EnviroStats

Canada's Quarterly
Natural Resource Wealth

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Standard table symbols

The following symbols are used in Statistics Canada publications:

.   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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Introduction

Natural resources, a key component of natural capital, play an important role in the Canadian economy. Their extraction forms a significant component of Canada's gross domestic product (GDP) or current income. Likewise, remaining stocks of natural resources are a potential source of future income. As such, natural resources are a key component of the country's wealth – as important in Canada as its buildings and equipment.

> Natural capital comprises land, natural resources, and ecosystems and the ecosystem goods and services these generate. An eventual goal of Statistics Canada's environmental accounts and statistics program is to track stocks of all main types of natural capital. Currently, accounts include natural resource asset accounts, thematic ecosystem accounts on land cover/ land use and on water. Statistics Canada also produces accounts that track the flows of selected natural capital (water, energy), as well as residuals (greenhouse gas emissions). See the *Methodological Guide for the Canadian System of Environmental–Economic Accounting* for more details (www.statcan.gc.ca/pub/16-509-x/ 16-509-x2016001-eng.htm).
>
> This article focuses on natural resource stocks as estimated by the Natural Resource Asset Account (NRAA). These accounts currently include three categories of natural resource stocks:
>
> - energy resources composed of coal, crude oil, crude bitumen and natural gas
> - mineral resources consisting of gold, iron, copper, nickel, molybdenum, uranium, potash, lead and diamonds
> - timber
>
> In theory, other natural resources could be included in the NRAA, but the necessary data and methods to value resources such as fish stocks are not yet available.

Annual natural resource wealth estimates: a data series integrating price, production, and resource reserves

Natural resource asset accounts (NRAA) help show a broader dimension to Canada's national wealth by quantifying the economic value of the stocks of natural resources such as energy resources, mineral resources, timber and land. Although the monetary value of a natural resource asset can be derived using several approaches, the NRAA uses the value of the net present value generated from the resource.

The value of a natural resource stock is primarily determined by its global demand and supply and can fluctuate substantially due to factors such as major discoveries, geo-political uncertainty, and expected growth in resource importing economies such as India and China. The stock's value is also partly determined by the current value (net present value) of the resource rent,[1] which is influenced by market conditions. For example, the recent rapid declines in natural resource wealth have been heavily influenced by the drop in energy resource prices, particularly for crude oil and crude bitumen.

Natural resource wealth is therefore inherently volatile as it embodies highly unpredictable factors such as resource prices, extraction costs and resource rent. The physical reserve of a resource, the basis of the wealth, also occasionally undergoes changes due to extraction, technological advancement and discoveries or re-evaluations of resource stocks.

Currently, Statistics Canada estimates both annual and quarterly NRAA, with both facilitating informed economic decisions. Annual estimates of energy reserves date back to 1961 for some asset types, consistent with the land and produced asset accounts, while most mineral reserve estimates date back to 1976 or 1977.

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1. Resource rent is the total revenue from sales minus total extraction costs of a resource.

Addition, extraction and reserve

Natural resources are of two types: renewable resources such as naturally grown timber and fish; and non-renewable resources such as oil, gas and gold. A renewable resource can be sustained if it is not over-exploited; however, the stock of a non-renewable resource is assumed to be fixed even though the total amount is largely unknown. The known physical reserve of a resource, used to calculate natural resource wealth, largely depends on the discovery and extraction of the resource.

Using a set of economic and geological criteria, Natural Resources Canada classifies mineral resource reserves under several classes: proven and probable, indicated and measured, and speculative and hypothetical.[2] Statistics Canada assigns monetary value only to those mineral reserves in the first class. Similarly, Statistics Canada limits its natural resource wealth estimates to established reserves for oil and gas and to accessible and harvestable reserves for timber.[3]

The variation in the size of an established reserve is exemplified by crude bitumen. In 2006, crude bitumen reserves, widely known as oil sands, more than doubled in size reaching 3,340 million cubic metres from the previous year (Chart 1). The reserve continued to increase and peaked at 4,300

cubic metres in 2008 (Chart 1). These fluctuations were driven by factors such as rising energy prices, extraction rates and changes in technology, which increased the portion of the known stock that was economically recoverable.

