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Income and Expenditure Accounts Technical Series

The Natural Resources Satellite Account: Feasibility study

by Marco Provenzano, Conrad Barber-Dueck and Joseph Floyd (National Economic Accounts Division, Statistics Canada)



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- . not available for any reference period
- .. not available for a specific reference period
- ... not applicable
- 0 true zero or a value rounded to zero
- 0^s value rounded to 0 (zero) where there is a meaningful distinction between true zero and the value that was rounded
- ^P preliminary
- ^r revised
- X suppressed to meet the confidentiality requirements of the *Statistics Act*
- ^E use with caution
- F too unreliable to be published
- * significantly different from reference category ($p < 0.05$)

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The Natural Resources Satellite Account: Feasibility study



Prepared for Natural Resources Canada

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Executive summary

This study indicates that it is feasible to create a satellite account that quantifies the size and scope of the natural resource sector in the Canadian economy. Estimates can be made available, both on an annual and quarterly basis, up to the current quarter (three months after the reference period, and approximately one month after the release of quarterly national GDP).

Provisional estimates of a Natural Resources Satellite Account (NRSA) have been constructed within the Canadian System of National Accounts (CSNA) framework. As such, they are directly comparable to values of Gross Domestic Product (GDP) and other economic measures produced within the CSNA.

This study defines natural resource activities as products and services originating from naturally occurring assets used in economic activity. These assets comprise mineral and energy resources, water, as well as natural timber, aquatic, and other natural biological resources. The resource assets may be renewable or non-renewable. They do not include intensively cultivated biological resources.¹ To provide a more complete measure of the economic importance of this sector, natural resource products and the services required in the initial extraction as well as the initial processing of the natural resource inputs are included. The activities related to the production of natural resource products constitute the scope of production for the natural resource satellite account.

Given the importance of various downstream natural resource activities to the Canadian economy, secondary and tertiary processing will also be identified in the Natural Resources Satellite Account. The downstream activity will be fully separable from the core natural resources sector for analytical purposes allowing the core activity to remain consistent with international definitions.

As an organizing framework, the satellite account presents information on natural resource activities by sub-sector (forestry, mining, energy and other²).

This study provides annual provisional estimates for the natural resource sector for the years 2009 to 2012 (with revised estimates from 2007 to 2015 available on CANSIM). These estimates serve as the foundation for possible future extensions including:

- more timely, quarterly natural resource statistics;
- provincial and territorial estimates;
- employment and human resources statistics;
- capital investment including research and development;
- links to the Natural Resource Stock Account and the Clean Tech Satellite Account³; and
- government revenue attributable to the natural resource sector.

1. Overview

The natural resources sector is an important part of the Canadian economic landscape. It plays a significant role in Canada's economic growth, employment and investment. The development of new mines, energy sources, oil and gas reserves as well as forestry products have led to the sector's increasingly important role in Canada's overall economic development. The sector is often an important driver of economic growth and is a key influence on regional economic performance. Given the importance of this sector, policymakers, researchers, businesses and households require comprehensive and timely statistics in order to assess the evolution, structure, role and the contribution of this sector to the Canadian economy.

Statistics Canada produces a wealth of information on the natural resources sector. Statistics related to jobs, output, imports, exports, and investment can be found among the many products released by the agency. While a significant amount of detailed data on the natural resource sector exists, it is not currently organized in a coherent and comprehensive economic framework that can be easily expanded to address emerging issues.

This paper examines the feasibility of developing a Natural Resources Satellite Account (NRSA) consistent with the Canadian System of National Accounts. The NRSA is an expandable framework that can be used to present Statistics Canada's existing data holdings for the natural resource sector as well provide increased detail for data users. This feasibility study starts by discussing satellite accounts within the framework of the System of National Accounts (SNA). The definition of natural resources is addressed. Experimental results are then provided for the years 2009 to 2012, based on the proposed definition. In this study, annual estimates have been calculated in both nominal and real terms. Further developments are discussed in a concluding section, including the computation of more timely, quarterly data along with other potential linkages and extensions.

2. The Canadian system of national accounts

The foundation of a Natural Resource Satellite account is the data contained within the Canadian System of National Accounts (CSNA). The CSNA is based on the 2008 System of National Accounts (2008 SNA), an internationally recognized framework used to measure economic activity within a country or region. The framework is used by countries throughout the world to record their production, incomes, investment, consumption, financial transactions and stocks of assets and liabilities. The data are organized into a sequence of accounts that articulate the change in wealth from one period to another by tracking the activities of economic agents (households, governments, corporations). The SNA provides a set of concepts, classifications and accounting rules for compiling and integrating data to give a comprehensive picture of the economy and how it works. Key measures that emerge from this framework include gross domestic product (GDP) at both basic and market prices, household disposable income, investment, capital stock, productivity, the international balance of payments and government debt.

The annual supply and use tables (SUT) produced by Statistics Canada are the main source of information used to derive the annual NRSA estimates. These tables balance the total supply of all products in the economy with their uses. By definition, total supply must equal total demand for each product. The supply of a product can originate from domestic production or imports and is expressed in market prices (the price paid by the final consumer of the good); including margins for transport, trade, sales tax and tariffs. The various uses of a product include the utilization by businesses for the production of other goods or services (intermediate consumption), along with final consumption by households, government or non-profit institutions. Further, the product could be purchased as an asset for ongoing use in the production of other products (investment or gross fixed capital formation) or exported.

At Statistics Canada, industries are defined by the North American Industry Classification System (NAICS). Similarly, all products are catalogued by the North American Product Classification System (NAPCS). These classification systems are the building blocks for constructing the Supply-Use Tables (SUT), formerly known as Input-Output Tables (IOT) at Statistics Canada. The SUT combine and modify some of these industries and products. These, in turn, are then called the Input Output Industry Classification (IOIC) and the Supply Use Product Classification (SUPC).

3. Satellite accounts

One of the strengths of the System of National Accounts is its flexibility. While the system lays out the concepts, accounts and accounting rigour required to produce a set of integrated and internally consistent set of accounts, it does afford the compiler the flexibility to vary and in a sense 'expand' the framework to address a specific need. At the limit this 'expanding' is referred to as satellite accounting. There are essentially two types of satellite accounts that can be produced. One type of satellite account involves a rearrangement of the classifications or data (e.g., more detail alternative aggregations) and

possible addition of complementary information of the existing core accounts. These satellite accounts do not change the underlying concepts of the core System of National Accounts but provide an expanded perspective on a particular sector, group of products or activity.⁴ The second type of satellite account seeks to expand or supplement the underlying concepts of the core System of National Accounts to study a topic of social interest. This could involve, for example, expanding the concept of production (e.g., including volunteer activities as production), consumption or capital formation. The Natural Resource Satellite Account falls into the first category, where concepts are consistent with the core CSNA, but additional detail and presentational changes are used to better identify and articulate the natural resource sector.

The development of an NRSA involves extracting detail related to natural resource activities from the core set of published CSNA data. The account follows the main principles, classifications and definitions of the core CSNA, ensuring it is directly comparable with the rest of the CSNA. From this account, therefore, it will be possible to calculate a gross domestic product for the natural resource sector comparable to total gross domestic product—providing a measure of the sector's contribution to total economic activity. By using the same principles as those in the CSNA, the satellite account leverages an internationally accepted statistical framework and infrastructure. Examples of other macroeconomic aggregates directly comparable to the core framework include international exports and imports, gross fixed capital formation (investment) and employment.

In addition to comparability and efficiency, the use of the CSNA infrastructure also provides a number of other advantages. A large array of data is already available at Statistics Canada to construct standard macroeconomic accounts and can be used as the starting point in the construction of an NRSA. The data has already gone through data quality validation and have been further integrated, reconciled and balanced in the process of producing the CSNA. This ensures that the data underlying the satellite account is equivalent in quality to Canada's core macroeconomic accounts.

The NRSA also provides a clear organizing framework for analysis of the natural resources sector. It clearly defines the natural resource sector and thereby presents a consistent set of numbers rather than a variety of estimates based on inconsistent concepts. The account goes beyond an industry perspective of the Natural Resources sector, rather using natural resource activities as its main organizing structure. As a result, the NRSA will eliminate industry production un-related to natural resources and add in natural resource production which takes place in industries which aren't traditionally defined as natural resources (such as the production of refined precious metals in the miscellaneous manufacturing industry and the production of fuel wood in the agricultural crop industry).

The NRSA has the potential to include information related to production, incomes, international trade, employment, investment, financial transactions and wealth in one coherent and integrated set of accounts, providing a convenient way to understand and analyze the natural resource sector comparable with traditional economic measures.

Finally, the NRSA is expandable in that work can be undertaken to disaggregate a given dimension (such as an industry or product) to provide additional granularity required by data users. For example, the satellite account could provide investment by sub-sector and by asset undertaken by the natural resource sector, which could be further expanded to examine investment by foreign controlled enterprises. Section 7 provides some possible further extensions of the base estimates constructed as part of this feasibility study.

4. Defining natural resources

The first step in creating the NRSA is to clearly define natural resource activity and to develop the corresponding classification systems. In doing so, two important factors to consider are:

- Does the definition align with international standards?
- Does the account serve the needs of users for policy or business decisions?

4.1 International definitions

It is important that the NRSA, as much as possible, follow international standards to ensure data are not only comparable with the Canadian accounts but also internationally. Two key international definitions of natural resources come from the Organization for Economic Cooperation and Development (OECD) and The System of Environmental-Economic Accounting 2012—Central Framework (SEEA), the internationally accepted economic-environment accounting framework.

The OECD defines natural resources as: “Naturally occurring assets that provide benefits through the provision of raw materials and energy used in economic activity (or that may provide such benefits one day) and that are subject primarily to quantitative depletion through human use”.⁵

The SEEA defines natural resources as including “... all natural biological resources (including timber and aquatic resources), mineral and energy resources, soil resources and water resources. All cultivated biological resources and land are excluded from scope.”⁶

Moreover, the definition of energy is taken from Statistics Canada’s Energy Statistics Framework which is based on of the International Recommendations for Energy Statistics (IRES) established by the United Nations Statistical Division⁷. These frameworks follow the definitions above while more precisely defining the energy sub-sector, for example, treating all products produced within petroleum refineries to be energy.

4.2 Natural resources satellite account definition

With these definitions in mind, this feasibility study defines natural resource activities as those which result in products and services originating from naturally occurring assets used in economic activity. These assets comprise mineral and energy resources, water, as well as natural timber, aquatic, and other natural biological resources. The resource assets may be renewable or non-renewable. They do not include intensively cultivated biological resources such as agricultural crops.⁸ To provide a more complete measure of the economic importance of the natural resource products, the services required in the extraction as well as the initial processing of natural resource inputs will be included. The activities related to the production of natural resource products constitute the scope of production for the natural resource satellite account.

In essence, the above definition splits the scope of natural resource activity into three processes: (1) the extraction of the natural resource inputs, (2) the services required to undertake this extraction (such as transportation, distribution and scientific services), and (3) the initial processing of the resulting natural resource products.

This initial feasibility study only provides experimental estimates related to forestry, mining and energy. For completeness, future studies will cover the full range of natural resource products including, for example, fisheries and water resources.

4.3 Natural resource products

Using the above definition, the economic activities defined as natural resource-related can be mapped out. This can be done from both a product and industry perspective. For products, the starting point is the SUT product classification, as these tables contain all the goods and services produced in the Canadian economy. The product classification structure is based on NAPCS.

4.3.1 Extractive natural resource products

From a product perspective, given the criteria to exclude intensively cultivated biological resources, agricultural products such as crop or livestock production would not be included in the account, nor would aquaculture products (fish farms), fur farming or tree farms.⁹ Commercial fishing from the ocean or inland lakes would be included, as would products from hunting and trapping, as well as goods produced from forestry and mining. The extraction of energy from natural resources (such as water, wind, solar) would also be included. These products would constitute the natural inputs portion of the account (see Table 1).

4.3.2 Natural resource service products

As part of the process of extracting natural resource inputs, some service products are required, that would not be produced in the economy without the extraction activity. As a result, they are included in the sector to provide a more complete picture of the size of the natural resource activity in the economy. Services related to the extraction or discovery and development of natural resources are included in this category. Further, any transportation of the natural resource product to the location of processing is also included. As such, mineral exploration as well as pipeline transportation would be included as service products in this category. The transportation services provided in the forestry and mining sector for the delivery of goods to the initial processing location (e.g., trucking and rail) should also be included as natural resource activity but data for this service is not separately available at this time (see Table 1). Further investigation will be made to determine whether this data

can be readily obtained.¹⁰ Services related to research and development as well as legal, and scientific and technical services are included, as are all other services which are required to create the product. Housing and accommodation services are excluded as they would exist regardless of the existence of the sector.

4.3.3 Initial processing products

Similar to the case of natural resource service products, the initial processing of the natural resource inputs, for the most part, would not be found in the economy without their initial extraction.¹¹ As a result, the initial processing of natural resources is a clear extension of the extraction industry and is therefore included within the natural resources sector. These products are often classified as manufactured goods within the SUT framework since the processes physically transform inputs. As a practical implementation rule, manufacturing activity will only be included in the natural resources sector if over 50% of the material inputs into the production process are natural resource inputs (4.3.1).¹²

In practice, natural resource inputs (such as logs and crude oil) are first identified. Secondly, each industry within the SUT framework is examined to determine if it meets the 50% criteria in its production process (these could be thought of as the “main” natural resource industries, although natural resource activity could also take place in other industries (see Table 2 for examples). As a final step, all products made primarily in these industries are deemed to be natural resource products. The NRSA captures the production of these products regardless of whether they take place in the main natural resource industries or outside of them.

