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Coal Association of Canada

Economic impact analysis of the coal mining industry in Canada

October 31, 2012



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Executive summary

Introduction

The Coal Association of Canada engaged PricewaterhouseCoopers LLP (“PwC”) to quantify the economic contributions of Canada’s coal mining industry to the national economy. In this study, results are provided of the estimated economic impact of the Canadian coal mining industry, at the direct and indirect level in terms of output, GDP, employment, wages and salaries, and government tax revenues.

The coal mining industry in Canada is made up of exploration and producing companies primarily located in British Columbia, Alberta, Saskatchewan and Nova Scotia. Twenty-five companies were identified as being either solely engaged in exploration activities or producers of operating mines supported by exploration activities. In 2011, there were 24 producing mines of which 11 mines were producing metallurgical coal and 13 were producing thermal coal.

Canada had 6.6 billion tonnes of coal recoverable reserves in 2009 (latest year for which data are available) of which roughly 53% represents bituminous coal and 47% sub-bituminous and lignite coal. Based on current depletion levels, recoverable coal reserves in Canada have been estimated to support 100 years of future production. Canada’s coal potential could be even larger with a broader measure of coal resources in-place estimated at 190 billion tonnes.

Canada produces well over 60 million tonnes of metallurgical and thermal coal every year, generating significant economic benefits to communities across the country. In 2011, the value of coal production reached \$7.0 billion. Bituminous and sub-bituminous coal contributes 50% and 35% of total production respectively with lignite accounting for the remainder. Alberta produced roughly 30 million tonnes of coal in 2010, followed by British Columbia with 27 million and Saskatchewan with almost 10 million tonnes.

Export sales for metallurgical coal were reported as \$8.0 billion in 2011 representing almost 40% of coal produced in Canada.¹ Export sales of this magnitude make the coal industry a positive contributor to the country’s trade balance. Of the remaining coal production, the majority is used as a fuel source to generate electricity in Canada. Coal mining contributes to Canada’s employment and since 2004 coal employment has been rising steadily both in level terms and as a share of total mining employment. In 2010, the coal mining industry accounted for 14% of total mining employment, compared to 12% ten years ago.

This report supersedes the report issued on August 30, 2012 to clarify information that was provided in the August 30, 2012 report issued to the Coal Association of Canada.

Estimated economic impact of the coal mining industry in Canada

Coal companies across Canada were surveyed to determine the industry’s economic contributions to Canada’s national economy. Of the 25 companies invited to participate in the survey, 18 responded for a 72% response rate to the survey. As such, the results below are considered to be conservative although representative of the industry overall. The survey data was used to estimate the direct and indirect economic impacts of the coal mining industry in terms of output, GDP, employment, wages and salaries, and government tax revenues as shown in the table below.

The economic impacts for the coal mining industry are based on reported expenditures of \$5.9 billion in 2011 as reported by the coal companies participating in the survey. The direct effects include the Canadian economic

¹ It should be noted that the export values reported by Statistics Canada are reported FOB at port of export and include transportation costs from the mine site and shipping tariffs.

activity of mine operators, companies providing support to mine operators, and transportation companies that carry mine output to purchasers. Indirect effects include the Canadian economic activity of suppliers, including suppliers of capital goods for mining operations.

Table E1. Summary of the economic impact of the coal mining industry in Canada, 2011

	Direct Impact	Indirect Impact	Total Economic Impact
Output (millions)	\$5,943	\$3,712	\$9,655
GDP (millions)	\$3,244	\$1,988	\$5,232
Wages and Salaries (millions)	\$1,769	\$837	\$2,606
Government Revenues (millions) *	\$450	\$248	\$698
Employment (Number of Jobs)	25,471	16,559	42,030

*Economic impact multipliers do not take into account mining royalties paid

In terms of GDP, expenditures made by the industry resulted in a total estimated economic contribution by the coal mining industry to Canada of \$5.2 billion. The coal mining industry contributed \$3.2 billion in direct impacts with \$2.0 billion of indirect impacts to Canada's GDP. In 2011, this represented approximately 0.09% of the national GDP.

Industry expenditures were a source of approximately 42,030 jobs across Canada and represented \$2.6 billion in wages and salaries. The estimated average wage for the industry was \$92,785 for direct employment from coal companies responding to the survey (7,154 employees). In comparison, the average coal mining industry wage is twice that of the average national wage of \$43,700. Industry wage levels are significant for communities close to coal mine sites as they are generally located in rural areas.

Total tax revenue from the coal mining industry was approximately \$698 million. In addition, in 2011, \$344 million was reported as mineral royalties and mineral land taxes. Tax revenue paid helps to support local community infrastructure and government programs.

1.0 Background and study purpose

1.1 Background

The Coal Association of Canada engaged PricewaterhouseCoopers LLP (“PwC”) to conduct an industry survey and quantify the economic contributions of Canada’s coal mining industry to the national economy. The purpose of this study is to estimate the economic impact of the industry, reporting on the direct and indirect economic impacts in terms of output, GDP, employment, wages and salaries, and government tax revenues. Moreover, the study also includes an economic profile of the Canadian coal mining industry, highlighting the importance of the industry to the national economy.

The Coal Association of Canada is a non-profit industry association that represents companies engaged in the exploration, development, use and transportation of coal. Members include major coal producers and coal-using industrial customers, railroads, ports and terminals that ship coal, industry suppliers of goods and services, and municipalities.

This report supersedes the report issued on August 30, 2012 to clarify information that was provided in the August 30, 2012 report issued to the Coal Association of Canada.

1.2 Project scope and industry definition

The scope of the study includes the analysis of the economic impacts and benefits produced by the Canadian coal mining industry and assessment of the economic impacts. Economic impacts of the coal industry impacts were assessed to determine the industry’s contribution to Canada’s output, GDP, employment, wages and salaries, and tax revenues.

For purposes of this study, the coal mining industry is defined as the exploration for, extraction and primary processing of coal. Primary processing includes the coal cleaning process which occurs at the mine site. The direct coal mining industry then includes the Canadian economic activity of mine operators, companies providing support to mine operators, and transportation companies carrying mine output to purchasers. Indirect effects then include the Canadian economic activity of suppliers including suppliers of capital goods for mining operations.

1.3 Project methodology and approach

The economic impact analysis of the Canadian coal mining industry is based on a confidential survey of the industry conducted between April and May 2012.

PwC conducted and independently reviewed the responses for reasonableness and consistency. In total, 18 responses from coal companies were received out of a possible 25 companies invited to participate for a 72% response rate. However, the economic impacts reported here are based on survey responses, as such, given that not all companies responded to the survey, results reported are conservative but are indicative of the industry overall.

Economic impact methodology

To conduct the economic impact modelling, Statistics Canada’s input-output tables were used to estimate industry impacts. Input-output tables depict the industrial structure of the Canadian economy and are used to generate estimates of direct and indirect industry contributions.

Data availability and reliability

Industry statistics provided in this report were mainly sourced from Statistics Canada and National Resources Canada. International statistics were obtained from the US International Energy Administration and BP Statistical Energy.

Additional material was collected through a review of data on exploration and mining activity published by Natural Resources Canada, provincial ministries of mines and energy, mining associations, and other publicly available sources. Additional information on the coal companies was obtained through a review of annual reports and corporate sustainability reports, websites and news releases.

Further detail on the survey and economic impact methodology is provided in section 3.0 of the report.

1.4 Organization of the report

The report is structured as follows:

- **Section 1** provides the background to the report and the study purpose, and overview of the study methodology.
- **Section 2** provides a historical profile of the coal mining industry in Canada, based on publicly available information. Data is presented from 2001 to 2010 and where available, 2011 data is provided.
- **Section 3** provides the results of the economic impact analysis for the Canadian coal mining industry using company financial data obtained through the online and confidential survey of coal companies across Canada and supplemented by data obtained from Statistics Canada and other sources.
- **Section 4** provides the results of the economic impact in summary form.

1.5 Report limitations

This report was prepared by PricewaterhouseCoopers LLP (PwC) at the request of the Coal Association of Canada. The comments included in this report do not constitute professional advice, nor should they be relied upon to replace professional advice. This report is not to be published in whole or in part without PwC's prior written consent. Any use that a third party makes of this report or reliance thereon, or any decision made based on it, is the responsibility of such third party. PwC accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken based on this report.