Higher resource prices provide an incentive for businesses to expand and intensify exploration and drilling activities. Consequently, new deposits are often discovered. Also, with the advancement of technology, previously discovered reserves may become profitable to extract, and in turn, increase the size of the reserve. This in return would increase the monetary value of the reserves that Statistics Canada assigns to natural

resources. For example, extraction of offshore oil and gas resources, which had been discovered in the late 1970s, began only in the late 1990s when it became economically and technologically feasible.[4] For similar reasons, diamonds[5] discovered in the late 1980s, did not become part of natural wealth until 1998.

Adding natural resource wealth to the National Balance Sheet

Canada's National Balance Sheet Accounts (NBSA) help track the country's non-financial capital stocks, including the value of land and of produced assets, including residential and non-residential

Chart 1
Established crude bitumen reserves, 1990 to 2014

million cubic metres
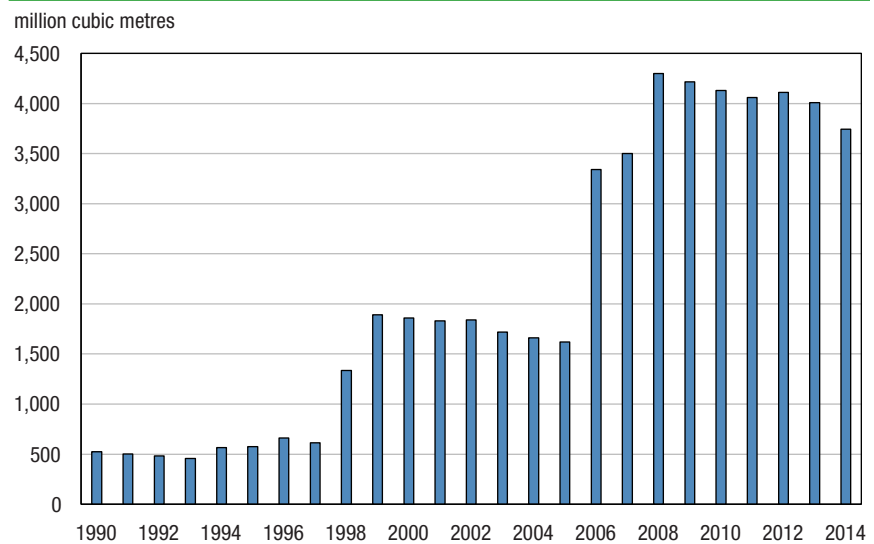
Source: Statistics Canada, CANSIM table 153-0122, accessed March 24, 2017.

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2. The 'proven and probable' refers to a portion of the reserve with a 90% likelihood of extraction, whereas this likelihood for the 'indicated and measured' class is around 50%. The 'speculative and hypothetical' class has the potential to be discovered based on geological surveys. For details, see Generalized model of mineral resource development (https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/mineralsmetals/pdf/mms-smm/generalized_model_e.pdf) accessed July 25, 2016.

3. The established energy reserves has the highest probability of extraction. Timber valuation is based on the assumption that the accessible and harvestable reserves will remain the same for an indefinite period.

4. In 1979, the Hibernia oil field—315 kilometres east-southeast of St. John's, Newfoundland—was discovered, and in November 1997, the project came on stream and became the first offshore oil extraction site in Canada. For details, see: Economic and Project Analysis (www.economics.gov.nl.ca/EB-oil.asp) (accessed January 11, 2016).

5. Canada's first diamond mine, the Ekati diamond mine—300 kilometres northeast of Yellowknife, Northwest Territories—came on stream in October 1997. Until 2003, the reserves continued to decline because of extraction. In 2003, the Diavik mine, located 300 km northeast of Yellowknife, gave a boost to the reserves. For details, see Industry, Tourism and Investment (www.iti.gov.nt.ca/diamonds) (accessed January 11, 2016).

structures, machinery and equipment, consumer durable goods and inventories.

