Statistics Netherlands

INDICATORS IN THE SEEA: IDENTIFYING THE MAIN ACCOUNTING AGGREGATES IN SEEA – VOLUME I

SEEA RESTRUCTURE PAPER FOR THE LONDON GROUP MEETING IN BRUSSELS, 29 SEPTEMBER-3 OCTOBER 2008

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1. Introduction

1. The construction of environmental indicators is largely motivated by the need for 'simple to understand' information on environmental concerns (De Haan, 2004). Indicators for the environment can be used at international and national levels in state of the environmental reporting, measurement of environmental performance

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and reporting on policy progress towards sustainable development. Indicators derived from the environmental accounts may play a key role as they are part of an integrated framework and their linkages between economic and social issues.

2. At its 12th meeting the London group discussed a paper on indicators drafted by Statistics Netherlands (Schenau, 2007). This was the second paper drafted with the purpose of developing a more coherent treatment of indicators in the revised SEEA. One key recommendation in this paper endorsed by the LG is that a series of main accounting aggregates should be explicitly addressed in all parts of the SEEA accounts in order to point out the main building block of (potential) indicators in Volume I of the revised SEEA. For this purpose specific tables must be introduced to highlight these main accounting aggregates. In Part III of SEEA on policy applications a more elaborate discussion on SEEA indicators and indicator analyses will take place.

3. This third issue paper on environmental indicators in SEEA is a follow up of the paper presented in Rome. Following the conclusions of the London Group, this paper further elaborates on the precise identification of key aggregates that can be derived from the standard tables and which should be explicitly identified as such in Volume I of the revised SEEA. The goal of this paper is to bring the London Group discussion on accounting aggregates to an end and to subsequently advice the UNCEEA on the presentation of accounting aggregates in the revised SEEA.

2. Conclusions from the 11th and 12th London Group meetings

4. In the London Group meetings in March and December 2007 the following conclusions regarding indicators in de revised SEEA were reached:

- There was a general consensus that environmental indicators are an important outcome of the compilation of environmental accounts and therefore indicator construction should be explicitly addressed in the revised SEEA.
- Meaningful accounting aggregates should be defined within the accounts and subsequently presented in the Statistical Standard (Vol. I). Aggregates, similar to GDP, direct result from the compilation of the accounts and are coherent statistical measures which are consistent over time.
- Indicator building (such as resource productivity indicators) is typically subject to Volume III of the revised SEEA with the aim of stressing the policy relevance of the accounting aggregates.
- The accounting identities within the conceptual supply-use framework do not necessarily provide the useful aggregates that can serve as meaningful indicators. It seems more useful to discuss potential important key aggregates on the basis of specific supplementary accounts, such as the flow

accounts for residuals, energy, water, and economy wide material flow accounting.

- The London Group requested Statistics Netherlands to prepare a proposal of a series of key aggregates that should be presented in all parts of Volume I of the revised SEEA that includes the standard accounts (i.e. physical flow accounts, asset accounts, depletion accounts, environmental expenditure and economic instruments accounts).

3. Indicators in the revised SEEA

5. Following the conclusions of previous London Group meetings, in Part I accounting identities and tables will be structured in such a way that they will explicitly reflect the most important key accounting aggregates. These key-aggregates will also be identified and discussed in small paragraphs in the text. This accounting design is quite similar to that of the System of National Accounts (SNA). In the SNA economic transactions are ordered in such a way that the System provides in a systematic way a range of balancing items that are considered to represent meaningful aggregates for economic policy analysis.

6. Accordingly, there will be a strong link of indicators with the standard tables that will be included in the text of the SEEA Part I. Aggregates (or indicators) that can be directly derived from the standard tables will be identified and explained. Examples are the *net emission totals*, *total sum of waste recycled*, *national expenditure on environmental protection* or the *national saving net of total natural resource depletion*. In addition, some important indicators that can be directly derived from individual tables by combining important aggregates will be pointed out, for example the *recycling rate of solid waste* and the *expected life length of an asset*. Composite or ratio indicators derived from combining data from *different* tables will not be discussed in Volume I (see next paragraph). This will be the domain of SEEA Volume III on Uses and Policy applications.

