

System of Environmental and Economic Accounting for Energy

SEEA-E

Draft Chapter 6 Monetary and Hybrid Flow Accounts

United Nations Statistics Division

DESA

February 2011

Table of Contents

CHAPTER 6	MONETARY FLOW ACCOUNTS.....	4
A.	INTRODUCTION	4
B.	MONETARY SUPPLY AND USE TABLES	4
1.	<i>Basic concepts - prices, taxes and margins</i>	4
2.	<i>Monetary supply table for energy</i>	6
3.	<i>Monetary use tables for energy</i>	8
C.	HYBRID SUPPLY AND USE TABLES FOR ENERGY	12
1.	<i>Consistency of physical and monetary supply and use tables for energy</i>	12
2.	<i>Hybrid accounts – combining monetary and physical tables</i>	12
D.	STANDARD SNA 2008 ACCOUNTS FOR ACTIVITIES RELATED TO ENERGY	16
1.	<i>Production, generation of income and gross fixed capital formation</i>	16
E.	DEPLETION ADJUSTED ACCOUNTS	19
1.	<i>Resource rent</i>	19
2.	<i>Rent payments (property income)</i>	20
3.	<i>Depletion</i>	22
4.	<i>Attributing gross operating surplus to fixed capital and energy resources</i>	23
5.	<i>Depletion adjusted accounts</i>	25
F.	ECONOMIC TRANSFERS, ETC.	28
G.	ENVIRONMENTAL ACTIVITIES AND EXPENDITURES	31
1.	<i>Environmental protection</i>	32
2.	<i>Energy resource management</i>	37

Chapter 6 Monetary flow accounts

A. Introduction

6.1. The objective of this chapter is to study the economy of energy supply and use, that is to identify the economic transactions of energy including the revenues, costs, taxes, value added and income associated with the production and use of energy products. Furthermore, the measurement of capital formation and consumption of fixed capital related to energy extraction and energy production is presented.

6.2. In addition so-called depletion adjusted aggregates as well as accounts for environmental protection expenditures and resource management are presented.

6.3. The starting point is to set up supply and use tables for energy products corresponding to the physical supply and use tables presented in chapter 5 (cf. Table 5.1 and 5.2). This is done in Section B. In Section C the consistency of physical and monetary supply and use tables for energy and so-called hybrid supply and use tables are dealt with. Section D presents standard national accounts for production as well as accounts for generation and allocation of income for the industries, which extract energy resources and produce energy. Section E presents supplementary information regarding the resource rent, rent payments, depletion and so-called depletion adjusted accounts, which goes beyond the standard national accounts principles. Section F summarises the information on taxes, subsidies and other transfers related to energy. Finally, Section G deals with energy related expenditures for environmental protection and resource use and management.

B. Monetary supply and use tables

6.4. The monetary supply and use tables correspond on the one hand to the physical supply and use tables with respect to classifications and on the other hand to the principles described in the SNA 2008 with regard to the format of general supply and use tables and the valuation principles for economic transactions.

6.5. Before the monetary supply and use tables are presented in section 2 and 3, respectively, a short introduction to basic concepts of prices, taxes and subsidies, and trade and transport margins is given. More information on these concepts can be found in the SNA 2008.

1. Basic concepts - prices, taxes and margins

Basic prices and purchasers' prices

6.6. Products can be valued at different price levels. The distinction between the price levels is related to the treatment of taxes, subsidies, separately invoiced transport margins and wholesalers' and retailers' trade margins.

6.7. The value of domestic products measured at basic prices, refers to the amounts the producer realises. It excludes any product taxes (e.g. VAT, energy taxes, CO₂ taxes, etc.) and trade and distribution margins paid in relation to a transaction of the product, regardless of whether it is the

producer or another unit that collects (or receive) these extra amounts on behalf of the government or the distributor. Similarly, subsidies on energy product, which the government pays out to reduce the price charged to the purchasers, are not taken into account.

6.8. The value of a product, measured at purchasers' prices, refers to the actual cost the purchaser pays for the product. The value at purchasers' prices is obtained from the value at basic prices by adding all taxes on products (including non-deductible VAT), subtracting all subsidies on products and adding trade and transport margins related to the product.

