Chapter 6: Integrating and presenting the accounts

Version for discussion at London Group meeting

Stockholm, September 2011.

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6.1 Introduction

1. Environmental and economic information is significant in the assessment of a range of contemporary environmental and economic policy and research questions. Beyond the provision of relevant information, a primary motivation of the SEEA is the effective integration of the vast amount of environmental and economic data. It also assists with the integration of social data, such as population and labour statistics.

2. This chapter shows the potential for information to be organised and integrated within the SEEA framework. The integration can take a number of forms. At a first level it can mean the presentation of information using common formats and classifications. At a second level, the framework can be used to provide a range of descriptive statistics and indicators of environmental pressures, states and responses. At a third level, data integrated using the SEEA framework can be used to construct analytical models for the analysis of consumption and production patterns, including for example, consumption footprint type indicators.

3. The focus in this chapter is on the first two levels of integration – the organisation of information, in particular the compilation of combined physical and monetary accounts, and the presentation of descriptive statistics and indicators. The SEEA central framework accounts are built up in such a way as to fully support analytical uses. SEEA Part 3: Extensions and applications of the SEEA discusses the use of information from the SEEA framework to build analytical models and other similar purposes in more detail.

4. An important point is that it is not necessary to complete an exhaustive physical supply and use table for every material, or compile asset accounts for every natural resource. The intention of the SEEA is that supply and use tables, asset accounts and other parts of the SEEA are used as an organising framework, depending on the intended analysis and the availability of data. Therefore, for many applications it is legitimate to integrate a limited set of information.

5. In Section 6.2, the chapter commences with a description of the four key areas of integration within the SEEA framework: physical and monetary supply and use tables, asset accounts, the full sequence of monetary flow accounts and functional accounts.

6. Section 6.3 provides guidance on the basic organisation and presentation of environmental and economic information. One motivation for the organisation of information following the SEEA framework is for the improvement of data quality through data confrontation in an accounting framework. In particular, there can be benefits for data compilation through the confrontation of estimates measured in physical and monetary terms.

7. Section 6.4 introduces approaches to combining physical and monetary data in the SEEA framework to form combined physical and monetary presentations or

accounts. Section 6.5 provides examples of combined physical and monetary accounts for energy products, water flows and air emissions.

8. Section 6.6 provides guidance on the derivation of a range of descriptive statistics and environmental-economic indicators from information organised within the SEEA framework. The scope of the statistics and indicators covered in this section is limited to those that are either aggregates or totals within the core accounts and tables of the SEEA framework, or that are easily derived from different parts of the SEEA framework without the use of weighting or other complex assumptions. The statistics and indicators presented are not intended to reflect an exhaustive set since ultimately the selection of statistics and indicators is dependent upon the policy or research questions.

9. SEEA Part 3: Extensions and applications provides introductory material on a number of different ways in which data from the SEEA framework can be used in a more analytical way. The topics in SEEA Part 3 include input-output modelling and structural decompositions of environmental-economic information.

6.2 Integration within the SEEA framework

6.2.1 Introduction

10. The strength of the SEEA framework arises from the consistent application of accounting rules, principles and boundaries in the organisation of environmental and economic information in both physical and monetary terms. Consequently, the SEEA accounts and tables can add considerable value to the underlying statistical information. The nature of the integration of the various components within the SEEA framework is outlined in summary terms in Chapter 2. This section provides additional detail on the integrated SEEA framework across the four key areas of integration within the SEEA framework.

11. The first key area of integration is the link between measures of flows of goods and services in physical and monetary terms as reflected in monetary and physical supply and use tables. An important part of this integration involves recording physical flows of natural inputs from the environment and flows of residuals generated through economic activity. The use of consistent product and industry classifications and similar definitions is important in optimising the potential for analysis.

12. The second key area of integration is the link between changes in the stock of environmental assets over an accounting period and the use of extracted natural resources as an input to economic production and consumption. The connection between asset accounts and supply and use tables is of interest in this case.

13. The third key area of integration is the connection between the measures of production, consumption and accumulation in monetary terms and measures of flows of income between different sectors. These sectoral flows of income are reflected in a sequence of accounts and balancing items such as value added and saving. Importantly, the SEEA adjusts these balancing items for depletion such that estimates of the monetary cost of using up natural resources can be deducted from conventional economic aggregates such as GDP and saving to form depletion adjusted aggregates.

14. The fourth area of integration concerns the identification of economic activities undertaken with an environmental protection or resource management purpose in functional accounts. Generally, these activities are not clearly identified using conventional classifications of industries and products. By identifying these activities within the conventional national accounting framework the significance of environmental activities can be assessed in comparison to key economic aggregates such as GDP, value-added, capital formation and employment.

6.2.2 Integration of supply and use tables in physical and monetary terms

15. The integration of supply and use tables in physical and monetary terms centres on the use of common classifications for the measurement of flows and the use of common boundaries between the economy and the environment. Consequently, flows recorded in monetary terms that focus on the exchanges of products between economic units are, in broad terms, the same set of flows of products measured in physical terms. The addition

of physical flows of natural inputs and residuals does not compromise the recording of flows relating to products.

16. The integration of supply and use tables in physical and monetary terms is the basis for the compilation of extended supply and use and input-output tables that are often used in environmentally extended input output analysis. An environmentally extended monetary supply and use table may be referred to as a National Accounting Matrix with Environmental Accounts (NAMEA).

17. The alignment of supply and use tables in physical and monetary terms is shown in Table 6.2.1. This is an extension of the general physical supply and use table described in Chapter 3 (Table 3.2.1). The key areas of integration are the use of the same classifications for industries and products and the use of common groupings of economic units – industries, households, government and the rest of the world.

Table 6.2.1 Supply and use tables in physical and monetary terms

SUPPLY in physical terms							
	Industries (including household production on own account)	**Households**			**Rest of the World**	**Environment**	**Total**
Natural inputs						Flows from environment	
Products	Domestic production				Imports of products		
Residuals	Residuals generated by industry Residuals generated following treatment	Residuals generated by households			Residuals received from rest of the world	Residuals recovered from the environment	
Total							
USE in physical terms							
	Industries	**Households**	**Government**	**Accumulation**	**Rest of the World**	**Environment**	**Total**
Natural inputs	Extraction of natural inputs						
Products	Intermediate consumption	Household Consumption	Government consumption	Gross Capital Formation	Exports of products		
Residuals	Residuals received by waste mgt and other industries			Accumulation in controlled landfill sites	Residuals sent to the rest of the world	Residual flows direct to environment	
Total							
SUPPLY in monetary terms							
	Industries (including household production on own account)				**Rest of the World**		**Total**
Products	Domestic production				Imports of products		
Total							
USE in monetary terms							
	Industries	**Households**	**Government**	**Accumulation**	**Rest of the World**		**Total**
Products	Intermediate consumption	Household Consumption	Government consumption	Gross Capital Formation	Exports of products		
Total							

18. As described in Chapter 3 there are some exceptions to the general consistency of the recording of flows in physical and monetary terms.

    i. In cases where goods are sent abroad for processing, the monetary supply and use tables record transactions related to the service provided by the processing country. In physical terms the actual physical flows of the goods should be recorded.

    ii. In some cases it may be of interest to record physical flows of materials, energy and water and their transformation into other products within an establishment. In monetary terms only flows between establishments are recorded and hence the value of these intra-establishment flows are not shown in the monetary supply and use tables.