7. It is foreseen that in SEEA Volume III a general discussion will follow on deriving indicators from the SEEA and their policy applications. This discussion may include the following issues:

- general introduction on indicators,
- aggregation issues, ratio indicators (such as eco-efficiency and productivity measures),
- comparisons with international indicator sets,
- indicators derived from economic analyses and modelling applications.

8. This SEEA restructure paper discusses the representation of key aggregates as they should be defined and embedded in the SEEA Standard accounts (Volume I). This discussion also addresses the recommended units of account such as the global

warming potentials. The selection of accounting units is especially crucial when addressing in the environmental accounts specific environmental pressures.

4. Physical flow accounts

9. The physical flow accounts of the revised SEEA will include flow accounts for materials, energy and water. This section discusses accounting aggregates from the perspective of the various sub-accounts, namely (economy-wide) material flow accounts, residual flow accounts and the accounts for water en energy. Material flow accounts as presented in the current SEEA chapter 3 represent several key aggregates. The basic representation format of the material flow accounts are the physical supply and use tables, showing the origin and the destination of the different physical flows. Flows are recorded by type of material (products, natural resources, ecosystem inputs and residuals) and by economic activities (production branches, final use categories, flows with ROW). Table 1 and 2 provide an overview of the main aggregates and the derived indicators that can be obtained from the physical flow accounts.

Table 1: Key aggregates for the physical flow accounts

	Key aggregate	Units	Description
EWMFA			
1	Domestic material consumption	kg	DMI minus exports
2	Net additions to stock	kg	Physical growth rate of the economy
3	Physical trade balance	kg	Imports minus exports
Residual accounts			
4	Net emissions	kg or equivalents	Gross emissions minus absorption / reuse
6	Net accumulation on national territory	kg or equivalents	Gross emissions plus/minus transboundary flows minus absorption /use
7	Net cross boundary outflow by env. media	kg or equivalents	Inflow of residuals from ROW minus outflow of residuals to ROW
Energy accounts			
	Total domestic energy extraction	Joule	The domestic extraction of all primary energy products (renewable and non-renewable)
	Total energy requirement of the economy	Joule	Equals imports of energy products + domestic energy extraction. This is also equal to the total net energy consumption + exports of energy products
	Total net energy consumption	Joule	The total net energy consumption of the economy: final energy use + conversion losses
Water accounts			
	Total water abstraction	m3	Total water abstraction by the economy (groundwater and surfacewater)
	Total use of water received from other economic units	m3	Total water use supplied by other economic units
	Total supply of wastewater to other economic units	m3	Supply of wastewater to sewerage
	Total returns	m3	Total return of water to the environment
	Total water consumption	m3	Difference between total water supply and total water use

Table 2: Derived indicators for the physical flow accounts

Derived indicator	Units	Description
Residual accounts		
1 Absorption / recycling	kg or %	Percentage (or total) of the residuals reused by economic activities
Energy accounts		
2 Percentage of renewable energy consumption	%	Renewable energy consumption as percentage of the total net energy consumption
3 Import dependancy	%	Percentage of net energy use originating from imports
Water accounts		
4 Reused water / total water supply to economic units	%	Percentage of water reused for economic activities

4.1 (Economy wide) material flow accounts

10. Economy-wide material flow accounts (EWMFA) provide an aggregate overview in tonnes of annual material inputs and outputs to an economy, including inputs and outputs to and from the environment. EWMFA constitutes the basis from which several material flow based indicators can be derived (SEEA-2003 3.198-3.208). Indicators including hidden flows are not discussed here, as these hidden flows represent flows outside the SEEA's boundaries.

11. The main accounting identity underlying EWMFA is the following:

Import + Natural resource extraction = Export + Residual output + Material accumulation in the economic sphere

This identity shows that material flows within the economic system are not part of the EWMFA system in which the economic sphere remains basically a 'black box'.

12. The EWMFA type of indicators are still under debate. The relationship between mass and environmental pressure is not constant and therefore the use of mass as a representative unit for environmental pressures is a fairly weak one. On the other hand it is argued that the total material consumption of an economy is a rough macro aggregate for the natural resource dependency of an economy. It is therefore proposed to a) include a short list of indicators in Volume I and briefly point out the aggregation issues involved, and b) to more elaborately discuss these indicators in Part III of the revised SEEA.