6.9. For imported goods the correspondence to basic prices is import prices, c.i.f. (costs, insurances and freight) i.e. the prices at the point of entry into the importing country, including the costs, insurances and freight incurred between the exporter's border and the importer's border. The c.i.f. price excludes the cost of transport from the border of the importing economy to the premises of the importer.

6.10. Imported products valued at purchasers' prices include in addition to the value of imports, c.i.f. also taxes on products, including import duties less subsidies on products, transport margins on the domestic territory, trade margins and VAT.

6.11. Exports may be valued at basic prices or at export prices f.o.b. (free on board), which include all product taxes and subsidies, and trade and transport margins incurred before the exporter's customs border.

Taxes and subsidies on products

6.12. Generally, a tax on a product is a tax that is payable per unit of some good or service. The tax may be a specific amount per unit of quantity (e.g. volume or weight), or it may be calculated ad valorem as a specified percentage of the price per unit or value of the product transacted. A tax on a product usually becomes payable when it is produced, sold or imported, but it may also become payable in other circumstances, such as when a good is exported, transferred, delivered, or used for own consumption. (SNA 2008, 7.88).

6.13. Value added tax, VAT, is one type of taxes on products. Taxes on exports and taxes on imports are other specific types.

6.14. Subsidies on products are current unrequited payments that government units, including non-resident government units, make to enterprises on the basis of the quantities or values of the goods or services that they produce, sell or import. (SNA 7.98).

6.15. Of special interest in relation to the energy accounts are the taxes and subsidies payable per unit of energy products. The taxes on products can be subdivided into value added type taxes and other taxes on products. The latter include taxes named after the tax base, e.g. petrol taxes, but also CO₂ taxes for which the tax base is the unit of energy involved in the transaction. However, if the emissions tax is levied on the emissions and not on the use of energy, the tax is not categorised as taxes on products, but instead as *other taxes on production*. (SNA 2008, 7.97).

Trade and transport margins

6.16. When an energy product is sold through wholesalers and retailers, the activities of these are allocated to the section G - Wholesale and retail trade; repair of motor vehicles and motorcycles of ISIC Rev.4, and the trade margins are recorded as output of this industry section. At the same time, the trade margins are part of the difference between the basic price realised by the producer of the energy product and the purchasers' price finally paid by the user.

6.17. In addition to the activities of the wholesalers and the retailers, the delivery of an energy product will normally involve a transport activity, which may or may not be charged and invoiced

separately to the buyer regardless of whether it is the producer or another unit, which carry out the transport activities. If the transport activities are charged separately, the charges are recorded as transport margins, which together with the trade margins and the taxes and subsidies on products make up the difference between the basic prices and the purchasers' prices.

6.18. If the producer carries out the transport activity without charging it explicitly to the buyer, or if the buyer collects the product directly from producer, no transport margins are recorded.

2. *Monetary supply table for energy*

6.19. The SEEA-E monetary supply table for energy products, Table 6.1, shows the value of the domestic production of the different energy products and the value of imports valued at basic prices. The table also presents (1) the amount of taxes and subsidies charged in relation to each energy product, when it is sold to a purchaser, and (2) the sum of trade and transport margins related to each energy product.

6.20. In accordance with common national accounts practice, the amounts of taxes and subsidies are presented as taxes less subsidies (taxes, net) in Table 6.1. If information is available, it is, of course, possible to show the taxes and subsidies separately. It should also be noted that in section E a breakdown of total taxes less subsidies by taxes on products, other taxes on production, subsidies on products and other subsidies on production is presented. In addition, in Section F a presentation of all so-called transfers, etc. related to energy production and use is presented.

6.21. The value of the supply at purchasers' prices is obtained when the taxes minus subsidies on products and the margins are added to the supply at basic prices. Observe that the concept of supply at purchasers' prices is in fact an accounting concept, which as such is estimated. It is normally not directly observed or recorded by the producers of the energy products.

6.22. The supply table at basic prices corresponds directly to the parts of the supply tables measured at physical quantities, which represents the supply of energy products to other economic units (cf. the first block of Table 5.1 and 5.3). Dividing the entries in the upper part of Table 6.1 by the corresponding entries in the corresponding parts of Table 5.1 and 5.3 gives the implicit basic energy prices per physical unit of energy supplied by industries and the rest of the world (imports). Similarly, the average taxes and subsidies, and average trade and transport margins per physical unit can be calculated for each energy product from the information included in the lower part of Table 6.1 and the corresponding parts of Table 5.1 and 5.3.

