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SEEA-Energy: Process leading to the publication

Paper prepared by UNSD

(for discussion)

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Progress report prepared by UNSD

UNCEEA meeting, New York, 26-27 June 2008

A. Introduction

1. Energy accounts have been identified by the UN Committee of Experts on Environmental-Economic Accounting (UNCEEA) as an important domain of environmental-economic accounting. During its first meeting in New York, the UNCEEA agreed that energy accounts should feature prominently in the revised SEEA (Minutes of the First Meeting of the UNCEEA, New York 22-23 June 2006).

2. At its second meeting there was general consensus among the UNCEEA members for the preparation of a publication on energy accounts, *System of Environmental-Economic Accounting for Energy* (SEEA-E), which would present standard concepts, definitions, classifications and tables for energy accounts (Minutes of Second Meeting of the UNCEEA, 5-6 July 2007)¹.

3. This paper presents the scope and coverage of the SEEA-E and provides an update on the process for its drafting including a timetable. It is being submitted to the UN Committee of Experts on Environmental-Economic Accounting for approval, given its mandate to ensure the overall coordination of activities in environmental-economic accounting and related statistics. The last section of the paper presents questions to the UNCEEA.

B. Scope and coverage

4. The aim of the SEEA-E is to provide a standard for energy accounts and energy-related air emission accounts, consisting of agreed concepts, definitions, classifications and inter-related tables and accounts for multi-purpose analytical and policy use. The SEEA-E will also discuss the links between energy balances and energy accounts and the links between emission inventories used for reporting to the United Nations Framework Convention for Climate Change (UNFCCC) and the air emission accounts.

5. The SEEA-E will present an internationally agreed set of conventions on how to compile energy accounts. They are expressed in terms of concepts, definitions, classifications and accounting rules for measuring items such as energy resource stocks, supply and use of energy products and energy-related air emissions. The SEEA-E accounting framework will allow physical data on energy and energy-related emissions to be presented together with economic data in a format that is designed for purposes of economic analysis, decision-taking and policy-making.

6. The SEEA-E is designed for analysis, decision-taking and policy-making, whatever the industrial structure or stage of economic development reached by a country.

¹ http://unstats.un.org/unsd/envaccounting/ceea/meetings/UNCEEA_2_4.pdf

The basic concepts and definitions depend upon economic reasoning and principles which should be universally valid and invariant to the particular circumstances in which they are applied. Similarly, the classifications and accounting rules are meant to be universally applicable.

7. The SEEA-E framework is an elaboration of the handbook of national accounting *Integrated Environmental and Economic Accounting*, SEEA 2003 in the sense that it further develops the SEEA modules with focus on energy and it elevates the SEEA concepts, definitions, classifications and tables to the level of a standard.

8. The development of the SEEA-E will contribute to the process of the revision of the SEEA. In particular, it will contribute to the clarification and solution of energy-related issues on the research agenda of the revision of the SEEA as well as in the development of standard tables for energy and energy-related emission accounts.

9. The SEEA-E enhances the use of energy statistics and balances by providing the integration framework for basic energy statistics consistent with the system of national accounts. Basic energy statistics and energy balances are discussed in the *International Recommendations on Energy Statistics* (IRES) being developed by UNSD in cooperation with the Oslo Group on Energy Statistics. IRES will focus on a list of data items, concepts, definitions and classifications for energy statistics covering flows and stocks (over- and under-ground) in physical and monetary terms as well as on data sources and compilation strategies, data quality, metadata and dissemination of energy statistics. (UNSD, 2008)².

10. IRES and the SEEA-E will be two complementary and fully coordinated documents. While IRES complies to the extent possible with the SEEA-E conceptual structure and data needs, the SEEA-E's accounting standards are developed on the basis of IRES, namely using IRES definitions of data items and classifications of energy products and flows. Both the SEEA-E and IRES will be complemented by the *Energy Statistics Compilers Manual* (ESCM) which will provide additional guidance to assist countries in the implementation of the international recommendations and compilation of the standard tables.

