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Asset Accounts

Workshop on the System
of Environmental-
Economic Accounting
Central Framework and
Sustainable
Development Goals
indicators

26-29 March 2018
Amman, Jordan

Joe St. Lawrence
Statistics Canada



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Why measure environmental assets?

“Conventional economic aggregates generated through national accounting, such as GDP, do not reflect the extent to which production and consumption activities may be using up environmental assets and limiting the capacity for these assets to generate ecosystem services in the future.”

-The Economics of Ecosystems and Biodiversity:
Guidance Manual for Countries (2013)



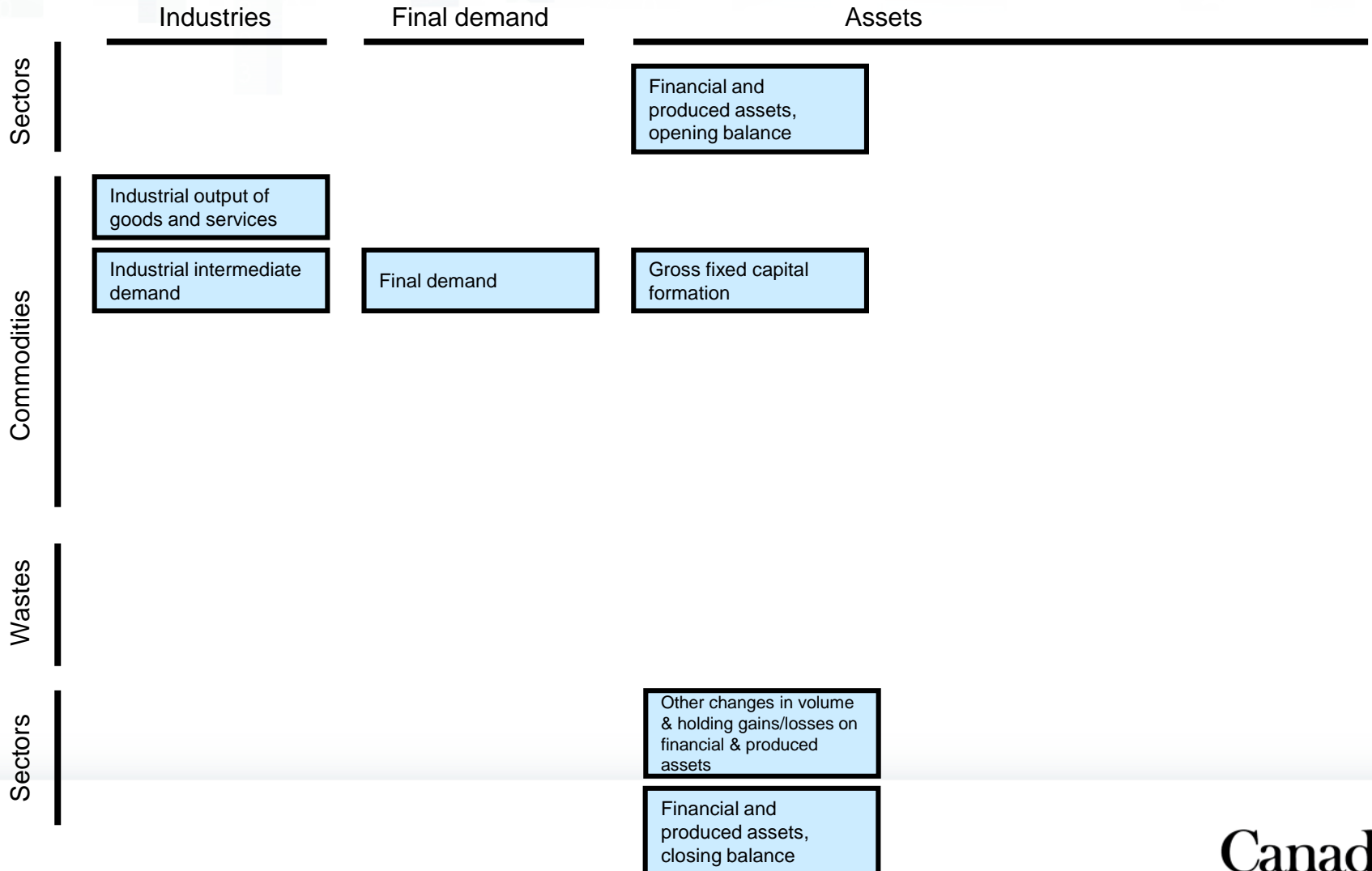
Policy relevance

Monitoring and management of natural wealth

- What is the contribution of natural assets to national wealth?
- Are we maintaining total wealth (produced and natural) over time, both in total and per capita?
- To what extent are we substituting produced assets for natural assets?
- Is resource rent recovered successfully by governments?