This definition results in the inclusion of manufacturing activities such as sawmills and the refining of ores and oil in the NRSA. Further downstream processes using the refined products, for example, wood furniture and plastics manufacturing, are not in scope for the core NRSA (see Table 1 and Table 2).

With advances in technology, new natural resource products are being developed and new uses are being found for traditional by-products or waste products from natural resource product manufacturing. For example, lignin used to be considered a by-product of producing pulp; now, it is being used as an important building block for bio-products. Unfortunately, data on lignin, and other new natural resource products, are not easily accessible at this time. It is not known where in the NAICS or NAPCS they have been included. Although included in the scope of the feasibility study, they have not been included in the estimates as reliable data currently does not exist within Statistics Canada. Going forward, attempts will be made to fully capture these activities as new data sources become available.

4.3.4 Downstream activities (secondary and tertiary production)

Although not part of the core account, natural resources have important downstream effects on other sectors. These products fall outside of the definition of the natural resources sector but are nonetheless important in understanding the role of natural resources in the Canadian economy. They include such items as iron pipes, copper and aluminium tubing, cutlery and wood and kitchen cabinets. In this study, they are labelled as secondary and tertiary products (see Table 2). Measurements can and have been made for these activities (see Appendix 1). In general, secondary production uses a large portion of primary manufactured products as inputs. These secondary products are then used in the production processes of tertiary products. The economic contribution of these products are calculated at the request of NRCan, however, they are not part of Statistics Canada’s natural resources calculations.

4.4 Natural resource industries

Within the industry classifications of the SUT, there is no single industry that comprises all natural resource activity. Rather, the economic activity attributable to natural resources is found in many industries. For the purposes of the satellite account, natural resource industries can be defined as those in which more than half of total output originates from the production of primary natural resource inputs as described in section 4.3.1. It also includes industries in which at least half of the material

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Table 1
In-scope products

Product	Status
Forestry	
ENE113003 - Fuel wood	Extraction
MPG113001 - Logs	Extraction
MPG113002 - Pulpwood	Extraction
ENE# - Forest biomass-based natural gas	To be investigated
ENE# - Forest biomass-based light fuel oils	To be investigated
ENE# - Forest biomass-based jet fuel	To be investigated
MPS115300 - Support services for forestry	Service
MPS# - Transportation	To be investigated
Other services related to forestry production ¹	Service
MPG113004 - Rough untreated poles, posts and piling	Initial processing
MPG321101 - Hardwood lumber	Initial processing
MPG321102 - Softwood lumber	Initial processing
MPG321103 - Wood chips	Initial processing
MPG321104 - Other sawmill and treated wood products	Initial processing
MPG321201 - Veneer and plywood	Initial processing
MPG321202 - Engineered wood members and trusses	Initial processing
MPG321203 - Reconstituted wood products	Initial processing
MPG321X00 - Waste and scrap of wood, wood by-products	Initial processing
MPG322101 - Wood pulp	Initial processing
MPG322102 - Paper (except newsprint)	Initial processing
MPG322103 - Newsprint	Initial processing
MPG322104 - Paperboard	Initial processing
MPG325105 - Other basic organic chemicals (from forestry)	Initial processing
MPG325201 - Plastic resins (from forestry)	Initial processing
MPG# - Artificial and synthetic staple fibres	To be investigated
MPG# - Artificial and synthetic filament yarns	To be investigated
Minerals and mining	
ENE212100 - Coal	Extraction
MPG212210 - Iron ores and concentrates	Extraction
MPG212220 - Precious metal ores and concentrates	Extraction
MPG212231 - Copper ores and concentrates	Extraction
MPG212232 - Nickel ores and concentrates	Extraction

MPG212233 - Lead and zinc ores and concentrates	Extraction
MPG212291 - Radioactive ores and concentrates	Extraction
MPG212299 - Other metal ores and concentrates, not elsewhere classified	Extraction
MPG212310 - Stone	Extraction
MPG212320 - Sand, gravel, clay, and refractory minerals	Extraction
MPG212392 - Uncut diamonds	Extraction
MPG212396 - Potash	Extraction
MPG21239A - Non-metallic minerals (except diamonds)	Extraction
MPS21311B - Support services for mining and quarrying (except exploration)	Service
MPS21A000 - Mineral and oil and gas exploration (minerals only)	Service
MPS# - Transportation	To be investigated
Other services related to mineral and mining production ¹	Service
MPG325104 - Other basic inorganic chemicals	Initial processing
MPG327301 - Cement	Initial processing
MPG327302 - Ready-mixed concrete	Initial processing
MPG327303 - Concrete products	Initial processing
MPG327A01 - Clay products and refractories	Initial processing
MPG327A02 - Glass and glass products	Initial processing
MPG327A04 - Lime and gypsum products	Initial processing
MPG327A09 - Non-metallic mineral products, not elsewhere classified	Initial processing
MPG331301 - Bauxite and aluminum oxide	Initial processing
MPG331303 - Aluminum and aluminum-alloy semi-finished products	Initial processing
MPG331401 - Refined copper and copper alloys	Initial processing
MPG331402 - Refined nickel and nickel alloys	Initial processing
MPG331403 - Refined precious metals and precious metals alloys	Initial processing
MPG331404 - Refined non-ferrous metals and non-ferrous metal alloys	Initial processing
MPG331406 - Basic non-ferrous metal products	Initial processing
MPG331X02 - Waste and scrap of non-ferrous metals	Initial processing
MPG331100 - Iron and steel basic shapes and ferro-alloy products	Initial processing
MPG331302 - Aluminum and aluminum-alloy ingots and billets	Initial processing
Energy	
ENE113003 - Fuel wood	Extraction
ENE211101 - Conventional crude oil and non-conventional synthetic crude oil (petroleum)	Extraction
ENE211102 - Natural gas (includes light natural gas)	Extraction
ENE211103 - Natural gas liquids and related products (includes propane, ethane, butane)	Extraction
ENE211104 - Bituminous shale (oil sands)	Extraction
ENE212100 - Coal	Extraction
MPG212291 - Radioactive ores and concentrates	Extraction
MPS21311A - Support services for oil and gas extraction (except exploration)	Service
MPS21A000 - Mineral and oil and gas exploration (oil only)	Service
MPS221200 - Natural gas distribution	Service
MPS486200 - Transportation of natural gas by pipeline	Service
MPS486A00 - Transportation of crude oil and other commodities by pipeline	Service
MPS # - Other transportation of natural gas and crude oil	To be investigated

Other services related to energy production ¹	Service
ENE221100 - Electricity (includes distribution /transmission)	Initial processing
ENE221303 - Steam and heated or cooled air supply services	Initial processing
ENE324111 - Motor gasoline	Initial processing
ENE324112 - Diesel fuel	Initial processing
ENE324113 - Light fuel oils	Initial processing
ENE324114 - Jet fuel	Initial processing
ENE324115 - Heavy fuel oils	Initial processing
ENE3241A2 - Coke and other coke oven products	Initial processing
MPG324116 - Lubricants and other petroleum refinery products ²	Initial processing
MPG3241A1 - Asphalt and asphalt products ²	Initial processing
MPG325101 - Petrochemicals ²	Initial processing
MPG3241A9 - Other petroleum and coal products ²	Initial processing
MPG# - Biofuels	To be investigated
<p>1 Other services includes such commodities as MPS541600 – Management, scientific and technical consulting services and MPS541100 – Legal Services which take place within each specific sub-sector. It also includes the own consumption of software design and research and development services. This excludes services that would be produced in the economy without the presence of each sector (for example housing and accommodation services).</p> <p>2 As per the IRES and the Energy Statistics Framework, all products primarily produced in petroleum refineries are considered energy.</p> <p>Source: Statistics Canada</p>	

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Table 2
Downstream products (secondary and tertiary)

Product	Level
Forestry	
MPG321902 - Other wood millwork products	Secondary
MPG321903 - Wood containers and pallets	Secondary
MPG322201 - Paperboard containers	Secondary
MPG322202 - Paper stationery products	Secondary
MPG322203 - Disposable diapers and feminine hygiene products	Secondary
MPG322204 - Sanitary paper products	Secondary
MPG322209 - Other converted paper products	Secondary
MPG322X00 - Waste and scrap of paper and paperboard	Secondary
MPG321901 - Wood windows and doors	Secondary
MPG321909 - Prefabricated wood buildings and components	Secondary
MPG337101 - Wood kitchen cabinets and counter tops	Secondary
MPG337102 - Household furniture	Secondary
MPG337201 - Office furniture	Secondary
MPG337202 - Office and store fixtures	Secondary
MPG339909 - Other miscellaneous goods (where applicable)	Secondary
Minerals and mining	
MPG331201 - Iron and steel pipes and tubes (except castings)	Secondary
MPG331202 - Rolled and drawn steel products including wire	Secondary
MPG331501 - Ferrous metal castings (except pipe)	Secondary
MPG331502 - Non-ferrous metal castings	Secondary
MPG331X01 - Waste and scrap of iron and steel	Secondary
MPG335902 - Communication and energy wire and cable	Secondary
MPG336370 - Motor vehicle metal stamping	Secondary
MPG332100 - Forged and stamped metal products	Tertiary
MPG332301 - Prefabricated metal building and components	Tertiary
MPG332302 - Fabricated steel plates and other fabricated structural metal	Tertiary
MPG332303 - Metal windows and doors	Tertiary
MPG332309 - Other ornamental and architectural metal products	Tertiary
MPG332401 - Light gauge metal containers, crowns and closures	Tertiary
MPG332402 - Boilers, tanks and heavy gauge metal containers	Tertiary
MPG332500 - Hardware	Tertiary
MPG332600 - Springs and wire products	Tertiary

MPG332700 - Threaded metal fasteners and other turned metal products	Tertiary
MPG332A01 - Hand tools, blades and dies for power tools, kitchen utensils	Tertiary
MPG332A02 - Metal valves and pipe fittings	Tertiary
MPG332A03 - Ball and roller bearings	Tertiary
MPG332A04 - Guns, ammunition and ordnance	Tertiary
MPG332A09 - Fabricated metal products, not elsewhere classified	Tertiary
MPS332800 - Coating, engraving, heat treating and similar metal processing	Tertiary
MPG339901 - Jewellery and silverware	Tertiary
MPS3X0000 - Custom work, manufacturing production services (where applicable)	Tertiary
Source: Statistics Canada	

inputs in the production process are natural resource inputs. For example, the forestry industry chiefly produces SUPC commodity MPG113001 – Logs, a natural resource commodity and therefore is a natural resource industry. The main products from these industries are then considered natural resource products (4.3).

It is important to note that only activity within an industry attributable to natural resource product production is included in the NRSA. Therefore, if the forestry industry produces both logs and provides housing for its employees, only the natural resource activity (production of logs) will be included.

Further, some non-natural resource industries may produce natural resource products. This economic activity is also included in the account. For example, an agriculture chemical manufacturer may produce some electricity internally as part of their primary production process. Although the manufacturer's total output would not be included in the energy sub-sector, its production of electricity would. Another example concerns the production of refined precious metals in the "other miscellaneous manufacturing" industry. This production would be included in the mineral and mining sector. Other output from this industry, such as sporting and athletic goods will be excluded.

In this way, the NRSA goes beyond a simple industry perspective of natural resources and seeks to accurately identify natural resource activities within the Canadian economy. Table 3 and Table 4 show some of the industries where natural resource products are produced.

4.5 Natural resource sub-sectors

Moreover, the natural resources sector will be split into four distinct sub-sectors: forestry, energy, mining and "other".¹³ SNA and NRSA concepts will be applied consistently across the four sub-sectors with the aggregation forming the total natural resources sector. The sub-sectors are each a cross-section of products and industries. For example, the forestry sub-sector includes the natural inputs, services and processing products related to forestry. This activity occurs across several IOIC industries.

One complication of the sector presentation is that in some cases products and industries may be classified to more than one sub-sector. The three chief examples in this study are coal and uranium mining, which are included in the energy and mining sub-sectors, as well as the extraction of fuel wood, in both energy and forestry. Under Statistics Canada's SUT classification systems, fuel wood is considered an energy product which is primarily produced within forestry industries. Similarly, coal and uranium are considered energy products produced in mining industries. For the purposes of aggregation, each of these products will be assigned to sub-sectors based on their industry classification. That is to say, fuel wood will primarily be considered part of the forestry sub-sector and coal and uranium will be primarily considered part of the mineral and mining sub-sector. In order to accommodate the cross-cutting nature of these activities, the tables in this feasibility study present each sub-sector both with and without these specific products.¹⁴

5. The scope of the feasibility study

The objective of this feasibility study is to determine if the above definition can be used to extract data from the annual supply and use tables to determine the size of the natural resource sector in Canada. The scope is annual data for the years 2009 to 2012. These years were chosen since a complete SUT is available for this period. Along with many other economic measures, the SUT contain the necessary information to calculate the GDP attributable to natural resource activity. The GDP of the natural resource economy in Canada can be calculated in three separate ways using these tables: production, incomes and final expenditures. These methods all provide estimates of GDP. These different calculations of GDP fit into the SNA sequence of accounts that begin with total output (production) and continue to articulate primary incomes generated in productive activity and final expenditures.