Table 6.1 Supply table at basic prices with transformation to purchasers' prices

	Industries by ISIC						Total output, basic prices	Imports c.i.f.		Total supply, basic prices
	A	B	C	D	H	E-G, I-U		Total	of which	
	Agriculture, forestry and fishing	Mining and quarrying	Manufacturing	Electricity, gas steam and air conditioning supply	Transportation and storage	Other industries			<i>Pur- chased by resi-dents abroad</i>	
	Currency unit									
Energy products										
1. Coal, coke, gas work gas and peat	171						171	3 783		3 955
a) Coal, coke and peat								3 783		3 783
b) Gas work gas	171						171			171
2. Oil		48 455	26 818				75 273	52 757	26 310	128 030
3. Natural Gas		12 289		19 344			31 633			31 633
4. Electricity				23 741			23 741	1 778		25 519
5. Heat				13 538			13 538			13 538
6. Renewable fuels and waste	873		267				1 140	932		2 072
a) Solid biomass and wastes	873		267				1 140	932		2 072
b) Liquid biofuels and biogas										
Total supply	873	60 744	27 085	56 795			145 497	59 251	26 310	204 748

	Total supply at basic prices	Taxes on energy products	Subsidies on energy products	Taxes, net	Trade and transport margins	Total supply at purchasers' prices
Currency unit						
Energy products						
1. Coal, coke, gas work gas and peat	3 955			203	104	4 262
a) Coal, coke and peat	3 783			154	104	4 041
b) Gas work gas	171			49		221
2. Oil	128 030			27 372	7 800	163 202
3. Natural Gas	31 633			4 252		35 885
4. Electricity	25 519			16 148		41 667
5. Heat	13 538			6 135		19 673
6. Renewable fuels and waste	2 072			482	894	3 448
a) Solid biomass and wastes	2 072			482	894	3 448
b) Liquid biofuels and biogas						
Total supply	204 748			54 592	8 797	268 137

3. *Monetary use tables for energy*

6.23. The first use table is at purchasers' prices. It shows the amounts, which the users actually pay for the various energy products they use. As in the physical use table (Table 5.2 and 5.4), the use is divided into intermediate consumption by industries and other uses i.e. private consumption, exports and inventory changes. In contrast to the physical use table, the monetary use table does not include any entries for losses, since what is paid from the use side is always received at the supply side (including the taxes and margins, which are received by government, and traders and distributors, respectively).

6.24. For each energy product, the total use at purchasers' prices is equal to the total supply at purchasers' prices as presented in the last column of Table 6.1. This reflects the following accounting identity for the monetary energy flows:

Total supply at purchasers' prices = Domestic production at basic prices + Imports, c.i.f. + taxes less subsidies on products + trade and transport margins

=

Total use at purchasers' prices = Intermediate consumption + Private consumption + Inventory changes + Exports

6.25. Based on the general principles for supply and use tables, the use side should, in principle, also include entries for government consumption and gross fixed capital formation, but since all energy used by the government are recorded as inputs to intermediate consumption, and since the use of energy products is not regarded as capital formation these items are omitted here.

6.26. The following tables, Tables 6.3, 6.4 and 6.5, present a breakdown of the use at purchasers' prices into the elements of taxes less subsidies, trade and transport margins, and use at basic prices.

6.27. The taxes less subsidies paid in relation to each energy product are allocated to the users of the energy products in table 6.3. It is assumed that it is the users of the energy products, which in the end pay the taxes and receives the subsidies on products, since the taxes and subsidies affect the purchasers' price of energy. It should be noted, however, that the taxes and subsidies normally are collected or received by the producers or the wholesale and retail traders on behalf of the users. The allocation of the taxes and subsidies on products by users of the energy products is therefore based on assumptions and calculations, and not on observation about actual payments of taxes and subsidies on products.

6.28. The total of taxes less subsidies allocated to users of energy products, Table 6.3, corresponds to the total of taxes less subsidies in the supply table, Table 6.1.