The material in this report reflects PwC's best judgement in light of the information available at the time of its preparation. PwC has relied upon the completeness, accuracy and fair presentation of all the information, data, advice, opinion or representations obtained from public sources and from the Coal Association of Canada (collectively, the Information). The findings in the report are conditional upon such completeness, accuracy and fair presentation of the Information. PwC has not verified independently the completeness, accuracy and fair presentation of the Information.

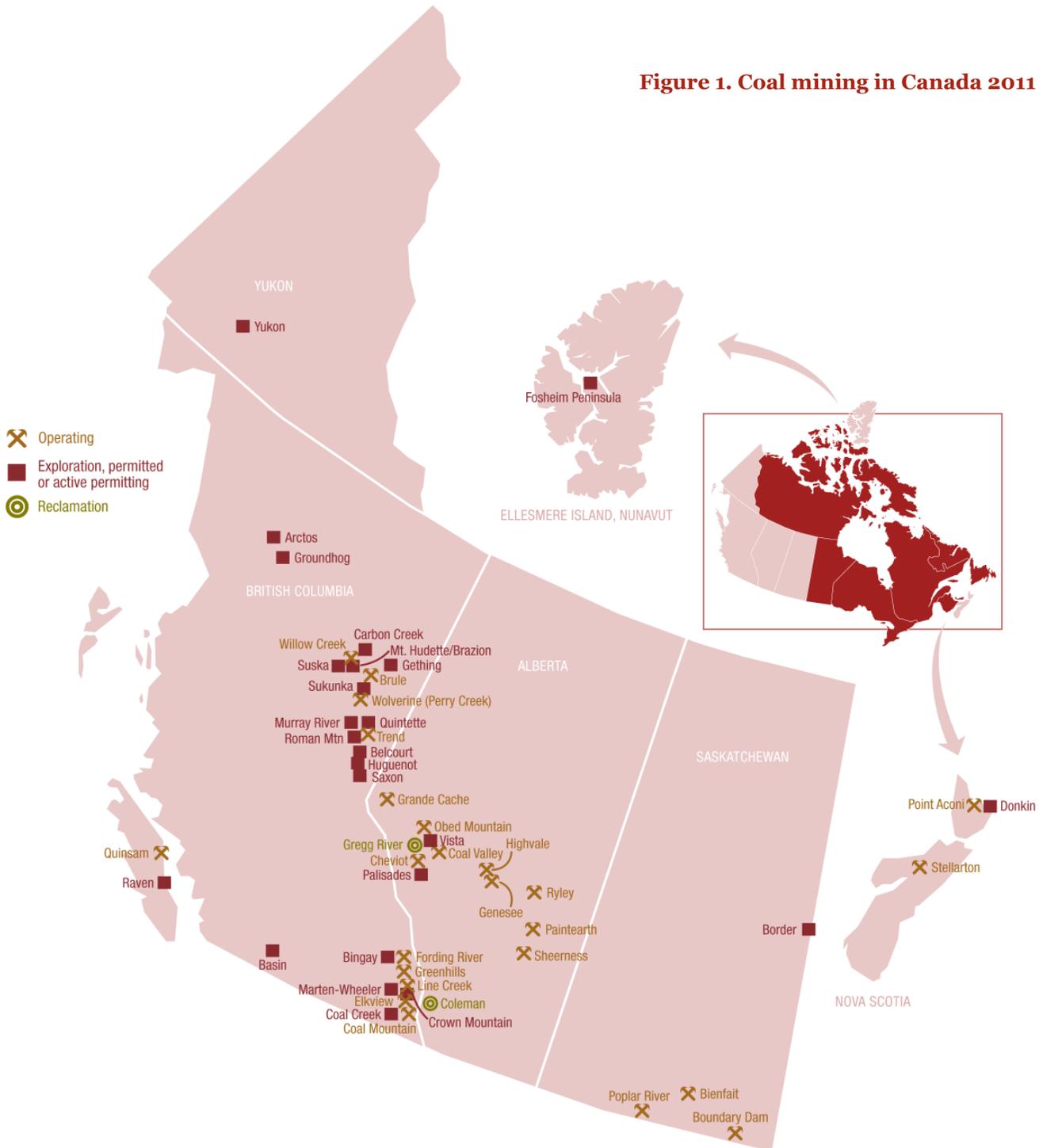
PwC reserves the right, at its discretion, to withdraw or make revisions to the report should PwC be made aware of facts existing at the date of the report which were not known to PwC when it prepared the report. The findings are given as of the date hereof and PwC is under no obligation to advise any person of any change or matter brought to its attention after such date which might affect the report's findings and conclusions.

We understand the results of this study will be shared with Coal Association of Canada members, government and agency partners, and other industry stakeholders. As well, results of the study will be made publicly available to the broader industry and public audiences.

2.0 Overview of the coal industry in Canada

This section provides an historic overview of the coal industry in Canada from 2001 to 2010 and is based on publicly available information mostly from Statistics Canada and Natural Resources Canada. To the extent information was available data for 2011 has been included. Figure 1 shows the general locations of where coal mining occurs including active mines, exploration and reclamation sites across Canada.

Figure 1. Coal mining in Canada 2011



2.1 About the coal mining industry in Canada

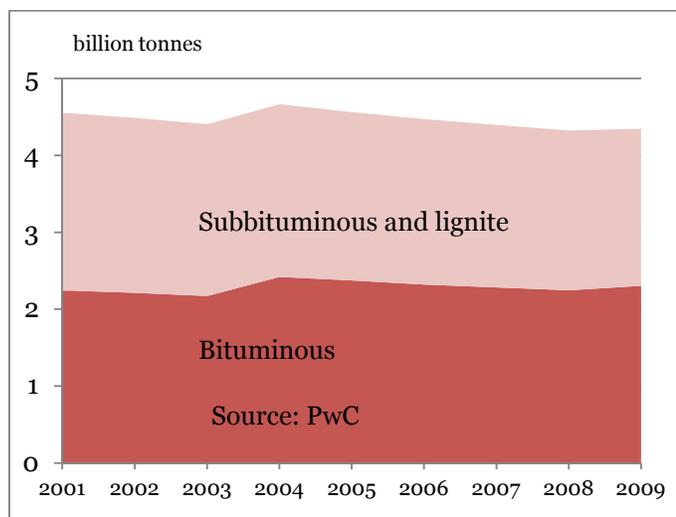
Canada holds abundant reserves of coal throughout its territory, with large commercial quantities of metallurgical and thermal coal currently produced in British Columbia, Alberta, Saskatchewan and Nova Scotia. According to Natural Resources Canada, significant coal formations have also been identified in the Yukon, Ontario, Newfoundland and Labrador, the Northwest Territories and Nunavut, but these resources are not currently being exploited. In 2011, there were 24 producing mines across Canada of which 11 mines were producing metallurgical coal and 13 were producing thermal coal.

At the end of 2010, the last year for which data are available from Natural Resources Canada, Canada had 6.6 billion tonnes of recoverable coal reserves. Of these, roughly 53% represent bituminous coal and 47% sub-bituminous and lignite coal (see Figure 2 below). As shown on Figure 2 below, recoverable reserves have decreased by a modest annual rate of 0.8% over the past 10 years, as production has slightly exceeded the amount of new reserves added every year. While current depletion levels suggest that recoverable reserves are enough to support 100 years of future production, Canada's coal potential is much larger than that. Indeed, the total amount of coal resource in-place, a broader measure that includes identified and undiscovered deposits, has been estimated at 190 billion tonnes.²

Coal production has remained relatively flat over the past 10 years, at around 66 million tonnes. In 2010, coal production reached 67.9 million tonnes, with bituminous and sub-bituminous coal contributing 50% and 35% of total production respectively, and lignite accounting for the remaining 15% (see Figure 3 below). From a provincial perspective, Alberta produced roughly 30 million tonnes of coal in 2010, followed by British Columbia with 27 million and Saskatchewan with almost 10 million tonnes.