19. It is also noted that depending on the purpose and focus of the accounts being compiled there may be interest in more fully describing flows associated with household production for own-use than would be the case in the compilation of supply and use tables in monetary terms for general economic analysis.

6.2.3 Integration of asset accounts and supply and use tables

20. Integration of information from asset accounts and supply and use tables is of particular relevance in the analysis of natural resources. For example, asset of the stock of fish resources will focus not only on changes in the stock over an accounting period but also on the relationship between the rate of extraction and the supply and use of fish products in the economy and associated international trade in fish products. There may also be interest in understanding the production processes associated with cultivated or natural fish resources and the supply and use tables can provide information on the types of inputs used. Similar considerations are relevant in the analysis of other natural resources.

21. Asset accounts present information on the stock of environmental assets at the beginning and end of an accounting period and on the changes in the stock over the period. The changes may be of many types. They may be due to economic activity (e.g. extraction of natural resources) or due to natural flows (e.g. losses of environmental assets following natural disasters).

22. Changes due to economic activity are recorded consistently in both the asset accounts and the supply and use tables since extraction represents both a reduction in stock (an asset account entry) and a use of natural inputs (an entry in the physical supply and use table). For environmental assets this consistency is ensured by defining individual natural resources for the purposes of asset accounting in the same way as natural resource inputs in the physical supply and use table.

23. The distinction between cultivated and natural resources needs to be accounted for in bringing together information from supply and use tables and asset accounts. For natural resources, extractions recorded in the asset account will be recorded as increases in the inventories of the resource in the accounts of the extractor reflecting the output associated with the extraction process.

24. For cultivated biological resources, a distinction must be made between those that are inventories and those that are fixed assets. In the supply and use table the supply recorded is equal to the total growth in the resources over the accounting period. In a steady state situation this will be matched by equivalent

amounts of extraction. In normal circumstances the growth will be affected by losses of resources, due to disease, weather events, etc and these normal losses will reduce the estimated supply. The growth in the stock, the extractions and the normal losses are all also accounted for in the asset account. In addition the asset account captures losses due to catastrophic events and various reclassifications and reappraisals of the stock.

25. For those cultivated resources that are fixed assets, for example dairy cattle and orchards, the growth to maturity is capitalised and shown as supply by the relevant economic unit and, generally, use by the same unit as gross fixed capital formation. There are no extractions of these resources as such since the benefits come from the products supplied by the resources, e.g. milk and fruit. However, there are normal losses of these resources which are recorded as consumption of fixed capital. Additional flows are recorded in the asset account, as for inventories, to account for catastrophic events and various reclassifications and reappraisals of the stock.

26. Another aspect of the alignment concerns the treatment of natural resource residuals. In the physical supply and use tables the majority of natural resources are recorded as being extracted and entering the economy to be transformed into products. Some natural resources are moved or lost during extraction, for example mining overburden, and fishing by-catch and are considered natural resource residuals. They are recorded as immediately returning to the environment.

27. Although all natural resource residuals are recorded as returning to the environment, a distinction is made between those flows that are losses (amounts that the extractor would prefer to retain), unused extraction (amounts that the extractor has no ongoing interest in) and return flows of water.

28. In the asset accounts the recording of natural resource residuals is dependent on the type of flow. Losses are considered reductions in the stock of assets whereas return flows of water add to the stock of water. Unused extraction often represents material of a different kind than the natural resource being extracted (e.g. rock or soil removed during mining operations) and in this case the natural resource residual will be recorded against a different type of resource in the asset accounts.

6.2.4 The full sequence of SEEA monetary flow accounts

29. Supply and use tables and asset accounts record the bulk of the information of interest in the assessment of the interactions between the economy and the environment. However, there are a range of other transactions and flows that are of interest such as payments of rent for the extraction of natural resources and payments from government units to other economic units to support environmental protection and resource management activity. These transactions and flows are of particular interest when considered from the perspective of different institutional sectors of the economy, such as households, governments and corporations.

30. The SNA shows all of these flows in a presentation referred to as the full sequence of accounts. A particular feature of the SNA sequence of accounts is the presentation of balancing items that represent aggregates derived as balances within individual accounts and that also link the accounts together. Key balancing items include gross value added, saving and net lending.

31. The articulation of the accounting framework of the SEEA is thus made complete in presenting a full sequence of accounts that presents information on all environmentally related transactions and flows. A key driver for the construction of the full sequence of SEEA accounts is that balancing items can be defined that take into account specific environmentally related flows, in particular the depletion of environmental assets. Thus, measures of depletion adjusted value added and depletion adjusted saving are defined as part of the full accounting framework.

32. The entries required at a sector level are basically the same as those at the national level except in situations in which an environmental asset is considered to be jointly owned by two sectors. This situation most commonly occurs in respect of mineral and energy resources where often the extractor has a long term lease over the resource from the government and both sectors share the resource rent attributable to the mineral and energy resources. The appropriate accounting for these situations is undertaken within the sequence of accounts framework and is described in Section 5.5: Asset accounts for mineral and energy resources.

33. Table 6.2.2 presents the SEEA sequence of accounts for institutional sectors based on the SNA. The primary difference from the SNA sequence of accounts are the adjustments for depletion made to the balancing items of value added, operating surplus, balance on primary incomes, disposable income and saving. In other cases, the role of the sequence of accounts is to provide a logic for the recording of environmentally related transactions such as environmental taxes, environmental subsidies, and the payment of rent on natural resources.

