

System of Environmental Economic Accounting



System of
Environmental
Economic
Accounting

Monetary Asset Accounts

17-20 December 2019, Almaty, Kazakhstan

Jessica Ying Chan

United Nations Statistics Division




United Nations

Outline

- Content and scope of monetary asset accounts for energy
- Valuation
 - > Net present value
 - > Resource rent
 - > Reserve life

Scope of monetary accounts

- All known deposits of mineral and energy resources could potentially be included in the monetary asset accounts.
 - SEEA-Energy recommends that only the valuations of deposits in class A be included in the monetary asset accounts.
 - > Classes B and C are not because of the degree of uncertainty regarding expected extraction profiles and incomes.
-
- 
- > *Class A: Commercially recoverable resources*
 - > *Class B: Potentially commercially recoverable resources*
 - > *Class C: Non-commercial and other known deposits*

Why monetary accounts?

- Mineral and energy resources are a critically important input to almost all types of economic activity
- Value of those resources are relevant to measurement of a country's total wealth, which includes the natural resources of the country.
- Allows for the development of estimates of the value of the depletion of resources.
- Enable the calculation of depletion-adjusted economic aggregates such as:
 - > Depletion-adjusted value added for extractive industries
 - > Depletion-adjusted GDP

Structure of monetary asset accounts

Conceptual form of the monetary asset account for energy resources

Type of mineral and energy resource	
Class A: Commercially recoverable resources	
(Currency units)	
Opening value of stock of resources	
Additions to value of stock	
Discoveries	
Upward reappraisals	
Reclassifications	
<i>Total additions to stock</i>	
Reductions in value of stock	
Extractions	
Catastrophic losses	
Downward reappraisals	
Reclassifications	
<i>Total reductions in stock</i>	
Revaluations	
Closing value of stock of resources	

Same definitions as physical asset account—reflects a valuation of physical asset account

Accounts for changes in value of assets due to movements in price of the resource

Link to 2008 SNA

- In principle, scope of monetary asset accounts and SNA asset accounts for mineral & energy resources are identical
- Both look at *economically exploitable reserves* and *proven resources* (*commercially recoverable resources* in SEEA-Energy)
- However, SEEA-Energy defines scope of mineral & energy resources through reference to the United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources 2009 (UNFC-2009)

Scope of mineral and energy resources within SEEA-Energy and SNA asset accounts

SEEA-Energy classification	SEEA-Energy asset accounts		2008 SNA asset accounts
	Physical asset accounts	Monetary asset accounts	
Class A: Commercially recoverable resources	Quantities	Market values assigned to quantities associated with known deposits that can be estimated with high (G1), moderate (G2) or low (G3) levels of confidence in geologic knowledge	Market value assigned, but with some ambiguity about which estimate to use
Class B: Potentially commercially recoverable resources	Quantities	Market value assumed to be zero	Outside asset boundary
Class C: Non-commercial and other known deposits	Quantities	Market value assumed to be zero	Outside asset boundary
Potential resources		Outside asset boundary	

Ex: Monetary Asset Account

Home » CANSIM

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 [Ⓐ]
Reconciliation account additions [Ⓐ]	611.1	3,244.6	13,280.2	1,820.4	-515.5	1,799.0 [Ⓐ]
Reconciliation account depletion [Ⓐ]	7,618.1	10,571.1	9,181.4	10,104.1	17,317.4	3,203.2 [Ⓐ]
Reconciliation account revaluation [Ⓐ]	161,310.8	95,764.8	-92,112.4	6,164.0	217,739.5	-444,356.1 [Ⓐ]
Reconciliation account closing stock [Ⓐ]	336,498.2	424,936.5	336,923.0	334,803.4	534,710.0	88,949.7 [Ⓐ]

Symbol legend:

[Back to original table](#)

[Ⓐ] Preliminary

How are mineral and energy 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 many 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.**
 - > Need to first know the return on energy assets

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
- Measure of the return on environmental assets