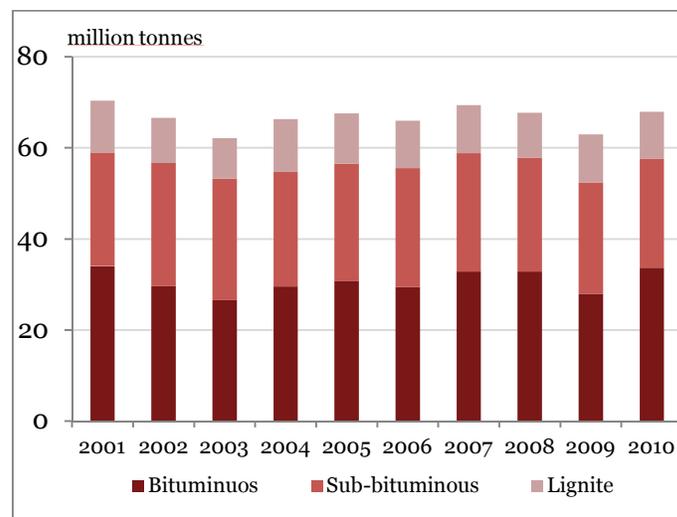
The large majority of the coal produced in British Columbia is primarily used for metallurgical purposes (i.e., steelmaking) and is exported to Asian markets. In contrast, Alberta and Saskatchewan's production predominantly consists of thermal coal and is used domestically for electricity generation. At present, approximately 40% of the fuel-generated electricity in Canada comes from coal. This represents about 13% of the electricity consumed in the country. On a regional basis, the dependence on coal for electricity generation is greater in Alberta, Saskatchewan and Nova Scotia at 74%, 73% and 60% respectively in 2009.

Figure 2. Recoverable reserves 2001 – 2009*



Source: Statistics Canada (*2009 last year data available)

Figure 3. Annual coal production 2001 – 2010



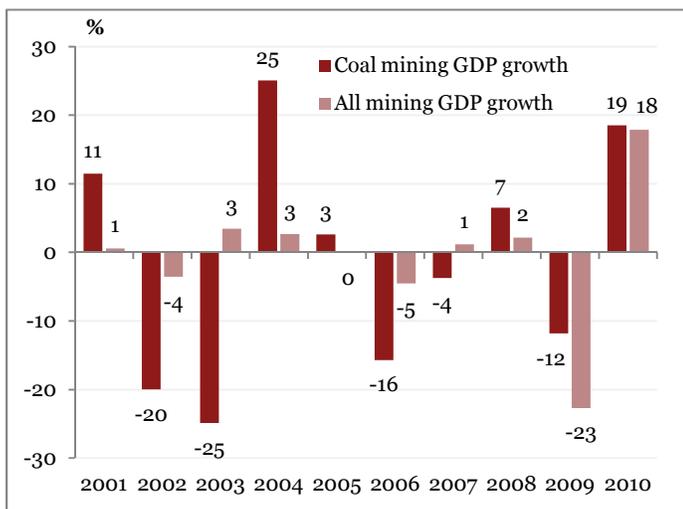
Source: Statistics Canada

² Natural Resource Canada, "About Coal" <http://www.nrcan.gc.ca/energy/sources/1205>

GDP contribution

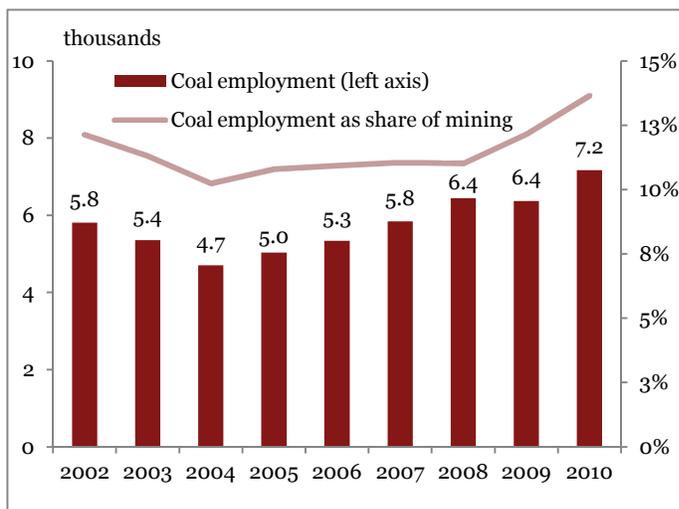
The coal sector is an important contributor to the country’s GDP. Between 2001 and 2010, coal mining added, on average, approximately \$1 billion annually to Canada’s real GDP. Coal mining represents approximately 12% of the country’s mining GDP. Real GDP growth in the coal sector has experienced a significant amount of volatility over the past decade, as a result of fluctuations in coal prices, in particular for metallurgical coal, and production costs in recent years (see Figure 4 below). This volatility however, is not specific to coal mining and has also been observed in the overall mining sector. Commodity prices in general, including coal, have experienced significant swings over the past 10 years, reaching record highs at the end of 2008 to then collapse as the global recession ensued in 2009 and rebound again in 2010 and 2011. Sudden changes in global activity cause commodity prices to fluctuate, which in turn makes the GDP growth of commodity-related sectors quite volatile.

Figure 4. Percentage GDP growth 2001 – 2010



Source: Statistics Canada

Figure 5. Direct Employment 2001 – 2010



Source: Statistics Canada

Employment

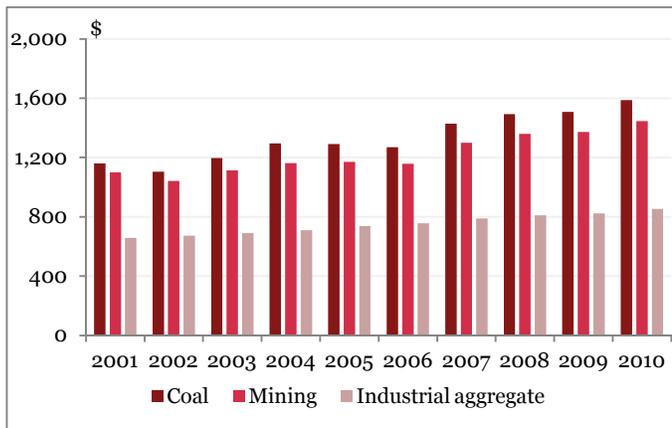
The coal sector has also been an important source of employment in the country. In 2010, roughly 7,200 people were directly employed in coal mining activities in Canada, with the industry adding approximately 1,400 jobs between 2001 and 2010. Coal employment has been rising steadily since 2004, both in level terms and as a share of total mining employment (see Figure 5 above). In 2010, coal represented approximately 14% of total Canadian mining employment compared to approximately 12% in 2001.

Wages and labour productivity

The rapid development of Canada’s mining sector over the past decade has resulted in an acute and persistent shortage of qualified workers in the industry. Coal has not been the exception. Some of the factors contributing to the labour shortage in coal mining include an aging workforce, competing labour demands from other industries, and the rural and remote location of mines. In light of historically high mineral prices, mining companies have responded to these labour shortages by offering relatively high salaries and wages to their employees.

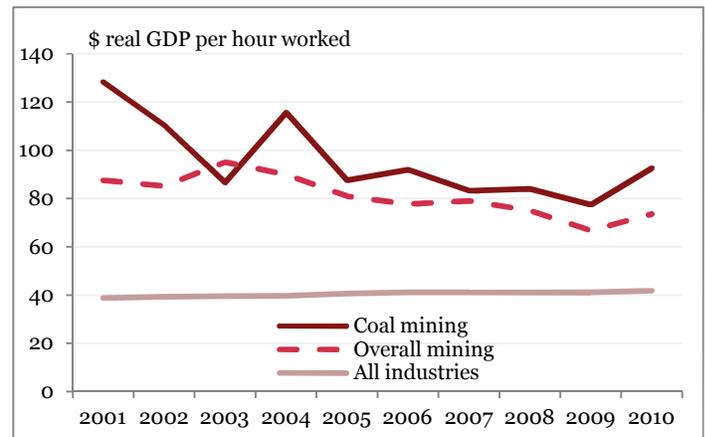
Between 2001 and 2010, average weekly earnings (including overtime) in Canada’s mining sector rose 31% to \$1,445, more than doubling the average weekly earnings in Canada’s overall industrial sector. In the coal sector the increase has been perhaps even higher. While Statistics Canada only publishes average weekly earnings for coal mining up to 2008, using the same growth rate observed in the overall mining sector earnings should have reached \$1,586 in 2010 (see Figure 6 below). This represents a 37% increase from the levels recorded in 2001, and slightly higher than the average for the mining sector.