6.29. The tax table is useful for analysing the net tax burden related to the use of energy products. The table can be broken down further by specific taxes and subsidies, e.g. tables corresponding to Table 6.3 can be set up for VAT, CO₂ taxes and other energy taxes.

6.30. The trade and transport margins are allocated to the use of energy products in Table 6.4. For each energy product, the total of trade and transport margins in Table 6.4 corresponds to the margins presented in the supply table, Table 6.1. As in the case of taxes allocated to uses, the allocation of trade and transport margins has to be based on assumptions and calculations, since the allocation is not directly observable. If data is available for a breakdown, Table 6.4 can be subdivided into separate tables showing the individual margins: wholesale trade margins, retailers' trade margins, and transport trade margins.

6.31. It should be noted, that even though the allocation of taxes less subsidies on products and transport margins by users is complex, the resulting tables are useful for analysis. In addition, setting up

supply and use tables measured at the same price level is instrumental for the compiler, since it ensures the consistency of data and makes it possible to fill out missing data by using available information and using judgment to reach a balance by adjusting the components as necessary (SNA 2008, 14.6).

6.32. By subtracting the taxes less subsidies on products and the trade and transport margins from the use at purchasers' prices, a use table at basic prices, Table 6.5, is obtained. This table shows for each energy product and each of the user categories the total use of imported and domestically produced energy products. A further breakdown on separate tables for use of domestic produced energy products and imported energy products may be made by using information and assumptions on market shares, etc.

6.33. The accounting identity that total supply at basic prices (Table 6.1) is equal to total use at basic prices (Table 6.5) for each energy product is fulfilled. This can also be expressed by the identity:

Total supply at basic prices = Imports, c.i.f. + Domestic production at basic prices

=

Total use at basic prices = Intermediate use at basic prices + Private consumption at basic prices + Inventory changes at basic prices + Exports at basic prices

Table 6.2 Use table at purchasers' prices

	Use														Total use of energy products
	Intermediate Consumption, Industries by ISIC								Private consumption, inventories and exports						
	A	B	C	D	H	E-G, I-U	Total		Private consumption	Changes in inventories	Exports		Total private consumption, inventories and exports		
	Agriculture, forestry and fishing	Mining and quarrying	Manufacturing	Electricity, gas steam and air conditioning supply	Transportation and storage	Other industries	Total Industries	of which Non-energy purposes			Total	of which Sold to non-residents on national territory			
Currency unit															
Energy products															
1. Coal, coke, gas work gas and peat	58	10	423	3 618		16	4 124		340	- 254	52		138	4 262	
a) Coal, coke and peat	58	10	419	3 618			4 104		139	- 254	52		- 63	4 041	
b) Gas work gas			4			16	20		201				201	221	
2. Oil	4 377	114	27 361	964	35 744	9 461	78 021	270	26 218	2 279	56 684	4 353	85 181	163 202	
3. Natural Gas	117	109	2 858	15 867	73	1 906	20 930		5 587	138	9 230		14 955	35 885	
4. Electricity	1 196	46	5 169	272	1 401	9 135	17 219		19 985		4 464		24 449	41 667	
5. Heat	97	0	636		202	5 353	6 289		13 383				13 383	19 673	
6. Renewable fuels and waste	50		165	891		67	1 173		2 234		42		2 276	3 448	
a) Solid biomass and wastes	50		165	891		67	1 173		2 234		42		2 276	3 448	
b) Liquid biofuels and biogas															
Total use	5 894	279	36 611	21 612	37 421	25 939	127 756	270	67 748	2 162	70 471	4 353	140 381	268 137	