Table 6.2.2 SEEA Full sequence of accounts

	Institutional sectors				
Accounting entry	Corporations	Households	General government	NPISH*	Total
Production account					
Output					
Less Intermediate consumption					
Gross Value Added					
Less Consumption of fixed capital					
Less Depletion of natural resources					
Depletion adjusted Net Value Added					
Generation of income account					
Gross value added					
Less Compensation of employees					
Less Environmental Taxes on production					
Plus Environmental subsidies on production					
Less Other taxes less subsidies on production					
Gross operating surplus					
Less Consumption of fixed capital					
Less Depletion of natural resources					
Depletion adjusted Net operating surplus					
Allocation of primary income account					
Rent on natural resources					
Other property income (interest, dividends)					
Depletion adjusted balance of primary income/national income					
Distribution of secondary income account					
Environmental current transfers (excl. Env subsidies on production)					
Other current transfers					
Depletion adjusted disposable income					
Use of disposable income account					
Depletion adjusted disposable income					
Less Final consumption expenditure					
Depletion adjusted saving					
Capital account					
Depletion adjusted saving					
Less Gross fixed capital formation					
Less Changes in inventories					
Less Acquisitions less disposals of valuables					
Less Acquisition less disposals of natural resources and land					
Less Acquisition less disposals of other non-produced, non financial assets					
Plus Environmental capital transfers					
Plus Other capital transfers					
Add back Consumption of fixed capital					
Add back Depletion of natural resources					
Net Lending					

* Non-Profit Institutions Serving Households

Description of the sequence of accounts

34. Each step of production, income distribution, income redistribution and use is described in a separate account. Each account has a name and leads to a balancing item which ensures that the sources and uses of funds are equal. These balancing items are of analytical interest in themselves and are often quoted in isolation from the underlying sequence of accounts.

35. The balancing items link successive accounts as they are both the last entry in each account and the first entry in the following account in the sequence. The following description of the sequence of accounts focuses on the derivation of these balancing items.

Production account

36. The aggregate described in connection with the supply and use table is value added. In the sequence of accounts value added is also the balancing item of the production account and, as in the supply and use tables, represents the difference between output and intermediate consumption. Value added summed across all productive activities constitutes gross domestic product (GDP) at basic prices.

37. Value added (and other balancing items) may be shown before or after deduction of consumption of fixed capital which is the deduction made to reflect the using up of fixed capital in the production process. Where consumption of fixed capital is not deducted the balancing item is prefaced by the term "gross". Where consumption of fixed capital has been deducted the preface used is "net". Differently from the SNA, the SEEA also accounts for own account environmental protection services (see Chapter 4). This leads to recording higher levels of output and intermediate consumption but value added and subsequent balancing items are not affected.

38. The key difference in the production account of the SNA and the production account of the SEEA is the deduction of depletion of natural resources from gross value added to form depletion adjusted estimates of value added. In a manner analogous to consumption of fixed capital, the depletion adjustment reflects the using up of natural resources that takes place as a consequence of production.

Generation of income account

39. The generation of income account shows how value added is allocated to the factors of production, i.e. labour and capital including both produced and non-produced assets. Amounts accruing to labour are shown as compensation of employees while amounts accruing to capital are shown as operating surplus. Operating surplus is also the balancing item in this account. Taxes less subsidies on production must be deducted from value added to derive operating surplus. In the SEEA environmental taxes and subsidies are explicitly identified from other taxes and subsidies. Also, as in the production account depletion is deducted from operating surplus, in addition to the deduction for consumption of fixed capital to reflect the using up of natural resources in generating income from production.

Allocation of primary income account

40. Compensation of employees, taxes less subsidies on production and operating surplus are three types of primary income. The final type of primary income is property income comprised of flows of interest, dividends and rent. This type of income is received in exchange for putting financial assets and non-produced assets such as land and mineral and energy resources at the disposal of other economic units. At a sector level the balancing item of these flows is the balance of primary incomes.

41. At a national level the net impact of property income flows reflects the balance of these flows to and from the rest of the world. There may also be flows of compensation of employees to and from the rest of the world (recorded in the generation of income account). At a national level the balancing item of the allocation of primary income account is national income.

42. A key element in the SEEA allocation of primary income account is rent on natural resources. This income reflects payments for the use of natural resources between the extractor or user of the natural resource and the legal owner of the resource. Usually, the rent on natural resources represents one part of the income generated by the resource since most commonly the extractor will also retain some operating surplus after the payment of rent to the legal owner. The details of the accounting treatment in these situations is outlined in Chapter 5, Section 5.5.

Distribution of secondary income account

43. Primary income is redistributed in the next account by means of transfers. These are payments made without a quid pro quo, or in other words, payments made that are not related to an exchange between economic units. The largest types of transfers are taxes on income, wealth etc. and social benefits paid by government such as unemployment benefits and old-age pensions. The balancing item in the distribution of secondary income account is disposable income and shows the amount available for expenditure on final uses (consumption and capital formation).

44. For the SEEA the main flows to be identified here are payments of environmental subsidies and similar transfers although excluding environmental subsidies associated directly with production (recorded in the generation of income account) and environmental investment grants (recorded in the capital account). Typical payments recorded here are payments to households to support environmental protection activities, payments from one government to another to support the environment and donations to non-profit institutions involved in environmental protection and resource management activities.

Use of disposable income account

45. Disposable income can only be spent on current final consumption or saved. In the use of disposable income account the balancing item is saving derived by deducting consumption expenditure from

disposable income. Most commonly, this balancing item is shown after the deduction of consumption of fixed capital, i.e. net saving.

46. At a sector level, consumption expenditure is only recorded for households and general government equal to the amount of consumption purchased by each sector. An alternative perspective on consumption is to recognise that often the consumption of households is supported by expenditure by governments on behalf of the households in an economy, for example, through the provision of education. Thus an aggregate of the "actual" consumption of households can be defined equal to household consumption expenditure plus the amount of government consumption expenditure that is classified as individual consumption. Individual consumption is distinguished from collective consumption which is consumption that cannot be attributed to individuals or households such as defence services or the services of a legal and justice system.

47. The measurement of actual consumption is useful for cross country comparisons and long term comparisons within a country as it accounts for the way the provision of services to households is organised.

Capital account

48. Income that is saved is used in a number of ways. It may be used for the acquisition of fixed capital, the acquisition of valuables, accounted for as a change in inventories or it may be used to purchase financial assets (e.g. bank deposits) or reduce financial liabilities (e.g. home mortgages). The amount available for the acquisition of fixed capital and valuables may also be affected by capital transfers and the net flow of these transfers is also reflected in the capital account.

49. It is also important to show that amounts of consumption of fixed capital that were effectively set aside in the derivation of balancing items in earlier accounts are in fact amounts that are available for the acquisition of fixed capital since they are not an outlay in terms of current monetary expenditure. The same is essentially true of amounts of depletion although the resources themselves cannot be "re-acquired" as is the case with fixed capital. Nonetheless this amount remains available for use, so consumption of fixed capital and depletion are added back in the capital account.

50. The balancing item of the capital account is net lending (if the account is in surplus) or net borrowing if the account is in deficit. These terms are used since any surplus must be lent to other units and any deficit is made up by borrowing from other units.