**Figure 6. Average weekly earnings
2001 – 2010**



Source: Statistics Canada and PwC estimates

**Figure 7. Labour productivity
2001 – 2010**



Source: Statistics Canada and PwC estimates

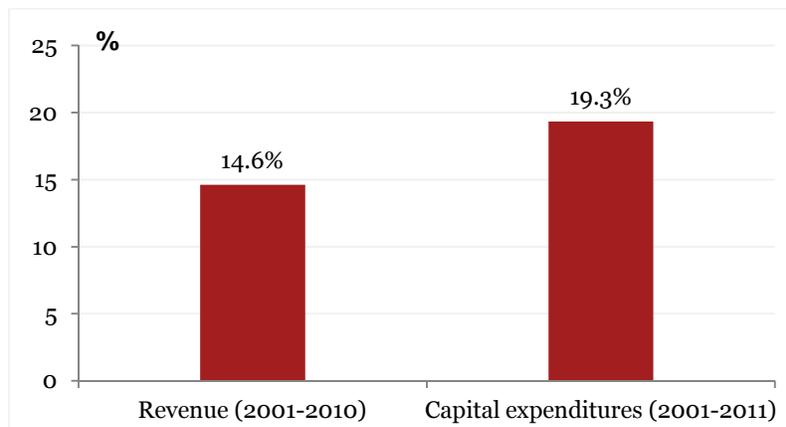
Historically, labour productivity in coal mining has been consistently higher than in the overall mining sector and across all industries of the economy. However, this labour productivity advantage has been gradually declining over the past ten years, as more effort is now required to extract additional amounts of coal from the ground. Figure 7 above shows that the decline in labour productivity is also evident in the overall mining sector, as this trend is inherent to the extractive industries in general. Resources that are easier to extract and process are commonly mined first. But as these resources are depleted, companies have to find additional reserves to sustain their production rates. Mining these new resources usually requires additional levels of effort, as they are either located in more remote places or require new technology and additional labor input for the extraction process.

Moreover, labour productivity in the mining sector – including coal mining– has also been negatively impacted by a persistent shortage of skilled labour. A consequence is that labour in the mining sector has become less productive, meaning that each additional hour of work produces less output. Overall, labour productivity in coal mining declined at an average annual rate of 4% between 2001 and 2010. However, it is important to note that there was an uptick in labour productivity in the coal sector in 2010, reversing some of the decline observed in recent years.

Capital investment and revenue growth

Canada’s coal sector has experienced remarkably strong rates of growth in revenue and capital investment in recent years. As Figure 8 below shows, an increased demand for metallurgical coal in emerging Asian economies, coupled with rising energy prices, results in the total value of the sector’s output growing at an average annual rate of 14.6% between 2001 and 2010. Similarly, capital investment in the sector grew at an average rate of 19.3% per year during the 2001 to 2011 period.

Figure 8. Revenue and capital investment average annual growth rate

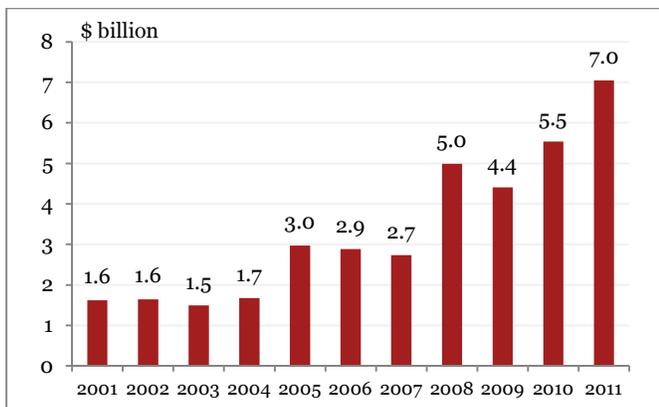


Source: Statistics Canada, Natural Resources Canada

While production volumes have remained relatively constant, the value of coal production reached \$7.0 billion in 2011, marking a historical record and representing a fourfold increase from the \$1.6 billion registered in 2001.³ As shown in Figure 9 below, the value of Canadian coal production started to increase in 2005 in response to higher coal prices.

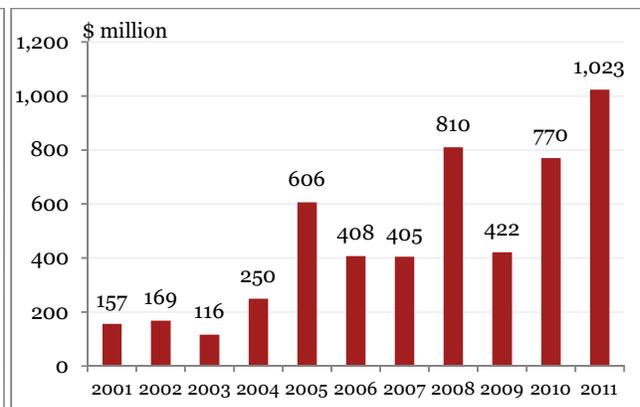
The global economic recession negatively affected Canada’s mineral extraction sector, as financing sources for large-scale projects dried up and coal prices fell sharply in late 2008 and early 2009. However, investment activity in the sector has already resumed its growth path, with capital expenditures rebounding to levels higher than those observed before 2008. In 2011, capital expenditures were \$1.023 billion, well above the \$422 million registered in 2009 and the \$411 million ten year average (Figure 10).

Figure 9. Coal production value 2001 – 2011



Source: Statistics Canada, Natural Resources Canada

Figure 10. Capital investment 2001 – 2011



Source: Statistics Canada

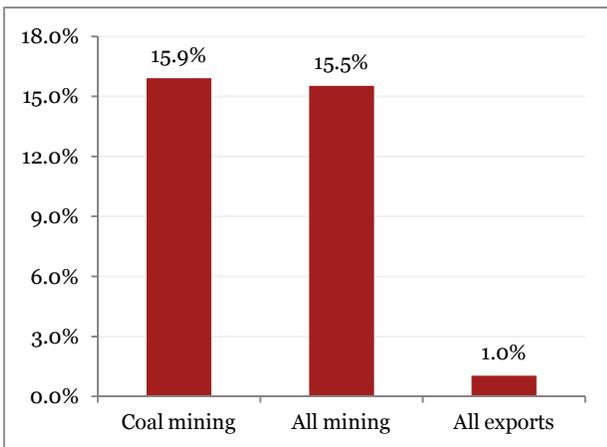
³ It should be noted that the export values reported by Statistics Canada are reported FOB at port of export and include transportation costs from the mine site and shipping tariffs.

Trade performance

Exports from Canada’s coal sector, measured in dollar terms, grew at an average annual rate of 16% during the past decade, well above the 1% average annual growth rate observed in Canada’s overall exports and in line with the growth rate experienced by the overall mining sector (see Figure 11). Cumulatively, the coal sector increased its exports from 2001 to 2011 by over 300%.

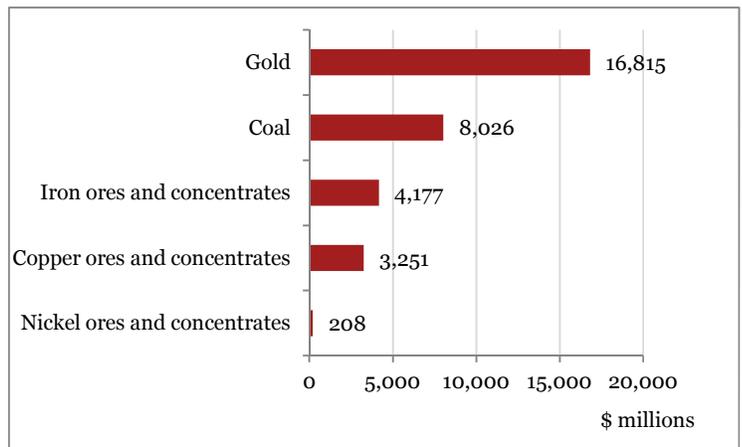
From an international trade perspective, coal accounts for an important portion of Canada’s mining exports. Between 2001 and 2011 the sector contributed, on average, approximately 19% of the country’s mineral exports. Indeed, as shown on Figure 12 below coal exports, in dollar terms, were only second to gold in 2011. Canada’s coal mining sector has benefitted from higher commodity prices and production volumes in recent years.