The National Balance Sheet records national wealth; that is the sum of all sectors' produced non-financial assets such as buildings, machinery and equipment, as well as non-produced non-financial assets such as land and natural resources.[6] For several years, annual stock estimates of Canada's natural resource asset accounts have also been incorporated in the annual estimates of the National Balance Sheet at the aggregate level. Integrating natural resource assets with other income-generating assets such as land,[7] buildings and bridges is essential for tracking the national wealth of a resource-based economy like Canada's.

Until recently however, natural resource assets were not reflected in the quarterly versions of the NBSA for two reasons: (i) conceptual challenges related to the need to allocate the natural resource assets to the various sectors of the economy, and (ii) the need to develop quarterly estimates to match the frequency of the NBSA.

In December 2015,[8] Statistics Canada became one of the first national statistical agencies to integrate natural resource wealth into the quarterly NBSA. Doing so involved developing a robust and rigorous methodology to sector natural resources using Statistics Canada's annual estimates of natural resource assets as the basis for generating quarterly estimates.[9]

## Moving from an annual estimate to a quarterly

The new quarterly NRAA are produced using the annual natural resource wealth estimates as their basis. They have been produced from 1990 and are also projected forward to 2016 to be consistent with the quarterly NBSA.[10]

As noted above, there are two key challenges related to using the annual Natural Resource Wealth estimates in the quarterly NBSA. The first is to develop quarterly estimates that reference the same period as the NBSA. The second is to divide natural resource wealth estimates among the various sectors of the economy.

Quarterly estimates are developed using monthly production and prices for each commodity included in the natural resource asset accounts, along with a set of extraction cost indicators. An example of this type of indicator would be production costs such as raw materials and supply, labour and fuel. In the event that monthly numbers are not available for a particular commodity, an average is taken from the available months to complete the quarterly estimate. The projected estimates are later revised in subsequent quarters when benchmark data and other indicators become available.

The second step in creating quarterly natural resource wealth

Chart 2
Natural resource assets, corporate and government sectors' claims, first quarter of 1990 to fourth quarter of 2016
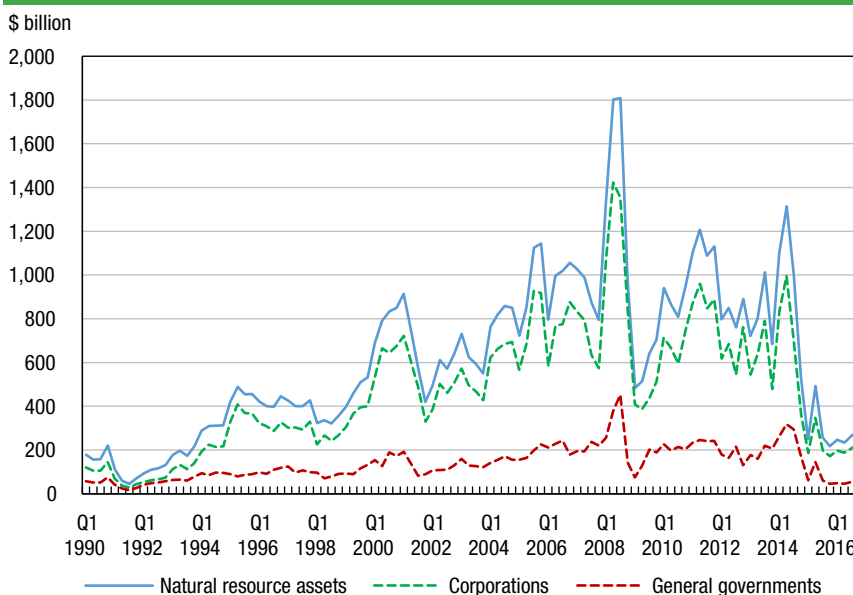
Note: General governments include federal, provincial and territorial, local and aboriginal.
Source: Statistics Canada, CANSIM table 378-0121, accessed March 24, 2017.