51. Net lending/borrowing is also the balancing item of the financial account which shows how the surplus or deficit recorded in the capital account is financed. If a country records a deficit in its capital account then it must also show some amount of net borrowing from the rest of the world (either through an increase in financial liabilities or a decrease in financial assets) in the financial account that corresponds to the financing of that deficit.

6.2.5 Functional accounts

52. The fourth area of the integrated SEEA set of accounts concerns the identification of flows relating to environmental activity in monetary terms. These accounts are known as functional accounts as they focus on economic activity undertaken for a particular function or purpose. The purposes of interest in the SEEA central framework are environmental protection and resource management. The two functional accounts that are described in Chapter 4 are the Environmental Protection Expenditure Account (EPEA) and statistics on the Environmental Goods and Services Sector (EGSS).

53. The basic organisation of information for the SEEA functional accounts follows the structure of the core monetary supply and use tables and the full sequence of accounts. Within this basic structure the objective is to identify all transactions with a specific environmental purpose.

54. The integrated aspects of functional accounts come from the use of the core accounting structures, rules and principles of the national accounts. Consequently, information on environmental activities can be readily compared and contrasted with information on other activities within the economy. Further, environmental activities can be compared with other activities in relation to other economic variables such as employment within the same framework.

55. While the focus of functional accounts and statistics such as EPEA and EGSS are on flows in monetary terms, it is also possible to align the monetary estimates with relevant physical flows. This can be done because the underlying accounting in these functional accounts is consistent in terms of the definition of economic units (industries, households, governments, rest of the world) and the scope of products. It is possible, for example, to relate expenditure on environmental protection with air emissions.

6.3 Organisation of accounting information

6.3.1 Introduction

56. It is important that the information in the SEEA accounts can be effectively communicated to users and decision makers. This section highlights some important considerations in the presentation and organisation of data.

6.3.2 Time series data

57. The tables in this book are designed to explain the accounting concepts and relationships of the SEEA and therefore feature data only for a single time period. In practice, time series of the aggregates that show the trends in economic and environmental variables are also of interest to users.

58. Some of the SEEA tables can be easily adapted to the presentation of data in time series fashion. For others that are in a matrix type format, for example supply and use tables, choices need to be made regarding which variables should be highlighted. The ability to release data in non-paper based format – for example in databases – permits a greater flexibility in the release of data.

59. Generally, time series should be compiled and presented over as long a period as possible with the periodicity determined based on the needs of users. Often in environmental and economic accounts, the length of time series may be short as the source data may have been collected infrequently or only in recent years.

60. One difficulty in the creation of time series of accounting data is the consistency with which source data are compiled over time. Changes in the classifications, coverage, and definitions used in source data can require significant re-working by accountants in order to prepare consistent time series. This may be especially problematic when the source data are compiled on an irregular or infrequent basis.

61. It is recommended that accountants place emphasis on maintaining a continuity of time series, in part by using the power of the accounting framework that requires meaningful balances and accounting identities to be upheld.

62. One consequence of compiling accounting data in time series fashion is that changes and additions to source data require the reassessment of data from previous accounting periods and hence revisions in the time series may need to be implemented. Although in principle a compiler can wait until all possible data are available before releasing the accounts for one period, generally, a balance must be found between the accuracy of the accounts and the timeliness of the information, and hence making revisions to the accounts should be considered standard practice.

63. At the same time, revisions must be made in a way that is explicable to users and can be operationalised by compilers in a meaningful way. To this end, the best practice for formulating a revisions policy and for undertaking analysis of revisions has been summarised in *Guidelines on*

Revisions Policy and Analysis (Organisation for Economic Co-operation and Development, 2008). Ideally, the revisions policies of national accounts and environmental accounts should be aligned.

6.3.3 Institutional sector and sub-sector data

64. For some accounts and tables, the SEEA central framework describes the compilation of data by institutional sector. In principle, all accounts can be compiled at this level of detail although the data and accounting requirements may be quite extensive for a complete set of institutional sector accounts to be compiled.

65. At the same time, there may be particular instances where a broad focus on specific institutional sectors or sub-sectors is appropriate. For example, there may be particular interest in the environmental activities of government at different levels of government, i.e. at national, regional or local levels. To compile accounts of this type the flows between these different levels of government need to be recorded and balanced.

66. Another area of focus may be the household sector and in particular those parts of the household sector which are commonly not observed, for example the collection of water and fuelwood by households, subsistence farming and other informal household sector activities. While in concept these activities are part of the economy often the lack of market transactions makes them difficult to observe and estimate. Given the close relationship between these non-observed activities and the local environments on which they depend, the preparation of accounts specifically for these types of units may be desirable.

6.3.4 Data by geographic area

67. The initial consideration in the organisation of information on a geographic basis is the application of the residence principle within all SEEA datasets. Consistent with the 2008 SNA the SEEA accounts and tables for a country are defined by the economic residence of the economic units rather than by the location of the activity of the units. The distinction between residence and territory principles of recording is described in Chapter 3.

68. The main focus of the accounting descriptions and explanations in the SEEA is on accounting for a country as a whole. This aligns with the intent of the 2008 SNA and with the general purpose of the SEEA to be a national accounting tool rather than used for accounting at the level of an economic unit. One of the motivations for retaining a higher level focus is that for the principles to be applied at finer levels of geographic detail there is a need to understand the flows in and out of the smaller regions and to understand the area of predominant economic interest for each economic unit and often this type of information is difficult to establish at small geographic levels.

69. At the same time, there are likely to be both administrative boundaries within countries and different environmental and economic circumstances in different areas of a country that suggest the compilation of accounts by sub-national geographies is sensible. The geographic areas relevant

for environmental and economic accounting may not be the same as the administrative breakdowns of regional areas.

70. In principle, all accounts can be compiled at these finer levels but compilers should be aware that generally additional assumptions will be required to complete the accounts particularly regarding the location of economic units.

71. It may also be relevant to select specific variables – for example output, employment, or emissions and compile data relating to these variables at a regional level without compiling a full accounting framework. Provided the relationship between the variables is interpreted in the same way as in the broader accounting framework then meaningful information concerning the pressures and drivers in particular regions might be established without the need to compile a full set of supply and use tables and other accounts.

6.3.5 Data in volume terms

72. For many environmental and economic indicators and statistics it is important and more useful to present monetary data in terms of the underlying volumes. That is, the effect of price changes on movements in estimates of the value of stocks, transactions and other flows can be removed. This is particularly important when presenting time series of data. Commonly, these estimates of volumes are termed estimates in “constant prices”.

73. A discussion on the approach to compiling monetary data in volume terms is in Chapter 2. From an integration perspective, compiling data in volume terms can be an important part of data confrontation. For the compilation of conventional national accounts estimates it is increasingly common for countries to compile monetary supply and use tables in volume terms by removing the effects of price change from the supply and use tables reflecting transaction values. In concept, estimates in “volume” supply and use tables should bear a reasonable resemblance in structure to the flows of products in the physical supply and use tables.