Figure 11. Average annual growth of exports 2001 – 2011



Source: Statistics Canada

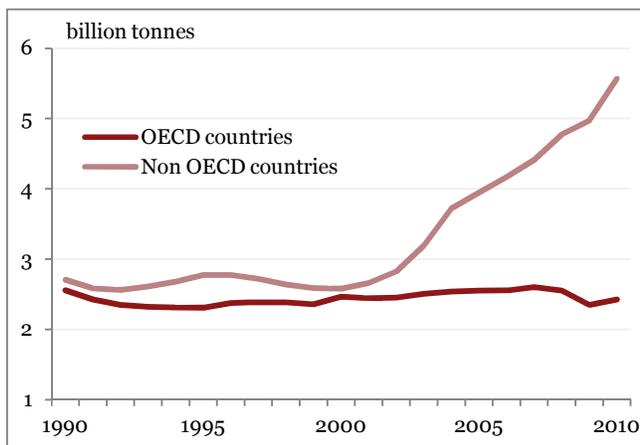
Figure 12. Exports of selected commodities in 2011



Source: Statistics Canada

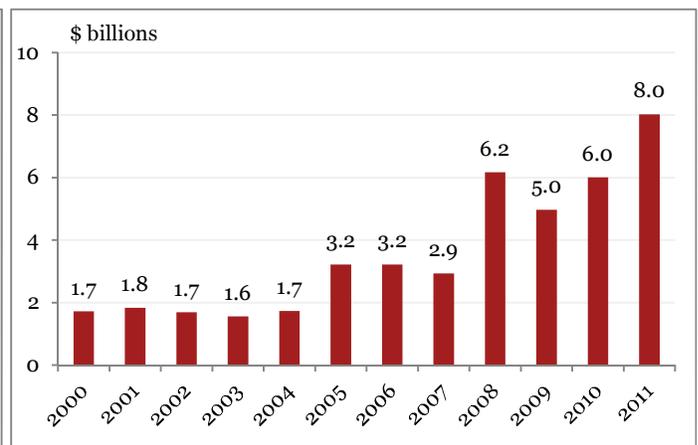
Sustained economic growth in emerging markets, particularly in Asia, has contributed to the increase in global coal consumption observed over the past decade. As shown in Figure 13, emerging countries more than doubled their consumption of coal between 2000 and 2010, as high industrialization and urbanization rates persisted in these economies throughout the decade. Canada has benefited from the increase in global demand, as the country capitalizes on the vast amount of coal resources. For example, the total value of coal exports reached a historic record high of \$8 billion in 2011 (Figure 14), representing an increase of almost fivefold from export values recorded in the early part of the previous decade.

Figure 13. World coal consumption 2001 – 2010



Source: US International Energy Administration

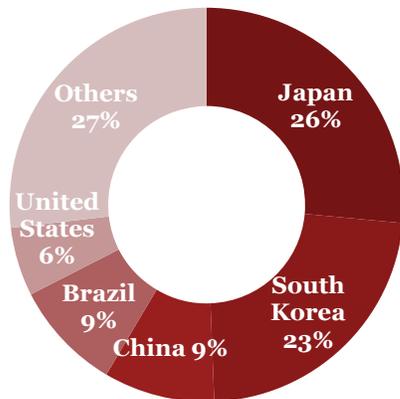
Figure 14. Value of Canadian coal exports 2000 – 2011



Source: Statistics Canada

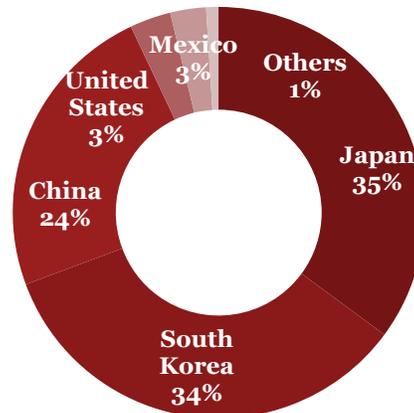
As indicated previously, most of the metallurgical coal produced in Canada is exported while the large majority of thermal coal produced is used domestically for energy generation purposes. Japan (26%), South Korea (23%) and China (9%) are the main market destinations for Canadian metallurgical coal, followed by Brazil (9%), the US (6%) and other countries (27%) across Europe and Asia (see Figure 16 below). The majority of exported thermal coal is shipped to Asian markets (93%) as show in Figure 16. ⁴

Figure 15. 2011 exports of metallurgical coal, \$7.4 billion



Source: Statistics Canada

Figure 16. 2011 exports of thermal coal, \$625 million

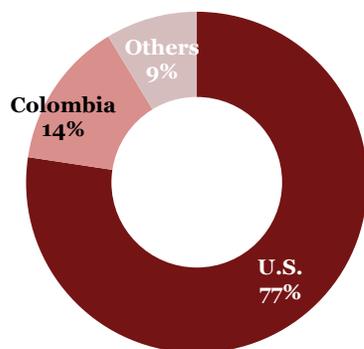


Source: Statistics Canada

While Canada is a net exporter of coal, the country also imports commercial quantities of metallurgical and thermal coal. Over the past decade, imports of metallurgical coal have increased at a modest rate of 0.2% per year, reaching a total of \$875 million in 2011. Imports of thermal coal, on the other hand, have been declining at an annual rate of 6.5% during the same period.

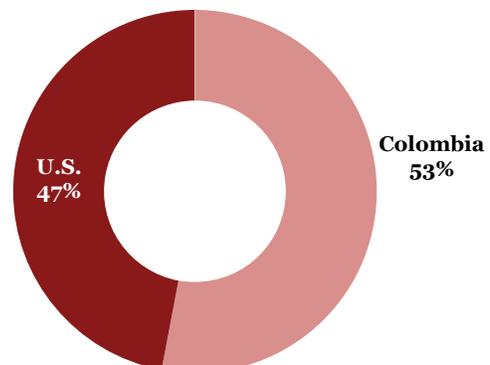
The largest source of Canadian coal imports is the US, which provides around 77% and 47% of metallurgical and thermal coal respectively (see Figures 17 and 18 below). The US is followed by Colombia, which accounts for roughly 14% of metallurgical coal imports and 53% of thermal coal imports.

Figure 17. 2011 imports of metallurgical coal, \$875 million



Source: Statistics Canada

Figure 18. 2011 imports of thermal coal, \$88 million



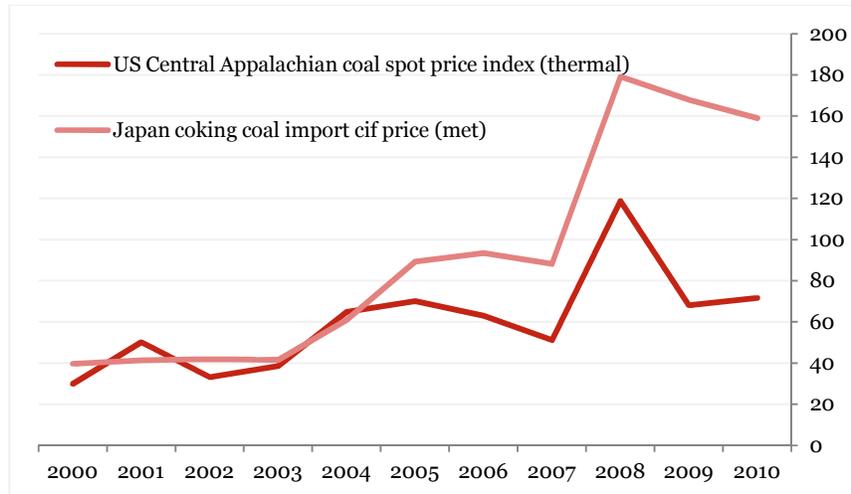
Source: Statistics Canada

⁴ Note: Figures 15 through 18 were prepared using Harmonized System Code data at the 8-digit level.