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6. Non-produced assets include the value of agricultural and other developed land and natural resources. Produced assets include residential structures, non-residential structures, machinery and equipment, consumer durable goods and inventories.

7. Land is included when it is leased or rented. Vacant land is excluded.

8. National balance sheet and financial flow accounts, third quarter 2015 (www.statcan.gc.ca/daily-quotidien/151214/dq151214a-eng.htm).

9. The methodology used to integrate the value of selected natural resource assets into the quarterly national balance sheet accounts is available in the publication *Latest developments in the Canadian Economic Accounts*. For details: Natural resource wealth statistics in the National Balance Sheet Accounts (www.statcan.gc.ca/pub/13-605-x/2015009/article/14239-eng.htm).

10. At the time of publication, the latest annual estimates of natural resource wealth are for 2015: www.statcan.gc.ca/daily-quotidien/161216/dq161216b-eng.htm.

estimates relates to partitioning the value of these assets between the government and the corporate sectors.

In Canada, natural resources belong to the government, but the exploration and extraction are conducted by private businesses. The resource rent from an extracted resource is shared between the government and corporations; that is, the government collects royalties and corporations earn profits. This allows both to anticipate receiving a stream of income in the future. Accordingly, total natural resource wealth is allocated between the government and corporations based on the split between the amount of royalties collected by the government and the amount of profits earned by the corporations.

Chart 2 illustrates the share of corporations' and general governments' claim of natural resource assets. From the first quarter of 1990 to the fourth quarter in 2016, the government's average share of total natural resource wealth is 23% (Chart 2); this percentage share changes from time to time and from jurisdiction to jurisdiction for each resource. Both government and corporate sector wealth exhibited similar volatility because royalties are closely tied to natural resource prices.

How important is natural resource wealth in Canada's economy?

The addition of natural resources in late 2015 had a significant impact on fluctuations in the overall non-financial national wealth. Chart 3

shows the NBSA's major types of non-financial assets on a quarterly basis, including natural resource wealth. The quarterly estimates of natural resources are based on existing annual natural resource wealth estimates (1990 to 2015), including a projection forward to 2016. The main benefit of projecting these figures forward is to provide a comparison to other types of capital in the latest estimates of the NBSA.

In the fourth quarter of 2016, total national wealth—the sum of produced assets, land and natural resources—grew 1.4% reaching $9,920 billion. Produced assets[11] and land[12] grew 1.2% and 1.0% respectively, and natural resource assets increased 11.1%.

These three separate components of national wealth do not always behave in a similar manner. Chart 3 shows

that the pace of growth for both produced assets and land has been relatively steady, reaching $5,772 billion and $3,855 billion in the fourth quarter of 2016, respectively. By contrast, natural resource wealth, with its tie to global natural resource prices, is much more volatile. This demonstrates that including natural resource wealth in the NBSA has a significant impact on the aggregate wealth measure, while helping to highlight the impact of these assets on the Canadian economy.

The role played by natural resource assets in the economy is highlighted in Chart 4, which shows that natural resource wealth peaked at $1,808 billion in the third quarter of 2008 due to record-high oil prices coupled with increases in the energy resource reserves. However, it quickly plummeted in the next two