11. The SEEA-E includes the following modules. An annotated outline of the SEEA-E is included in Annex I.

- *Physical and monetary asset accounts for energy resources and inventories of energy products*: These accounts record the stocks of energy resources. They describe all increases and decreases in the stock due to extraction and natural causes in physical terms. In addition, the stocks and changes in stocks are also measured in monetary terms and allow for the calculation of depletion of energy resources. These accounts are particularly useful as they link depletion of energy resources to the income measures, thus allowing for the derivation of environmentally-adjusted indicators (e.g. environmentally-adjusted value added and genuine savings) and they provide an indication of the value of the contribution of energy resources to the wealth of a nation.

² http://www.ssb.no/ocg/vienna/2b_paper.pdf

- *Physical flow accounts for energy and energy-related emissions:* These accounts provide information by economic activity of the use of energy products for energy and non-energy purposes as input in production and consumption and the use of renewable resources for energy purposes (e.g. bio fuels). They are presented in the form of supply and use tables. The flow accounts also include energy-related air emissions by industry and households.
- *Monetary and hybrid flow accounts:* The *monetary accounts* separately identify energy-related transactions that are already part of the conventional economic accounts. These include for example information on the costs associated with the energy extraction and distribution, costs and fees paid by the users, energy-related taxes and subsidies, leases and licenses for access to the energy resources, etc.

The *hybrid accounts* align the physical information recorded in the physical supply and use tables with the monetary supply and use tables of the conventional economic accounts by combining the physical quantities with the matching economic flows.

12. The SEEA-E provides a set of standard tables, which shows the general format and minimum level of detail that countries should apply when implementing the energy accounts. To support the understanding of the concepts, the SEEA-E includes a set of tables populated with a fictitious data set.

13. The SEEA-E does not provide advice on the implementation of the energy accounts which is the domain of IRES and ESCM. Furthermore, since the SEEA-E is written using the style of a standard, it does not contain country examples. However, a collection of country practices is included in the searchable archive posted on the UNCEEA website³.

C. Process and timetable for the preparation of the SEEA-E

14. The United Nations Statistics Division (UNSD) has embarked on the drafting of the *System of Environmental-Economic Accounting for Energy* (SEEA-E) as part of its regular work programme following the recommendation by the UNCEEA at its second meeting.

15. In preparing the SEEA-E, UNSD will work in close cooperation with the London Group on Environmental Accounting and the Oslo Group on Energy Statistics which are the city groups with expertise in energy accounting and energy statistics, respectively.

16. A number of activities in support of the preparation of the SEEA-E have taken place since the previous UNCEEA meeting in July 2007. These include:

- (a) Organization of a special session on energy accounts by UNSD in conjunction with the 12th London Group Meeting on Environmental Accounting (Rome, Italy, 17-19 December 2007). At that meeting, a list of issues on energy

³ <http://unstats.un.org/unsd/envaccounting/ceea/archive/Introduction.asp>

accounts was discussed and agreed and a drafting group⁴ was established to assist UNSD in developing SEEA-E.

- (b) Consultation with the Oslo Group on Energy Statistics on the list of issues at its third meeting (Vienna, 4-6 February 2008). At that meeting, members of the Oslo Group agreed to actively contribute to the activities of the drafting group. A consolidated list of issues for the SEEA-E is included in Annex II.
 - (c) Hiring of an expert to assist UNSD in the drafting of the SEEA-E.
 - (d) Drafting of chapters 1-4 of the SEEA-E and consultation with the drafting group. Comments from the drafting group members will be incorporated in the second draft of the chapters.
 - (e) Establishment of a website to facilitate the consultation on the SEEA-E⁵.
 - (f) Consultation with the UNECE Ad Hoc Group of Experts on Harmonization of Fossil Energy and Mineral Resources Terminology on the proposed SEEA-E classification of natural energy resources.
17. Future activities in the preparation of the SEEA-E include:
- (a) Drafting of chapters 5-8 including physical and monetary flow accounts and emissions accounts is expected to be sent to the drafting Group in August 2008 for commenting, and to seek inputs for the publication.
 - (b) Drafting of a number of technical papers addressing some of the issues on the research agenda for the SEEA revision for discussion at the 13th London Group meeting (Brussels, 29 September – 3 October 2008).
 - (c) Organization of an Expert Group Meeting on energy accounts and statistics to discuss the complete draft of the SEEA-E.
 - (d) World-wide consultation on the new draft of the SEEA-E resulting from the discussion during the Expert Group Meeting. The consultation will involve countries and international organizations to ensure the SEEA-E universal relevance, applicability and feasibility of implementation.
 - (e) Submission to the UNCEEA for its recommendation to the United Nations Statistical Commission (UNSC) for adoption.
18. Table 1 below presents the timetable for the preparation of the SEEA-E.