Coal price trends

Prices for both metallurgical and thermal coal have increased at a strong pace since 2008. As with other commodities, the price of coal reached an all time high in 2008. However, with the global economy entering into recessionary territory and the financial crisis in full swing, coal prices dropped sharply in 2009, losing some of the gains made in the prior year. However, coal prices have remained well above historic price levels, even during the recent recession. The decline in coal prices was more accentuated for thermal than for metallurgical coal, as Asian demand continued to support higher prices for metallurgical coal throughout the recession. The following graph shows prices for thermal and metallurgical coal over the past 10 years.

Figure 19. Coal prices



Source: Statistics Canada and BP Statistical Energy, 2011

2.2 Summary of key economic indicators

- Canada had 6.6 billion tonnes of coal recoverable reserves in 2009 (latest year for which data are available). Of these, roughly 53% represent bituminous coal and 47% sub-bituminous and lignite coal.
- Based on current depletion levels, recoverable coal reserves in Canada have been estimated to support 100 years of future production. When identified and undiscovered deposits are included, coal reserves have been estimated at 190 billion tonnes.
- Coal production reached 67.9 million tonnes in 2010, with bituminous and sub-bituminous coal contributing to 50% and 35% of total production respectively and lignite accounting for the remaining 15%. Alberta produced roughly 30 million tonnes of coal in 2010, followed by British Columbia with 27 million and Saskatchewan with almost 10 million tonnes.
- Between 2001 and 2010, coal mining contributed approximately \$1 billion annually to Canada's real GDP. This amount is equivalent to roughly 12% of the country's mining GDP.

- In 2011, total coal production was valued at \$7.0 billion, representing a fourfold increase from the \$1.6 billion registered in 2001.
- Coal employment has been rising steadily since 2004, both in level terms and as share of total mining employment. In 2010 coal accounted for 14% of total mining employment, compared to 12% ten years ago.
- After a steep decline in 2009, investment activity in the sector rebounded strongly in 2010. Capital expenditures reached \$1,023 million in 2011, well above the ten year average.
- Between 2001 and 2011, the sector contributed on average approximately 19% of the country's mineral exports. Canada's coal exports grew at an average annual rate of 16% during the past decade, well above the 1% average annual growth rate observed in Canada's overall exports. Overall, Canada's coal exports have increased by over 300% between 2001 and 2011.

Table 1 – Coal industry indicators (2001 – 2011)

Key Indicators	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Production (m tonnes)	70,355	66,608	62,139	66,308	67,557	66,002	69,362	67,749	62,934	67,896	67,114
% change	1.7	-5.3	-6.7	6.7	1.9	-2.3	5.1	-2.3	-7.1	7.9	-1.2
Value of production (\$m)	1,624	1,642	1,493	1,675	2,968	2,886	2,735	4,986	4,406	5,541	7,050
% change	13.8	1.1	-9.1	12.2	77.1	-2.7	-5.2	82.3	-11.6	25.7	27.2
Real GDP (2002 \$m)	1,321	1,057	794	993	1,019	859	827	881	777	921	NA
% change	11.5	-20.0	-24.9	25.1	2.6	-15.7	-3.7	6.5	-11.8	18.5	NA
Employment (direct)	6,143	5,811	5,357	4,705	5,037	5,336	5,844	6,443	6,369	7,170	6,881
% change	-14.7	-5.4	-7.8	-12.2	7.1	5.9	9.5	10.2	-1.1	12.6	-4.0
Capital investment (\$m)	157	169	116	250	606	408	405	810	422	770	1,023
% change	34.8	7.7	-31.1	114.7	142.5	-32.7	-0.6	99.7	-47.9	82.4	32.9
Exports (\$m)	1,834	1,691	1,558	1,728	3,221	3,222	2,936	6,171	4,971	6,003	8,026
% change	6.5	-7.8	-7.9	10.9	86.4	0.0	-8.9	110.2	-19.4	20.7	33.7

3.0 Survey and economic impact methodology

3.1 Introduction

Canada's economy benefits from the various activities conducted by the coal mining industry in Canada. The coal mining industry provides employment, pays higher than average wages and generates overall economic value to the Canadian economy. However the economic contribution of the coal mining industry is greater than these direct effects. Also included are effects from construction and operations expenditures generated from coal mining companies that includes the purchase of goods and services from suppliers. These activities are considered spill-over effects and also contribute economically to the national economy. Governments at the federal, provincial and local levels collect taxes on these activities and, in turn, provide services to the general public.

Economic impact estimates presented in this section of the report are based upon data provided by industry participants responding to a confidential survey. A direct comparison with the data provided in the preceding section is not advised as the data was taken from publicly available information and developed using different methodologies.

3.2 Survey methodology

The economic impact analysis and the industry profile of the Canadian coal mining industry are based on aggregated data from an industry survey administered by PwC. Survey data was gathered from industry participants by means of an online and confidential questionnaire. PwC independently reviewed the survey responses for reasonableness and consistency.

Identifying potential survey participants

The first step of the study was to identify potential survey respondents representing the coal mining industry in Canada. The Coal Association of Canada provided PwC with a list of 25 coal companies and contacts from across Canada that included exploration companies and producers.

Survey development

PwC then prepared a survey template that asked questions relating to the coal mining industry such as:

- Mine location and type of coal mined
- Mining revenues
- Operating costs and capital expenditures
- Salaries and employment
- Research and development spending
- Coal shipments

Survey deployment, monitoring and data collection

Once the survey questionnaire was finalized, the survey was uploaded to a password protected, on-line website for distribution. All survey submissions are held in confidence by PwC and results presented in this report are on an aggregated basis so that no individual company results are identifiable.

In total, 18 out of the 25 companies invited participated in the survey representing a 72% participation rate. Because of the high participation rate, the survey results are largely representative of the industry however, the results are still considered to be conservative as not all companies invited participated in the survey.

Additional data sources

Additional material was collected through a review of data on exploration and mining activity published by Natural Resources Canada, provincial ministries of mines and energy, mining associations, and other publicly available sources. Additional information on the coal companies was obtained through a review of annual reports and corporate sustainability reports, websites and news releases.

3.3 Economic impact methodology

Economic impact modelling in this study uses information in what are called Input-Output accounts to predict how an increase in demand for the products of one industry will impact on other industries and therefore on the Canadian economy. The Statistics Canada Input-Output accounts reflect the underlying industrial structure of the entire Canadian economy in terms of who makes what and who uses what. In principle, the model contains the recipes for every output of the economy.

The Input-Output approach was selected because of its widespread use, and ability to facilitate comparisons with economic impact studies of other industries. The fundamental philosophy behind economic impact analysis is that changes (increases or decreases) in expenditures are multiplied through the economy. An increase in spending on some goods and services generates a need for additional goods and services and by using this approach it is possible to track this cascading effect through the economy. In addition, using the Input-Output accounts, the appropriate economic impact multipliers were developed and applied to arrive at the economic impacts of the activities of Canada's coal industry.

Input-Output analysis does not address whether the inputs have been used in the most productive manner or whether the use of these inputs in this industry promotes economic growth by more than their use in another industry or economic activity. Nor does input analysis evaluate whether, when or where these inputs might be employed elsewhere in the economy if they were not employed in this industry at this time. Input-Output analysis reports the direct and indirect economic impacts which can reasonably be expected to result in the economy when these inputs are used in this industry, based on historical relationships within the economy.

Direct and indirect economic impacts

Economic impacts may be estimated at the direct and indirect levels.

Direct impacts - are changes that occur in "front-end" businesses that would initially receive expenditures and operating revenue as a direct consequence of the operations and activities of a facility. For the coal mining industry, these include activities directly attributable to activities at the mine site which include mine output and transportation of mine output from the mine to the purchaser.

Indirect impacts - arise from changes in activity for suppliers of the "front-end" businesses (mining suppliers) such as contractors and other companies providing inputs (goods and services) to mining companies.

Estimating direct and indirect economic impacts are generally done through the use of Input-Output multipliers. The most commonly used of these measures are output, Gross Domestic Product (GDP), employment, wages and salaries, and government tax revenues. Each of these measures is described below.

- **Output** - represents the total sum of all economic activity that has taken place in connection with expenditures made through the Canadian coal companies and is the broadest measure of economic activity.
- **GDP** - the "value added" to the economy by an industry. Since the GDP figure captures the difference between the value of output and the value of intermediate inputs, it represents the unduplicated total

value of economic activity that has taken place. The GDP impacts in this report represent the value added to the economy as a result of the expenditures of coal companies in Canada.