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Table 3
In-scope products and main industries 1

Products	Main industries where the product is produced
Forestry	
ENE113003 - Fuel wood	BS111A00 - Crop production (except greenhouse, nursery and floriculture production) BS113000 - Forestry and logging
MPG113001 - Logs	BS113000 - Forestry and logging
MPG113002 - Pulpwood	BS113000 - Forestry and logging
MPS115300 - Support services for forestry	BS113000 - Forestry and logging BS115300 - Support activities for forestry GS912000 - Other provincial and territorial government services
MPG113004 - Rough untreated poles, posts and piling	BS113000 - Forestry and logging
MPG321101 - Hardwood lumber	BS321100 - Sawmills and wood preservation BS321900 - Other wood product manufacturing BS321200 - Veneer, plywood and engineered wood product manufacturing
MPG321102 - Softwood lumber	BS321100 - Sawmills and wood preservation BS321900 - Other wood product manufacturing BS321200 - Veneer, plywood and engineered wood product manufacturing
MPG321103 - Wood chips	BS321100 - Sawmills and wood preservation BS113000 - Forestry and logging BS321200 - Veneer, plywood and engineered wood product manufacturing BS321900 - Other wood product manufacturing
MPG321104 - Other sawmill and treated wood products	BS321100 - Sawmills and wood preservation BS321900 - Other wood product manufacturing BS337100 - Household and institutional furniture and kitchen cabinet manufacturing
MPG321201 - Veneer and plywood	BS321200 - Veneer, plywood and engineered wood product manufacturing BS321900 - Other wood product manufacturing
MPG321202 - Engineered wood members and trusses	BS321200 - Veneer, plywood and engineered wood product manufacturing BS321100 - Sawmills and wood preservation BS321900 - Other wood product manufacturing
MPG321203 - Reconstituted wood products	BS321200 - Veneer, plywood and engineered wood product manufacturing BS321900 - Other wood product manufacturing
MPG321X00 - Waste and scrap of wood, wood by-products	BS321100 - Sawmills and wood preservation BS321900 - Other wood product manufacturing BS321200 - Veneer, plywood and engineered wood product manufacturing BS326100 - Plastic product manufacturing

MPG322101 - Wood pulp	BS322100 - Pulp, paper and paperboard mills
MPG322102 - Paper (except newsprint)	BS322100 - Pulp, paper and paperboard mills
	BS322200 - Converted paper product manufacturing
	BS323000 - Printing and related support activities
	BS3241A0 - Petroleum and coal products manufacturing (except petroleum refineries)
MPG322103 - Newsprint	BS322100 - Pulp, paper and paperboard mills
MPG322104 - Paperboard	BS322100 - Pulp, paper and paperboard mills
	BS322200 - Converted paper product manufacturing
	BS323000 - Printing and related support activities
Minerals and mining	
ENE212100 - Coal	BS212100 - Coal mining
MPG212210 - Iron ores and concentrates	BS212210 - Iron ore mining
MPG212220 - Precious metal ores and concentrates	BS212220 - Gold and silver ore mining
MPG212231 - Copper ores and concentrates	BS212230 - Copper, nickel, lead and zinc ore mining
	BS212220 - Gold and silver ore mining
MPG212232 - Nickel ores and concentrates	BS212230 - Copper, nickel, lead and zinc ore mining
MPG212233 - Lead and zinc ores and concentrates	BS212220 - Gold and silver ore mining
	BS212230 - Copper, nickel, lead and zinc ore mining
MPG212291 - Radioactive ores and concentrates	BS212290 - Other metal ore mining
MPG212299 - Other metal ores and concentrates, not elsewhere classified	BS212290 - Other metal ore mining
	BS212230 - Copper, nickel, lead and zinc ore mining
MPG212310 - Stone	BS212310 - Stone mining and quarrying
	BS212320 - Sand, gravel, clay, and ceramic and refractory minerals mining and quarrying
	BS23E000 - Other activities of the construction industry
	BS327A00 - Non-metallic mineral product manufacturing (except cement and concrete)
MPG212320 - Sand, gravel, clay, and refractory minerals	BS212310 - Stone mining and quarrying
	BS212320 - Sand, gravel, clay, and ceramic and refractory minerals mining and quarrying
	BS23E000 - Other activities of the construction industry
	BS327A00 - Non-metallic mineral product manufacturing (except cement and concrete)
	BS327300 - Cement and concrete product manufacturing
MPG212392 - Uncut diamonds	BS212392 - Diamond mining
MPG212396 - Potash	BS212396 - Potash mining
MPG21239A - Non-metallic minerals (except diamonds)	BS21239A - Other non-metallic mineral mining and quarrying (except diamond / potash)
	BS212320 - Sand, gravel, clay, and ceramic and refractory minerals mining and quarrying
	BS212396 - Potash mining
	BS325300 - Pesticides, fertilizer and other agricultural chemical manufacturing
MPS21311B - Support services for mining and quarrying (except exploration)	BS21311B - Support activities for mining and quarrying (except oil and gas)
	BS212320 - Sand, gravel, clay, and ceramic and refractory minerals mining and quarrying
	BS212290 - Other metal ore mining
MPS21A000 - Mineral and oil and gas exploration	BS21311B - Support activities for mining and quarrying (except oil and gas)
MPG325104 - Other basic inorganic chemicals	BS331400 - Non-ferrous metal (except aluminum) production and processing
MPG327301 - Cement	BS327300 - Cement and concrete product manufacturing
MPG327302 - Ready-mixed concrete	BS327300 - Cement and concrete product manufacturing
MPG327303 - Concrete products	BS327300 - Cement and concrete product manufacturing

MPG327A01 - Clay products and refractories	BS327A00 - Non-metallic mineral product manufacturing (except cement and concrete)
MPG327A02 - Glass and glass products	BS327A00 - Non-metallic mineral product manufacturing (except cement and concrete)
MPG327A04 - Lime and gypsum products	BS327A00 - Non-metallic mineral product manufacturing (except cement and concrete)
MPG327A09 - Non-metallic mineral products, not elsewhere classified	BS327A00 - Non-metallic mineral product manufacturing (except cement and concrete)
MPG331301 - Bauxite and aluminum oxide	BS331300 - Alumina and aluminum production and processing
	BS327A00 - Non-metallic mineral product manufacturing (except cement and concrete)
MPG331303 - Aluminum and aluminum-alloy semi-finished products	BS331300 - Alumina and aluminum production and processing
MPG331401 - Refined copper and copper alloys	BS331400 - Non-ferrous metal (except aluminum) production and processing
MPG331402 - Refined nickel and nickel alloys	BS331400 - Non-ferrous metal (except aluminum) production and processing
MPG331403 - Refined precious metals and precious metals alloys	BS331400 - Non-ferrous metal (except aluminum) production and processing
	BS339900 - Other miscellaneous manufacturing
MPG331404 - Refined non-ferrous metals and non-ferrous metal alloys	BS331400 - Non-ferrous metal (except aluminum) production and processing
MPG331406 - Basic non-ferrous metal products	BS331400 - Non-ferrous metal (except aluminum) production and processing
	BS332700 - Machine shops, turned product and screw, nut and bolt manufacturing
MPG331X02 - Waste and scrap of non-ferrous metals	BS331300 - Alumina and aluminum production and processing
	BS331400 - Non-ferrous metal (except aluminum) production and processing
	BS339900 - Other miscellaneous manufacturing
Energy	
ENE113003 - Fuel wood	BS111A00 - Crop production (except greenhouse, nursery and floriculture production)
	BS113000 - Forestry and logging
ENE211101 - Conventional crude oil and non-conventional synthetic crude oil (petroleum)	BS211113 - Conventional oil and gas extraction
	BS211114 - Non-conventional oil extraction
ENE211102 - Natural gas	BS211113 - Conventional oil and gas extraction
ENE211103 - Natural gas liquids and related products (includes propane, ethane, butane)	BS211113 - Conventional oil and gas extraction
	BS324110 - Petroleum refineries
	BS325100 - Basic chemical manufacturing
	BS221200 - Natural gas distribution
ENE211104 - Bituminous shale (oil sands)	BS211114 - Non-conventional oil extraction
ENE212100 - Coal	BS212100 - Coal mining
MPG212291 - Radioactive ores and concentrates	BS212290 - Other metal ore mining
MPS21311A - Support services for oil and gas extraction (except exploration)	BS21311A - Support activities for oil and gas extraction
MPS21A000 - Mineral and oil and gas exploration (Oil only)	BS211113 - Conventional oil and gas extraction
	BS211114 - Non-conventional oil extraction
MPS221200 - Natural gas distribution	BS221200 - Natural gas distribution
MPS486200 - Transportation of natural gas by pipeline	BS486200 - Pipeline transportation of natural gas
MPS486A00 - Transportation of crude oil and other commodities by pipeline	BS486A00 - Crude oil and other pipeline transportation
ENE221100 - Electricity	BS221100 - Electric power generation, transmission and distribution ²
ENE221303 - Steam and heated or cooled air supply services	BS221100 - Electric power generation, transmission and distribution
	BS221300 - Water, sewage and other systems
	BS322100 - Pulp, paper and paperboard mills
ENE324111 - Motor gasoline	BS324110 - Petroleum refineries
ENE324112 - Diesel fuel	BS324110 - Petroleum refineries
ENE324113 - Light fuel oils	BS324110 - Petroleum refineries
ENE324114 - Jet fuel	BS324110 - Petroleum refineries

ENE324115 - Heavy fuel oils	BS324110 - Petroleum refineries
ENE3241A2 - Coke and other coke oven products	BS211114 - Non-conventional oil extraction
	BS324110 - Petroleum refineries
	BS3241A0 - Petroleum and coal products manufacturing (except petroleum refineries)
	BS331100 - Iron and steel mills and ferro-alloy manufacturing
MPG324116 - Lubricants and other petroleum refinery products	BS324110 - Petroleum refineries
	BS3241A0 - Petroleum and coal products manufacturing (except petroleum refineries)
	BS325100 - Basic chemical manufacturing
MPG3241A1 - Asphalt and asphalt products	BS324110 - Petroleum refineries
	BS3241A0 - Petroleum and coal products manufacturing (except petroleum refineries)
MPG325101 - Petrochemicals	BS324110 - Petroleum refineries
	BS3241A0 - Petroleum and coal products manufacturing (except petroleum refineries)
	BS325100 - Basic chemical manufacturing
MPG3241A9 - Other petroleum and coal products	BS324110 - Petroleum refineries
	BS3241A0 - Petroleum and coal products manufacturing (except petroleum refineries)
<p>1 Not all industries are listed here for simplicity</p> <p>2 Many industries produce small amounts of electricity. The electricity output of these industries is included in the energy sector, such as BS325300 - Pesticides, fertilizer and other agricultural chemical manufacturing; BS331300 - Alumina and aluminum production and processing; and BS333600 - Engine, turbine and power transmission equipment manufacturing.</p> <p>Source: Statistics Canada</p>	

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Table 4

Downstream ¹ products and main industries (secondary and tertiary)

Product	Industry
Forestry	
MPG321902 - Other wood millwork products	BS321100 - Sawmills and wood preservation
	BS321900 - Other wood product manufacturing
	BS416000 - Building materials and supplies wholesaler-distributors
	BS444000 - Building materials and garden equipment / supplies dealers
MPG321903 - Wood containers and pallets	BS321900 - Other wood product manufacturing
MPG322201 - Paperboard containers	BS322200 - Converted paper product manufacturing
MPG322202 - Paper stationery products	BS322200 - Converted paper product manufacturing
	BS323000 - Printing and related support activities
MPG322203 - Disposable diapers and feminine hygiene products	BS322100 - Pulp, paper and paperboard mills
	BS322200 - Converted paper product manufacturing
MPG322204 - Sanitary paper products	BS322100 - Pulp, paper and paperboard mills
	BS322200 - Converted paper product manufacturing
MPG322209 - Other converted paper products	BS322200 - Converted paper product manufacturing
	BS322100 - Pulp, paper and paperboard mills
	BS326100 - Plastic product manufacturing
MPG322X00 - Waste and scrap of paper and paperboard	BS322200 - Converted paper product manufacturing
MPG321901 - Wood windows and doors	BS321900 - Other wood product manufacturing
	BS337100 - Household and institutional furniture and kitchen cabinet manufacturing
	BS326100 - Plastic product manufacturing
MPG321909 - Prefabricated wood buildings and components	BS321900 - Other wood product manufacturing
	BS321200 - Veneer, plywood and engineered wood product manufacturing
	BS416000 - Building materials and supplies wholesaler-distributors
MPG337101 - Wood kitchen cabinets and counter tops	BS337100 - Household and institutional furniture and kitchen cabinet manufacturing
	BS337200 - Office furniture (including fixtures) manufacturing
MPG337102 - Household furniture	BS337100 - Household and institutional furniture and kitchen cabinet manufacturing
	BS337200 - Office furniture (including fixtures) manufacturing
MPG337201 - Office furniture	BS337200 - Office furniture (including fixtures) manufacturing
Minerals and mining	
MPG331100 - Iron and steel basic shapes and ferro-alloy products	BS331100 - Iron and steel mills and ferro-alloy manufacturing
	BS331200 - Steel product manufacturing from purchased steel
	BS331400 - Non-ferrous metal (except aluminum) production and processing
	BS332300 - Architectural and structural metals manufacturing