⁴ The drafting group consists of experts of energy statistics and energy accounts from Australia, Austria, Canada, China, Denmark, Germany, Italy, Netherlands, Norway, Eurostat, IMF, UNESCWA and UNSD.

⁵ <http://unstats.un.org/unsd/envaccounting/seeae>

Table 1. Timetable for the preparation of the SEEA-E

	2007	2008				2009				2010
	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1
Inputs to the drafting	Issue list agreed at the special session on energy accounts (Rome, Dec.) Collection of country experiences	Issue list discussed at the Oslo Group (Vienna, 4-6 Feb)	Global Assessment of Energy Accounts	Analysis of the Global Assessment of Energy Accounts						
Drafting		Expert hired by UNSD to draft SEEA-E	Completed first Chps 1-4	Completed first draft Chps 5-8 Revised draft Chapters 1-4	Revised draft Chps 5-8 Draft Chapter 9		Revised SEEA-E on the basis of the EGM recommendations			
Consultation			Chapters 1-4 circulated to drafting group UNCEEA reviews progress of work and process (NY, 26-27 June)	Chapters 5-8 are circulated to the drafting group Issue papers on energy-related issues for discussion to the LG (Brussels, September) International Workshop on Energy Statistics discusses selected issues (Mexico City, December)	Expert Group Meeting on emission inventories to advance the climate change agenda	Oslo Group meeting discusses draft chapters SEEA-E Report on progress of work to the UNSC by the UNCEEA Expert Group meeting on energy accounts and statistics reviews SEEA-E Issue papers on energy-related issues for discussion to the LG (March 09)	World-wide global consultation to review the revised SEEA-E	User-producer conference		
Final draft SEEA-E								Final draft SEEA-E	Approval of the UNCEEA of the SEEA-E and recommendation to the UNSC	SC adoption

D. Questions to the UNCEEA

19. The UNCEEA may wish to express its views on the following:

- 1) *Does the UNCEEA agree with the scope and coverage of the SEEA-E [Section B]?*
- 2) *Does the UNCEEA agree with the process and timetable for the preparation of the SEEA-E [Section C]?*
- 3) *Does the UNCEEA agree in principle with the draft Annotated Outline of the SEEA-E [Annex I]?*

Annex I

Annotated outline

Chapter 1: Introduction. This chapter will introduce the objectives of the SEEA-E, describe the target audience, present the relevance of energy accounts for policy-making including climate change and sustainable development policies, and describe the structure of the publication.

Chapter 2: SEEA-E framework. This Chapter introduces the SEEA-E accounting framework and explains the fundamental principles and features of the system. It describes how the generic asset accounts and supply-use tables are used as building blocks for SEEA-E. It describes the classifications used in the SEEA-E which form the backbone of the accounting framework and the interconnections between the different accounts. The Chapter also discusses the link with the energy balances and in particular the residence versus the territory principle.

Chapter 3: Physical asset accounts for energy resources. This chapter describes the definitions and classification of energy resources. It presents the links with the United Nations Framework Classification for Fossil Energy and Mineral Resources and the classification of assets of the SNA 2008. It (a) introduces the basic structure of an asset account; (b) explains and define the asset accounts entries (e.g. stocks of energy resources, discoveries and extraction); and (c) provides recommendations on measurement units and conversion factors in order to aggregate across different energy resources. The Chapter also presents asset accounts for inventories of energy products. It presents the SEEA-E standard tables for the physical asset accounts and tables populated with a numerical data set.