12. Some of the EWMFA indicators (such as direct material input) suffer from double counting problems. From this viewpoint the Direct Material Consumption indicator (equals imports plus extraction minus imports) is conceptually sound and can conceptually compared and linked to GDP to measure overall resource productivity. If one wants to derive one key aggregate from EWMFA it is

recommendable to put forward the *Direct Material Consumption* indicator. In addition, *Net Additions to Stock* (equals direct material input minus domestic produced output minus exports) and the *Physical Trade Balance* (imports minus exports) can be recommended as supplementary main aggregates. It is also useful to indicate some meaningful aggregates for individual resources or groups of resources, such as biomass or metals, which can be used to measure resource productivity

4.2 Accounts for residuals

13. Physical flow accounts for residuals show the origin and destination of different types of pollutants or waste categories. The origin (supply) table distinguishes between residuals originating from consumers, producers and other sources (landfills). The destination (use) table shows pollutants that are either reabsorbed by the economy or end up in the environment. The main accounting identity underlying the physical flow accounts for residuals contributing to environmental degradation on a global scale (greenhouse emissions) is the following:

Gross emissions by producers, households and other sources = reabsorpion by producers + accumulation in the global environment

And for residuals contributing to environmental degradation on a regional scale (acid precursors):

Transboundary inflow + gross emissions by producers, households and other sources = transboundary outflow + reabsorpion by producers + accumulation on national territory

14. The supply and use tables for residuals provide several meaningful aggregates, namely 1) the gross emissions by residents, 2) the net emissions by residents, and the 3) net accumulation on the national territory. In addition the absorption or reuse of residuals provides important information on the recycling / reuse of materials. The net cross boundary flow shows whether the domestic economy partly created environmental problems outside its geographic territory or reversely whether the rest of the part contributes to national environmental concerns.

15. The gross emissions by residents are equal to the total output of residuals caused by economic activities. A problem with this aggregate is that it may be

subject to double counting. For example, waste generated by households and companies is collected and processed by the waste disposal industries. This industry also produces waste such as slacks and other residues which cannot be processed any further. So, this residual is double counted in a gross emission concept.

Table 3. Net emissions by residents and net accumulation on national territory, 2005.

	NO_x	SO_2	NH_3	P	N
	mln kg				
Emissions by consumers	66	1	9	13	125
Emissions by producers	518	149	126	58	597
Emissions by other sources	0	0	0	3	-6
Gross emissions by residents	584	150	135	74	716
Absorption by producers (-)	0	0	0	21	116
Net emissions by residents	**584**	**150**	**135**	**53**	**600**
Emission transfers from the ROW	203	133	24	16	342
Emission transfers to the ROW	575	126	71	15	483
Net accumulation on national territory	**212**	**157**	**88**	**54**	**459**

Source: Statistics Netherlands, 2006

16. To prevent double counting, the gross emission by residents can be corrected by subtracting the amount of residuals reabsorbed by the economy (see Table 3). For example, most of the solid waste produced by economic activities is either recycled or burned in waste incineration plants (leading again to a range of residual outputs). Usually only small parts of the gross waste outflow contribute to environmental burdens via additions to landfills. So, the net emission concept gives a much better indication for the actual environmental pressures of waste and other residual outputs. The gross/net distinction only plays a role for emissions to water and solid waste, and not for emissions to air as these are always directly emitted into the atmosphere[1].

17. In addition, the net emissions by residents can be corrected by trans-boundary emissions not caused by the domestic economic activities. This gives the

[1] Possibly, the future storage of CO_2 in the subsoil has to be treated as absorption by the economy. This issue needs further elaboration in the revised SEEA.

net pollution accumulation on the national territory. These transboundary flows include the deposition of pollutants transported from abroad via international transport, air or the influx of water pollutants by rivers. For some environmental problems, such as acidification, these transboundary flows may have an important contribution to domestic environmental problems like acidification or eutrophication.

18. Pollutants may contribute to a different extent to certain environmental problems. For example, the emission of one kilogram methane contributes much more to the greenhouse effect than the emission of one kilogram of carbon dioxide. Aggregation based on scientific weights may provide useful indicators. Aggregation based on scientific weight and indicators, measured in equivalent units, should be included in Volume I of SEEA (table 4). See also Table of SEEA2003 for an overview of these indicators.