74. It is not necessary to compile complete supply and use tables and asset accounts in volume terms in order to develop indicators that use variables expressed in volume terms. Ideally, an estimate of price change that is specific to the target variable should be used but it may be sufficient to divide a time series of monetary values by a general estimate of price change in an economy, for example a consumer price index.

6.4 Combining physical and monetary data

6.4.1 Introduction

75. Given the integrated accounting structures for physical and monetary accounts and statistics, it is logical to use this structured format to present both physical and monetary information. Such formats are sometimes referred to as “hybrid” presentations or accounts because they contain data in different units. Even though the units are different, the data sets are presented according to common classifications and definitions.

76. Different forms of combined physical and monetary presentations are possible and, indeed, there is no standard form for these presentations or accounts. Commonly, physical flow data is presented alongside information from monetary supply and use tables but even for this basic structure different combinations are possible. Ultimately, the structures of combined presentations of monetary and physical data are dependent on the availability of data and the question under investigation.

77. While no standard structure can be defined, compiling and contrasting monetary and physical data in meaningful ways is at the heart of the SEEA philosophy. This section provides general guidance on the compilation of combined physical and monetary presentations. More detailed presentations involving structures such as input-output tables, the full sequence of economic accounts or presentations that cover a particular theme or topic, for example fisheries, are considered in SEEA Part III: Extensions and applications and in targeted thematic SEEA publications.

6.4.2 The concept of combining physical and monetary data

78. At the core of combining physical and monetary data is the logic of recording physical flows in a manner compatible with economic transactions as presented in the 2008 SNA. This linkage guarantees a consistent comparison of environmental burdens with economic benefits, or environmental benefits with economic costs. This linkage can be examined not only at the national level but also at disaggregated levels, for example, in relation to regions of the economy, or specific industries, or for the purpose of examining the flows associated with the extraction of a particular natural resource or the emissions of a particular material.

79. Because these presentations combine physical data that may be of more immediate use to scientists, with monetary data familiar to economists, they also have the potential to form a bridge between these two schools of concern about the environment.

80. It is reinforced that it is quite legitimate to include only a limited set of variables, depending on the most urgent environmental concerns to be taken into consideration and it is not necessary to complete an exhaustive physical supply and use table to be able to present combinations of physical and monetary data.

81. A combined physical and monetary presentation thus represents an analytical framework showing which parts of the economy are most relevant to specific indicators and how changes in the economic structure influences the evolution of indicators over time. Further, because the accounts provide consistent environmental and economic indicators, the possible trade-offs in environmental terms between alternative environmental and economic strategies can be analysed.

82. At finer levels of disaggregation, hybrid presentations can provide the research community with access to a structured database for further research into the role of these indicators in monitoring the overall environmental performance of national economies. In particular datasets with combinations of physical and monetary data may be of direct use in the development of environmental-economic models.

6.4.3 Aligning data in physical and monetary terms

83. One of the key features of the SEEA is that it brings together physical and monetary information in a single framework. However, for the full benefits of the SEEA to be gained there must be a reasonable alignment between the physical and the monetary data used in the compilation of the indicators and presentations. Three of the key issues are the classifications that are used, the consistency of the accounting period to which the source data refer and potential differences in accounting treatment between physical and monetary accounts. Each of these issues is described here.

Classifications

84. The monetary accounts in the SEEA are compiled using a consistent set of classifications of products and industries as used in the 2008 SNA. Often, for physical data, different classifications are used for different topics and themes that are specifically developed for analysis of those topics. For example, detailed classifications for water and energy in physical terms have been developed. While powerful for the purposes of measurement in physical terms, these specific classifications are not necessarily the most appropriate when compiling SEEA accounts and any differences in classification need to be resolved before combining physical and monetary data.

Timing

85. It is important to ensure that the source data underpinning the physical and the monetary data relate to the same accounting period. Generally, monetary accounts will be compiled on a financial or calendar year basis. Physical data may be compiled on a basis that aligns more closely to natural environmental patterns and seasons. Where needed, adjustments to take these differences into account may need to be made.

Accounting adjustments

86. The SEEA outlines two areas in which the compilation of physical accounts should record additional and different flows relative to the monetary accounts compiled following the 2008 SNA. These areas concern goods for processing overseas and own account production.

87. In both cases, the consistency between measures of output and intermediate consumption in physical and monetary terms is affected and the impact should be resolved before combining physical and monetary data.

6.5 Examples of presentations of combined physical and monetary data

6.5.1 Introduction

88. As noted in Section 6.4, there is no standard structure for combining physical and monetary data as the logical structure varies depending on the topic or theme under investigation and the scope and availability of data in physical and monetary terms.

89. The capacity to develop different structures allows the combination of information from different core accounting structures – for example from both supply and use tables and asset accounts. This makes these presentations particularly appropriate for the organisation of information on particular topics or themes.

90. For example, the compilation of asset accounts for fish resources may provide useful information in both physical and monetary terms. However, in combination with information on the supply and use of fish resources through the economy, information on the emissions generated by aquaculture, and information on any payments made for fishing quotas, a far more complete view of the fishing industry is likely to be presented. The breadth of the SEEA framework encompasses all of these types of information.

91. This section presents four examples of the ways in which physical and monetary data might be combined. Examples are shown for energy, water, air emissions and forests.

6.5.2 Combined accounts for energy products

92. Within energy accounts, there is particular interest in comparing the supply and use of energy products in both monetary terms and in terms of energy content. Therefore, a combined presentation of the supply and use of energy products in monetary and physical terms using the same industry and sector breakdowns may provide a useful comparison.

93. An example of combined accounts for energy products is shown in Tables 6.5.1 and 6.5.2. Table 6.5.1 shows the supply of energy products by type of energy product in monetary terms (measured in currency units) and in physical terms (measured in joules). Table 6.5.2 shows the use of energy products by type of energy product in monetary terms and in physical terms.

Please note that at this stage of the consultation process Tables 6.5.1 and 6.5.2 are direct copies from the draft SEEA-Energy. Pending final decisions on content for Chapter 6 these Tables will be aligned with the structures, terms and classifications finalised in other chapters of the SEEA.

94. Broadly, each entry in physical terms has a corresponding entry in monetary terms. The exception concerns own-use of energy and losses of energy including those due to reinjection of natural gas and flaring and venting of natural gas at the well-head. These physical flows are included only in specific rows in the supply and use tables in physical terms as there are no associated monetary transactions.

95. Additional entries in the monetary supply table are required to convert estimates of supply measured in basic prices to estimates of supply in purchasers' prices. Monetary estimates in purchasers' prices are required as they are the basis of valuation in the use table.