Chapter 4: Monetary asset accounts. This chapter introduces the principle of valuation of assets. It presents the net present value method as the recommended valuation method for valuing those resources that are economic in the SNA sense, in line with the SNA2008. It further provides methodological guidance on how to compile the monetary asset accounts for the stocks and changes in stocks in current prices as well as in constant prices. It also recommends to do a sensitivity analysis for the NPV obtained using different discount rates and rates of return to capital.

The chapter also presents standard tables for monetary asset accounts for inventories of energy products as well as asset accounts for produced assets relevant for energy analysis such as equipment, buildings and exploration and evaluation.

Chapter 5: Physical flow accounts for energy. This chapter presents the physical flow accounts for energy. It will introduce classification of products by purpose, namely classification of energy products used for energy or non-energy purposes and the classifications of other products used for energy purposes (e.g. bio fuels). It will describe the standard supply and use tables for energy products populated with the data from the fictitious data set. It will also discuss the different measurement units that can be used to

compile the tables. The chapter describes also the link between the standard tables and basic energy statistics and energy balances.

Chapter 6: Monetary flow accounts. This chapter describes supply and use tables of energy products in monetary terms, identifies the costs associated with the production and use of these products, the income generated by them, the cost of the infrastructure to explore and evaluate resources, to extract them and distribute them as well as the cost of maintaining them. The monetary supply and use tables can be compiled in both current and constant prices.

The chapter also describes energy-related transactions which are already in the SNA but are often not explicitly identified. These include for example (a) economic instruments such as taxes, subsidies, licenses and permits to bestow property rights over energy resources to designated users; (b) financing of energy and energy-related products (including infrastructure) through transfers; (c) emission permits. The chapter provides standard tables for the compilation of monetary accounts for energy and energy-related products, their financing, taxes subsidies, licenses and permits.

Chapter 7: Energy-related air emission accounts. This chapter describes energy-related air emission accounts. Emission inventories, which are usually compiled by countries to report to the United Nations Framework Convention on Climate Change (UNFCCC) are also discussed together with their link to accounts.

Chapter 8: Hybrid accounts and sequence of accounts. This chapter brings together the tables presented in the previous chapters. It presents the hybrid accounts which link the physical flow accounts to the monetary accounts. This is a very useful analytical tool for analyzing the interaction between the economy and the environment and provides the basis for more in-depth analysis, including input-output modeling.

The chapter also presents the sequence of accounts and shows the derivation of depletion-adjusted aggregates (e.g. environmentally-adjusted value added and genuine savings).

Chapter 9 Application of energy accounts. This chapter provides examples of applications of energy and energy-related air emission accounts derived from the techniques and tables presented in the previous chapters. These include, for example, the derivation of indicators to monitor and evaluate policies, decomposition analyses of economic growth and energy use and emissions; and scenario modeling including input-output analysis to estimate for example the impact of changes in energy prices or costs of emission permits on the economy;

Annex 1. Standard tables. This annex will present the standard tables which are presented in the various chapters. The standard tables constitute the minimum data set that all countries are encouraged to compile. An Excel file with templates for standard tables and populated with the fictitious data set will be available on the UNSD web-site.

Annex 2. Classifications. This annex will present the classifications that are relevant for the compilation of energy accounts: in particular the classification of energy assets, the classification of economic activities related to energy, classification of energy products and classifications relevant for the emission accounts.

Annex 3. List of indicators. This annex will present a list of indicators that can be derived from the SEEA-E. It will link the energy and air emission indicators most commonly used with the SEEA-E standard tables.

Glossary. An agreed glossary of terms and definitions relevant for SEEA-E will be included.

Annex II

List of issues for the SEEA-E

The list of issues for the SEEA-E presented below has been developed on the basis of the issue list discussed at the First Meeting of the United Nations Committee of Expert on Environment-Economic Accounting (New York, 22-23 June 2006)⁶, the Special Session of the London Group on Energy Accounts (Rome, 17-19 December 2007)⁷, at the Third Meeting of the Oslo Group on Energy Statistics (Vienna, 4-6 February 2008)⁸.