Table 6.3 Taxes less subsidies on products allocated to use of energy products

	Intermediate Consumption, Industries by ISIC								Final consumption					Total use of energy products	
	A	B	C	D	H	E-G, I-U	Total		Private consumption	Changes in inventories	Exports		Total final consumption		
	Agriculture, forestry and fishing	Mining and quarrying	Manufacturing	Electricity, gas steam and air conditioning supply	Transportation and storage	Other industries	Total Industries	of which Non-energy purposes			Total	of which Sold to non-residents on national territory			
Currency unit															
Energy products															
1. Coal, coke, gas work gas and peat	2	6	23	18		3	52		151				151	203	
a) Coal, coke and peat	2	6	23	18			49		104				104	154	
b) Gas work gas			0			3	3		46				46	49	
2. Oil	749	17	941	49	2 963	4 304	9 023	8	16 103		2 246	2 246	18 350	27 372	
3. Natural Gas	8	2	653		32	835	1 530		2 722				2 722	4 252	
4. Electricity	123	4	499	- 3	519	3 914	5 057		11 139		- 49		11 090	16 148	
5. Heat	42	0	95		46	1 317	1 499		4 635				4 635	6 135	
6. Renewable fuels and waste				9		13	23		460				460	482	
a) Solid biomass and wastes				9		13	23		460				460	482	
b) Liquid biofuels and biogas															
Total use	924	29	2 212	74	3 560	10 385	17 184	8	35 210		2 197	2 246	37 407	54 592	

Table 6.4 Trade and transport margins allocated to use of energy products

Use														
	Intermediate Consumption, Industries by ISIC								Final consumption				Total use of energy products	
	A	B	C	D	H	E-G, I-U	Total		Private consumption	Changes in inventories	Exports			Total final consumption
	Agriculture, forestry and fishing	Mining and quarrying	Manufacturing	Electricity, gas steam and air conditioning supply	Transportation and storage	Other industries	Total Industries	of which Non-energy purposes			Total	of which Sold to non-residents on national territory		
Currency unit														
Energy products, own use and losses, etc.														
1. Coal, coke, gas work gas and peat	21	1	49	28			98		6			6	104	
a) Coal, coke and peat	21	1	49	28			98		6			6	104	
b) Gas work gas														
2. Oil	1 019	12	265	100	1 532	1 401	4 329		2 825		646	25	7 800	
3. Natural Gas														
4. Electricity														
5. Heat														
6. Renewable fuels and waste	10		0	114			123		770			770	894	
a) Solid biomass and wastes	10		0	114			123		770			770	894	
b) Liquid biofuels and biogas														
Total use	1 049	12	315	242	1 532	1 401	4 551		3 601		646	25	8 797	

Table 6.5 Use table at basic prices

	Intermediate Consumption, Industries by ISIC								Final consumption				Total use of energy products at basic prices	
	A	B	C	D	H	E-G, I-U	Total		Private consumption	Changes in inventories	Exports			Total final consumption
	Agriculture, forestry and fishing	Mining and quarrying	Manufacturing	Electricity, gas steam and air conditioning supply	Transportation and storage	Other industries	Total Industries	of which Non-energy purposes			Total	of which Sold to non-residents on national territory		
Currency unit														
Energy products														
1. Coal, coke, gas work gas and peat	35	3	350	3 572		13	3 973		183	- 254	52	- 19	3 955	
a) Coal, coke and peat	35	3	347	3 572			3 956		29	- 254	52	- 173	3 783	
b) Gas work gas			4			13	17		154			154	171	
2. Oil	2 609	86	26 154	814	31 250	3 757	64 670	262	7 290	2 279	53 792	2 082	63 361	
3. Natural Gas	109	106	2 205	15 867	41	1 072	19 400		2 865	138	9 230		12 233	
4. Electricity	1 073	42	4 670	275	882	5 220	12 161		8 846		4 513		13 358	
5. Heat	55	0	541		157	4 036	4 790		8 748				8 748	
6. Renewable fuels and waste	41		165	767		54	1 027		1 004		42		1 046	
a) Solid biomass and wastes	41		165	767		54	1 027		1 004		42		1 046	
b) Liquid biofuels and biogas														
Total use	3 921	238	34 085	21 295	32 329	14 153	106 021	262	28 936	2 162	67 628	2 082	98 727	
													204 748	

C. Hybrid supply and use tables for energy

1. Consistency of physical and monetary supply and use tables for energy

6.34. The classification of industries and products and the supply and use categories in the physical and monetary supply and use tables are exactly the same. The recording principles and balancing principles are also the same. This facilitates that the tables are set up consistently and that the physical and monetary information can be used for coherent analyses.

6.35. However, when it comes to the compilation of the accounts it is important to be aware of differences in the principles of the underlying statistics, which may lead to inconsistencies if steps are not taken to remove the inconsistencies.