- **Employment** - the number of additional jobs created as a result of the expenditures made by coal companies in Canada.
- **Wages and Salaries** - measures the additional wages and salaries generated and include direct wages and salaries, as well as supplementary labour income and mixed income sources.
- **Government Tax Revenues** - arise from personal income taxes, indirect taxes less subsidies (e.g. sales tax), corporate income taxes and is measured as the total amount of tax revenues generated for each level of government (municipal, provincial and federal). By definition, government tax revenues generated using the input-output approach does not include royalties collected.

The economic impacts presented in the following section represent impacts generated for the year 2011.

4.0 Economic Impact Analysis

4.1 Estimated economic impact of the coal mining industry in Canada

The direct and indirect economic impacts for the coal mining industry presented in table 2 below, are based on the results of the survey responses from 18 of the coal mining companies invited to participate which represent a 72% response rate. As such, the results of the economic impact estimates provided are considered to be conservative, although the representation is strong enough to be considered indicative of the mining industry generally.

The economic impacts below for output, GDP, wages and salaries, government revenues and employment are based on expenditures of \$5.9 billion in 2011 as reported by the 18 survey participants.

The direct coal mining industry then includes the Canadian economic activity of mine operators, companies providing support to mine operators, and transportation companies carrying mine output to purchasers. Indirect effects then include the Canadian economic activity of suppliers including suppliers of capital goods for mining operations.

Table 2 –Summary of the economic impact of the coal mining industry in Canada, 2011

	Direct Impact	Indirect Impact	Total Economic Impact
Output (millions)	\$5,943	\$3,712	\$9,655
GDP (millions)	\$3,244	\$1,988	\$5,232
Wages and Salaries (millions)	\$1,769	\$837	\$2,606
Government Revenues* (millions)	\$450	\$248	\$698
Employment (Number of Jobs)	25,471	16,559	42,030

*Economic impact multipliers do not take into account mining royalties paid

In total, the coal mining industry in Canada generates approximately \$9.7 billion in economic output, of which close to \$5.2 billion can be considered new, or value-added to the economy. The GDP total includes \$3.2 billion of direct mine site activity and \$2.0 billion from mining supply and other related economic activity.

Total direct and indirect tax revenue generated from the coal mining industry was approximately \$698 million. Government tax revenues reported in this study include impacts from personal income taxes, indirect taxes and corporate income taxes and are a conservative estimate of total tax revenues. As noted above, government tax revenues generated using the input-output approach does not include royalties collected. Additional mineral royalties collected and reported by provincial governments in 2011 were \$344 million and are in addition to the tax revenues estimated above.

Industry expenditures were a source of approximately 42,030 jobs across Canada with direct and indirect wages and salaries of \$2.6 billion. Direct employment reported by the survey participants was 7,154 jobs which generated an estimated average wage for the industry of \$92,785. In comparison, the average national wage was \$43,700.

4.2 Estimating economic impacts by category of expenditure

To conduct the economic impact analysis, coal mining expenditures reported in the survey were separated into six categories:

1. Operating expenditures
2. Capital expenditures
3. Outward transportation costs
4. Exploration & development expenditures
5. Mine reclamation expenditures
6. Research and development expenditures

Operating, capital and outward transportation expenditures generated the most economic impacts nationally. Details of the economic impacts generated by each category are provided in tables 3 to 8.

Operating expenditures

Operating expenditures include spending that is required when a mine is in operation. These include production materials and supplies, cleaning costs, professional and technical services including contract work, salaries and benefits, education and training, and the total cost of energy purchased including fuel and electricity and water rental fees.

The economic impacts for operating expenditures are presented in Table 3 below.

Table 3 – Economic impacts of operating expenditures, 2011

	Direct Impact	Indirect Impact	Total Economic Impact
Output (millions)	\$2,722	\$1,664	\$4,386
GDP (millions)	\$1,688	\$991	\$2,679
Wages and Salaries (millions)	\$780	\$262	\$1,042
Government Revenues (millions)	\$191	\$84	\$275
Employment (Number of Jobs)	9,761*	5,918	15,679

*Direct employment reported by survey participants was 7,154 and is included in the total direct jobs of 9,761.

The estimated total output of operating expenditures was approximately \$4.4 billion was made up of roughly \$2.7 billion and \$1.7 billion in direct and indirect impacts respectively.

Operating expenditure impacts in terms of contribution to GDP was estimated at \$2.7 billion and consisted of \$1.7 billion and \$991 million in direct and indirect impacts respectively.

Estimated government tax revenues generated was approximately \$275 million and consists of \$191 million in direct and \$84 million in indirect impacts.

Approximately 15,679 jobs were supported by the coal mining industry in Canada of which 7,154 were employed directly by the survey respondents. The estimated average annual wage for direct employment of survey respondents representing the coal mining industry in Canada was \$92,785. Employment represents part-time and full time staff members.

Capital expenditures

The economic impacts for capital expenditures, including construction materials, are based on the 2011 survey data. It appears that 2011 was an active year in terms of construction, with direct expenditures amounting to \$1.5 billion. During the construction phase of a mine, companies are highly labour intensive. However, once the mine is in operation, the total number of workers required for construction activities tends to fall. The economic impacts for capital expenditures are presented in Table 4 below.

Capital expenditures included the purchase of lands and mining rights, expenditures on all buildings and other surface structures, machinery, equipment, construction materials, mine shafts and underground work.

Table 4 – Economic impacts of capital expenditures, 2011

	Direct Impact	Indirect Impact	Total Economic Impact
Output (millions)	\$1,504	\$912	\$2,416
GDP (millions)	\$640	\$446	\$1,086
Wages and Salaries (millions)	\$389	\$265	\$654
Government Revenues (millions)	\$92	\$73	\$165
Employment (Number of Jobs)	4,644	4,647	9,291

The estimated total output for capital expenditures was estimated at \$2.4 billion and was made up of \$1.5 billion in direct capital spending impacts and an estimated \$912 million in indirect impacts.

In terms of GDP, capital expenditures contributed an estimated \$1.1 billion to the Canadian economy and consisted of \$640 million and \$446 million in direct and indirect impacts respectively.

Estimated government tax revenues on capital expenditures generated were approximately \$165 million and consisted of \$92 million in direct and \$73 million in indirect impacts.

Wages and salaries amounted to \$389 million and represented contract workers during capital construction with indirect wages representing wages and salaries of employees of suppliers. Employment based on capital expenditures was approximately 9,291 jobs based on an estimated 4,644 direct jobs and 4,647 indirect jobs.

Outward transportation costs

Outward transportation expenditures include the transportation of coal to the free on board point of delivery, including costs of company-operated carriers and duty and brokerage fees paid. The economic impacts for outward transportation costs are presented in Table 5 below.

Table 5 – Economic impacts of outward transportation costs, 2011

	Direct Impact	Indirect Impact	Total Economic Impact
Output (millions)	\$984	\$712	\$1,696
GDP (millions)	\$509	\$316	\$825
Wages and Salaries (millions)	\$289	\$164	\$453
Government Revenues (millions)	\$95	\$49	\$144
Employment (Number of Jobs)	4,229	3,092	7,321

The estimated total output of approximately \$1.7 billion was made up of \$984 million in direct impacts and indirect impacts of approximately \$712 million based on transportation expenditures.

Contribution to GDP was estimated at \$825 million and consists of \$509 million and \$316 million in direct and indirect impacts respectively.

Estimated government tax revenues generated was approximately \$144 million and consisted of \$95 million in direct and \$49 million in indirect impacts.

Total wages and salaries for outward transportation related activity were estimated to be \$453 million which resulted in an estimated total employment of 7,322 jobs in Canada.

Exploration and development expenditures

According to survey respondents, coal mining exploration and development expenditures amounted to \$380 million in 2011. Since economic impacts are based on survey results, the impacts reported below for exploration and development expenditures are considered to be a conservative estimate of impacts.

