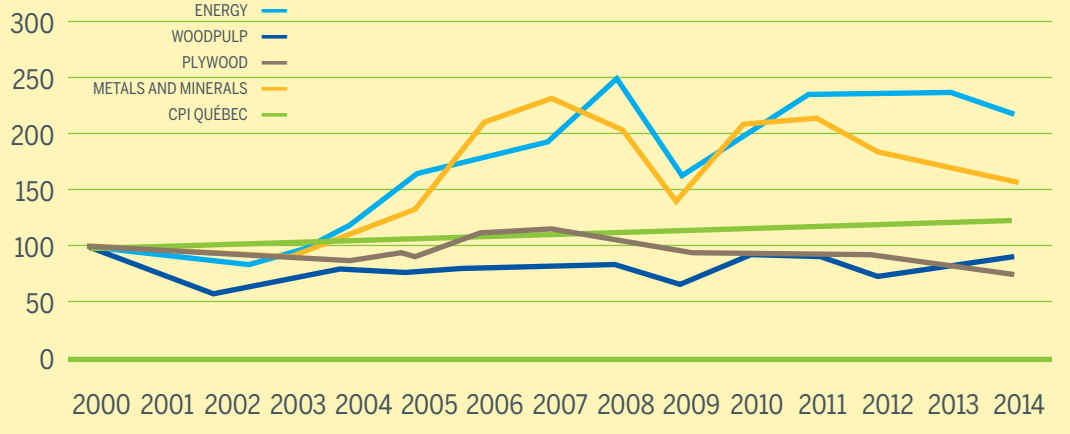
Next, structural reforms play a role that is just as essential as natural resource development itself. Investing in key sectors such as education and manpower training, ensuring market flexibility and improving the competitiveness of other commercial sectors would allow the economy to adjust more quickly to abrupt external changes and reduce the related risks. Another aspect that should be taken into account is diversification of the economy and its sectors of activity, natural resources products and trade partners. Quebec has been relatively successful in this area so far, but there is always room for improvement.

Finally, in a sustainable development perspective, natural resource development could be accompanied by appropriate "green taxation" policies that will stimulate investments in new, innovative technologies while reducing other taxes that hinder economic growth. Green taxation is based on the principle of internalizing the external costs related to the negative environmental effects of a given activity. Revenue derived from green taxation could be used to fund public priorities such as reducing payroll taxes, supporting R&D and R&D commercialization, and providing Quebec companies with support in shifting to sustainable development.

Changes in international prices

International natural resource prices have a fundamental impact on the economic performance of natural resource development. Prices are driven by dynamics that can differ sharply from changes in inflation in a given economy, and these dynamics can thus be a source of wealth or, to the contrary, generate losses for resource companies. Financial professionals often link the notions of return and risk: to obtain a high return on an investment, an investor has to be ready to accept higher risks (and, by extension, accept a lower return by opting for lower risks). This is also true in the natural resource sector, where economic performance depends on variations in international demand and prices, which can be considerable. The following chart describes changes in international natural resource prices over the past 14 years.

CHANGES IN INTERNATIONAL NATURAL RESOURCE PRICE INDICES, 2000 TO 2014 (2000 = 100)



Sources: Global Economic Monitor (GEM) Commodities and CANSIM table 326-0021. Calculations by the authors.

The chart shows, for example, that the prices of plywood and wood pulp have gone up and down since 2000, and are currently at about the same level as 15 years ago. Average energy prices increased by 250% between 2000 and 2008, dropped sharply following the 2008 financial crisis, rose again and then declined again in 2014. As for metals and minerals, the price trend was comparable to that for energy up until 2011; since then, metal and mineral prices have dropped dramatically. In short, we are far from the stability of the Consumer Price Index (CPI), with all this implies in terms of financial and operational issues for natural resource companies.

Natural resource development helps reduce economic inequality

Calling on Statistics Canada's *Labour Force Survey,* researchers at the Vancouver School of Economics[26] have shown that since the end of the 1990s, natural resource development has had a considerable positive impact on wage growth in Newfoundland, Saskatchewan and Alberta compared with the other provinces (accounting for about two-thirds of the divergence). Using Ontario as the benchmark, the authors found that average wages grew by an additional 23 percentage points in the three provinces in question. They also noted a reduction in wage inequalities in the provinces affected by the natural resources boom (mining resources, oil and gas). The boom has not only "lifted all the boats," resulting in higher wages for all workers, it has also contributed to a reduction in wage dispersion between less educated and younger workers on the one hand and highly qualified workers on the other hand.