Assets in the SNA





Assets in the SEEA

| | Industries | Final demand | Assets | | |
|-------------|---|---|--|--|--|
| Sectors | | | Financial and produced assets, opening balance | Natural resource assets, opening balance | Natural resource assets, opening balance |
| Commodities | Industrial output of goods and services | | | | |
| | Industrial intermediate demand Environmental protection expenditures | Final demand Environmental protection expenditures | Gross fixed capital formation Capital expenditures for environmental protection | | |
| | Resource production by industries Resource use by industries | Resource production by households/gov't Resource use by households/gov't | | | |
| Wastes | Waste consumption by industries Waste output by industries | Waste consumption by households/gov't Waste output by households/gov't | | | |
| Sectors | | | Other changes in volume & holding gains/losses on financial & produced assets | Changes in and holding gains/losses on natural resource assets | Changes in natural resource assets |
| | | | Financial and produced assets, closing balance | Natural resource assets, closing balance | Natural resource assets, closing balance |



Accounting Structure

- **Structure:** conforms with a balance sheet structure - opening stocks, closing stocks and annual variations

Table 5.8

Physical asset account for mineral and energy resources

| | Type of mineral and energy resource | | | | |
|---|---|---|--|-----------------------------------|--|
| | (Class A: Commercially recoverable resources) | | | | |
| | Oil resources (thousands of barrels) | Natural gas resources (cubic metres) | Coal and peat resources (thousands of tonnes) | Non-metallic minerals (tonnes) | Metallic minerals (thousands of tonnes) |
| Opening stock of mineral and energy resources | 800 | 1 200 | 600 | 150 | 60 |
| Additions to stock | | | | | |
| Discoveries | | | | | 20 |
| Upward reappraisals | | 200 | | 40 | |
| Reclassifications | | | | | |
| <i>Total additions to stock</i> | | 200 | | 40 | 20 |
| Reductions in stock | | | | | |
| Extractions | 40 | 50 | 60 | 10 | 4 |
| Catastrophic losses | | | | | |
| Downward reappraisals | | | 60 | | |
| Reclassifications | | | | | |
| <i>Total reductions in stock</i> | 40 | 50 | 120 | 10 | 4 |
| Closing stock of mineral and energy resources | 760 | 1 350 | 480 | 180 | 76 |

United Nations, 2012, *System of Environmental-Economic Accounting: Central Framework*, New York.



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Physical Asset Accounts

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Table 153-0122 [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), [7](#), [14](#)

Selected natural resource reserves annual (data in thousands)

Add/Remove data

Manipulate

Download

Related information

Help

The data below is a part of CANSIM table 153-0122. Use the [Add/Remove data](#) tab to customize your table.

Selected items [[Add/Remove data](#)]

Geography = Canada ¹

Asset type = Established crude bitumen reserves (cubic metres) ¹⁰

| Stock | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---------------|-----------|-----------|-----------|-----------|------------------------|-----------|
| Opening stock | 4,216,000 | 4,130,000 | 4,060,000 | 4,110,000 | 4,009,400 | 3,880,000 |
| Additions | 7,500 | 31,000 | 162,000 | 20,400 | -3,740 ^r | 77,253 |
| Depletion | 93,500 | 101,000 | 112,000 | 121,000 | 125,660 | 137,553 |
| Closing stock | 4,130,000 | 4,060,000 | 4,110,000 | 4,009,400 | 3,880,000 ^r | 3,819,700 |

Symbol legend:

[Back to original table](#)