Issue 1. Classification of energy resources

Issue 1a. Classification of assets for energy resources

An agreed classification of energy resources is fundamental for the development of standard tables on asset accounts for energy resources. The SEEA-2003 distinguishes, in its asset classification, mineral and energy resources into the following categories: EA.111 Fossil fuels; EA.112 Metallic minerals; and EA.113 Non-metallic minerals. The SEEA asset classifications has to be revisited and to make sure that the categories are mutually exclusive (e.g. coal is a fossil fuel and a non-metallic mineral) and extended to include also new forms of energy (e.g. nuclear energy and renewable energy).

Issues 1b. Categorization of resources

The SEEA-2003 provides a categorization of resources based on the geological and economic characteristics of the deposits, into proven, probable and possible. This categorization is based on the McKelvey box. More recently, the development of United Nations Framework Classification for Fossil Energy and Mineral Resources (UNFC) was endorsed by the United Nations Economic and Social Council (ECOSOC) which recommended its application worldwide. The UNFC, in addition to the geological and economic characteristics of the deposits, introduces a third dimension, which is linked to the project feasibility. As a result, there is a need for the SEEA-E to develop a categorization of resources based on the UNFC.

Aggregation over energy resources over different fields and with heterogeneous quality is an additional issue to be addressed.

Issue 2. Valuation of energy resources

In absence of market prices the net present value method has been identified as being the preferred valuation method for energy resources. Some general methodological recommendation on how best to implement the net present value still need to be developed. They include, for example a discussion on the rate of return to capital, the rationale behind the choice of the discount rate, the calculation of the resources rent in case of joint production (e.g. in the case of a combined silver and copper mine), the

⁶ <http://unstats.un.org/unsd/envaccounting/ceea/meetings/UNCEEA-1-10.pdf>

⁷ <http://unstats.un.org/unsd/envaccounting/londongroup/meeting12.asp?sID=2>

⁸ http://www.ssb.no/english/conference/ocg/vienna/2c_paper.pdf

treatment of fluctuations in resource rents over relatively short periods of time, volatility and negative resource rents, the use of moving averages of resource rents, determining the extraction profiles and constant price valuations of stocks.

Issue 3. Renewable energy resource stocks

Renewable energy resources have become increasingly important. Some have argued that for renewable energy resources there may be a stock which would be the expected generation of renewable energy depending on the technology. Not including the stock of renewable resources in the stock may provide an unbalanced view of total stock of energy available in the country.

Issue 4. Decommissioning costs and recording ownership of mineral-related assets

The SEEA-2003 suggested more than one option in recording decommissioning costs and recording of ownership of mineral-related assets. According to SNA 2008, decommissioning costs (terminal costs) lead to the creation of a fixed asset which has to be recorded as gross fixed capital formation in the asset accounts. Similarly, the asset account should in each period reflect a consumption of this fixed asset. The gross fixed capital formation are recorded at the end of the life time of the related asset, while the recording of the consumption of fixed capital takes place during the life time of the fixed asset. In order to estimate and record the consumption of fixed capital before the terminal costs actually has taken place it is necessary to estimate an expected terminal cost, which can be used as basis for the calculation of consumption of fixed capital.

The SEEA-E will have to be updated to reflect the changes in the SNA 2008.

Issue 5. Classification/disaggregation of economic activities

In the supply and use tables for energy, the relevant breakdown of industries for the standard and supplementary tables has to be identified and mapped to the International Standard Industrial Classification of All Economic Activities, Revision 4 (ISIC Rev. 4). The breakdown has to include the relevant economic activities on the supply side, such as, for example, economic activities for the extraction of energy resources, transformation/conversion of primary energy products and supply of energy products and the relevant activities on the use side.

The starting points should be the detailed industry breakdown used in energy statistics which distinguishes three groups of industries (which are called in energy statistics terminology “sectors”) and within each group a detailed list of industries is identified. The main groups are: the “transformations sector” (broadly corresponding to activities dealing with the conversion of energy to other forms), “energy sector” (corresponding to energy producing activities - e.g. for heating, lighting and operation of all equipment used in the extraction process, for traction and for distribution). in the supply of energy) and “end-user sector” (industry, transport, residential, commercial/public services, agriculture/forestry, fishing and non specified).