Table 4: factors to convert residuals into environmental theme equivalents

Compartment	environmental theme	Theme equivalents	Conversion factors
Air	Greenhouse effect	CO2-equivalents	CO2: 1 CH4: 21 N2O: 310 F-gasses: various high converion factors
	Ozone layer depletion	CFK-12 equivalents	CFC12: 1 CFC13: 1 CFC113: 0,8 CFC114: 1 CFC115: 0,6 Halon 1211: 3 Halon 1301: 10
	Acidification	Acidification-equivalents	NOx: 0,217 SO2; 0,313 NH3; 0,588
	Tropospheric ozone formation	TOFP-equivalents	NOx: 1,22 NMVOS: 1,0 CO: 0,11 CH4: 0,014
Water and soil	Eutrophication	Eutrophication equivalents	N: 1 P: 10
	Dispersion of heavy metals	heavy metal equivalents	Zinc: 0,0333 Lead: 0,04 Chromium: 0,04 Arsenic: 0,1 Copper: 0,333 Cadmium: 5 Mercury: 33

4.3 Energy

19. The energy flow accounts should be able to provide information on different levels, namely a) gross energy accounts and b) net energy accounts. The gross energy accounts are equal to the supply and use tables for energy products as described in the conceptual framework. As discussed, these flows are subject to

double counting as one kind of energy (crude oil) may be converted into other energy products (car fuel, electricity). Consequently, aggregates from the gross tables (total gross energy supply or total gross energy use) are not necessarily useful aggregates to feed indicator compilations.

20. The net energy accounts show all energy that is actually consumed for final purposes and imported (use table), and all energy that is extracted within a country and is imported (supply table). In contrast to the gross energy accounts, there is no double counting.. Only energy entering the economy (imports and extraction) and energy leaving the economy (exports and energy use for final purposes) are recorded. The aggregation issue is not a problem as energy products can be aggregated according to their energy content (joules). The main accounting identity underlying the net flow accounts for energy is the following:

Imports + Direct Extraction + Stock changes = Exports + Final use + Energy losses due to conversions

21. Useful aggregates are the total net domestic energy extraction, the total energy requirement of the economy (equals extraction plus imports) and the net energy consumption (equals final use plus conversion losses)

Water

22. SEEA-W provides a list of important indicators that can be derived from the physical flow accounts for water (Annex III). However, this list is mainly concerned with ratio indicators. Only the accounting aggregates underlying these indicators should be discussed in Volume I. The main accounting identity underlying the flow accounts for water is the following:

Total abstraction + Use of water received from other economic units = Supply of water to other economic units + Total returns + Water consumption

23. Useful aggregates and derived indicators are listed the above accounting items: Total abstraction, total use of water received from other economic units, total supply of water to other economic units, total returns to the environment en total water consumption (see also Table 3.1 in SEEA-W). The total use of water (equals total abstraction plus use of water derived from other economic units) and total supply of water (equals total supply to other economic units plus total returns to the

environment) are subject to double counting and therefore less suitable as an indicator.

4.4 Accounts for environmental expenditure and other environmental related transactions

24. Key aggregates that can be derived from the environmental expenditure accounts and accounts for other environmental related transactions are the expenditure totals per transaction category for the national economy, such as the total amount of environmental protection expenditure, the total amount of environmental taxes paid / received, the total amount of environmental subsidies paid / received, total value added of the eco-industries etc.

25. The most interesting indicators for these accounts, however, are ratio indicators, such as the share of environmental taxes and environmental subsidies in the total amount of taxes and subsidies, the share of environmental expenditure in the total intermediate consumption of companies, the contribution of the environmental goods and services sector to GDP. When these monetary (total taxes, total intermediate consumption, GDP, etc), are included in the standard tables, these indicators can be directly derived from these tables. We therefore propose to include these kind of ratio indicator (and thus also in volume I of SEEA). This only holds for ratio indicators that are obtained by other than monetary (for example environmental tax per capita or the implicit tax rate) are excluded from volume I. Below we describe the most important aggregates and indicators to be derived from the standard tables for the monetary accounts.

26. In the next paragraphs the most important key aggregates and derived indicator from the monetary accounts Table 5 and 6 provide an overview.