^r Revised



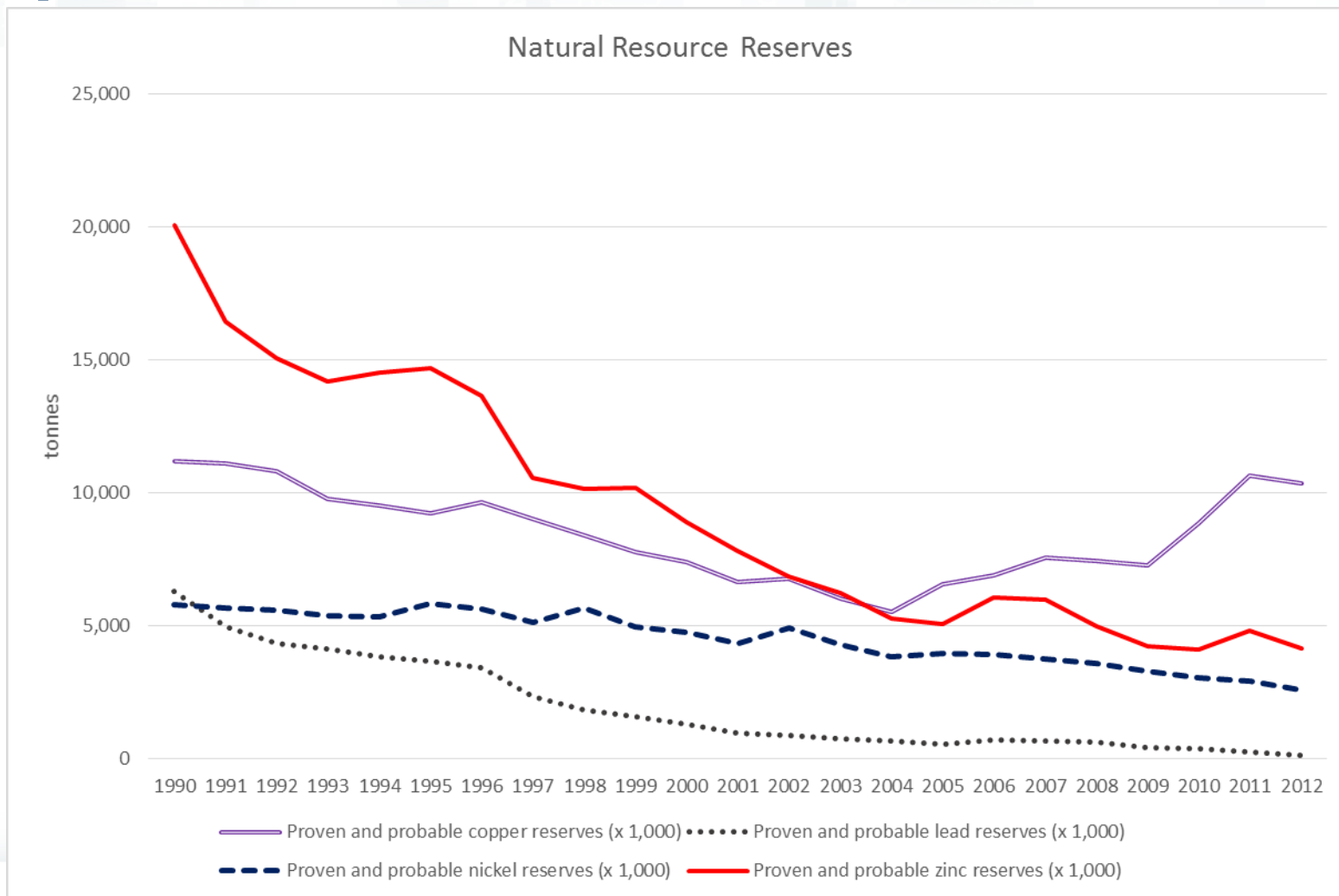
Physical Asset Accounts: Applications

Physical indicators that relate to the management of natural resource stocks and their use in the economy

- Are resource stocks growing / declining over time?
- Stocks of mineral and energy assets
- Remaining reserve life of energy and mineral assets
- Annual depletion of mineral and energy reserves
- Total natural resource base

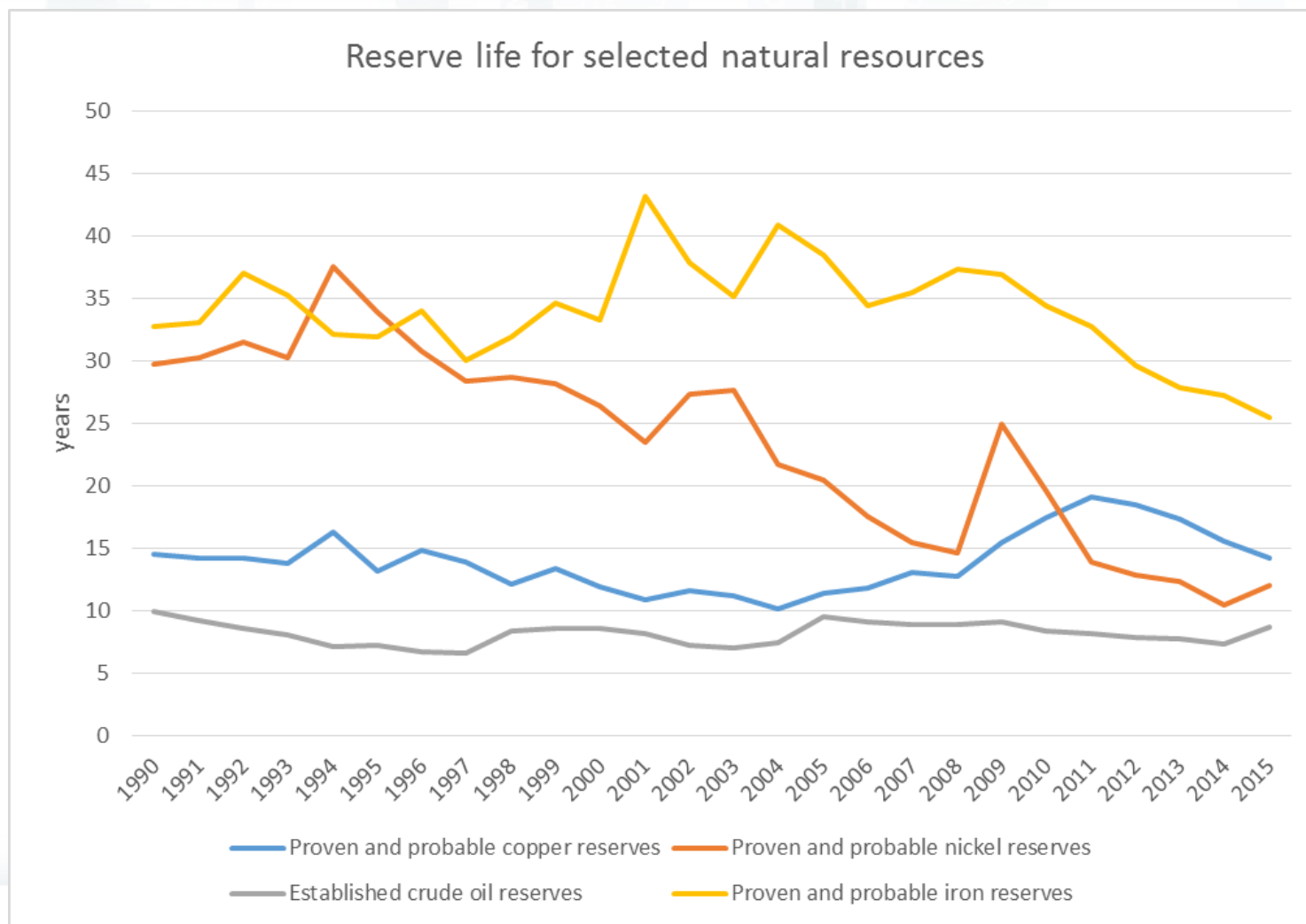


Physical Stocks of Selected Natural Assets





Reserve Lives of Selected Natural Assets





Monetary Asset Accounts

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Table 153-0121 ^{1, 2, 10}

Value of selected natural resource reserves

annual (dollars x 1,000,000)

[Data table](#) [Add/Remove data](#) [Manipulate](#) [Download](#) [Related information](#) [Help](#)

The data below is a part of CANSIM table 153-0121. Use the [Add/Remove data](#) tab to customize your table.

