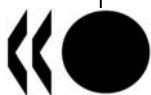


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RESULTS OF THE SURVEY ON SUB-SOIL ASSETS IN OECD COUNTRIES

To be held on 14-16 October 2008
Tour Europe, Paris la Défense
Beginning at 9:00 a.m. on the first day

This document reports on a survey about countries' efforts to measure the stock of sub-soil assets in their national balance sheets. Delegates are invited to comment on the report and to complete or adjust country information.

This document has been prepared by Young-Hwan Kim, OECD, and will be presented under item 8 of the draft agenda

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RESULTS OF THE SURVEY ON SUB-SOIL ASSETS IN OECD COUNTRIES

Introduction

1. Many OECD countries compile estimates of the stock of fixed assets and financial assets, but relatively few compile estimates of non-produced assets that would enable them to prepare complete balance sheets. The most significant non-produced asset in most countries is land, and so in 2007, the OECD Secretariat conducted a survey to determine how OECD member countries that do derive estimates of the stock of land go about it. The results of the survey reveal that a number of different methods can be used and the choice depends mostly on what data are available. The results also suggest that most countries could derive estimates using available data if they really wanted to.

2. After land, sub-soil assets are the second most important non-produced asset in most countries. Hence, in the (northern) summer of 2008, the OECD Secretariat conducted another survey with a simple questionnaire (see attachment) concerning sub-soil assets¹. Like land, the lack of estimates of the stock of sub-soil assets, such as coal, oil, natural gas, metallic minerals and non-metallic mineral reserves, is a major impediment for productivity studies and measuring national wealth.

3. As for land, it is hoped that sharing the knowledge of countries that derive estimates of sub-soil assets will be of benefit to those that do not. It should be noted that how to estimate of stock of sub-soil assets has been addressed from the viewpoint of environmental accounting² by the London Group. Measurement of sub-soil assets in connection with mineral exploration and evaluation is also discussed in the draft of the *Handbook on Deriving Capital Measures of Intellectual Property Products*.

4. Of the 30 OECD member countries and 5 accession countries, fifteen countries responded to the survey. However, only seven countries reported that they derive estimates of the stock of sub-soil assets. The seven countries are: **Canada, Czech Republic, Korea, Mexico, the Netherlands, Norway, and the United Kingdom**.

Survey results

Type of sub-soil assets estimated

5. Canada replied that they estimate energy resources (oil, gas, and coal), metallic minerals and non-metallic mineral assets. Metallic minerals include gold, nickel, copper, lead, zinc, iron, molybdenum, and uranium. Non-metallic minerals include potash and diamonds.

6. Mexico, the Netherlands, Norway, and the United Kingdom reported that their estimates cover the total value of oil and gas. Korea reported that they estimate the stock of metallic minerals, natural gas

¹ According to SNA definition, sub-soil assets are: "Proven reserves of mineral deposits located on or below the earth's surface that are economically exploitable, given current technology and relative prices. Ownership rights to the sub-soil assets are usually separable from those to the land itself. Sub-soil assets consist of coal, oil and natural gas reserves, metallic mineral reserves and non-metallic mineral reserves"

² Some issues relating to sub-soil assets (mineral resources) have been discussed at the London Group meeting on Environmental Accounting.

and non-metallic minerals, but they have very little sub-soil assets and the value of sub-soil assets is negligible in the total value of non-produced assets.

7. Czech Republic also reported that they estimate the stock of sub-soil assets (AN.212). However, they estimate it indirectly by subtracting the stock of land (AN.211) from the stock of tangible non-produced assets (AN.21). They estimate the stock of land (AN.211) and the stock of tangible non-produced assets (AN.21) from statistical surveys.

Table 1. The type of sub-soil assets estimated

Country	Oil	Gas	Coal	Metallic minerals	Non-metallic minerals
Canada	o	o	o	o	o
Korea		o		o	o
Mexico	o	o			
Netherlands	o	o			
Norway	o	o			
United Kingdom	o	o			

Institutional breakdown

8. Canada, Norway and the United Kingdom publish only the total value of sub-soil assets without distributing it to sectors.

9. Korea and Mexico reported that they classify ownership of sub-soil assets to the general government sector (S.13), given that only government can award the rights to permit exploration and exploitation.

10. In the Netherlands, the institutional breakdown is determined on the basis of the economic ownership of oil and gas reserves using a financial lease arrangement. The value of the resource rents arising during the period of the extractive license is attributed to the extractor (non-financial institutions), with the remainder of the reserve value attributed to the legal owner (the Dutch government).