6.36. Most important is that all energy flows are included in the physical SEEA-E flow accounts no matter if it is associated by monetary transactions or not. Thus, energy produced and retained for own in

6.37. Intermediate use and energy, which is lost after it has been produced is included in the physical supply table. In contrast, the monetary supply and use tables present only flows associated with an economic transaction. These flows correspond to the 'supply to other economic units' blocks of the physical supply and use tables.

6.38. Note, that even though no monetary transactions may take place, the supply or use of energy may nevertheless be the basis for a tax (or subsidy). For instance, the production of electricity by wind power may carry a subsidy, although no economic transaction of the wind power is recorded in the accounts. If a tax (or subsidy) payment actually takes place in relation to such non-marketed energy flows, it should be recorded in the monetary supply and tables (Table 6.1, 6.2 and 6.3) accounts together with the monetary flows related to energy products.

2. Hybrid accounts – combining monetary and physical tables

6.39. To highlight the consistency between the physical and monetary supply and use tables and to provide a basis for analysis of the links, Table 6.6 and Table 6.7 present so-called hybrid supply and use tables in which the physical and monetary flows are combined.

6.40. The upper parts of the tables present the monetary supply and use of energy products corresponding to how they are included in Table 6.1 and Table 6.3.

6.41. In addition to the monetary flows related to the economic transactions of energy also the supply and use of all other products supplied and used in the economy are presented for completeness. Thus, the monetary parts of the supply and use tables are in fact full supply and use tables, which describes all flows of products within the economy. However, compared to conventional supply and use tables, the presentation is here focused on the energy products, while all other products are aggregated to one group.

6.42. By including the supply and use of all non-energy products in these tables it is immediately possible to see how much the output of energy accounts for in relation to the total output of products in the economy. Similarly it is possible to see, which role energy plays in relation to other products when it comes to the intermediate consumption by industries, private consumption and exports, etc.

6.43. The lower part of the tables presents the physical energy supply and use measured at terajoules, i.e. the flows as presented in Tables 5.3 and 5.4.

6.44. First, the supply and use corresponding to the monetary flows are entered. These are the physical flows, which are linked to economic transactions between economic units, i.e. establishments, consumers, and the rest of the world. Own use of energy and losses including re-injection of natural gas, flaring and venting of natural gas are not included. The latter flows of energy are instead entered in a separate row of the tables.

Table 6.6 Hybrid supply table for energy products

Supply							Taxes and margins				Total supply at pur- chasers' prices			
	Industries by ISIC						Total output, basic prices	Imports c.i.f.	Total supply, basic prices	Taxes		Sub- sidies	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			0.0		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								225	225	1) These numbers are not not included in sums since they are included in output of ISIC G.				
a) Coal, coke and peat									0					
b) Gas work gas	0.5						0.5							
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					

Table 6.7 Hybrid use table for energy products

	Intermediate Consumption, Industries by ISIC						Private consumption, inventories, exports and other uses						Losses and re-injection	Total use
	A	B	C	D	H	E-G, I-U	Private consumption	Changes in inventories	Exports	Government consumption	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	Total 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							243	1	- 21	2			- 19	225
a) Coal, coke and peat							0	0					0	0
b) Gas work gas						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	3 498

D. Standard SNA 2008 accounts for activities related to energy

6.45. The monetary transactions related to energy as presented in the previous sections make up only a part of the overall economic activities involved in energy resource extraction and production of energy products. In this section, a broader picture of the overall activities related to energy supply is drawn up. It is done by presenting the so-called production and generation of income accounts for the relevant industries.

6.46. It should be noted that some of the items (e.g. consumption of fixed capital and gross fixed capital formation) presented in this section are also recorded in the asset accounts for fixed assets used by the extraction industries and the energy production industries, cf. Chapter 4, Section J. Further, there is a close link between the items in the production and generation of income accounts for the extraction industries and the resource rent calculation presented in Section E of this chapter and more generally in Chapter 4.

1. Production, generation and allocation of income, and gross fixed capital formation

6.47. Table 6.8 presents the *production account* and the *generation of income account* for the ISIC rev. 4 industries carrying out extraction of energy resources and production of energy products as principal activities (cf. Chapter 5, Section D.4). In addition, the *allocation of primary income account* is presented together with supplementary information on the fixed capital formation.