Selected items [\[Add/Remove data\]](#)

Geography = Canada

Asset type = Established crude bitumen reserves

| Stock | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|-----------|-----------|-----------|-----------|-----------|-------------------------|
| Reconciliation account opening stock [§] | 182,194.4 | 336,498.2 | 424,936.5 | 336,923.0 | 334,803.4 | 534,710.0 ^P |
| Reconciliation account additions [§] | 611.1 | 3,244.6 | 13,280.2 | 1,820.4 | -515.5 | 1,799.0 ^P |
| Reconciliation account depletion [§] | 7,618.1 | 10,571.1 | 9,181.4 | 10,104.1 | 17,317.4 | 3,203.2 ^P |
| Reconciliation account revaluation [§] | 161,310.8 | 95,764.8 | -92,112.4 | 6,164.0 | 217,739.5 | -444,356.1 ^P |
| Reconciliation account closing stock [§] | 336,498.2 | 424,936.5 | 336,923.0 | 334,803.4 | 534,710.0 | 88,949.7 ^P |

Symbol legend:

^P Preliminary

[Back to original table](#)



Linking Natural Assets to the SNA

Table 378-0121

National Balance Sheet Accounts

quarterly (dollars x 1,000,000)

[Data table](#) [Add/Remove data](#) [Manipulate](#) [Download](#) [Related information](#) [Help](#)

The data below is a part of CANSIM table 378-0121. Use the [Add/Remove data](#) tab to customize your table.

Selected items [\[Add/Remove data\]](#)

Geography = Canada

Sectors = Total all sectors

Valuation = Market value

| Categories | 2014 | | | | 2015 | | | | 2016 | | | | 2017 | | |
|--|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|------------|------------|------------|------------|------------|
| | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 |
| Non-financial assets | 9,468,487 | 9,810,380 | 9,635,893 | 9,360,075 | 9,209,486 | 9,558,035 | 9,501,224 | 9,561,227 | 9,744,960 | 9,845,745 | 10,045,019 | 10,311,058 | 10,497,278 | 10,523,168 | 10,557,937 |
| Produced non-financial assets ¹ | 5,089,522 | 5,175,631 | 5,274,345 | 5,336,000 | 5,414,069 | 5,450,284 | 5,514,838 | 5,553,538 | 5,612,360 | 5,641,384 | 5,730,224 | 5,796,371 | 5,843,350 | 5,872,767 | 5,930,411 |
| Residential structures ⁴ | 2,089,344 | 2,125,696 | 2,160,357 | 2,183,648 | 2,197,504 | 2,224,307 | 2,253,650 | 2,274,186 | 2,301,937 | 2,340,860 | 2,383,427 | 2,410,222 | 2,438,348 | 2,458,817 | 2,476,533 |
| Non-residential structures ⁴ | 1,594,359 | 1,637,271 | 1,668,170 | 1,679,401 | 1,708,768 | 1,715,948 | 1,719,455 | 1,726,939 | 1,748,080 | 1,744,182 | 1,776,770 | 1,799,097 | 1,804,032 | 1,800,275 | 1,841,855 |
| Machinery and equipment ⁴ | 343,897 | 344,510 | 346,774 | 358,890 | 378,993 | 380,591 | 391,633 | 396,708 | 401,535 | 391,595 | 386,242 | 393,267 | 400,474 | 409,200 | 385,848 |
| Intellectual property products ⁴ | 221,041 | 221,763 | 230,981 | 233,923 | 237,023 | 232,776 | 233,707 | 236,183 | 237,772 | 235,573 | 235,639 | 235,617 | 233,948 | 234,509 | 235,268 |
| Consumer durables ⁴ | 549,521 | 561,891 | 568,539 | 575,354 | 576,695 | 594,336 | 601,199 | 606,370 | 610,157 | 632,047 | 637,829 | 644,445 | 647,916 | 661,715 | 668,142 |
| Non-produced non-financial assets ¹ | 4,378,965 | 4,634,749 | 4,361,548 | 4,024,075 | 3,795,417 | 4,107,751 | 3,986,386 | 4,007,689 | 4,132,600 | 4,204,361 | 4,314,795 | 4,514,687 | 4,653,928 | 4,650,401 | 4,627,526 |
| Land ⁴ | 3,276,864 | 3,350,514 | 3,381,845 | 3,404,102 | 3,463,651 | 3,539,661 | 3,595,707 | 3,703,271 | 3,832,969 | 3,889,139 | 3,921,366 | 4,034,200 | 4,159,995 | 4,159,435 | 4,161,715 |
| Natural resources ⁴ | 1,102,101 | 1,284,235 | 979,703 | 619,973 | 331,766 | 568,090 | 390,679 | 304,418 | 299,631 | 315,222 | 393,429 | 480,487 | 493,933 | 490,966 | 465,811 |