Table 5: Key aggregates from the environmental expenditure and other environmental related transactions

	Key aggregates	Units	Description
	Environemntal taxes and subsidies		
1	Total green taxes	monetary	
2	Total environmental fees	monetary	
3	Environmentally motivated subsidies	monetary	
4	Potentially environmentally damaging subsidies	monetary	
5	Environemtal off-budget subsidies	monetary	
	Environmental protection expenditure		
6	Total environmental protection expenditure	monetary	
7	Total capital expenditure on environmental protection	monetary	
8	Total current expenditure on environmental protection	monetary	
9	Total resource management expenditure	monetary	
10	Total investments in resource management	monetary	
	Environmental permits		
	Opening stock	number of permits or monetary	
	Closing stock	number of permits or monetary	
	Total of pemits purchaes	number of permits or monetary	
	Total of permits sold	number of permits or monetary	
	Total of permits surrendered	number of permits or monetary	
	Environmental goods and services sector		
	Total value added EGSS	monetary	
	Total employment EGSS	fte	
	Total exports EGGS	monetary	

Table 6: Derived indicators for environmental expenditure and other environmental related transactions

	Derived indicators	Units	Description
	Environemntal taxes and subsidies		
1	Green taxes / total tax revenues	%	tax burden on the use of the environment
2	Environmental fees / total tax revenues	%	tax burden on the use of the environment
3	Environmentally motivated subsidies / total subsidies	%	
4	Potentially environmentally damaging subsidies / total subsidies	%	
	Environmental protection expenditure		
5	Total EPE of households / total household expenditures	%	relative contribution of households to EPE
6	Total EPE of industries / total intermediate consumption	%	relative contribution of government to EPE
7	Total EPE of government / total public spending	%	relative contribution of industries to EPE
8	Total environmental capital expenditure / total capital expenditure	%	share in total investments
	Environmental permits		
9	Total of permits allocated / verified emissions	%	
10	Total of permits sold / total of permits allocated	%	volume of trade
11	Total of permits imported / permits purchased	%	portion og foreign trade
12	Total of permits exported / total of permits sold	%	portion og foreign trade
	Environmental goods and services sector		
13	Contribution EGSS (value added) to economic growth	%	Contribution of environmental industry to economic growth
14	Total employment EGSS / total employment	%	Contribution of environmental industry to labour force
15	Total exports EGGS / total exports	%	Contribution of environmental industry to exports

Environmental expenditure and resource management expenditure

27. Key aggregates from the environmental protection expenditure accounts are the national current and capital expenditure, by categories of users/beneficiaries and financing units, and by environmental domain. Comparing expenditure and financing, the effective application of the polluter pay principle can be assessed. For resource management expenditure similar key aggregates can be pointed out.

Environmental taxes and subsidies

28. Environmental taxes can be divided into green taxes and environmental fees. Green taxes can be further disaggregated in energy taxes, transport taxes, pollution taxes, and resource taxes. Most interesting indicators are the share of these taxes in the total tax revenues, which is an indicator for green tax reform, and the share of GDP.

29. As indicated in the LG paper on environmental subsidies (Statistics Sweden), three main groups of environmental related subsidies can be identified: environmentally motivated subsides, environmentally harmful subsidies and Environmental off-budget subsidies. The main aggregates are thus the totals of these groups of subsidies. Interesting indicators are also the share of these subsidies in total subsidies and GDP.

Environmental permits

30. In both SEEA-2003 and SNA93,rev.1 emission permits are seen as economic assets, and as a result the physical aspects are not mentioned. As proposed in the LG paper on environmental permits (Statistics Denmark, the link to the physical flows should be accentuated. Basis for the accounting for emission permits is the balance sheet, which can be expressed both in monetary and physical terms (expressed in mln tons of CO_2). The balance sheet for emission permits is based on the following accounting identity:

Opening stock =

Permits allocated + permits purchased + CDM and JI credits – permits sold – permits surrendered =

Closing stock

The balance sheet shows the stocks of permits and how these stocks change within one accounting period (flows of permits). Important aggregates are thus the opening en closings stock, the total amounts of permits sold or purchased and the number of permits surrendered.

35. An additional important indicator is the amount of permits allocated / verified emissions. This indicator shows whether companies have met the emissions targets set by the government or not. The volume of trade divided by the total amount of permits indicates how well the emission trading system is working.