Issue 6. Classification/disaggregation and definition of energy products

The list of energy products to be included in the supply and use tables has to be identified and mapped into international classifications of products such as the Central Product Classification (CPC ver. 2) and the Harmonized System Codes (HS).

The distinction between primary and secondary energy products is often made in energy statistics to distinguish energy products that are “either extracted or captured directly from natural resources such as crude oil, hard coal, natural gas – primary; or are produced from primary sources – secondary” (OECD/IEA/Eurostat 2005⁹). Some countries distinguish between primary and secondary products in their energy accounts. It is relevant to have this distinction in the standard tables for energy accounts.

Issue 7. Classification of energy use by purpose

In energy statistics and balances a distinction is generally made in the use of energy products between “non-energy use”, “final energy use” and “transformation input”. Depending on how energy products are defined, there may be the need to cover in the supply and use table not only the supply and use of ‘energy products’ (as output of the ‘energy industry’), but also the supply and use of (the main) non-energy products which are used for energy purposes. In this regard it is particularly important to develop a classification of products by purpose (i.e. for energy and non-energy purposes) and to define the boundary of the non-energy products to consider. It should be said that the supply and use tables for non-energy products will include only the part of non-energy products used for energy purposes.

Non-energy use (of energy products) refers to the use of energy products as raw materials in the chemical, petrochemical and other industries, not for the purpose to produce energy (e.g. bitumen used for asphalt). Final energy use refers to the use of energy products for energy purposes. It excludes the use of energy product for transformation into other forms of energy. Transformation input refers to the conversion of primary forms of energy to secondary and further transformation (e.g. coking coal to coke, crude oil to petroleum products, and heavy fuel oil to electricity).

Issue 8. Energy losses (e.g. in distribution, storage, etc.)

Losses of energy (in the storage, distribution system, transformation) are an important indicator of the efficiency of the distribution/storage/transformation system and allow for a mass balance of the energy flow. The question is should the physical supply and use table record explicitly these flows and how to record them. In the case of water, the supplementary physical supply and use tables explicitly identify the losses in distribution which are allocated to the supplier. The same should be done for energy. Different types of losses, including flaring should be analyzed in order to develop a proper recording for these flows in the supply and use tables.

⁹ 2005, OECD/IEA/Eurostat *Energy Statistics Manual*.

Issue 9. Conversion factors

At present there exist different conversion factors which are applied to convert energy products among different units. There is a need to obtain an international agreed set of conversion factors to ensure international comparability if different measurement units are used by different countries. In this regards, the work of the Oslo Group will be an important input to the work on the SEEA – E.

Issue 10. Double counting

Detailed supply-use tables include all types of energy, i.e. primary energy products as coal and crude oil on one hand and transformed/converted types of energy like petrol and heating and electricity. This leads to a double counting when all uses of energy are added in the sense that the same energy is counted more than once. A standard way of recording energy supply and use should be developed (net , gross or both).

Issue 11. Permits to access the resources and emission permits

The treatment of permits leases and licenses to access natural resources and emission permits has changed in the SNA 2008 as opposed to the 1993 SNA and the SEEA-2003. The SEEA-E should analyse the recommendations of the SNA 2008 and decide whether to follow them or depart from them, in particular for what concerns the treatment of emission permits which are in the SNA 2008 treated as taxes and not as permits.

Issue 12. Recording of natural resource depletion for a non-renewable resource

A characteristic of the SEEA-2003 is the provision of multiple options including a number of aspects of natural resource depletion. A statistical standard requires that these options be replaced with unambiguous accounting recommendations. This include:

- i. identifying the income element;
- ii. recording of mineral exploration and mineral deposits;
- iii. recording of additions and subtractions from resource stocks;
- iv. recording of asset ownership;
- v. recording of depletion.

All these options need to be translated into unambiguous accounting recommendations. It is expected that these will together lead to clear cut recommendations on the compilation of depletion adjusted national accounts aggregates (product, income and saving).