	BS332A00 - Cutlery, hand tools and other fabricated metal product manufacturing
	BS335900 - Other electrical equipment and component manufacturing
MPG331201 - Iron and steel pipes and tubes (except castings)	BS331200 - Steel product manufacturing from purchased steel
	BS332300 - Architectural and structural metals manufacturing
MPG331202 - Rolled and drawn steel products including wire	BS331100 - Iron and steel mills and ferro-alloy manufacturing
	BS331200 - Steel product manufacturing from purchased steel
	BS331400 - Non-ferrous metal (except aluminum) production and processing
	BS332600 - Spring and wire product manufacturing
MPG331302 - Aluminum and aluminum-alloy ingots and billets	BS331300 - Alumina and aluminum production and processing
	BS335900 - Other electrical equipment and component manufacturing
MPG331501 - Ferrous metal castings (except pipe)	BS331500 - Foundries
	BS332A00 - Cutlery, hand tools and other fabricated metal product manufacturing
MPG331502 - Non-ferrous metal castings	BS331500 - Foundries
	BS331400 - Non-ferrous metal (except aluminum) production and processing
MPG331X01 - Waste and scrap of iron and steel	BS331100 - Iron and steel mills and ferro-alloy manufacturing
	BS331200 - Steel product manufacturing from purchased steel
MPG332100 - Forged and stamped metal products	BS332300 - Architectural and structural metals manufacturing
	BS332700 - Machine shops, turned product and screw, nut and bolt manufacturing
	BS332100 - Forging and stamping
	BS332300 - Architectural and structural metals manufacturing
MPG332301 - Prefabricated metal building and components	BS332300 - Architectural and structural metals manufacturing
MPG332302 - Fabricated steel plates and other fabricated structural metal	BS332300 - Architectural and structural metals manufacturing
	BS332400 - Boiler, tank and shipping container manufacturing
	BS332700 - Machine shops, turned product and screw, nut and bolt manufacturing
MPG332303 - Metal windows and doors	BS332300 - Architectural and structural metals manufacturing
	BS321900 - Other wood product manufacturing
	BS326100 - Plastic product manufacturing
MPG332309 - Other ornamental and architectural metal products	BS332300 - Architectural and structural metals manufacturing
	BS444000 - Building materials and garden equipment and supplies dealers
MPG332401 - Light gauge metal containers, crowns and closures	BS332400 - Boiler, tank and shipping container manufacturing
	BS332100 - Forging and stamping
MPG332402 - Boilers, tanks and heavy gauge metal containers	BS332400 - Boiler, tank and shipping container manufacturing
	BS332300 - Architectural and structural metals manufacturing
	BS332700 - Machine shops, turned product and screw, nut and bolt manufacturing
MPG332500 - Hardware	BS332500 - Hardware manufacturing
	BS332300 - Architectural and structural metals manufacturing
	BS336390 - Other motor vehicle parts manufacturing
	BS334200 - Communications equipment manufacturing
MPG332600 - Springs and wire products	BS332600 - Spring and wire product manufacturing
	BS331200 - Steel product manufacturing from purchased steel
	BS332300 - Architectural and structural metals manufacturing
MPG332700 - Threaded metal fasteners and other turned metal products	BS332700 - Machine shops, turned product and screw, nut and bolt manufacturing
	BS336310 - Motor vehicle gasoline engine and engine parts manufacturing
	BS336390 - Other motor vehicle parts manufacturing

MPG332A01 - Hand tools, blades and dies for power tools, kitchen utensils	BS332A00 - Cutlery, hand tools and other fabricated metal product manufacturing
	BS333500 - Metalworking machinery manufacturing
	BS334A00 - Other electronic product manufacturing
	BS336370 - Motor vehicle metal stamping manufacturing
MPG332A02 - Metal valves and pipe fittings	BS332A00 - Cutlery, hand tools and other fabricated metal product manufacturing
	BS333100 - Agriculture, construction and mining machinery manufacturing
	BS332700 - Machine shops, turned product and screw, nut and bolt manufacturing
MPG332A03 - Ball and roller bearings	BS332A00 - Cutlery, hand tools and other fabricated metal product manufacturing
MPG332A04 - Guns, ammunition and ordnance	BS332A00 - Cutlery, hand tools and other fabricated metal product manufacturing
MPG332A09 - Fabricated metal products, not elsewhere classified	BS332A00 - Cutlery, hand tools and other fabricated metal product manufacturing
	BS332700 - Machine shops, turned product and screw, nut and bolt manufacturing
	BS332100 - Forging and stamping
MPS332800 - Coating, engraving, heat treating and similar metal processing	BS332800 - Coating, engraving, heat treating and allied activities
	BS332A00 - Cutlery, hand tools and other fabricated metal product manufacturing
	BS332300 - Architectural and structural metals manufacturing
	BS332700 - Machine shops, turned product and screw, nut and bolt manufacturing
MPG339901 - Jewellery and silverware	BS339900 - Other miscellaneous manufacturing
<p>1 These products are not part of the main NRSA</p> <p>2 Not all industries are listed here for simplicity</p> <p>Source: Statistics Canada</p>	

The production method examines who produces the natural resource products and how they are produced. It is calculated using the total output of the natural resource sector less its intermediate inputs. Output is the production of goods and services by the sector. Intermediate consumption is the products and services the sector uses as material inputs into the production process. Other inputs include labour and capital.

The income method considers the generation of income. It sums all income originating from natural resource production, including both the return to capital (operating surplus) and labour (compensation of employees). In the case of unincorporated businesses, the return to capital and labour cannot be separated and therefore their income is referred to as mixed income. Taxes less subsidies on products and production are also included in this method, as they are part of the valuation of production at market prices.

The expenditure method sums all final expenditure on natural resources in the economy. These expenditures include final consumption of households, government and non-profit institutions. They also include investment on capital (gross fixed capital formation), and the change in inventory levels. Exports of natural resources minus any imports of inputs into the production process complete the calculation.

In the SUT, these GDP estimates, along with other data, are calculated in nominal terms. This study will also remove the impact of prices so that the volume of the economic activity can be observed. This is particularly important for the natural resources sector since prices can fluctuate significantly from year to year.

It is important to note that the annual estimates provide the foundation for all potential extensions of the natural resource account. Further extensions to the account are discussed in section 7.

6. Results

6.1 The overall natural resources picture

The results of the feasibility study should be considered provisional in that many of the proposed methods need to be reviewed and refined, this is especially true for real estimates. The main intent of this section is to show the type of analysis possible with the NRSA. Nevertheless, the overall picture demonstrated in this report is expected to remain intact. Several methods that still require development include using more precise prices for certain natural resources, moving real GDP from a Laspeyres volume index to a Chained Fisher volume index and adding in the “other natural resources” category. An extended time series from 2007 to 2015 along with revised estimates for 2009 to 2012 will be released on CANSIM in September 2016.

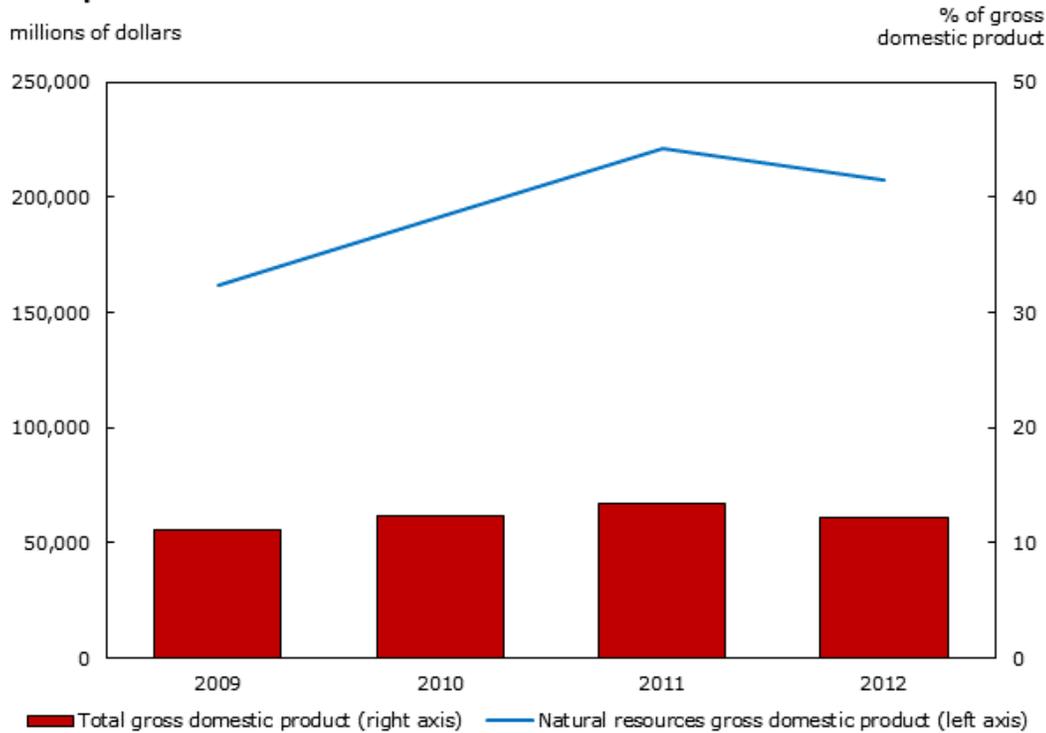
6.1.1 Nominal terms

GDP at basic prices for the natural resources sector totalled \$207.6 billion in 2012 (12.2% of total GDP). The year 2012 was down 6.3% from 2011 but was 28.3% higher than 2009. The largest component of the natural resources sector was energy, with a GDP in 2012 of \$147.5 billion¹⁵, representing 71.0% of natural resources GDP. The GDP for minerals and mining stood at \$46.8 billion¹⁶ (22.5% of natural resources) in 2012 while forestry registered a GDP of \$13.4 billion¹⁷ (6.5% of natural resources). More detailed tables are available in the appendix.

The NRSA provides many different views of the natural resource sector. For example, inputs into the production process of natural resources can be examined. These inputs totalled \$261.0 billion in 2012, representing an increase of 1.2% from the previous year. The largest non-natural resource inputs were “logging, mining and construction machinery and equipment”, “other financial investment and related activities” and “architectural, engineering and related services” at \$5.7 billion, \$5.6

Income and Expenditure Accounts Technical Series
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Chart 1
Natural resources gross domestic product (GDP) at basic prices

Chart 1
Natural resources gross domestic product (GDP) at basic prices



Source: Statistics Canada.

Income and Expenditure Accounts Technical Series

The Natural Resources Satellite Account: Feasibility study

Table 5

Natural resources gross domestic product (GDP) at basic prices,
to 2012

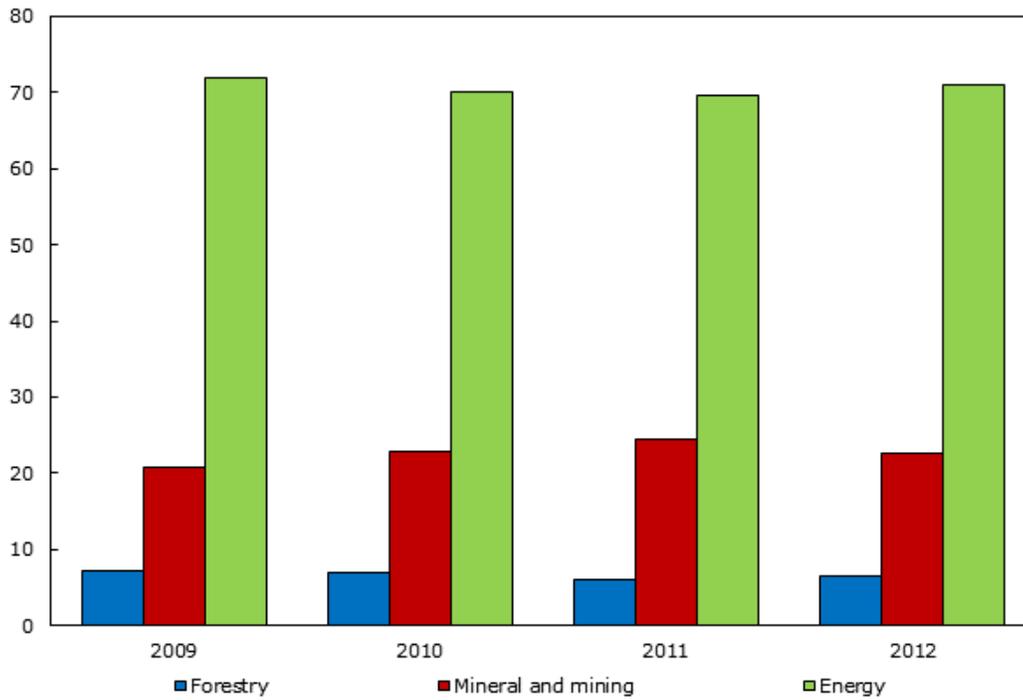
2009

	2009	2010	2011	2012
	millions of dollars			
Natural resources gross domestic product	161,873	191,311	221,689	207,637
Total gross domestic product	1,465,150	1,555,133	1,658,213	1,706,036
	percent			
Percent of total	11.1	12.3	13.4	12.2
Source: Statistics Canada				

Income and Expenditure Accounts Technical Series
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Chart 2
Sector share of natural resources gross domestic product (GDP)

Chart 2
Sector share of natural resources gross domestic product (GDP)

share of total (%)



Source: Statistics Canada.

billion and \$5.5 billion respectively in 2012. The largest natural resource input in 2012 was conventional and synthetic crude petroleum amounting to \$63.6 billion in 2012, with the vast majority (\$60.7 billion) used by petroleum refineries in producing fuel oils and motor gasoline.

The use of natural resources can also be examined with the NRSA. In 2012, \$468.6 billion of natural resources were produced in the Canadian economy. After adding imports and margins, the value of natural resources supply in the economy totalled \$643.8 billion. \$351.2 billion of the output was used as intermediate inputs into other production processes while \$86.2 billion was purchased by final domestic consumers. \$2.0 billion was placed into inventories and \$204.4 billion, or 31.8% of total supply, was exported out of the country.

Natural resource output used as intermediate inputs into the production of other goods can be further broken down between those used in the production of other natural resources and those used outside of the natural resources sector. In 2012, \$151.2 billion worth of natural resource output (43.1%) was used domestically as inputs into other natural resource production processes (for example, crude oil used in the production of gasoline and other fuels). The remaining 56.9%, or \$199.9 billion was used outside of the natural resources sector.

6.1.2 Real (volume) terms

In real (volume) terms, GDP of natural resources decreased by 2.9% in 2012, in contrast, nominal GDP decreased by 6.3%. This difference in growth rates was largely due to a weakening of certain commodity prices, such as natural gas and natural gas liquids, a major component of the natural resources sector as well as weak prices in the minerals and mining sub-sector.