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Linkage to the SNA

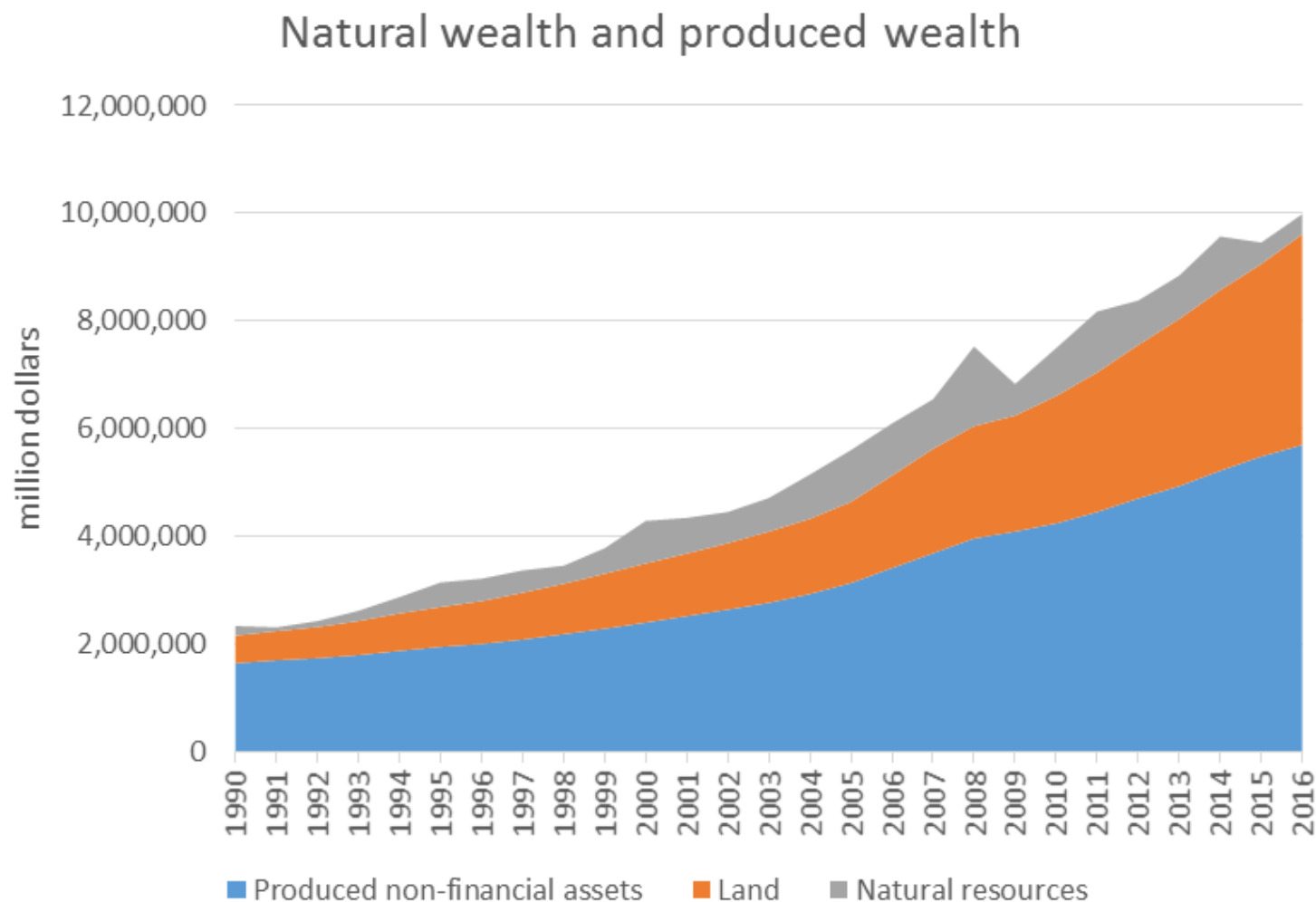
The monetary accounts are integrated with the National Wealth Account of the Canadian System of Macroeconomic Accounts.

The addition of the monetary values of key natural resource assets (energy, minerals, timber and land) recognizes that these resources, although provided by nature, contribute significantly to Canada's national wealth.



Natural Resource Assets and National Wealth

4





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How are natural resources valued?

In order to be included within the balance sheet accounts, natural resource assets must fit into the asset boundary of the SNA – i.e. they must be economic assets.

“Economic assets are entities over which ownership rights are enforced by institutional units, individually or collectively, and from which economic benefits may be derived by their owners by holding them, or using them, over a period of time.”

The assets also must be recoverable under current technological and economic conditions.

e.g., for Canada’s oil sands (crude bitumen) we only value “known deposits under active development”



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How are natural resources valued?

Valuation of natural resource asset stocks would *ideally* be based on observed market value for transactions in these assets.

Such values are not available for most resource assets however, since there are few transactions in resource assets in their “natural” state.

Estimates of market value must be derived indirectly via economic or resource rent.

The total value, or wealth, associated with the stock is calculated as the present value of all future annual rent that the stock is expected to yield.