Expenditures from exploration and development activity include greenfield exploration, exploration on properties under development as well as the development and new exploration on producing properties. Greenfield exploration activities include all exploration expenditures incurred in searching for and delineating mineral deposits on properties where no prior exploration has taken place. This includes airborne, surface and underground exploration costs. Development of non-producing and producing properties includes work done to outline and gain access to ore and prepare it for production. For producing properties, this also includes all exploration expenditures incurred in searching for and delineating additional mineral deposits.

The economic impacts for exploration & development expenditures are presented in Table 6.

Table 6 –Economic impacts of exploration & development expenditures, 2011

	Direct Impact	Indirect Impact	Total Economic Impact
Output (millions)	\$380	\$229	\$609
GDP (millions)	\$200	\$126	\$326
Wages and Salaries (millions)	\$154	\$79	\$233
Government Revenues (millions)	\$36	\$22	\$58
Employment (Number of Jobs)	3,304	1,492	4,796

The estimated total output of approximately \$609 million was made up of \$380 million in direct impacts and approximately \$229 million in indirect impacts.

Contribution to GDP was estimated at \$326 million and consists of \$200 million and \$126 million in direct and indirect impacts respectively.

Estimated government tax revenues generated is approximately \$59 million.

Total direct and indirect wages and salaries for exploration and development spending was \$233 million of which \$154 million was for direct wages and salaries and \$79 million was for wages and salaries of suppliers to mining companies.

Total employment for exploration and development activities was estimated at 4,796 jobs in Canada of which 3,304 was direct employment with mining companies and 1,492 was employment with suppliers.

Mine reclamation expenditures

Mine reclamation activity mitigates the environmental effects of mining after the recoverable mineral resources have been depleted. Mine reclamation expenditures include activities related to restoring mined land to a natural and / or economical state.

The economic impacts for mine reclamation expenditures are presented in Table 7.

Table 7 –Economic impacts of mine reclamation expenditures, 2011

	Direct Impact	Indirect Impact	Total Economic Impact
Output (millions)	\$350	\$193	\$543
GDP (millions)	\$205	\$108	\$313
Wages and Salaries (millions)	\$156	\$66	\$222
Government Revenues (millions)	\$35	\$20	\$55
Employment (Number of Jobs)	3,501	1,397	4,898

Total output generated from spending on mine reclamation was estimated to be \$543 million in 2011. In terms of GDP, mine reclamation expenditures contributed an estimated \$205 million in direct impacts and \$108 million in indirect impacts for total contribution of \$313 million in GDP impacts to the Canadian economy.

Government tax revenues generated an estimated \$35 million in direct and \$20 million in indirect impacts for total impacts of approximately \$55 million from mine reclamation expenditures

Mine reclamation expenditures were the source of approximately 4,898 part-time and full-time jobs with total wages and salaries of \$222 million.

Research and development expenditures

Research and development expenditures include the cost of in-house company research, and payment to outside organizations. These expenditures can include research activities such as core and bulk sampling, coal quality analysis, gasification, clean coal research, and potential acquisitions. As not all survey respondents answered questions about research and development expenditures, the responses and results are provided for reporting purposes only. As such, the economic impact estimates presented in Table 8 below are considered to be conservative and not representative of total industry spending on research and development.

Table 8 – Economic impacts of research and development expenditures, 2011

	Direct Impact	Indirect Impact	Total Economic Impact
Output (millions)	\$3.2	\$1.8	\$5.0
GDP (millions)	\$1.9	\$1.0	\$2.9
Wages and Salaries (millions)	\$1.4	\$0.6	\$2.0
Government Revenues (millions)	\$0.3	\$0.2	\$0.5
Employment (Number of Jobs)	32	13	45

Total output estimated for research and development was \$5.0 million of which \$3.2 million was direct and \$1.8 million indirect impacts.

GDP generated from research and development expenditures was estimated at \$2.9 million with direct contributions of \$1.9 million and an estimated \$1.0 million from indirect activities.

Approximately \$0.5 million in government taxes was generated through direct and indirect spending on research and development related activities.

Direct and indirect wages and salaries for these expenditures totalled \$2 million for a total of 45 estimated jobs in research and development.

4.3 Employment analysis

Economic activity generated by the coal mining industry in Canada is estimated to support 42,030 jobs with \$2.6 billion in associated wages and salaries. With approximately 17.3 million people employed in Canada at the end of 2011, the estimated direct employment impacts of 25,471 represent 0.15% of total Canadian employment.

Table 9 provides a comparison of the employment contributions of the coal mining industry to other industrial sectors as a percentage of total national employment.

Table 9 – Employment comparison of major Canadian industries, 2011

Industry	Employment	Share of national total
Coal mining industry (direct employment impacts include direct coal company employment and employment from related mining activities on the mine site)	25,471	0.15%
Mining, quarrying, and oil and gas extraction (including coal)	271,300	2%
Agriculture	305,600	2%
Manufacturing	1,760,200	10%
Canada	17,306,200	100%

*As calculated by economic impact analysis
Source: Statistics Canada and PwC estimates

5.0 Outlook and future activities in coal mining, 2012 to 2014

Generally, economic impact assessments provide a perspective on the industry at a given point in time. In this report, the results of the analysis are static and report the economic contributions of the industry for 2011. To obtain a look into the future, coal mining companies participating in the survey were asked to provide information on their future capital spending from 2012 to 2014.

Survey participants were asked to report their estimated capital costs that have already been committed to new mines and expansion projects for 2012 and out to 2014. These costs do not include costs incurred in 2011 and prior years.

Survey participants indicated a total value of approximately \$2.2 billion (or \$721 million annually) of future capital expenditures over the next three years (2012 to 2014). Future capital spending can be broken down by phase as follows:

- Mine exploration spending - \$302 million
- Mine development spending - \$1.1 billion
- Mine operations spending - \$690 million
- Mine reclamation spending - \$116 million

Future research and development spending

When asked, survey participants reported future research development and expenditures of \$3.5 million over the next three years from 2012 to 2014. As not all survey respondents answered the questions about research and development expenditures, the responses and results are provided here for reporting purposes only.

Research and development activities reported included the following:

- research and development of core sampling and coal analysis
- gasification
- clean coal research,
- bulk sampling and quality analysis.

In addition, survey participants also suggested other areas of research could be related to specific projects such as potential acquisitions, or company analysis and comparison.

Appendix A - Summary of economic impacts

The following table provides a detailed summary of the economic impacts by category of expenditure and impact type (direct, indirect and total).

\$ millions	Operating Expenditures	Capital Expenditures	Outward Transportation Costs	Exploration & Development Expenditures	Mine Reclamation	R&D Investment*	Total
Direct							
<i>Output</i>	\$2,722	\$1,504	\$984	\$380	\$350	\$3.2	\$5,943
<i>GDP</i>	\$1,688	\$640	\$509	\$200	\$205	\$1.9	\$3,244
<i>Wages & Salaries</i>	\$780	\$389	\$289	\$154	\$156	\$1.4	\$1,769
<i>Employment</i>	9,761	4,644	4,229	3,304	3,501	32	25,471
<i>Taxes</i>	\$191	\$92	\$95	\$36	\$35	\$0.3	\$449
Indirect							
<i>Output</i>	\$1,664	\$912	\$712	\$229	\$193	\$1.8	\$3,712
<i>GDP</i>	\$991	\$446	\$316	\$126	\$108	\$1.0	\$1,988
<i>Wages & Salaries</i>	\$262	\$265	\$164	\$79	\$66	\$0.6	\$837
<i>Employment</i>	5,918	4,647	3,092	1,492	1,397	13	16,559
<i>Taxes</i>	\$84	\$73	\$49	\$22	\$20	\$0.2	\$248
Total Effects							
<i>Output</i>	\$4,386	\$2,416	\$1,696	\$609	\$543	\$5	\$9,655
<i>GDP</i>	\$2,679	\$1,086	\$825	\$326	\$313	\$2.9	\$5,232
<i>Wages & Salaries</i>	\$1,042	\$654	\$453	\$233	\$222	\$2	\$2,606
<i>Employment</i>	15,679	9,291	7,321	4,796	4,898	45	42,030
<i>Taxes</i>	\$275	\$165	\$144	\$58	\$55	\$0.5	\$697

*As there were limited responses from survey participants regarding expenditures for research and development, the reported expenditures are not indicative of industry spending as whole. The information provided here is for reporting purposes only.