Methods used to derive estimates

11. Three methods are used to derive estimates of the stock of sub-soil assets by the five countries other than the Czech Republic: net present value method, net price method and user cost method³.

12. In the case of assets for which the returns are spread over a lengthy period, the 1993 SNA recommends the use of the net present value approach⁴. The net present value of sub-soil asset resources are usually determined by the present value of the expected net returns resulting from the commercial exploitation of those assets, although such valuations are subject to uncertainty and revision. (1993 SNA 13.59-13.60)

13. Canada, Korea, the Netherlands, Norway and the United Kingdom use the net present value method to estimate the stock of sub-soil assets.

³ A discussion of the three methods is presented in the report of 'Accounting for unsustainable mineral extraction in Madhya Pradesh and West Bengal', Indian Central Statistical Organization (2003)

⁴ Advisory Expert Group on National Accounts (AEG) agrees that the preferred valuation for mineral deposits is market price which is seldom available. Absent a market price, the deposit should be valued as the present value of future receipts of resource rent.

14. For example, in the Netherlands, the net present value method is used to discount expected future incomes, which are based on a physical extraction scenario and an expected resource rent. The resource rent is calculated as the gross operating surplus less the user cost of capital other than sub-soil assets in the industry ‘extraction of crude petroleum and natural gas.’ A 3-year moving average is used to estimate the expected unit resource rent. The future income flow is calculated by multiplying projected yearly physical extractions with the expected income per unit of the reserves (unit resource rent).

15. In the Netherlands, the net present value of future income from the reserves at the beginning of year t is calculated as⁵:

$$NPV_t = \sum_{\tau=t}^{\infty} \frac{RR_{t-1}^{\tau}}{(1+r)^{\tau-t+1}} = \sum_{\tau=t}^{\infty} \frac{rr_{t-1}^{\tau} Extr_{t-1}^{\tau}}{(1+r)^{\tau-t+1}} \quad \text{where,}$$

RR_t^{τ} = resource rent in year τ as expected at the end of year t ,

rr_t^{τ} = unit resource rent in year τ as expected at the end of year t ,

$Extr_t^{\tau}$ = extraction in year τ as projected at the end of year t , and

$(1+r)^{\tau}$ = discount rate for discounting extractions in year τ .

16. A 4 % discount rate is currently used in Canada and UK when they estimate the stock of sub-soil assets by the net present value method. An 8% rate of return on capital is used in the UK, based on Eurostat recommendations.

17. Canada uses the net price method as well as net present value method to estimate the stock of sub-soil assets. They produce two different estimates of the stock of sub-soil assets using the net price method: one with no return to capital and another with a 4.25% rate of return to capital.

18. According to net price method, the stock of sub-soil assets can be calculated by the resource rent per unit of the asset extracted in the current period (price minus marginal cost of extraction, development and exploration including a normal rate of return on invested produced capital) multiplied by the quantity of the proven reserves of the sub-soil asset that are exploitable under present economic conditions. The net price method is based on the Hotelling rent assumption, i.e. in a perfectly competitive market the net price of a natural resource rises at the rate of interest of alternative investment, offsetting the discount rate. In principle, therefore, the net price effective at the time of the resource use should be applied.

19. Canada has indicated that it intends to continue publishing estimates of the stock of sub-soil assets based on both methods (net present method and net price method) until such time as consensus is reached on a single valuation method.

20. Mexico uses the net price method as well as user cost method. However, they argue that net price method is easier to use to estimate the stock of sub-soil assets than the user cost method.

21. The user cost method is also known as the El Serafy method⁶. El Serafy argued that the resource rent should be divided into two elements: one is a true income (X) that can be consumed, and one is a

⁵ Erik Veldhuizen, Cor Graveland, Dirk van den Bergen and Sjoerd Schenau (2008), A draft report of ‘Valuation of oil and gas reserves in the Netherlands 1990-2005’, Statistics Netherlands

depletion cost or user cost (RR-X), which is invested to create a perpetual stream of income that would provide the same level of true income. But this is not really germane to estimating the value of the stock of the sub-soil asset. To calculate the value of the sub-soil asset, he assumed that the current level of resource rent and the rate of extraction is held constant during the lifetime of the resource. He also assumed the discount rate is constant. Under these assumptions, the stock of sub-soil assets at year t by the user cost method can be calculated as⁷:

$$V_t = \sum_{n=0}^m \frac{RR_t}{(1+r)^n}, \text{ where}$$

RR_t : resource rent in year t , m : life expectancy of the resource in year t

As can be seen, the El Serafy method of estimating the stock of the sub-soil asset is just a simplified version of the net present value method.