96. For each industry the tables show the supply and use of energy products and include, in monetary terms only, a row for the supply and use of "other products". By including the supply and use of all non-energy products in these tables it is immediately possible to see the share of output of energy products in relation to the total output of products in the economy. Similarly, it is possible to see the role that energy plays in relation to other products in terms of intermediate consumption by industries, household and government consumption and exports.

97. For the full benefits of such a supply and use comparison the same classification of energy products should be used. Currently, there is not a clear relationship between the Standard International Energy products Classification (SIEC), which is designed for classifying energy products in physical terms, and the Central Product Classification (CPC), which is generally used to classify product level data in monetary terms. Compilers must resolve these differences in classification, potentially by undertaking combined analysis at higher levels of aggregation that yield consistent commodity definitions.

Table 6.5.1 Combined supply table for energy products

	Supply									Taxes and margins				Total supply at purchasers' prices
	Industries by ISIC						Total output, basic prices	Imports c.i.f.	Total supply, basic prices	Taxes	Subsidies	Taxes less subsidies	Trade and transport margins	
	A	B	C	D	H	E-G, I-U								
	Agriculture, forestry and fishing	Mining and quarrying	Manufacturing	Electricity, gas steam and air conditioning supply	Transportation and storage	Other industries								
Monetary output	1000 Currency unit (basic prices)									1000 Currency units				
Energy products														
1. Coal, coke, gas work gas and peat				0.2			0.2	4	4			0.2	0.1	4
a) Coal, coke and peat								4	4			0.2	0.1	4
b) Gas work gas				0.2			0.2		0.2			0.0		0.2
2. Oil		48	27				75	53	128			27	8	163
3. Natural Gas		12		19			32		32			4		36
4. Electricity				24			24	2	26			16		42
5. Heat				14			14		14			6		20
6. Renewable fuels and waste	1		0.3				1	1	2			0	1	3
a) Solid biomass and wastes	1		0.3				1	1	2			0	1	3
b) Liquid biofuels and biogas														
Total output of energy products	**1**	**61**	**27**	**57**			**145**	**59**	**205**	**55**		**55**	**9**	**268**
Supply of other products	**64**	**4**	**583**	**0.3**	**351**	**1 774**	**2 778**	**742**	**3 520**	**211**	**- 17**	**194**	**(325)[1)]**	**3 705**
Total supply, all products	**65**	**65**	**611**	**57**	**351**	**1 774**	**2 923**	**801**	**3 724**	**265**	**- 17**	**249**	**(334)[1)]**	**3 973**
Physical energy supply	Terajoule													
Supply of energy products to other economic units														
1. Coal, coke, gas work gas and peat														
a) Coal, coke and peat								225	225					
b) Gas work gas				0.5			0.5		0					
2. Oil		722	338				1 060	930	1 990					
3. Natural Gas		369		369			739		739					
4. Electricity				150			150	22	173					
5. Heat				102			102		102					
6. Renewable fuels and waste														
a) Solid biomass and wastes	39		17				56	17	73					
b) Liquid biofuels and biogas														
Total supply of energy products to other economic units	**39**	**1 091**	**355**	**622**			**2 107**	**1 194**	**3 301**					
Total supply for own use, losses and re-injection, etc.	**0.3**	**70**	**55**	**66**			**191**	**6**	**197**					
Total physical supply	**39**	**1 161**	**410**	**689**			**2 298**	**1 200**	**3 498**					

1) These numbers are not not included in sums since they are included in output of ISIC G.

Table 6.5.2 Combined use table for energy products

	Intermediate Consumption, Industries by ISIC							Private consumption, inventories, exports and other uses						Losses and reinjection	Total use
	A	B	C	D	H	E-G, I-U	**Total Industries**	Private con-sumption	Changes in inven-tories	Exports	Govern-ment consump-tion	Final uses	**Private consumption, inventories, exports and other uses**		
	Agriculture, forestry and fishing	Mining and quarrying	Manufacturing	Electricity, gas steam and air conditioning supply	Transportation and storage	Other industries									
Monetary use	1000 Currency unit (purchasers' prices)														
Energy products															
1. Coal, coke, gas work gas and peat	0.1	0.0	0.4	3.6		0	4.1	0.3	- 0.3	*0.1*			0.1		**4**
a) Coal, coke and peat	0.1	0.0	0.4	3.6			4.1	0.1	- 0.3	0.1			- 0.1		**4**
b) Gas work gas			0.0			0.0	0.0	0.2					0.2		**0.2**
2. Oil	4	0.1	27	1.0	36	9.5	78	26	2				85		**163**
3. Natural Gas	0.1	0.1	3	16	0.1	1.9	21	6	0.1	9			15		**36**
4. Electricity	1.2	0.0	5	0.3	1	9.1	17	20		4			24		**42**
5. Heat	0.1	0.0	1		0.2	5.4	6	13					13		**20**
6. Renewable fuels and waste	0.1		0.2	0.9		0.1	1	2		*0.0*			2		**3**
a) Solid biomass and wastes	0.1		0.2	0.9		0.1	1	2		0.0			2		**3**
b) Liquid biofuels and biogas															
Total use of energy products	**6**	**0.3**	**37**	**22**	**37**	**25.9**	**128**	**68**	**2**	**70**			**140**		**268**
Use of other products	**41**	**8**	**379**	**8**	**169**	**812**	**1 416**	**718**	**13**	**780**	**422**	**356**	**2 289**		**3 705**
Total use, all products	**47**	**8**	**415**	**29**	**206**	**838**	**1 544**	**786**	**15**	**850**	**422**	**356**	**2 429**		**3 973**
Physical use	TeraJoule														
Energy products received from other economic units															
1. Coal, coke, gas work gas and peat															
a) Coal, coke and peat	2	0	18	223			243	1	- 21	2			- 19		**225**
b) Gas work gas			0			0	0	0					0		**0**
2. Oil	34	2	367	16	621	49	1 089	102	- 3	801			900		**1 990**
3. Natural Gas	2	2	39	452	0	12	507	28	2	201			232		**739**
4. Electricity	7	0	34	2	6	35	84	39		49			88		**173**
5. Heat	2	0	7		1	29	39	63					63		**102**
6. Renewable fuels and waste															
a) Solid biomass and wastes	3	0	4	31		1	38	33	0	1			34		**73**
b) Liquid biofuels and biogas															
Total use of energy products received from other ec. units	**50**	**4**	**469**	**724**	**628**	**127**	**2 002**	**267**	**- 22**	**1 055**			**1 300**		**3 301**
Total own use, losses and re-injection	**0**	**28**	**15**	**71**			**115**							**83**	**197**
Total physical use	**50**	**32**	**484**	**795**	**628**	**127**	**2 116**	**267**	**- 22**	**1 055**			**1 300**	**83**	**3 498**

6.5.3 Combined accounts for water flows

98. Within water accounting, the interest lies in linking the abstraction and use of water in physical terms with estimates of output and value added by industry and the total final consumption of households. The presentation of physical and monetary information in the same accounts allows for the derivation of consistent indicators for evaluating the impact on water resources of changes in the economy, e.g. changes in the economic structure, changes in interest rates, etc. Using combined accounts in economic models permits the analysis of possible trade-offs between alternative water policies and economic strategies.