The concept of resource rent

Resource rent is the part of the **revenue** from the sale of the resource which remains after having deducted all **costs** associated with extraction – including inputs, labour and capital costs.

$$RR = TR - C - (r_c K + \delta)$$

where:

RR = resource rent

TR = total annual revenue

C = annual non-capital extraction cost (excluding taxes)

δ = annual depreciation

$r_c K$ = return to produced capital

Net Present Value

Net present value (NPV) is the discounted value of future economic benefits from a given asset

- *Follows conventions adopted in the System of National Accounts to value capital assets*

$$NPV = \sum_{t=1}^T \frac{RR_1}{(1 + r_i)^t}$$

where:

RR=resource rent

T= reserve life, i.e. Closing stock ÷ extraction

r_i= discount rate



Land Assets

The Land Accounts provide information on the cover and the use of Canada's land.

The accounts respond to questions like:

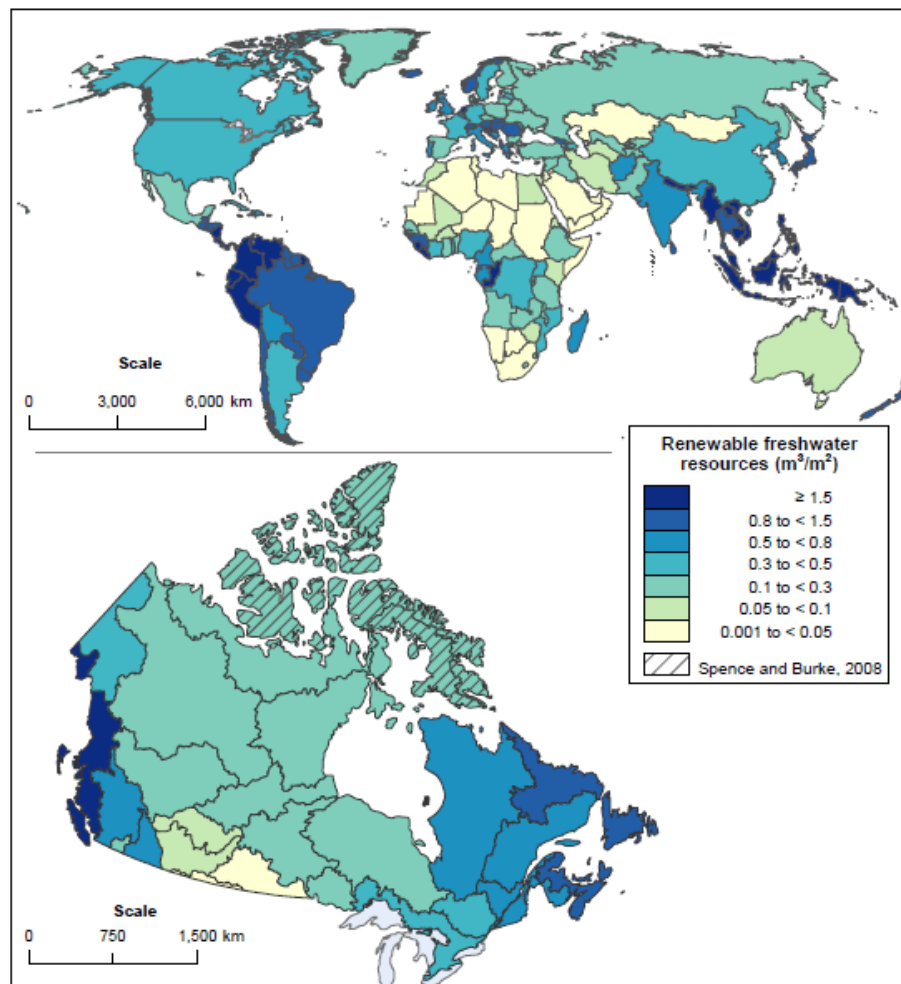
- What is the distribution and quality of the land?
- How is land used and what are the trends in this use?
- How quickly is rural land being converted to urban land?
- What share of urban land is occupying prime agricultural land?

At the moment, only agricultural and built-up land are valued and included in the country's National Wealth Account



Water Assets

Map 1.1
Renewable freshwater resources by country, and water yield by drainage region within Canada



Note(s) Data for Canada were derived from discharge values contained in Environment Canada, 2010, Water Survey of Canada, Archived Hydrometric Data (HYDAT) (www.wsc.ec.gc.ca/hydat/H20/index_e.cfm?cname=main_e.cfm).

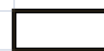
Source(s): Food and Agriculture Organization of the United Nations, 2009, *AQUASTAT main country database*, <http://www.fao.org/nr/water/aquastat/dbase/index.stm> (accessed December 15, 2009).
Spence C., and A. Burke, 2008, "Estimates of Canadian Arctic Archipelago Runoff from Observed Hydrometric Data," *Journal of Hydrology*, Vol. 362, pages 247 to 259.
Statistics Canada, Environment Accounts and Statistics Division, 2010, special tabulation.