6.2 The energy sub-sector

6.2.1 Nominal terms

Energy GDP was \$152.1 billion in 2012.¹⁸ This represented 8.9% of total economy-wide GDP in 2012 and is the largest of the three natural resource sub-sectors. Within this sub-sector, the largest shares of GDP are accounted for by conventional oil and gas extraction with a GDP of \$45.9 billion in 2012, and non-conventional oil extraction with a GDP of \$31.8 billion. When measured excluding fuel wood, uranium and coal, the GDP of the energy sector drops to \$147.5 billion or 8.6% of the economy.

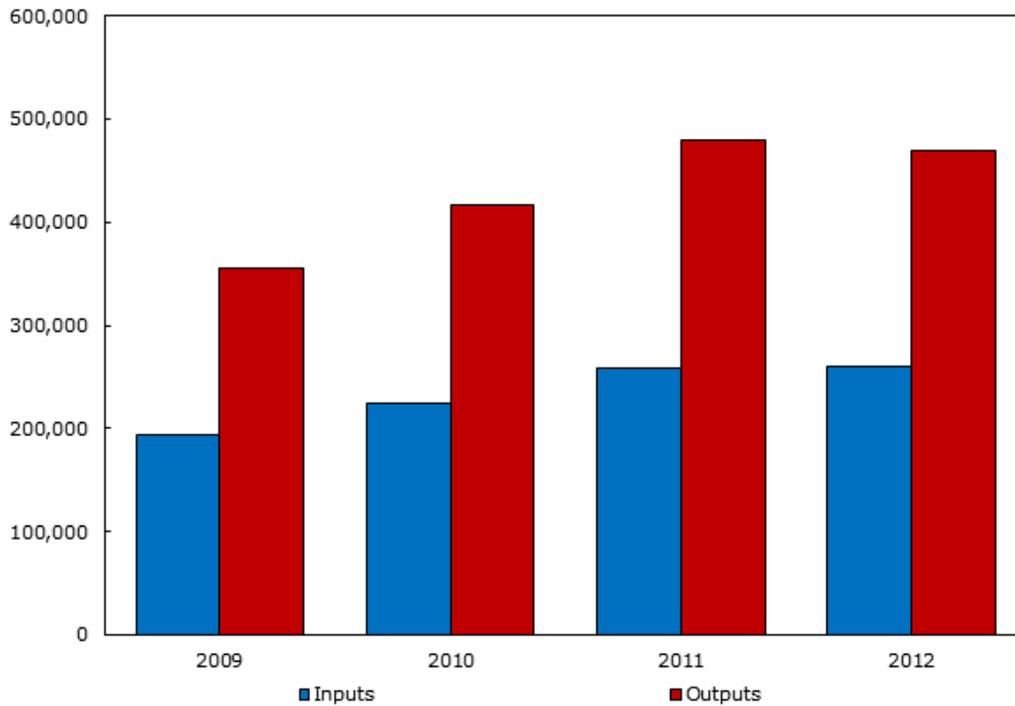
The largest component of energy, the oil and gas sector, can be further broken down into its main outputs, namely, crude oil, natural gas and bitumen. In 2012, just under a third (32.0%) of GDP for the sub-sector was attributable to crude oil while natural gas and bitumen contributed 5.0% and 7.6% of energy GDP, respectively.

Output from the energy sub-sector totalled \$310.5 billion in 2012, with the majority being conventional and non-conventional crude oil \$79.9 billion. Output of refined petroleum products was \$90.8 billion in 2012 with the majority being motor gasoline and diesel fuel.

Income and Expenditure Accounts Technical Series
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Chart 3
Inputs and outputs of the natural resources sector

Chart 3
Inputs and outputs of the natural resources sector

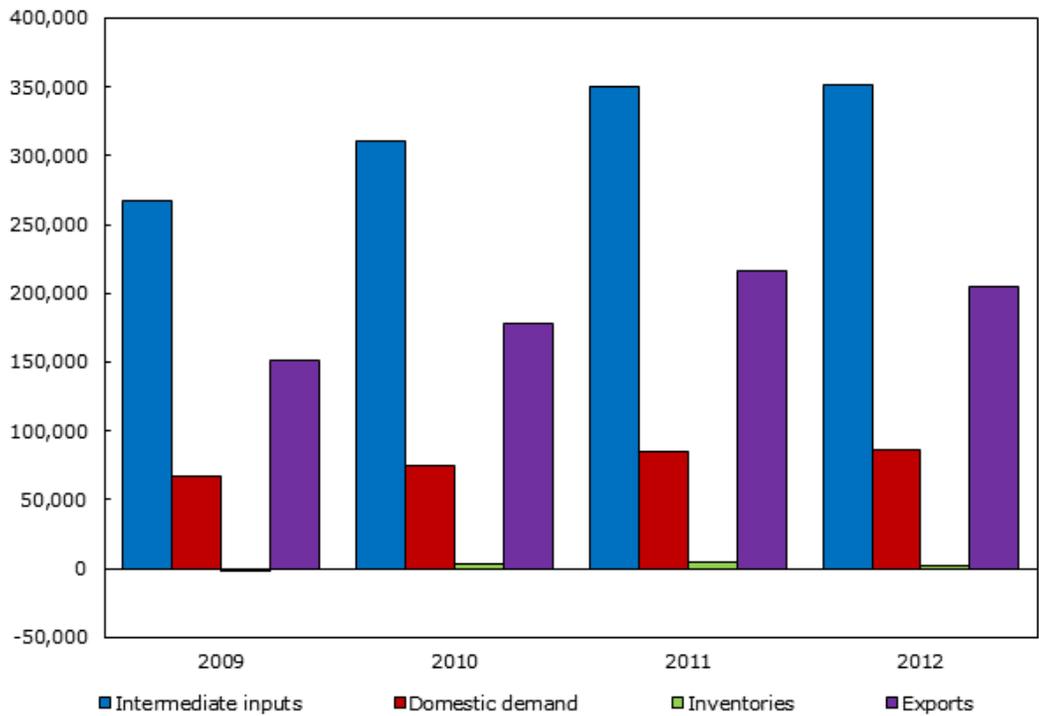
millions of dollars



Source: Statistics Canada.

Income and Expenditure Accounts Technical Series
The Natural Resources Satellite Account: Feasibility study
Chart 4
Use of natural resource output

Chart 4
Use of natural resource output
millions of dollars



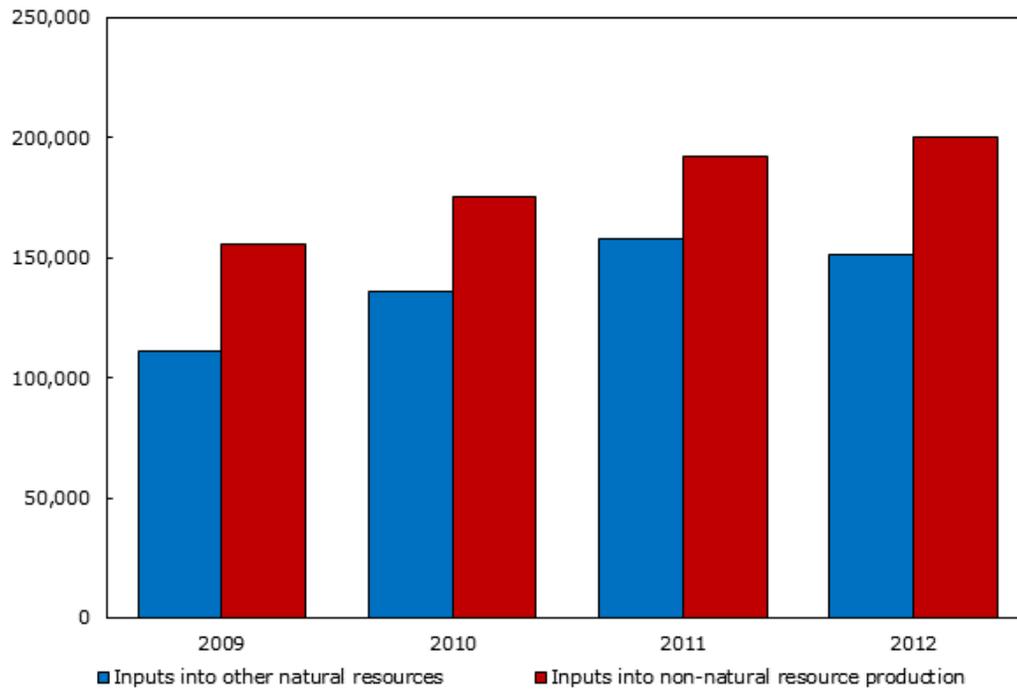
Source: Statistics Canada.

Income and Expenditure Accounts Technical Series
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Chart 5

Breakdown of natural resource output used as intermediate input s

Chart 5
Breakdown of natural resource output used as intermediate inputs

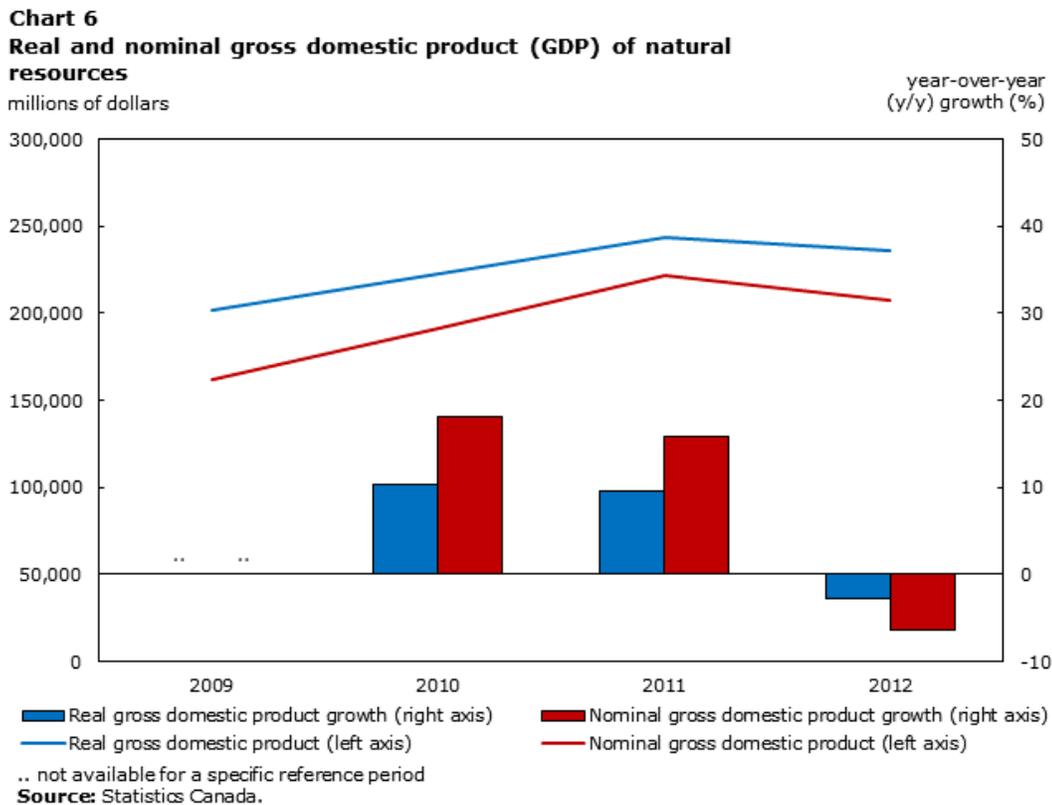
millions of dollars



Source: Statistics Canada.

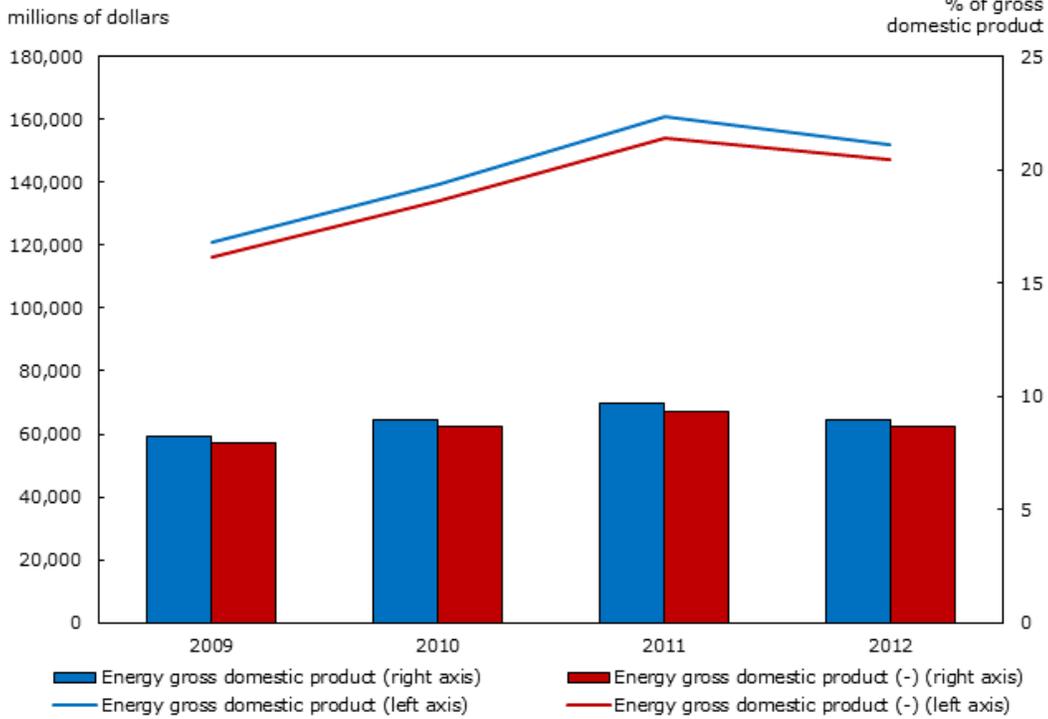
Income and Expenditure Accounts Technical Series
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 Chart 6

