Asset Accounting

UNSD SEEA Training of Trainers Seminar

July 7-10, 2014, New York

Joe St. Lawrence

Statistics Canada

Statistics Canada Statistique Canada

Canadä

"Beyond GDP"

"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."

-TEEB Guidance Manual for Countries (2013)

OECD: indicators and reports: *Green Growth* **and** *Material Flows and Resource Productivity*
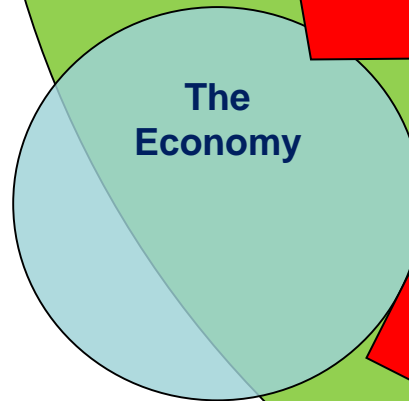
World Bank: *Wealth Accounting and the Valuation of Ecosystem Services (WAVES)*

The Economy and The Environment

-Natural Resources
-Ecosystem Services

Stocks

Flows

The Economy

Expenditures

-Residuals

Statistics Canada • Statistique Canada

System of Environmental-Economic Accounts (SEEA) view

	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

Statistics Canada •

Accounting structure

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

Table 5.5.3 Physical asset account for mineral and energy resources (physical units*)

	Type of mineral and energy resource (Class A: Commercially recoverable resources)				
	Oil resources ('000 barrels)	Natural gas resources (m3)	Coal & peat resources ('000 tonnes)	Non-metallic minerals (tonnes)	Metallic minerals ('000 tonnes)
Opening stock of mineral and energy resources	800	1 200	600	150	60
Additions to stock					
Discoveries					20
Upwards reappraisals		200		40	
Reclassifications					
Total additions to stock		200		40	20
Reductions in stock					
Extractions	40	50	60	10	4
Catastrophic losses					
Downwards reappraisals			60		
Reclassifications					
Total reductions in stock	40	50	120	10	4
Closing stock of mineral and energy resources	760	1 350	480	180	76

* Different physical units (e.g. tonnes, cubic metres, barrels) will be used for different types of resources.

Statistics Canada • Statistique Canada

Physical stock accounts: an example for crude bitumen

Table 153-0012[1]

Established crude bitumen reserves

annual (cubic metres x 1,000)

| Data table | Add/Remove data | Manipulate | Download | Related information | Help |

The data below is a part of CANSIM table 153-0012. Use the Add/Remove data tab to customize your table.

Selected items [Add/Remove data]

Geography= Canada

Stock	2005	2006	2007	2008	2009	2010	2011
Opening stock, established crude bitumen reserves	1,660,000	1,620,000	3,340,000	3,500,000	4,300,000	4,216,000	4,130,000
Additions, established crude bitumen reserves	17,258	1,785,707	237,000	876,000	2,000	1,332	31,000[r]
Depletion, established crude bitumen reserves	57,258	65,707	77,000	76,000	86,000	87,332	101,000[r]
Closing stock, established crude bitumen reserves	1,620,000	3,340,000	3,500,000	4,300,000	4,216,000	4,130,000	4,060,000

Back to original table

Symbol legend:

[r]   Revised

Footnotes:

1.   Alberta Energy Regulator.

Source: Statistics Canada. *Table 153-0012 - Established crude bitumen reserves, annual (cubic metres),* CANSIM (database). (accessed: 2014-06-06)
Back to search

Monetary stock accounts: an example for crude bitumen

Table 153-0005[1, 2]

Value of established crude bitumen 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 153-0005. Use the Add/Remove data tab to customize your table.

Selected items [Add/Remove data]

Geography= Canada

Value	2005	2006	2007	2008	2009	2010	2011
Reconciliation account, established crude bitumen reserves, opening stock[3]	107,560.2	111,305.7	197,972.4	167,541.6	437,070.6	143,720.4	301,647.0
Reconciliation account, established crude bitumen reserves, additions[3]	1,185.8	105,844.5	11,345.0	89,040.4	68.2	97.3	2,872.7
Reconciliation account, established crude bitumen reserves, depletion[3]	3,934.1	3,894.6	3,685.9	7,725.0	2,931.7	6,378.5	9,359.3
Reconciliation account, established crude bitumen reserves, revaluation[3]	6,493.8	-15,283.1	-38,089.8	188,213.5	-290,486.7	164,207.9	81,064.9
Reconciliation account, established crude bitumen reserves, closing stock[3]	111,305.7	197,972.4	167,541.6	437,070.6	143,720.4	301,647.0	376,225.2

Back to original table

Footnotes:

1. Data source: Statistics Canada, Environment Accounts and Statistics Division.
2. For concepts, sources and methods, see "Concepts, Sources and Methods of the Canadian System of Environmental and Resource Accounts", catalogue number 16-505-GPE.
3. The reconciliation account entries are calculated using the present value methodology.
4. Negative values for net price I, net price II and present value are set to zero.