99. A basic combined supply and use table for water is presented in Tables 6.5.3. For the monetary part of the combined supply table, two water related products are identified – natural water and sewerage services. Depending on data availability other products may be incorporated, for example relating to irrigation water. The monetary part also includes estimates of total output for each industry thus providing an indication of the relative significance of the output of water related products as part of total industry output.

100. The monetary part of the combined table records additional entries to show the conversion of measures of output in basic prices to measures of output in purchasers' prices. This step enables an accounting balance to be maintained with the use table in monetary terms.

101. The physical flows in the combined supply table reflect volumes of water supplied between economic units including volumes of wastewater to sewerage (shown as an of which row), as well as total returns to the environment. The bulk of the supply of water appears in the columns corresponding to the Water collection, treatment and supply industry and the Sewerage industry. Flows relating to hydropower are shown explicitly due to the relative significance of these flows within the total physical flows of water.

102. The monetary part of the combined use table, shows the intermediate and final consumption of the two primary water related products, as per the combined supply table. Total intermediate consumption for each industry and total final consumption for households and government are also shown to provide an indication of the significance of the use of water as part of total consumption.

103. A distinction is also made between the final consumption expenditure by households and the actual final consumption of households. The difference reflects expenditure by governments to provide goods and services (in this case water supply) to households. Thus although these goods and services are purchased by governments the consumption is in fact that of households. This distinction allows an improved comparison of consumption over time and across countries as it is not dependent on the arrangements in place to manage and finance water supply.

104. It may be useful to add into the monetary part of the combined use table estimates of gross fixed capital formation (investment) for water supply and treatment operations. These entries are made for each relevant industry in additional rows in the table.

105. The physical part of the combined use table shows the volume of water abstracted from the environment including amounts retained for own use, and amounts received by economic units.

106. Depending on the purpose of analysis, additional information, for example concerning emissions to water by industry and household, or stocks of fixed assets used by water supply firms, can be included within the general combined supply and use table framework to provide a single reference point for relevant information. Additions such as these demonstrate the capacity of combined supply and use tables to incorporate additional information within a core structure.

Table 6.5.3 Combined supply and use table for water

			Industry													
			Agriculture, forestry and fishing	Mining & quarrying, Manufacturing and Construction	Electricity, gas, steam and air conditioning supply		Water collection, treatment and supply	Sewerage	Other industries (incl own account production)	**Total industries**	Rest of the world	Taxes less subsidies on products and trade and transport margins	Actual final consumption		Gross capital formation	**Total**
					Total	of which: Hydro power							Households	Government		
Supply in monetary terms																
	Total output															
	Output	Natural water														
		Sewerage services														
Supply in physical terms																
	Total supply of water															
	Water supplied to other economic units															
	Wastewater produced and sent for treatment															
	Return flows of water to the environment															
Use in monetary terms																
	Total use															
	Consumption	Natural water														
		Sewerage services														
	Gross fixed capital formation															
		Water supply														
		Water treatment														
Use in physical terms																
	Total abstraction from the environment															
		Retained for own use														
	Water received from other economic units															

6.5.4 Combined accounts for air emissions

107. Within air emission accounts, the interest is in presenting a range of physical and monetary information for industries and households using common classifications. Thus a combined presentation can be constructed that allows comparison of air emissions by industry with the output and value added of those same industries measured in monetary terms. This combined presentation does not require compilation of a full supply and use table in physical terms. Rather, specific rows and columns within the full framework are selected.

108. A framework for a set of combined accounts for air emissions is presented in Table 6.5.4. In the top left box, Box 1a, estimates of the main economic variables are included classified by industry. Since all industries produce air emissions, all industries are in scope of the combined accounts although it may be of interest to focus on some specific industries, for example electricity generation or steel manufacturing, if these industries are known to be large emitters in a particular country. The choice of economic variables could extend to the full set of supply and use variables. The main variables suggested in this framework are measures of output, intermediate consumption and value added in both current price and volume terms, and estimates of employment. Each of these variables are able to give an indication of the relative size of each industry and the extent to which the associated emissions are significant factors for a specific industry and for the economy.

109. In the bottom left box, Box 2a, estimates of household final consumption expenditure are reported in both current price and volume terms. The expenditure should be classified following the Classification of Individual Consumption according to Purpose (COICOP) with particular specification of expenditure for the purposes of transport and heating as these household activities are key sources of air emissions.

110. In the top middle box, Box 1b, estimates of total air emissions classified by type of pollutant and by industry are recorded. The industry classification is identical to that used in the classification of the economic variables in Box 1a.

111. In the bottom middle box, Box 2b, total air emissions by households are recorded classified by purpose with the specific recording of emissions due to transport and heating activities.

112. In the top right box, Box 1c, a subset of total air emissions by industry relating to those due to transport activity should be recorded. Although transport activity will be most concentrated in the transport industry, all industries are likely to generate emissions through transport activity to some extent. The identification of transport emissions is important because adjustments are often needed to account for resident and non-resident emissions.

113. Overall, this combined accounts framework for air emissions shows the benefits of the use of the same classifications and structures for the organisation of different

data. It permits the assessment of the relative importance of different air emissions, the derivation of relevant indicators for monitoring changes in air emissions; and the development of models based on the structured dataset.

Table 6.5.4 Structure of combined accounts for air emissions

Table 1a - Economic data by industry

	Current prices			Employment	Volume terms		
Industries	Output	IC	VA		Output	IC	VA
Industries classified by ISIC							

Table 1b - Emissions to air by industry

Industries	Emissions to air by type of pollutant
Industries classified by ISIC	

Table 1c - Emissions to air from transport activity

Industries	Emissions to air by type of pollutant
Industries classified by ISIC	

Table 2a - Household consumption expenditure

	Current prices	Volume terms
Households	Final consumption expenditure	
Household consumption expenditure classified by purpose - of which		
Transport		
Heating		

Table 2b - Household emissions to air

Households	Emissions to air by type of pollutant
Household emissions classified by purpose - of which	
Transport	
Heating	

IC: Intermediate consumption

VA: Value added

6.6 SEEA Indicators

6.6.1 Introduction

114. In the same way as the national accounts is best known by the important indicators that are derived from the accounting structure, particularly Gross Domestic Product (GDP). The SEEA also lends itself to the derivation of important indicators and aggregates.