Real and nominal gross domestic product (GDP) of natural resources



Income and Expenditure Accounts Technical Series
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 Chart 7
 Energy gross domestic product (GDP)

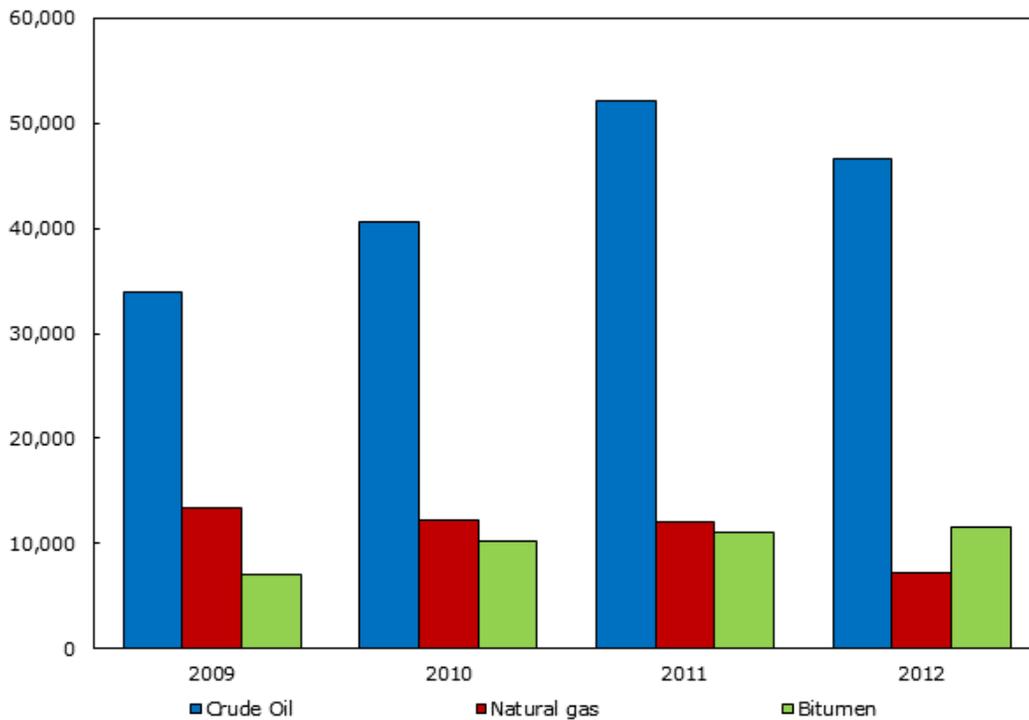
Chart 7
Energy gross domestic product (GDP)



Source: Statistics Canada.

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The Natural Resources Satellite Account: Feasibility study
Chart 8
Gross domestic product attributable to oil and gas components

Chart 8
Gross domestic product attributable to oil and gas components
millions of dollars



Source: Statistics Canada.

Inputs into energy production totalled \$158.3 billion in 2012, the majority of which came from crude petroleum used by refineries to produce gasoline and fuel (\$60.7 billion). The largest non-energy inputs were seen in the primary extraction of energy products such as conventional and non-conventional crude oil and in electric power generation.

For conventional and non-conventional crude oil and gas extraction, the largest non-energy inputs were “financial investment services” at \$2.9 billion, “repair and construction services” at \$1.4 billion and “architectural services” at \$1.5 billion. These services are indicative of highly capital intensive industries. The largest non-energy input into electrical power generation was “repair and construction services”, which totalled \$1.7 billion in 2012.

6.2.2 Real (volume) terms

On a real basis, GDP for the energy¹⁹ sub-sector decreased 1.2% in 2012 from the previous year, conversely, nominal GDP decreased by 5.4%. Over the 2009 to 2012 period, growth in real GDP has been more stable than nominal GDP. This was largely due to the sizeable drop in natural gas prices over the period (-48% from 2009 to 2012) as well as volatility in other energy prices.

6.3 The mining and minerals sub-sector

6.3.1 Nominal terms

The size of the Canadian mining and minerals sub-sector, which includes extraction and primary processing such as aluminum production, was approximately \$46.8 billion in 2012, or 2.7% of total GDP, based on preliminary estimates from this feasibility study.²⁰ This represents a 14.1% decrease from 2011 but a 38.9% increase since 2009. When excluding coal and uranium, the size of this sub-sector decreases to \$42.3 billion or 2.5% of total GDP in 2012.

The importance of downstream production (secondary and tertiary activities) related to the mineral and mining sub-sector can also be examined. These sectors, characterized by the use of primary and secondary products as inputs into their production processes, include such industries as iron and steel mills and a portion of hardware manufacturing. In 2012, downstream mineral and mining production contributed \$21.5 billion to the Canadian economy.

6.3.2 Real (volume) terms

On a real basis, GDP for the core mineral and mining sector declined 9.6% from the previous year, after registering two consecutive increases in 2010 and 2011 of 15.4% and 26.3% respectively. Prices in this sub-sector have generally been falling since 2009.

6.4 The forestry sub-sector

6.4.1 Nominal terms

The size of the Canadian forestry sector, which includes extraction and primary processing such as sawmill products, was approximately \$13.4 billion in 2012, based on preliminary estimates of this feasibility study. This marks a 1.4% increase from 2011 and a 14.0% increase from 2009 and represents roughly 0.8% of the total Canadian economy. When excluding fuel

Income and Expenditure Accounts Technical Series
 The Natural Resources Satellite Account: Feasibility study
 Table 9
 Natural resources satellite account expenditure account, 2012

Expenditure account	Natural resources
	millions of dollars
Final demand	86,228
Intermediate demand outside of sector	189,007
Inventories	2,594
Plus: Exports	196,121
Minus: Imports	96,919
Minus: Intermediate products from other sectors	105,099
Gross domestic product at market prices	271,931
Minus: Margin adjustment	68,393
Gross domestic product at basic prices	203,539
Implicit gross domestic product deflator	0.88
Real gross domestic product at basic prices	230,429
Source: Statistics Canada	

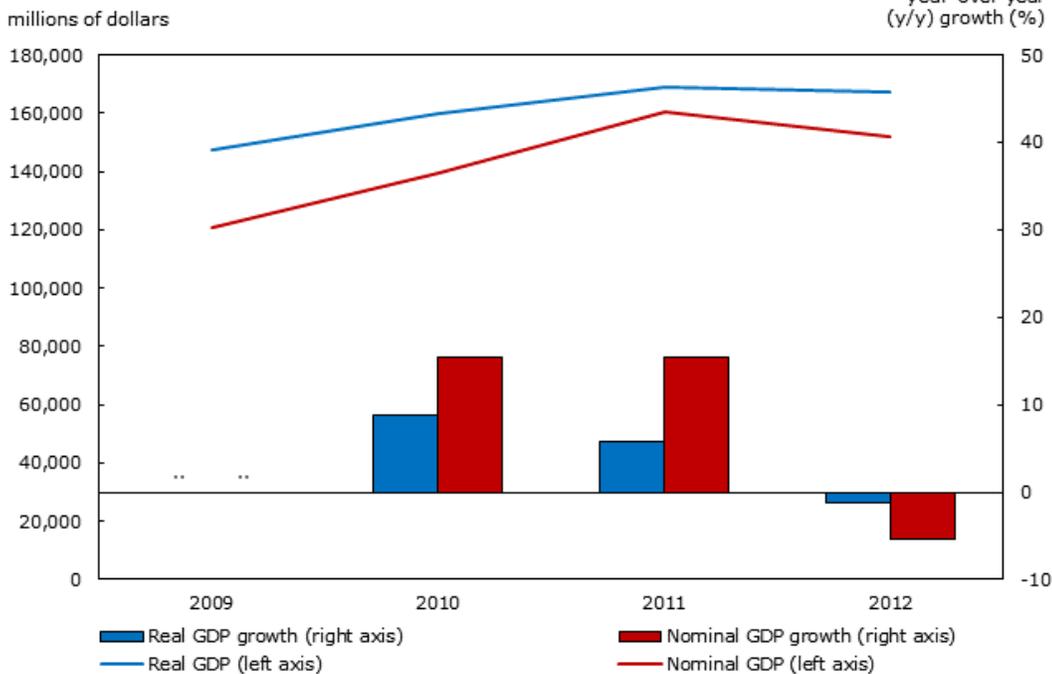
Income and Expenditure Accounts Technical Series
 The Natural Resources Satellite Account: Feasibility study

Chart 10

Real and nominal gross domestic product (GDP) of the energy sub sector

-

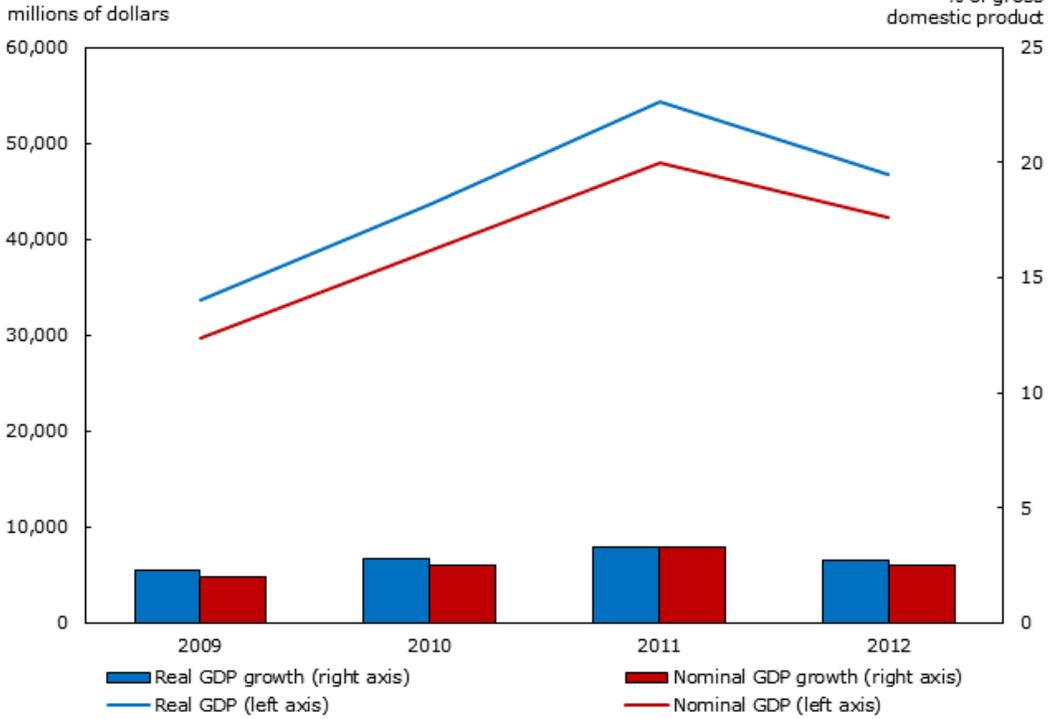
Chart 10
Real and nominal gross domestic product (GDP) of the energy sub-sector



.. not available for a specific reference period
 Source: Statistics Canada.

Income and Expenditure Accounts Technical Series
 The Natural Resources Satellite Account: Feasibility study
 Chart 11
 Mining and minerals gross domestic product (GDP)

Chart 11
Mining and minerals gross domestic product (GDP)

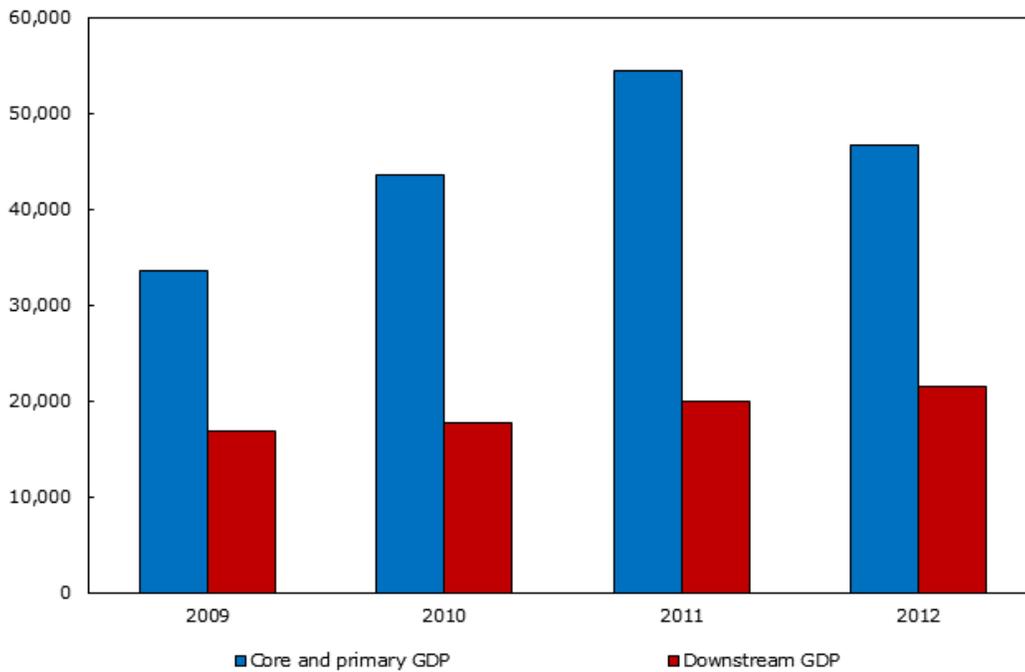


Source: Statistics Canada.