Valuation Exercise

1 Asset account for Crude Bitumen: Quantity and value

| | | | | | | | | | | | | | | | | |
|----|------------------------|-------------------|------------------------|------------------------------|-------------------|--------------------|-------------------|------------------------|---------------|--------------------|-----------------------|-------------------------|-----------------------|--------------|----------------------|-------------------|
| 2 | Crude Bitumen - 211114 | | | | | | | | | | | | | | | |
| 3 | | thousand m3 | | | | | | | | | | | | | | |
| 4 | | Opening stock | Additions | Depletion | Closing stock | | | | | | | | | | | |
| 5 | 2010 | | | | | | | | | | | | | | | |
| 6 | 2011 | | | | | | | | | | | | | | | |
| 7 | 2012 | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | |
| 11 | Year | Total revenues | Total production costs | Depreciation | Net capital stock | Rate of return | Return to capital | Total extraction costs | Resource rent | Opening Stock | Additions / Revisions | Depletion / Quantity of | Closing Stock | Reserve life | Discount factor | Net Present Value |
| 12 | | \$ '000 | \$ '000 | \$ '000 | \$ '000 | | \$ '000 | \$ '000 | \$ '000 | 000 m ³ | 000 m ³ | 000 m ³ | 000 m ³ | years | 4% | \$'000 000 |
| 13 | | CAPP ¹ | CAPP ² | CANSIM 031-0002 ³ | | Rate of return tab | (E*F) | (C+D+G) | (B-H) | (Mt-1) | (M-J+L) | AER ST98 ⁴ | AER ST98 ⁴ | (M/L) | (PV(NS2,N##,-1/N##)) | (I*N*O)/1000 |
| 14 | sample | 10000 | 1000 | 100 | 10000 | 1.00% | 100 | 1200 | 8800 | .. | 100000 | 1000 | 99900 | 100 | 0.2453 | 216 |
| 15 | 2010 | | | | | | | | | | | | | | | |
| 16 | 2011 | | | | | | | | | | | | | | | |
| 17 | 2012 | | | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | | | | |
| 19 | | million dollars | | | | | | | | | | | | | | |
| 20 | | Opening stock | Additions | Depletion | Revaluation | Closing stock | | | | | | | | | | |
| 21 | 2011 | | | | | | | | | | | | | | | |
| 22 | 2012 | | | | | | | | | | | | | | | |



¹ Canadian Association of Petroleum Producers, Statistical Handbook, Table 04-25B

² <http://www.capp.ca/library/statistics/handbook/pages/statisticalTables.aspx?sectionNo=4>

³ Canadian Association of Petroleum Producers, Statistical Handbook, Table 04-16B (Operating costs in-situ + mining + upgraders = Operating column)

⁴ <http://www.capp.ca/library/statistics/handbook/pages/statisticalTables.aspx?sectionNo=4>

⁵ Statistics Canada: CANSIM Table 031-0002 (Current prices, Non-conventional oil extraction, Total Assets, Geometric)

⁶ <http://www5.statcan.gc.ca/cansim/a26?lang=eng&retrLang=eng&id=0310002&paSer=&pattern=&stByVal=1&p1=1&p2=-1&tabMode=dataTable&csid=>

⁷ Alberta Energy Regulator: ST98: Alberta's Energy Reserves & Supply/Demand Outlook

⁸ <http://www.aer.ca/data-and-publications/statistical-reports/st98>



Steps to value a resource stock

Estimate the physical stock

Calculate the resource rent

Calculate the net present value

Valuation — Estimate the stock

| Year | Total revenues \$ '000 | Total production costs \$ '000 | Depreciation \$ '000 | Net capital stock \$ '000 | Rate of return | Return to capital \$ '000 | Total extraction costs \$ '000 | Resource cost \$ '000 | Opening Stock '000 m³ | Additions / Revisions '000 m³ | Depletion / Quantity of production '000 m³ | Closing Stock '000 m³ | Reserve life years | Discount factor % | Net Present Value \$'000 000 |
|------|---------------------------|-----------------------------------|-------------------------|------------------------------|----------------|------------------------------|-----------------------------------|--------------------------|--------------------------|----------------------------------|---|--------------------------|-----------------------|----------------------|---------------------------------|
| 1 | 10,000.00 | 4,000.00 | 100.00 | 10,000.00 | 0.02 | 200.00 | 4,300.00 | 5,700.00 | .. | 100,000 | 1,000 | 99,900 | 99.90 | 0.25 | 139.67 |

| Reserves under active development | | | |
|-----------------------------------|-----------------------|------------------------------------|-----------------------|
| Physical accounts | | | |
| Opening Stock | Additions / Revisions | Depletion / Quantity of production | Closing Stock |
| '000 m ³ | '000 m ³ | '000 m ³ | '000 m ³ |
| (Mt-1) | (M-J+L) | AER ST98 ⁴ | AER ST98 ⁴ |
| .. | 100000 | 1000 | 99900 |

Valuation – Calculate rent

[illegible]

| | | | GEOMETRIC | | | | | |
|--------|-------------------|------------------------|------------------------------|-------------------|--------------------|-------------------|------------------------|---------------|
| Year | Total revenues | Total production costs | Depreciation | Net capital stock | Rate of return | Return to capital | Total extraction costs | Resource rent |
| | \$ '000 | \$ '000 | \$ '000 | \$ '000 | | \$ '000 | \$ '000 | \$ '000 |
| | CAPP ¹ | CAPP ² | CANSIM 031-0002 ³ | | Rate of return tab | (E*F) | (C+D+G) | (B-H) |
| sample | 10000 | 1000 | 100 | 10000 | 1.00% | 100 | 1200 | 8800 |

$$RR_1 = TR - C - (r_c K + \delta) \quad \text{where:}$$

$RR = \text{resource rent (annual)}$

$$TR = \text{total annual revenue}$$

C = annual non-capital extraction cost (excluding taxes)