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

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

Resource Rent

- Data from System of National Accounts can provide most information, including:
 - > Value of output (or operating surplus)
 - > Most cost information from extraction industry
 - Need to ensure this does not contain secondary activities that do not relate to extraction

Net present value

- But we need the current value of future economic benefits
- Net present value (NPV) is the discounted value of future economic benefits from a given asset
 - *Provides the value of an asset based on the future income streams that are expected to accrue from the use of the asset*
 - *Follows conventions adopted in the System of National Accounts to value capital assets*

$$V_t = \sum_{\tau=1}^n \frac{RR_{t+\tau}}{(1+r)^\tau}$$

where:

RR = resource rent

n = reserve life, i.e. Closing stock \div extraction

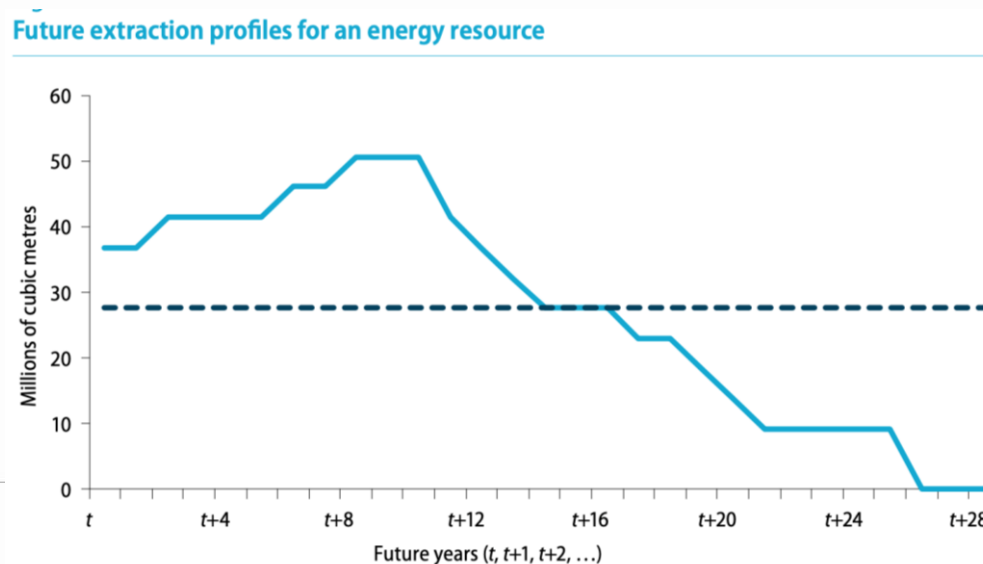
r = discount rate

Future resource rent

- Need to know forecast of the future resource rent
- Requires assumptions regarding:
 - > Development of prices and extraction costs
 - > Level of extraction
- Suggest to use simple and transparent assumptions
 - > e.g. resource rent will be same in constant price terms in all future years
- Assumptions also need to be made on the evolution of the per unit resource rent
 - > Possible assumption is that per unit resource rent evolves in line with an expected general rate of inflation
 - > $rr_{t+i} = rr^t * (1 + q_{t+i})^i$
 - where q_{t+i} is the expected general inflation rate in year $t+i$.

Reserve life

- To get to reserve life, you need to estimate future reductions in stock due to extraction.
- Where to find extraction profiles?
 - > Experts, ministries of energy, geologic institutes etc
 - > Care should be taken to ensure that the extraction profile is consistent with the best estimate of the commercially recoverable resources.
- Sum of future years' extraction should be no greater than the estimate of the quantity of resources in class A, as described in the physical asset account



Net present value

- Once the yearly unit resource rents have been calculated, they must be discounted back to the reference year
- Amount of income received in the following year is considered to be worth less than the same amount received in the current year
 - > Difference in value is reflected by the discount rate.

$$V_t = \sum_{\tau=1}^n \frac{RR_{t+\tau}}{(1+r)^\tau}$$

where:

RR = resource rent

n = reserve life, i.e. Closing stock \div extraction

r = discount rate



THANK YOU

seea@un.org