Table 2. Method used deriving estimates

Method	Country
Net price method	Canada, Mexico
User cost method	Mexico
Net present value method	Canada, Korea, Netherlands, Norway, United Kingdom

Volume estimates

22. In Canada, estimates of energy and mineral asset stocks are taken from data published by a number of agencies and government departments. For metallic minerals, volume estimates are presented by commodity (i.e., nickel, copper, zinc, etc.), whereas monetary estimates of reserves are produced using our NAICS industry classification (for example, the nickel-copper industry, lead-zinc industry, etc.). For energy resources, Canada typically reports “Established Reserves”. However for Crude Bitumen (tar sands); “Established Reserves under Active Development” is currently used.

23. In the Netherlands, the volume estimates for the extraction, opening and closing stocks of oil and gas reserves are derived from the yearly report ‘Oil and gas in the Netherlands’. This report is produced annually by TNO, the Netherlands Organisation of Applied Scientific Research, at the request of the Netherlands Ministry of Economic Affairs. The volumes of oil and natural gas are presented in terms of ‘Standard cubic meters’, usually abbreviated as Sm³.

24. In Mexico, volume estimates of oil are available in ‘Anuario Estadístico de PEMEX’ and ‘Memoria de Labore’ by the PEMEX.

25. In Norway, the volume of oil and gas reserves is based on statistics from the government agency, Oil and Gas Directorate.

⁶ El Serafy, S. (1989). 'The proper calculation of income from depletable natural resources', Environmental accounting for sustainable development: a UNEP- World Bank Symposium, Y. J.Ahmad, S. E. Serafy and E. Lutz. Washington D.C.

⁷ M. del Mar RUBIO (2005), ‘Value and Depreciation of Mineral Resources Over the Very Long Run: An Empirical Contrast of Different Methods’, Economics Working Papers 867, Department of Economics and Business, Universitat Pompeu Fabra

26. 24. In the UK, volume estimates are compiled by the Department for Business Enterprise and Regulatory Reform (BERR). A summary of these data is published for information purposes by ONS alongside monetary estimates of sub-soil assets.

27. Korea and Czech Republic have no volume estimates of sub-soil assets.

Summary

28. Seven out of the fifteen countries which responded to the survey estimate the stock of sub-soil assets: **Canada, Czech Republic, Korea, Mexico, Netherlands, Norway, and United Kingdom**. The estimates are published as part of the national balance sheet (Canada, the Netherlands), national wealth survey (Korea), a set of indicators of sustainable development (Norway), and environmental accounts (Mexico, UK).

29. These countries mainly derive estimates of the stock of oil and gas. Canada and Korea also derive estimates of the stock of metallic mineral reserves and non-metallic mineral reserves.

30. Five of the seven countries use the net present value method: **Canada, Korea, the Netherlands, Norway, and the United Kingdom**. Mexico also uses the net price method because of its advantage of simplicity. Canada derives three different estimates because it believes that there is no consensus on what is the best method.

31. Statistics concerning volume estimates are available from the official government data sources.

Appendix 1

Questionnaire on methods used by OECD countries to estimate the stock of sub-soil assets

A: Respondent details

Name of country:

Name of person who replied:

Email address:

B: Classification of sub-soil assets for which estimates are derived and institutional breakdown

Please describe the level of detail for which estimates of sub-soil assets are derived and for which institutional sectors. Do the estimates encompass all sub-soil assets that fall within the scope of the 1993 SNA asset boundary? If not, please describe the exclusions.

C: Methods used for deriving estimates

Please describe the methods used to derive the estimates, e.g. net present value, owner's valuation.

D: Reasons for not deriving estimates

If you do not derive complete estimates of sub-soil assets by institutional sector, please give the reasons, e.g. low priority, lack of resources, lack of data. If the last, do you think the obstacles can be overcome? Do you have the intention of deriving estimates in the next five years?

E: Volume estimates

If you derive volume estimates, please describe the measures you derive and the methods used.

F: Comments

Are there any comments you would like to make, based on your experience that could be of benefit to other countries.

Finally,

Do you agree that your response can be posted on the web site of the OECD?

If no, do you agree that it can be posted on the internal OECD web site for sharing with your colleagues?