Environmental goods and service sector

31. The compilation guide for the EGSS that is currently being developed by Eurostat, contains several standard tables. The tables provide several key aggregates. The most important are total value added, total employment, and total exports of the EGSS. These aggregates can also be expressed as a percentages.

4.5 Asset accounts and depletion

31. The environment contains various resources including minerals, water, land and ecosystems. These resources provide essential functions to the economy, mankind and other forms of life. The use of these resources reduces their future capacity (temporarily or permanently) to provide these functions, and constitutes depletion.

32. With the exception of mineral and energy resources, all environmental resources are considered to be renewable. These assets are subject to natural growth and mortality, and if used sustainable they essentially have infinite service lives[2]. Mineral and energy resources however, are considered to be non-renewable. Once they are used up they are gone forever.

33. The main accounting identity underlying (physical) asset accounts is the following:

Opening stock =

± changes due to transactions + additions to stock level – deductions from stock level ± other changes in stock level =

Closing stock

Table 7 gives an overview of the important accounting identities from the asset accounts (see also table 7.5 in SEEA-2003) and describes how these accounting identities can be interpreted as indicators. For most natural assets changes due to transitions and other changes in stock level are less important aggregates.

Table 7: Key aggregates from the asset accounts

Key aggregate	Units	Indicator for
1 Opening stock	kg or monetary	Level of the resource available at the beginning of the accounting perios
2 Changes due to transactions	kg or monetary	Acquisitions/ gross fixed capital formation /changes in inventories
3 Additions to stock level	kg or monetary	Discoveries/ reclassifications / natural growth
4 Deductions from stock level	kg or monetary	Extraction / reclassifications
5 Other changes in stock level	kg or monetary	Catastrophic losses / degradation of produces assets / change in classification
6 Closing stock	kg or monetary	Level of the resource available at the end of the accounting perios

Depletion Indicators in physical terms

33. In any attempt to apply the following list of indicators, it is important to understand the possible levels of aggregation that can occur. Indicators may be produced in respect of individual resources e.g. oil, gold, coal etc, or some degree of aggregation may be used e.g. depletion of non-metallic minerals (based on valuation?).

34. Higher level aggregation supports a 'headline' style of reporting, however resource specific information is potentially distorted or lost. One important way to express the economic significance of natural resources and natural resource depletion is by way of calculating natural resource depletion adjusted national accounts balancing items: domestic product, national income and saving. These adjusted balancing items provide an overview of the share of income or saving that is related to the value losses of natural resources due to extraction. It is expected that the calculation of natural resource depletion adjusting income and saving measuring will become part of the SEEA standard. For this purpose special tables needs to be introduced into the System that explain the scope of these SEEA balancing items and their mutual relationships.

These adjusted national accounts balancing items are expected to serve as very important indicators for those economies that heavily rely on the exploitation of

[2] Based upon the premise that a balanced environmental system is self-sustaining.

natural resources. For those countries national accounts balancing items net of natural resource depletion provide much better measures for income and saving.

35. Lower level aggregation supports a more informed analysis of depletion, but requires more detailed supporting data. Ultimately the indicator needs to paint an accurate picture that is useful for policy purposes.

36. It is also worth noting the distinction between indicators for renewable resources and indicators for non-renewable resources. This division is a logical consequence of the inherent differences between renewable and non-renewable environmental resources described earlier.

37. All suggested indicators (Table 8) use physical data to support the desired ratios. Physical data are more widely available than monetary data and provide the basis for powerful indicators of depletion.

Table 8: Indicators derived from the main aggregates for depletion

	Indicators	Units	Description
	Renewables		
1	(Natural Growth - Harvest) / Opening Stock	Physical units, %	the gain or loss of stock over the period as a percentage of the opening stock
2	Harvest / Opening Stock	Physical units, %	The percentage of opening stock that was harvested in the period.
3	Natural Growth / Harvest	Physical units, %	Natural growth as a percentage of harvest.
4	Remaining Stock / Harvest	Physical units, years, %	the number of years remaining until exhaustion at the prevailing rate of harvest
5	Natural Growth / Remaining Stock	Physical units, %	The gain or loss of stock (through natural growth and mortality) as a percentage of the remaining stock.
6	Remaining Stock / Natural Growth	Physical units, years, %	the number of years it would take for natural growth (at current levels) to recreate the size of the remaining stock
	Non-Renewables		
7	Extraction / Opening Stock	Physical units, %	The percentage of opening stock that was extracted in the period
8	Remaining Stock / Opening Stock	Physical units, %	The percentage of opening stock that remains at the end of the period
9	Remaining Stock / Extraction	Physical units, years, %	Indicates the number of years remaining until exhaustion at the prevailing extraction rate