115. The breadth of the SEEA framework means that many indicators can be sourced from the SEEA. This section introduces the range of indicators that are either embedded in the framework or easily derived as the ratio between variables within the framework. Data from within the SEEA framework may also be used to compile more complex indicators that require a range of assumptions and weighting patterns for their derivation. These indicators are not discussed in this section.

6.6.2 Descriptive statistics

Totals and aggregates

116. The accounting framework of the SEEA contains a range of totals and aggregates that may be of interest in monitoring changes in environmental and economic activity.

117. From the physical flow accounts total physical flows such as water, energy, air emissions and solid waste for the economy as a whole or for individual industries and households can be obtained.

118. From asset accounts, physical flows of natural resources including extraction and natural losses can be obtained as well as total values of natural resources and any associated depletion.

119. From the sequence of accounts, the key aggregates from the perspective of the SEEA are the depletion adjusted balancing items such as depletion adjusted value added and depletion adjusted saving.

120. From the functional accounts, EPEA and EGSS, totals such as national expenditure on environmental protection and total production of environmental goods and services may be obtained.

121. These various totals and aggregates are naturally obtained from the accounting structures that have been described in detail in chapters 3, 4 and 5.

Structural statistics

122. Another type of descriptive statistic that can be obtained from the accounting structures is statistics on the structure of different physical and monetary flows and stocks. Because the accounting structures are complete in their coverage of economic

units and geography, shares of different variables can be derived. For example, the share of total emissions by households and the share of water use by agriculture can be calculated in a straightforward manner from the relevant physical flow accounts.

123. Other examples of structural statistics include the share of environmentally related taxes in total taxes, the share of employment in the production of environmental goods and services, the share of energy from renewable energy sources and the structure of land cover and changes in land cover between points in time.

124. Specific mention is made of the ability to derive shares within functional accounts since the totals relating to expenditure and production can be directly related to conventional national accounts aggregates such as GDP and output.

6.6.3 Natural resource aggregates and indicators

125. Asset accounts in physical terms concerning individual natural resources can provide indicators on the availability of these resources and changes in availability through the comparison of the amounts extracted with the remaining stock of the resource. Such information may be relevant in the management of demand and supply of resources.

126. Asset accounts in monetary terms can be used to derive indicators for both individual resources and for combinations of resources since summation across resources is possible in monetary terms. A summation across resources can provide estimates of natural resource wealth which in turn can be compared to estimates of the value of other assets including produced and financial assets and estimates of total national and sector net worth can be calculated.

127. The sequence of accounts can provide information on the depletion of natural resources and also on the share of resource rent accruing to various sectors involved in the extraction of resources, particularly mineral and energy resources.

128. In combination with population statistics and descriptive statistics on households such as annual income, it is also possible to consider the use of resources on a per capita basis and the distribution and use of resources by different household types.

6.6.4 Indicators related to financing and cost recovery of environmental activity

129. Data contained in the sequence of accounts can provide important insights into the way in which environmental activity is financed and also the full cost of providing access to resources, particularly water and energy. The financing aspects can be considered through analysis of subsidies and other transfers for environmental purposes, particularly flows from government and the rest of the world. It may also be of relevance to consider the collection of environmental taxes as a means of supporting environmental activity.

130. Estimates of the full cost of providing resources must incorporate the general operating costs such as intermediate consumption of materials and compensation of employees and also other current and capital costs. These include payments of rent and interest as applicable and the costs of any relevant infrastructure and equipment. The estimation of capital costs should include both the consumption of fixed capital and the opportunity cost of investing in the assets which is equivalent to estimating a rate of return on the assets. The recognition of all costs is important in ensuring that investment decisions are taken with both short and long term costs in mind. All of the relevant variables for these estimates are contained in the SEEA sequence of accounts.

6.6.5 Environmental ratio indicators

131. The aggregates and indicators described in the preceding paragraphs emerge from accounts and tables in either physical or monetary terms. There are also important indicators of environmental pressures and responses that can be derived from combined physical and monetary presentations. They are generically referred to here as environmental ratio indicators. This sub-section describes three main types of these combined indicators.

Productivity and intensity type indicators

132. Productivity and intensity indicators are important indicators that can be derived from environmental and economic accounting data. Productivity indicators are formed as the ratio of an economic aggregate such as output or GDP to a physical flow such as the energy content of energy products used. Intensity indicators are formed the ratio of a physical flow to an economic aggregate, i.e. they are the inverse of productivity indicators. All of these indicators focus on the production process and changes in the extent to which natural resources and other environmental inputs or outputs are being used or created by industries to produce goods and services.

133. In the derivation of these types of indicators it is important that the economic aggregate being used is measured in volume terms if the intention is to measure changes over time. If not a misleading picture of the degree of productivity or intensity may be obtained.

Decoupling type indicators

134. Decoupling indicators are aimed at showing the extent to which growth in income and consumption is occurring with a decreasing use of environmental resources e.g. decreased energy use, or reduced emissions. They are derived by dividing a relevant economic aggregate (e.g. household consumption or national income) by a relevant physical flow for example air emissions. These are essentially productivity indicators, but the focus is on the divergence of the environmental and

economic aggregates. As for productivity type indicators the economic aggregates should be measured in volume terms for time series purposes.

Polluter pays type indicators

135. Polluter pays type indicators relate physical information on emissions to payments, primarily environmental expenditures and environmentally related taxes, that are made in relation to those emissions. These indicators can help to show the extent to which environmental protection costs are internalised and taxation and other payment schemes are influencing the amount of emissions. An example of this type of indicator is the implicit tax rate for energy which is derived as energy taxes (as defined in Chapter 4) divided by joules of energy.

6.6.6 The SEEA and international indicator initiatives

136. For many years there has been interest in the development of sets of indicators that give insight into environmental and sustainable development issues. Examples of international indicator initiatives are those connected to the OECD Green Growth project, the UNEP Green Economy project, the Beyond GDP initiative of the European Union and the indicator work within the Convention of Biodiversity. Many of the indicators that are of interest in these indicator sets can be found within the SEEA framework.

137. Because of the strength of the underpinning accounting structure of the SEEA, particularly in terms of defining relationships between indicators and in providing a strong data compilation and confrontation framework, the SEEA can provide an important information base from which indicators can be chosen for use in populating different sets of indicators.

138. In addition, the strong connection between the SEEA and the SNA provides links to core macro-economic aggregates that allows environmentally focused indicators to be seen from a more economic perspective that is accessible to a broader audience. This strong connection also allows for modelling and forecasting.

139. It is recommended that in the development of sets of indicators that focus on environmental and sustainable development issues that the SEEA framework be used as the basis for compiling indicators wherever appropriate.