Income and Expenditure Accounts Technical Series
The Natural Resources Satellite Account: Feasibility study
Chart 12
Total mineral and mining gross domestic product (GDP)

Chart 12
Total mineral and mining gross domestic product (GDP)

millions of dollars



Source: Statistics Canada.

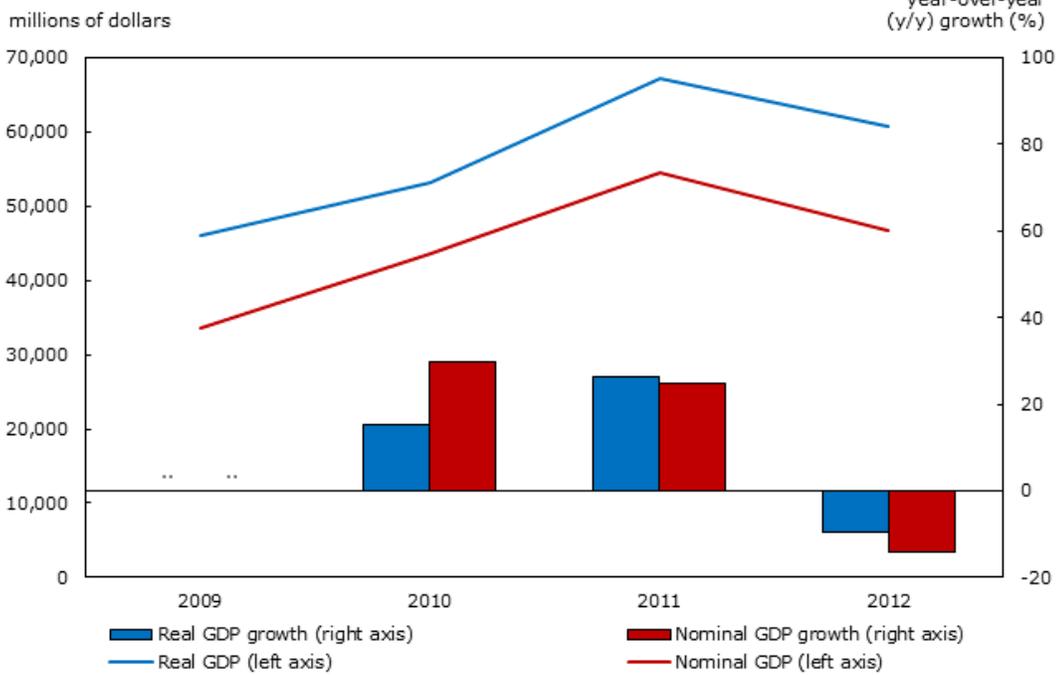
Income and Expenditure Accounts Technical Series
 The Natural Resources Satellite Account: Feasibility study

Chart 13

Real and nominal gross domestic product (GDP) of the mineral and mining sub-sector

Chart 13

Real and nominal gross domestic product (GDP) of the mineral and mining sub-sector



.. not available for a specific reference period

Source: Statistics Canada.

wood, the size of the sector decreases to \$13.2 billion, still representing 0.8% of GDP in 2012.

Downstream processing (secondary and tertiary activities) related to forestry, which are characterized by the use of primary products as inputs into their production processes, include such industries as mill working and wood furniture manufacturing. In 2012, downstream processing contributed \$9.8 billion to the Canadian economy.

6.4.2 Real (volume) terms

On a real basis, GDP for the forestry sub-sector decreased 2.0% in 2012 from the previous year, conversely, nominal GDP increased by 1.4%. Over the period (2009 to 2012) real GDP increased 2.5% while nominal GDP increased 14.0%.

7. Future extensions of the NRSA

This study presents provisional annual estimates for the years 2009 to 2012 in nominal and real terms. This data corresponds with the SUT benchmark years. The foundation created with this feasibility study is the base for many potential extensions to further illuminate economic activity in the natural resources sector.

7.1 Creating quarterly estimates

One such extension of the NRSA is more timely quarterly estimation. Quarterly data would be targeted to be published approximately ninety days after the reference period. For example, data for the first quarter of a year (January, February and March) would be released at the end of June. This information could be provided in current and constant dollars (adjusted for price effects). The tables would be less detailed than the annual data but could still provide estimates of GDP, international trade, production and employment. The methodology to produce these estimates would be similar to what is currently used to produce the quarterly National Tourism Indicators which rely heavily on the monthly and quarterly national accounts estimates. These estimates will be benchmarked to the annual NRSA.

7.2 The creation of more detailed commodities

Currently, the SUT tables provide commodity detail at a level that at times, is quite aggregated. Future work could focus on disaggregating these commodities into greater detail, providing greater insight into the structure of the natural resources sector. With more detailed analysis and by finding new data sources, some of the commodity detail could be published at lower levels (e.g., uranium separated from non-metal mining).

7.3 Provincial and territorial estimates

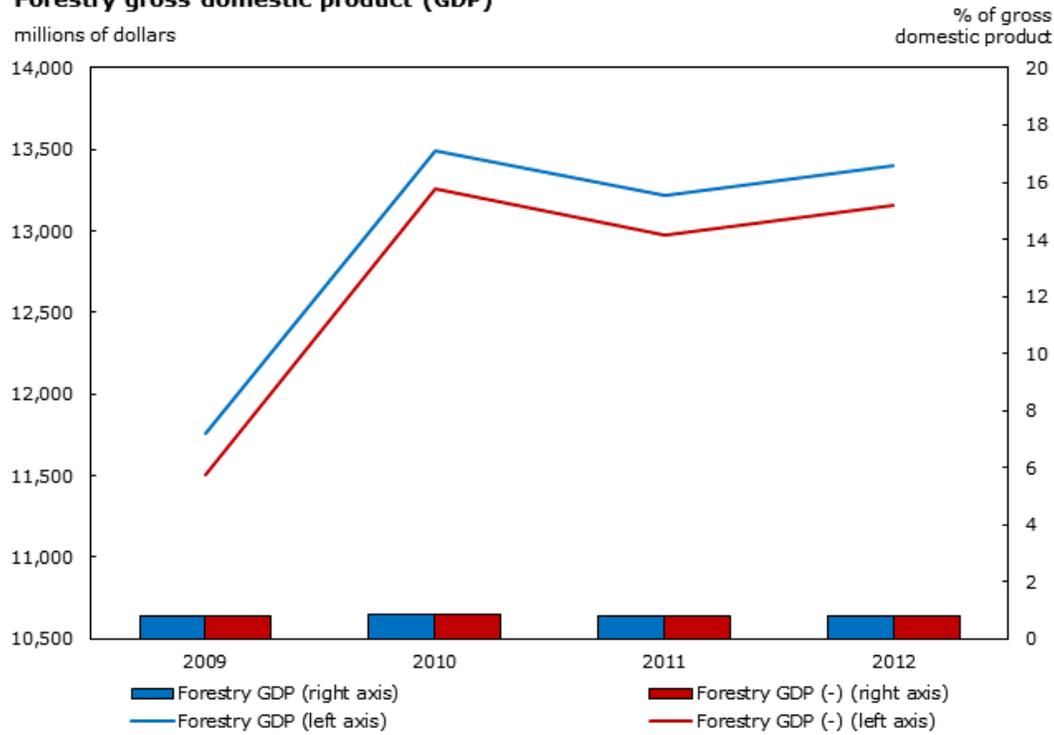
A possible extension is the development of a provincial and territorial Natural Resources Satellite Account. The creation of a provincial and territorial account would follow a similar path as the national account. Initially, an account would be created using the latest SUT Tables (in this case 2012).

Once this account has been created, it can be extended to more recent years using provincial income and expenditure accounts as well the provincial industry accounts. The publication of the full provincial account occurs in November of the following year (e.g., 2014 data was published in November 2015). A provincial natural resources account could be constructed and completed within several months of the publication of the full accounts. These statistics would be available at an annual frequency (not quarterly like the national statistics).

7.4 Employment and human resources

Income and Expenditure Accounts Technical Series
 The Natural Resources Satellite Account: Feasibility study
 Chart 14
 Forestry gross domestic product (GDP)

Chart 14
Forestry gross domestic product (GDP)

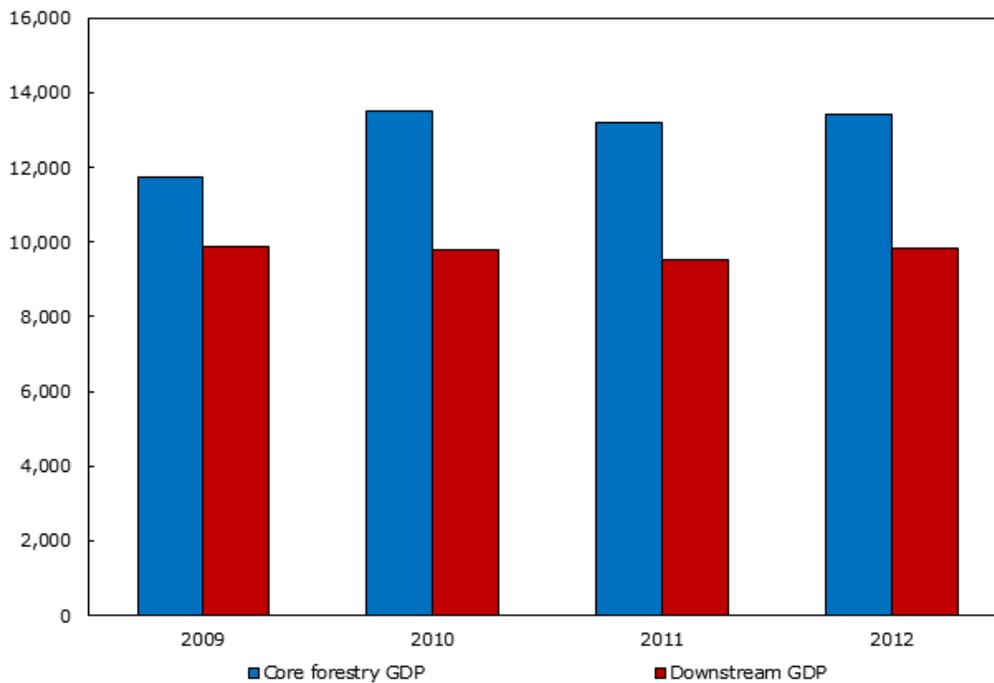


Source: Statistics Canada.

Income and Expenditure Accounts Technical Series
The Natural Resources Satellite Account: Feasibility study
Chart 15
Total forestry gross domestic product (GDP)

Chart 15
Total forestry gross domestic product (GDP)

millions of dollars



Source: Statistics Canada.

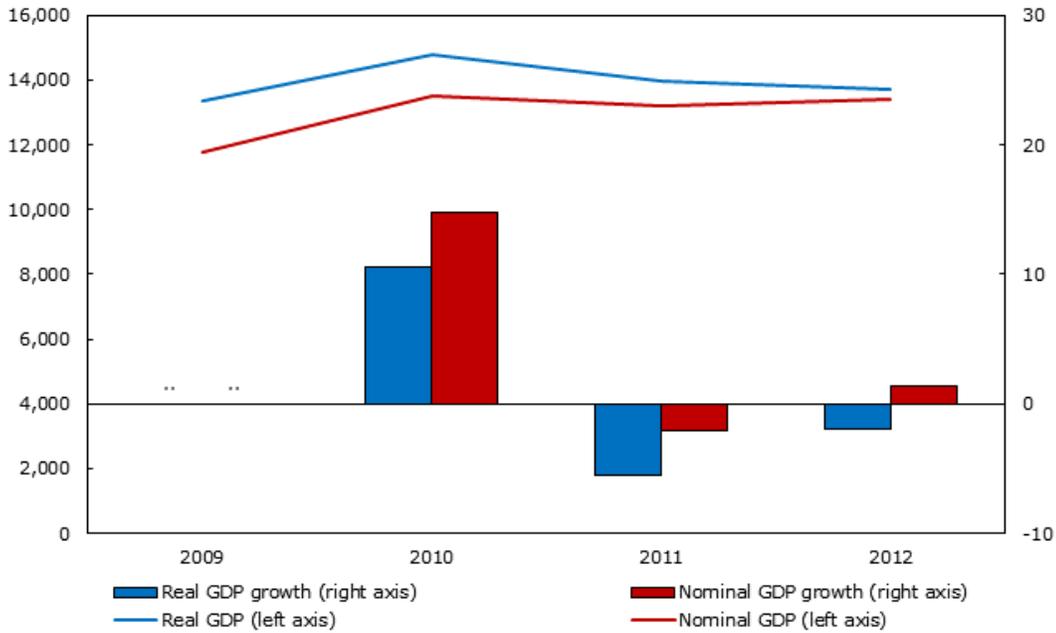
Income and Expenditure Accounts Technical Series
 The Natural Resources Satellite Account: Feasibility study
 Chart 16

Real and nominal gross domestic product (GDP) of the core forestry sub-sector

Chart 16
Real and nominal gross domestic product (GDP) of the core forestry sub-sector

millions of dollars

year-over-year (y/y) growth (%)



.. not available for a specific reference period
 Source: Statistics Canada.

A human resource module is another possible extension of the account. The module would focus on employment and occupation data related to the natural resource sector. Total employment data could be constructed by industry. The various types of occupations involved in the production of natural resources could also be estimated.

More timely employment data could also be published at the same time as the quarterly estimates described in section 7.1. Again, the publication of this data has been shown to be feasible as the Tourism Satellite Account-based estimates have been publishing employment data for many years using this methodology. This module would utilize data from the Canadian Labour Productivity Accounts.

7.5 Capital investment

Further, additional detail with respect to capital investment within the natural resources sector could also be examined and presented. Since natural resource industries are generally capital intensive, this could be an important extension to the account. Information would be taken from Statistics Canada's capital stock, investment and consumption of fixed capital program which is directly comparable to the CSNA. The analysis of investment data can be further extended to look at the source of the investment, whether it pertains to domestic controlled or foreign controlled firms (i.e., foreign direct investment).