Economic impact of shale gas production in the United States

Following several decades of increases higher than inflation, the price of a barrel of crude oil plummeted from US$107 in July 2014 to less than $50 at the start of 2015. At the time of writing, it had increased again to about US$60. One of the factors behind this dramatic decline is the development of American shale oil and gas production, especially shale gas extraction. Technological innovations in the oil and gas industry have made unprofitable deposits profitable, and this has given a major boost to activity in this sector. A recent National Bureau of Economic Research (NBER) study assessed the positive effects of these innovations for the U.S. economy.[27] The authors conclude that overall, between 2007 and 2013, increased shale gas extraction generated a net benefit of US$48 billion per year for consumers and producers. At the same time, the authors stress that additional data are required in order to measure and assess the environmental impact of this production.

26 Fortin, Nicole M. and Thomas Lemieux (2014). Changes in Wage Inequality in Canada: An Interprovincial Perspective. Vancouver School of Economics, University of British Columbia.

27 Hausman, C. and R. Kellogg. Welfare and Distributional Implications of Shale Gas. NBER Working Paper No. 21115, April 2015.

CONCLUSION

Quebec is most fortunate to have an abundance and diversity of natural resources (mines, forests, energy), whose economic potential is yet to be fully developed. Two aspects are interdependent and inseparable in this economic context. Firstly, natural resources are an economic lever that helps create thousands of jobs, drives regional economic development and contributes to a substantial share of public services through government revenues that are generated. On the other hand, the exploitation of natural resources must be done responsibly with respect to the environment and the communities while ensuring the sustainability of development for future generations.

We have reviewed the importance of natural resources to the economy, and have found that even though the natural resource sector has experienced a certain decline compared with the service sector over the past few decades, its contribution to the economy remains considerable, especially when one takes into account its contribution to regional economies, its major share of exports and its high added value.

We have described various ways in which natural resource industries make a substantial contribution to our collective prosperity. Natural resources raise our standard of living; they generated better-than-average paid jobs; they industries contribute to economic diversification and regional development; the terms of trade increase stemmed from natural resources real income; and natural resource development helps reduce economic inequalities.

Quebec lags behind the Canadian average when it comes to GDP and disposable income. Natural resources can help to fill this gap. Eliminating this gap would inject $58 billion in the economy and help meet citizens' quality-of-life needs in areas like health, education and social protection for the underprivileged.

APPENDIX 1

NATURAL RESOURCE SECTORS AND SUBSECTORS

NAICS Code	SECTORS Subsectors	Raw Materials or Processed Materials
	FOREST SECTOR	
113	Forestry and Logging	raw
1153	Support Activities for Forestry	raw
321	Wood Product Manufacturing	processed
322	Paper Manufacturing	processed
	MINERALS AND METALS SECTOR	
212*	Mining and Quarrying (Except Oil and Gas)	raw
21311B**	Support Activities for Mining	raw
327	Non-Metallic Mineral Product Manufacturing	processed
331	Primary Metal Manufacturing	processed
332	Fabricated Metal Product Manufacturing	processed
	ENERGY SECTOR	
211	Oil and Gas Extraction	raw
2121	Coal Mining	raw
21229***	Other Metal Ore Mining	raw
21311A****	Support Activities for Oil and Gas Extraction	raw
2211	Electric Power Generation, Transmission and Distribution	raw
2212	Natural Gas Distribution	raw
32411	Petroleum Refineries	processed
486	Pipeline Transportation	raw

* *Excluding codes 2121 (Coal Mining) and 21229 (Other Metal Ore Mining), which are included in the Energy sector.*

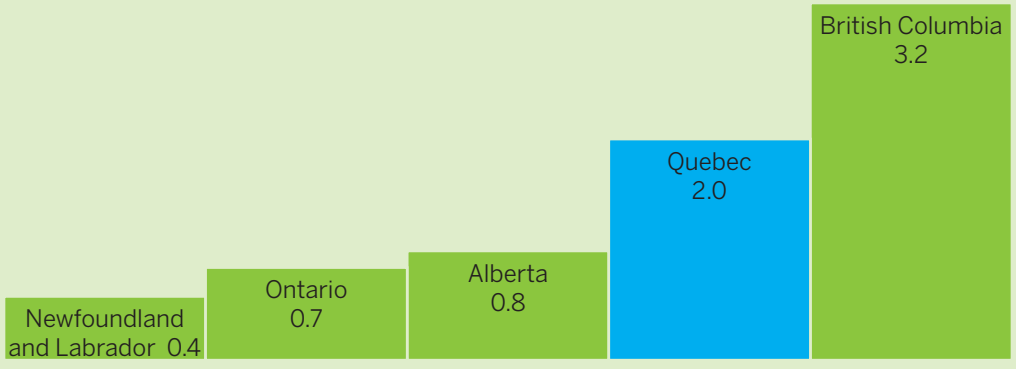
** *Groups together NAICS codes 213117 (Contract Drilling (Except Oil and Gas)) et 213119 (Other Support Activities for Mining).*