Assets accounts in monetary terms

38. Valuation of natural resource assets enables direct wealth comparisons with other asset types, like produced assets or financial assets. The composition of the national wealth of an economy gives an indication of the diversity of economy. It may for example indicate the extent to which a country's earnings depend on the exploitation of natural resources. The composition of total assets is important because, generally, a more diverse economy is more resilient. A comparison of the shares of produced and natural assets over time is one approach to monitoring progress toward diversification. In particular for sustainable economic development it is important that the earnings derived from natural resources is not only expensed

but also reinvested in other means of production and income such as infrastructure or foreign investment.

39. In Part I of the SEEA the measurement the economic wealth of natural resources is mainly restricted to those environmental asset that are also within the asset boundary of the SNA. These are the assets from which the owners can derive economic benefits and for which economic values can be determined on the basis of these current and future benefits. The service flows of a much wider range of environmental assets including ecosystems are excluded in this total wealth concept.

40. One may argue that this 'total' wealth measure follows a weak sustainability concept. This concept is particularly useful to measure the continuity of the income generation capacity of resource dependent economies which are usually dominated by economic activities such as agriculture, mining, fishing and quarrying. It does not take into consideration sustainability issues related to the degradation of critical environmental assets such as climate stability, ecosystems and biodiversity.

41. On the macro level the measurement of economic wealth or net worth in SEEA Part I should contain the following components:

- Fixed assets
- Inventories
- Valuables
- Non produced assets, including land, subsoil assets, non-cultivated biological resources and water resources
- The net position of financial assets (all assets minus liabilities) with the rest of the world

Much of this information can be derived directly from the standard national accounts balance sheet. The environmental accounts should provide the information about natural resource asset wealth. The macro presentation has probably key priority, however, it may also be very useful to present these balance sheets by institutional sectors, corporations, government and households. For corporations a subdivision may be carried out for those corporations under the control of foreign investors (SNA93-Annex V, S.11003). Of course an account for the periodic changes in assets should accompany the opening and closing balance sheets in order to systematically explain all changes in balance sheet positions.

42. The current accounts presented in the revised SEEA Part I should also include the standard SNA balancing items, *net domestic product*, *net national income*, *net disposable income* and *net saving* corrected, not only for the consumption of fixed capital but also for natural resource depletion. Particularly for resource dependent economies these income and saving measures provide more accurate measures for income and saving. It is recommendable to compile the measures also on the same sector basis as for the balance sheets mentioned above.

The measurement for value added, net consumption of fixed capital and depletion may also be recommended on the level of industry branches.

Conclusions

38. The system of environmental and economic accounting provides a range if important accounting aggregates which can logically be defined within the SEEA's accounting identities. One key recommendation made in this paper is that these main aggregates should be explicitly pointed out as potential indicators in Part I of the revised SEEA. For this purpose specific tables should be introduced to highlight these main accounting aggregates. In Part III a more elaborate discussion on SEEA indicators and indicator analyses will take place.

5. Questions for the London Group

1. Does the London group agree with the proposed selection and explicit presentation of accounting aggregates in Volume I with the goal of identifying the main building blocks of indicator construction as discussed in Volume III in the revised SEEA?
2. Does the London group agree that important indicators that can be directly derived from the standard tables should be mentioned in Volume I of the revised SEEA ?
3. Does the London group agree with the proposed list of key aggregates and derived indicators for physical flows as presented in table 1 and 2 ?
4. Does the London group agree with the proposed list of key aggregates and derived indicators for environmental expenditure and other environmental related transactions as presented in table 5 and 6 ?
5. Should wealth accounts and accounts for depletion adjusted national accounts balancing items be developed in the revised SEEA as suggested in par's 38 and 42?
6. Has the London group additional suggestions for identifying key aggregates that could serve as building blocks for SEEA indicators?