Another extension of the base satellite account would be an examination of research and development expenditures made by the natural resource sector. The supply and use tables articulate many inputs (expenses) made by companies within the natural resources sector including investments on research and development. These estimates could be presented by industry and sub-sector.

7.6 Stock account and clean tech

Another extension that could be explored is integration of the satellite account with the Natural Resources Stock Account, currently in production at Statistics Canada. This account examines the stock of natural resources currently used in production or other known stocks that could be brought into production. The two accounts are both based on SNA accounting principles. Similarly, links with the proposed Clean Tech Satellite Account, currently being evaluated for feasibility by Statistics Canada could also be made. Again, both accounts will share the SNA principles as their foundation.

7.7 Government revenues attributable to natural resources

Another useful extension that has been established for other satellite accounts are government revenues attribute to the satellite account sector, in this case, natural resources. This account would calculate the total government revenues collected from natural resource economic activity.

8. Conclusion

The Natural Resources Satellite Account will provide a useful framework to analyze the economic importance of the natural resources sector on the Canadian economy. It represents a coherent and credible data source that could be used to understand the role, evolution and structure of the natural resources sector in a macroeconomic context. Possible extensions to the account, including more timely quarterly estimates, provincial data, as well as information on jobs and investment, could provide further detailed statistics on natural resources and inform policy decisions for the natural resources sector.

Appendix 1. NRSA data tables

Income and Expenditure Accounts Technical Series
 The Natural Resources Satellite Account: Feasibility study
 Table 6
 Natural resources satellite account production account, 2012

Production account	Natural resources	Downstream processing
	millions of dollars	
Output of the natural resource sector	452,393	91,229
Intermediate consumption	248,854	58,369
Gross value added	203,539	32,860
Source: Statistics Canada		

Income and Expenditure Accounts Technical Series
The Natural Resources Satellite Account: Feasibility study

Table 7

Natural resources satellite account generation of income account t,
2012

Generation of income account	Natural resources	Downstream processing
	millions of dollars	
Taxes less subsidies on production	6,507	384
Taxes less subsidies on products	-1,806	-44
Wages and salaries	52,470	19,108
Supplementary labour income	10,961	4,432
Mixed income	713	193
Surplus	134,693	8,788
Gross value added	203,539	32,860
Source: Statistics Canada		

Income and Expenditure Accounts Technical Series
 The Natural Resources Satellite Account: Feasibility study
 Table 8
 Natural resources satellite account supply and use table, 2012

Supply - use	Natural resources	Downstream processing
	millions of dollars	
Production	468,586	82,810
Imports	103,402	51,188
Margins	71,782	29,064
Total supply	643,770	163,063
Intermediate input	351,158	103,961
Domestic demand	86,228	26,999
Household consumption	74,403	23,121
Government consumption	0	0
Non-profit institutions service households consumption	0	0
Construction	3	358
Machinery and equipment	-720	3,131
Intellectual property products	12,543	390
Inventories	1,991	-413
Exports	204,392	32,516
Total use	643,770	163,063
Source: Statistics Canada		

Income and Expenditure Accounts Technical Series
 The Natural Resources Satellite Account: Feasibility study
 Table 9
 Natural resources satellite account expenditure account, 2012

Expenditure account	Natural resources
	millions of dollars
Final demand	86,228
Intermediate demand outside of sector	189,007
Inventories	2,594
Plus: Exports	196,121
Minus: Imports	96,919
Minus: Intermediate products from other sectors	105,099
Gross domestic product at market prices	271,931
Minus: Margin adjustment	68,393
Gross domestic product at basic prices	203,539
Implicit gross domestic product deflator	0.88
Real gross domestic product at basic prices	230,429
Source: Statistics Canada	

Income and Expenditure Accounts Technical Series
 The Natural Resources Satellite Account: Feasibility study
 Table 10
 Energy sub-sector production account, 2012

Production account	Natural resources	Natural resources (excluding fuel wood, coal and uranium)
	millions of dollars	
Output of the natural resource sector	310,475	302,825
Intermediate consumption	158,335	155,341
Gross value added	152,140	147,484
Source: Statistics Canada		

Income and Expenditure Accounts Technical Series
 The Natural Resources Satellite Account: Feasibility study
 Table 11
 Energy sub-sector generation of income account, 2012

Generation of income account	Natural resources	Natural resources (excluding fuel wood, coal and uranium)
	millions of dollars	
Taxes less subsidies on production	5,058	5,042
Less subsidies on products	-1,394	-1,382
Wages and salaries	33,255	32,261
Supplementary labour income	5,847	5,625
Mixed income	173	149
Surplus	109,201	105,789
Gross value added	152,140	147,484
Source: Statistics Canada		

Income and Expenditure Accounts Technical Series
 The Natural Resources Satellite Account: Feasibility study
 Table 12
 Energy sub-sector supply and use table, 2012

Supply - use	Natural resources	Natural resources (excluding fuel wood, coal and uranium)
	millions of dollars	
Production	310,475	302,825
Imports	59,866	57,709
Margins	48,162	46,266
Total supply	418,504	406,799
Intermediate input	219,583	215,981
Domestic demand	78,316	77,503
Household consumption	70,302	69,489
Government consumption	0	0
Non-profit institutions service households consumption	0	0
Construction	2	2
Machinery and equipment	0	0
Intellectual property products	8,012	8,012
Inventories	-481	-541
Exports	121,086	113,855
Total use	418,504	406,799
Source: Statistics Canada		

Income and Expenditure Accounts Technical Series
The Natural Resources Satellite Account: Feasibility study
Table 13
Energy sub-sector expenditure account, 2012

Expenditure account	Natural resources	Natural resources (excluding fuel wood, coal and uranium)
	millions of dollars	
Final demand	78,316	77,503
Intermediate demand outside of sector	120,775	121,676
Inventories	-481	-541
Plus: Exports	121,086	113,855
Minus: Imports	59,866	57,709
Minus: Intermediate products from other sectors	59,527	61,035
Gross domestic product at market prices	200,303	193,750
Minus: Margin adjustment	48,162	46,266
Gross domestic product at basic prices	152,140	147,484
Implicit gross domestic product deflator	0.91	0.91
Real gross domestic product at basic prices	167,187	162,070
Source: Statistics Canada		

Income and Expenditure Accounts Technical Series
 The Natural Resources Satellite Account: Feasibility study
 Table 14
 Mineral and mining production account, 2012

Production account	Natural resources	Natural resources (excluding coal and uranium)	Downstream processing
	millions of dollars		
Output of the natural resource sector	122,338	115,375	57,127
Intermediate consumption	75,586	73,039	35,630
Gross value added	46,753	42,337	21,498
Source: Statistics Canada			

Income and Expenditure Accounts Technical Series
 The Natural Resources Satellite Account: Feasibility study
 Table 15
 Mineral and mining generation of income account, 2012

Generation of income account	Natural resources	Natural resources (excluding coal and uranium)	Downstream processing
	millions of dollars		
Taxes less subsidies on production	949	946	249
Less subsidies on products	-165	-165	-39
Wages and salaries	13,183	12,286	13,129
Supplementary labour income	2,666	2,485	3,147
Mixed income	224	224	107
Surplus	25,798	22,462	6,443
Gross value added	42,654	38,238	23,037
Source: Statistics Canada			

Income and Expenditure Accounts Technical Series
The Natural Resources Satellite Account: Feasibility study
Table 16
Mineral and mining supply use table, 2012

Supply - use	Natural resources	Natural resources (excluding coal and uranium)	Downstream processing
	millions of dollars		
Production	122,338	115,375	57,127
Imports	40,746	38,596	39,694
Margins	17,081	15,316	17,475
Total supply	180,166	169,287	114,297
Intermediate input	101,753	98,162	81,797
Domestic demand	7,013	7,013	8,521
Household consumption	3,437	3,437	9,140
Government consumption	0	0	0
Non-profit institutions service households consumption	0	0	0
Construction	0	0	3
Machinery and equipment	-720	-720	-908
Intellectual property products	4,296	4,296	285
Inventories	3,112	3,052	-72
Exports	68,287	61,060	24,051
Total use	180,166	169,287	114,297
Source: Statistics Canada			

Income and Expenditure Accounts Technical Series
The Natural Resources Satellite Account: Feasibility study
Table 17
Mineral and mining expenditure account, 2012

Expenditure account	Natural resources	Natural resources (excluding coal and uranium)	Downstream processing
	millions of dollars		
Final demand	7,013	7,013	8,022
Intermediate demand outside of sector	48,385	46,523	72,623
Inventories	3,715	3,655	-674
Plus: Exports	60,015	52,787	27,027
Minus: Imports	34,263	32,113	37,832
Minus: Intermediate products from other sectors	28,519	27,701	27,386
Gross domestic product at market prices	56,346	50,165	41,780
Minus: Margin adjustment	13,692	11,927	18,743
Gross domestic product at basic prices	42,654	38,238	23,037
Implicit gross domestic product deflator	0.78	0.78	1.26
Real gross domestic product at basic prices	54,685	49,023	18,283
Source: Statistics Canada			

Income and Expenditure Accounts Technical Series
 The Natural Resources Satellite Account: Feasibility study
 Table 18
 Forestry production account, 2012

Production account	Natural resources	Natural resources (excluding fuel wood)	Downstream processing
	millions of dollars		
Output of the natural resource sector	43,423	42,736	25,683
Intermediate consumption	30,022	29,576	15,860
Gross value added	13,401	13,160	9,823
Source: Statistics Canada			

Income and Expenditure Accounts Technical Series
The Natural Resources Satellite Account: Feasibility study
Table 19
Forestry generation of income account, 2012

Generation of income account	Natural resources	Natural resources (excluding fuel wood)	Downstream processing
	millions of dollars		
Taxes less subsidies on production	517	503	135
Less subsidies on products	-259	-247	-5
Wages and salaries	7,027	6929	5,978
Supplementary labour income	2,671	2630	1,284
Mixed income	340	315	86
Surplus	3,106	3030	2,344
Gross value added	13,401	13,160	9,823
Source: Statistics Canada			

Income and Expenditure Accounts Technical Series
The Natural Resources Satellite Account: Feasibility study
Table 20
Forestry supply use table, 2012

Supply - Use	Natural resources	Natural resources (excluding fuel wood)	Downstream processing
	millions of dollars		
Production	43,423	42,736	25,683
Imports	4,947	4,940	11,494
Margins	8,435	8,303	11,589
Total supply	56,805	55,980	48,766
Intermediate input	33,424	33,413	22,164
Domestic demand	1,712	899	18,478
Household consumption	1,477	664	13,980
Government consumption	0	0	0
Non-profit institutions service households consumption	0	0	0
Construction	0	0	355
Machinery and equipment	0	0	4,039
Intellectual property products	234	234	105
Inventories	-580	-579	-341
Exports	22,250	22,247	8,465
Total use	56,805	55,980	48,766
Source: Statistics Canada			

Income and Expenditure Accounts Technical Series
The Natural Resources Satellite Account: Feasibility study
Table 21
Forestry expenditure account, 2012

Expenditure account	Natural resources	Natural resources (excluding fuel wood)	Downstream processing
	millions of dollars		
Final demand	1,712	899	18,478
Intermediate demand outside of the sector	18,946	19,094	21,702
Inventories	-580	-579	-341
Plus: Exports	22,250	22,247	8,465
Minus: Imports	4,947	4,940	11,494
Minus: Intermediate products from other sectors	15,545	15,256	15,398
Gross domestic product at market prices	21,836	21,464	21,412
Minus: Margin adjustment	8,435	8,303	11,589
Gross domestic product at basic prices	13,401	13,160	9,823
Implicit gross domestic product deflator	0.98	0.98	1.34
Real gross domestic product at basic prices	13,674	13,429	7,331
Source: Statistics Canada			

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Notes

- 1 With the exception of biofuels and energy produced from biomass.
- 2 The "other" category includes products related to fishing (from oceans and lakes), hunting and trapping, as well as water resources.
- 3 Statistics Canada is currently analyzing the feasibility of producing a "Cleantech" satellite account which will seek to measure the contribution of clean technology to the Canadian economy.
- 4 Examples of this type of satellite account include the Tourism Satellite Account and the Culture Satellite Account, both produced by Statistics Canada.
- 5 [OECD Glossary of Environment Statistics](#).
- 6 [SEEA Central Framework p27, 2.101](#).
- 7 [A Statistical Framework for Energy in Canada](#).
- 8 However, it should be noted that globally, timber is often intensively cultivated, and the use of high-yield or genetically enhanced plantations growing in key forest product exporting countries such as the United States, New Zealand, and Brazil. Plantations have yet to take hold economically in Canada, but the relationship between the forest sector and what is considered natural resource products may need to be revisited in the future should circumstances change.
- 9 See footnote 5.
- 10 One possible solution would be to use the transportation margins associated with each product as a proxy for the transportation industry.
- 11 A natural resource could be imported and processed domestically. However, this does not seem to be the case for the majority of cases in Canada. One notable exception is bauxite in aluminium production.
- 12 For the energy industry, use is made of Statistics Canada's energy statistics framework based off of the [IRES](#).
- 13 The "other" category includes products related to fishing (from oceans and lakes), hunting and trapping, as well as water resources.

14 For example, for minerals and mining, tables for “natural resources with uranium and coal” as well as a “natural resources without uranium and coal” will be constructed.

15 This value excludes fuel wood, uranium and coal.

16 This value includes uranium and coal.

17 This value includes fuel wood.

18 When including fuel wood, coal, and uranium.

19 Including fuel wood, coal, and uranium.

20 When including coal and uranium.