Chart 3
**Canada's non-financial assets, first quarter of 1990 to fourth quarter of 2016**
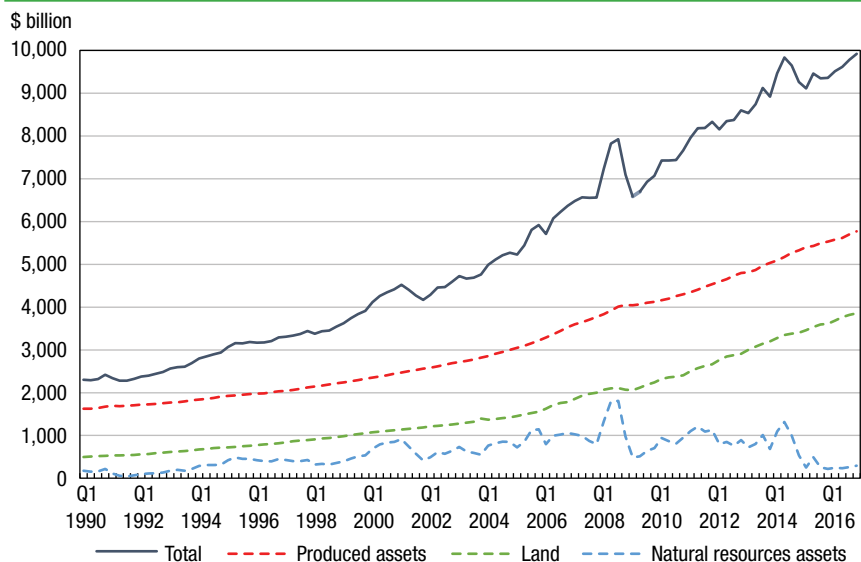
Source: Statistics Canada, CANSIM table 378-0121, accessed March 24, 2017.

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11. Produced assets consist of residential structures, non-residential structures, machinery and equipment, intellectual property products, consumer durables, inventories, and weapons systems.

12. Only developed land (used in farming, building houses and buildings) is included for wealth estimation.

Chart 4
Natural resource wealth, first quarter of 1990 to fourth quarter of 2016
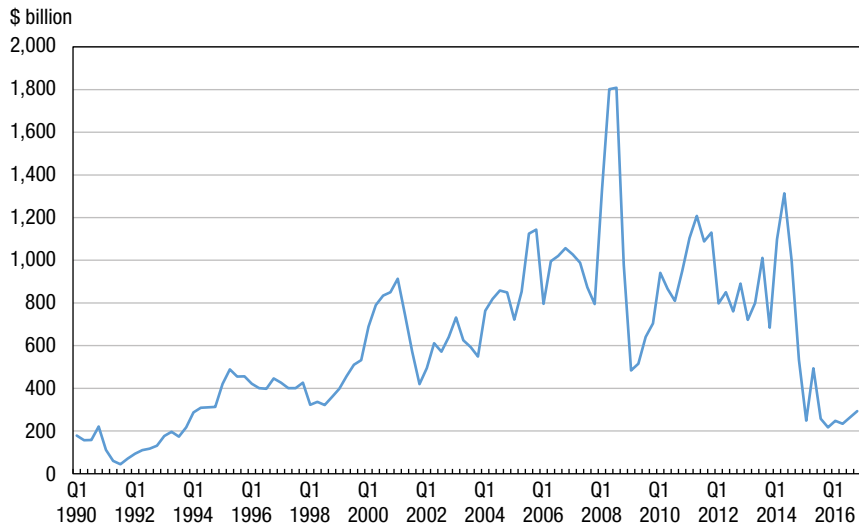
Source: Statistics Canada, CANSIM table 378-0121, accessed March 24, 2017.

quarters because of the sharp drop in energy resource prices in the wake of the 2008 global financial crisis. The drop in energy prices was driven by decreased oil prices in the global market.

Changes in oil prices also had an important impact on the relative composition of natural resource wealth. In 2010, energy reserves accounted for 62% of total natural resource wealth; mineral and timber resources 25% and 13% respectively.[13] By 2015, however, timber had become the most valued resource accounting for 55% of total natural resource wealth, followed by minerals at 26% and energy at 19%. This significant change was due to a drop in energy resources in 2015 due to lower crude bitumen prices. As a result, this also increased the shares of mineral and timber resources of total natural resource wealth.

13. Statistics Canada, CANSIM table 153-0121, accessed April 7, 2017.