Source: Statistics Canada. *Table 153-0005 - Value of established crude bitumen reserves, annual (dollars),* CANSIM (database). (accessed: 2014-06-06)
Back to search

Statistics Canada

Canadä

Information for... **Browse by subject** **Browse by key resource** **Help**

Table 378-0005[3]

Natural resource assets and produced assets

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 378-0005. Use the Add/Remove data tab to customize your table.

Selected items [Add/Remove data]

Geography= Canada

Categories	2008	2009	2010	2011	2012
Non-financial assets	7,416,200	6,629,425	7,313,829	7,960,934	8,041,096
Produced non-financial assets	4,187,815	4,246,166	4,408,493	4,639,292	4,895,157
Residential structures	1,654,058	1,687,356	1,778,316	1,871,006	1,980,938
Non-residential structures	1,319,709	1,328,319	1,393,163	1,489,886	1,588,777
Machinery and equipment	311,551	324,913	304,853	307,726	325,358
Intellectual property products	186,567	189,216	193,329	199,999	207,612
Consumer durable goods	465,860	476,435	495,912	513,720	525,196
Inventories	244,505	233,382	236,050	249,915	259,899
Weapons Systems	5,565	6,545	6,870	7,040	7,377
Non-produced non-financial assets	3,228,385	2,383,259	2,905,336	3,321,642	3,145,939
Land	1,805,153	1,931,790	2,037,456	2,202,114	2,360,816
Timber	131,789	71,567	122,276	120,499	113,133
Subsoil resource stocks	1,291,443	379,902	745,604	999,029	671,990
Selected energy resources[1]	987,017	256,900	516,642	679,642	441,628
Selected mineral resources[2]	304,426	123,002	228,962	319,387	230,362

Back to original table

Footnotes:

1. Includes crude oil, natural gas, crude bitumen and coal.
2. Includes gold, iron, copper, nickel, lead, zinc, molybdenum, uranium, diamonds and potash.
3. Corrections have been made to the following variables for 1990 to 2012: Selected energy resources; Subsoil resource stocks; Non-produced non-financial assets; Non-financial assets.

8

2018-11-17

Calculation of resource rent

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

where:
RR = resource rent (annual)
TR = total annual revenue
C = annual non-capital extraction cost (excluding taxes)
δ = annual depreciation
$r_c K$ = return to produced capital

Statistics Canada • Statistique Canada

Valuation – Numerical example

	A	B	C		D	E	F	G	H	I	J	K	L	M	N	O	P
													Reserves under active development		4.00%	= Discount rate	
					GEOMETRIC								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 m³	'000 m³	'000 m³	'000 m³	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(N$2,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

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

where:

RR = resource rent (annual)
TR = total annual revenue
C = annual non-capital extraction cost (excluding taxes)
δ = annual depreciation
$r_c K$ = return to produced capital

Valuation — 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*

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

where:
RR=resource rent
T= reserve life, i.e. Closing stock ÷ extraction
r_i= discount rate

Statistics Canada • Statistique Canada

2018-11-17

Valuation – Numerical example

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
Crude Bitumen - 211114																
											Reserves under active development				4.00% = Discount rate	
												Physical accounts				
					GEOMETRIC											
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 m³	'000 m³	'000 m³	'000 m³	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(N$2,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

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

t=1	t=2	t=3	t=4	...	t=100	Total ($ '000)
5,481	5,270	5,067	4,872	...	113	139,678
=5700/(POWER(1.04,1))					=5700/(POWER(1.04,100))	

Statistics Canada • Statistique Canada

2018-11-17

Questions?

Joe St. Lawrence

Environment Accounts and Statistics | Comptes et statistique de l'environnement
R.H. Coats Building | Immeuble R.-H.-Coats / Floor | Étage 25 M
Statistics Canada | 100 Tunney's Pasture Driveway, Ottawa ON K1A 0T6
Statistique Canada | 100, promenade Tunney's Pasture, Ottawa ON K1A 0T6
Joe.St.Lawrence@statcan.gc.ca
Telephone | Téléphone 613-951-7709
Facsimile | Télécopieur 613-951-0634
Government of Canada | Gouvernement du Canada