*** *Uranium Ore Mining.*

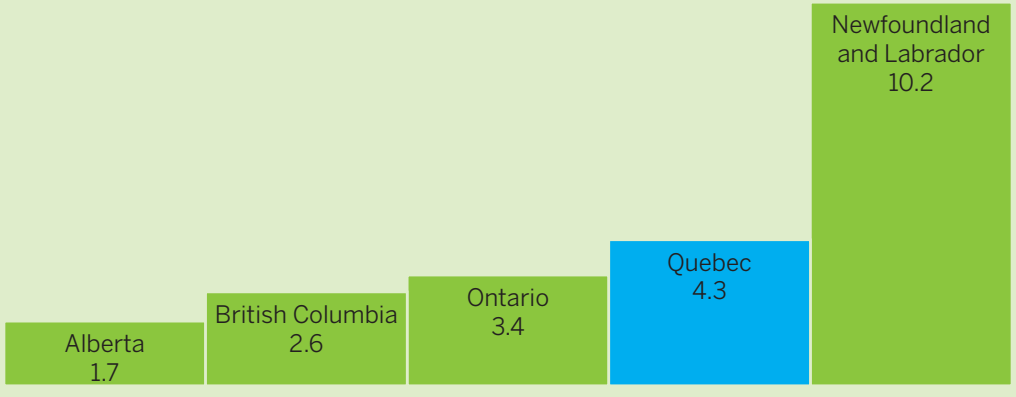
**** *Groups together NAICS codes 213111 (Oil and Gas Contract Drilling) and 213118 (Services to Oil and Gas Extraction).*

APPENDIX 2

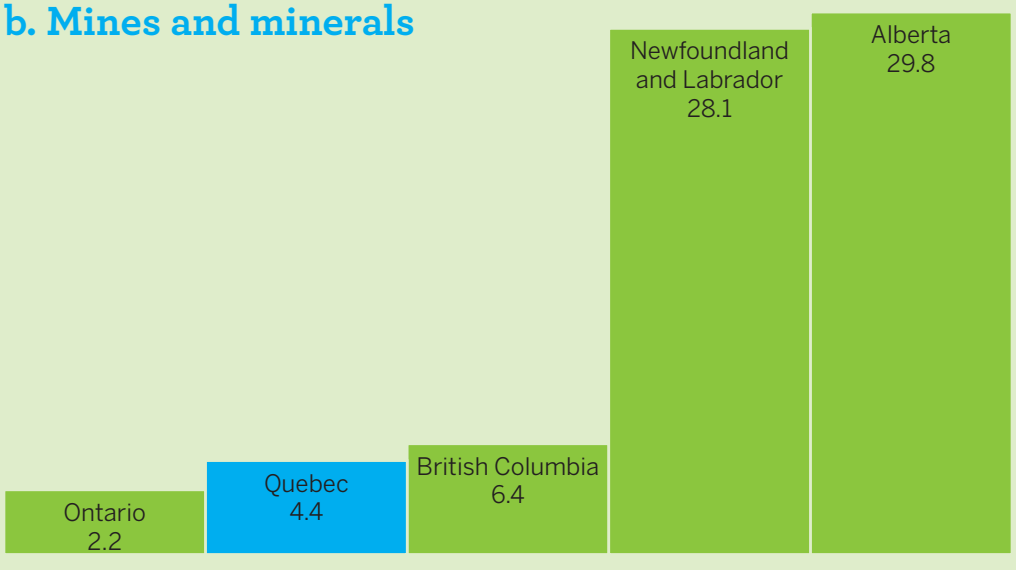
RANK OF QUEBEC'S NATURAL RESOURCE INDUSTRIES COMPARED WITH THOSE OF THE OTHER CANADIAN PROVINCES, IN TERMS OF AVERAGE PERCENT OF GDP, 2009-2013



a. Forests



b. Mines and minerals



c. Energy

Source: CANSIM table 379-0030. Compiled by the authors.

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