 $\delta = \text{annual depreciation}$

$r_c K$ = return to produced capital



Valuation — Calculate NPV

4

| A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P |
|------------------------------|-------------------|------------------------|------------------------------|-------------------|--------------------------|-------------------|------------------------|-----------------------------------|---------------------|-----------------------|------------------------------------|-----------------------|--------------|----------------------|-------------------|
| Crude Bitumen - 211114 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| GEOMETRIC | | | | | | | | Reserves under active development | | | | Physical accounts | | | |
| Year | Total revenues | Total production costs | Depreciation | Net capital stock | Rate of return | Return to capital | Total extraction costs | Resource rent | Opening Stock | Additions / Revisions | Depletion / Quantity of production | Closing Stock | Reserve life | Discount factor | Net Present Value |
| | \$ '000 | \$ '000 | \$ '000 | \$ '000 | | \$ '000 | \$ '000 | \$ '000 | '000 m ³ | '000 m ³ | '000 m ³ | '00 m ³ | years | % | \$'000 000 |
| | CAPP ¹ | CAPP ² | CANSIM 031-0002 ³ | | Rate of return folder | (E*F) | (C+D+G) | (B-H) | (Mt-1) | (M-J+L) | AER ST98 ⁴ | AER ST98 ⁴ | (M/L) | (PV(NS2,N##,-1/N##)) | (I*N*O)/1000 |
| 1 | 10,000.00 | 4,000.00 | 100.00 | 10,000.00 | 0.02 | 200.00 | 4,300.00 | 5,700.00 | .. | 100,000 | 1,000 | 99,900 | 99.90 | 0.25 | 139.67 |

$$NPV = \sum_{t=1}^T \frac{RR_1}{(1 + r_i)^t}$$

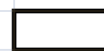
| Reserve life | Discount factor | Net Present Value |
|--------------|----------------------|-------------------|
| years | 4% | \$'000 000 |
| (M/L) | (PV(NS2,N##,-1/N##)) | (I*N*O)/1000 |
| 100 | 0.2453 | 216 |



Valuation Exercise

1 Asset account for Crude Bitumen: Quantity and value

| | | | | | | | | | | | | | | | | |
|----|------------------------|-----------------|------------------------|------------------|-------------------|--------------------|-------------------|------------------------|---------------|---------------|-----------------------|-------------------------|---------------|--------------|----------------------|-------------------|
| 2 | Crude Bitumen - 211114 | | | | | | | | | | | | | | | |
| 3 | | thousand m3 | | | | | | | | | | | | | | |
| 4 | | Opening stock | Additions | Depletion | Closing stock | | | | | | | | | | | |
| 5 | 2010 | | | | | | | | | | | | | | | |
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| 7 | 2012 | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | |
| 11 | Year | Total revenues | Total production costs | Depreciation | Net capital stock | Rate of return | Return to capital | Total extraction costs | Resource rent | Opening Stock | Additions / Revisions | Depletion / Quantity of | Closing Stock | Reserve life | Discount factor | Net Present Value |
| 12 | | \$ '000 | \$ '000 | \$ '000 | \$ '000 | | \$ '000 | \$ '000 | \$ '000 | 000 m³ | 000 m³ | 000 m³ | 000 m³ | years | 4% | \$'000 000 |
| 13 | | CAPP¹ | CAPP² | CANSIM 031-0002³ | | Rate of return tab | (E*F) | (C+D+G) | (B-H) | (Mt-I) | (M-J+L) | AER ST98⁴ | AER ST98⁴ | (M/L) | (PV(NS2,N##,-1/N##)) | (I*N*O)/1000 |
| 14 | sample | 10000 | 1000 | 100 | 10000 | 1.00% | 100 | 1200 | 8800 | .. | 100000 | 1000 | 99900 | 100 | 0.2453 | 216 |
| 15 | 2010 | | | | | | | | | | | | | | | |
| 16 | 2011 | | | | | | | | | | | | | | | |
| 17 | 2012 | | | | | | | | | | | | | | | |
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| 19 | | million dollars | | | | | | | | | | | | | | |
| 20 | | Opening stock | Additions | Depletion | Revaluation | Closing stock | | | | | | | | | | |
| 21 | 2011 | | | | | | | | | | | | | | | |
| 22 | 2012 | | | | | | | | | | | | | | | |



¹ Canadian Association of Petroleum Producers, Statistical Handbook, Table 04-25B

<http://www.capp.ca/library/statistics/handbook/pages/statisticalTables.aspx?sectionNo=4>

² Canadian Association of Petroleum Producers, Statistical Handbook, Table 04-16B (Operating costs in-situ + mining + upgraders = Operating column)

<http://www.capp.ca/library/statistics/handbook/pages/statisticalTables.aspx?sectionNo=4>

³ Statistics Canada: CANSIM Table 031-0002 (Current prices, Non-conventional oil extraction, Total Assets, Geometric)

<http://www5.statcan.gc.ca/cansim/a26?lang=eng&retrLang=eng&id=0310002&paSer=&pattern=&stByVal=1&p1=1&p2=-1&tabMode=dataTable&csid=>

⁴ Alberta Energy Regulator: ST98: Alberta's Energy Reserves & Supply/Demand Outlook

<http://www.aer.ca/data-and-publications/statistical-reports/st98>



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“Beyond GDP”

“...we often draw inferences about what are good policies by looking at what policies have promoted economic growth; but if our metrics of performance are flawed, so too may be the inferences that we draw.”

Stiglitz, J.E., A. Sen, and J-P. Fitoussi, (2009), Report by the Commission on the Measurement of Economic Performance and Social Progress, p.7

www.stiglitz-sen-fitoussi.fr/documents/rapport_anglais.pdf



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