6.48. The industries, which are of specific relevance for the extraction of energy resources (ISIC B) are presented at the ISIC rev. 4 division level (two digit level), and the energy producing industries (ISIC D) are presented at the group level (three digit level).

6.49. For each industry, the production account starts in the first part of Table 6.6 with the value of output of the industry at basic prices and subtracts the intermediate consumption at purchasers' prices. The resulting amount, the gross value added, is a measure of the contribution to GDP made by the industry.

6.50. Intermediate consumption does not cover the progressive wear and tear and obsolescence of the fixed capital used in production. Instead, it is recorded as a separate item: the consumption of fixed capital. The net value added is obtained by subtracting this item from the gross value added.

6.51. The value added corresponds to the income generated by the production activities. The second part of Table 6.8 shows how the income is generated and distributed to labour in the form of compensation of employees, to government as payment of other taxes less subsidies on production, and to the entrepreneur in the form of operating surplus. The latter is calculated both gross and net of the consumption of fixed capital.

6.52. The operating surplus measures the surplus or deficit accruing from production before taking account of any interest, rent or similar charges payable on financial assets or natural resources borrowed or rented by the enterprise, or any interest, rent or similar receipts receivable on financial assets or natural resources owned by the enterprise. (SNA 2008, 7.8). In Section E the operating surplus is split into surplus originating from the use of fixed capital and surplus originating from use of energy resources.

6.53. Taxes and subsidies on products were introduced in Section B. Other taxes on production are taxes imposed on the producer that do not apply to products nor are levied on the profits of the producer. Examples include taxes on land or premises used in production or on the labour force employed. The

distinction between subsidies on products and other subsidies on production is made on similar grounds (SNA 2008, 6.50).

Table 6.8 Production, generation and allocation of income, and gross fixed capital formation - Mining and production of energy

	ISIC B 05 - Mining of coal and lignite	ISIC C 06 - Extraction of crude petroleum and natural gas	ISIC D 19 - Manufacture of coke and refined petroleum products	ISIC D 351 - Electric power generation, etc.	ISIC D 352 - Manufacture of gas; distribution, etc.	ISIC D 353 - Steam and air conditioning supply	Government	Households	Total Use Resources
Currency units									
1. The Production Account									
P1 Output	60 744	28 415	23 891	19 622	13 542				146 214
P2 - Intermediate consumption	6 487	27 160	11 567	12 933	4 623				62 770
D21 of which non specific taxes on products	20	10	31	5	58				124
D21 specific taxes on products 1)	100								100
D31 non specific subsidies on products	- 52		- 3						- 55
D31 specific subsidies on products 1)									0
B1g = Value added, gross	54 257	1 255	12 324	6 689	8 919				83 444
P6 - Consumption of fixed capital	5 084	780	4 415	1 962	3 435				15 676
of which terminal costs	40								40
B1n = Value added, net	49 173	475	7 909	4 727	5 484				67 768
2. The Generation of Income Account									
B1g = Value added, gross	54 257	1 255	12 324	6 689	8 919				83 444
D1 - Compensation of employees	802	343	2 752	530	992				5 419
D29 - Other taxes on production and imports	15	11	130	27	99				282
of which specific other taxes 1)	3								3
D39 - Other subsidies on production and imports	- 30		- 100		- 63				- 193
of which specific other subsidies 1)	- 1								- 1
B2g = Operating surplus, gross	53 470	901	9 542	6 132	7 891				77 936
P6 - Consumption of fixed capital (cofc)	5 084	780	4 415	1 962	3 435				15 676
of which cofc on terminal costs	40								40
B2n = Operating surplus, net	48 386	121	5 127	4 170	4 456				62 260
3. The Allocation of Primary Income Account									
B2g Operating surplus, gross	53 470	901	9 542	6 132	7 891				77 936
D1 + Compensation of employees							5 419		5 419
D21 + Taxes on products						224			224
D29 of which specific taxes on products						100			100
D31 + subsidies on products						- 55			- 55
of which specific subsidies on products						0			0
D29 + Other taxes on production and imports						282			282
of which specific other taxes on production and imports						3			3
D39 + Other subsidies on production and imports						- 193			- 193
of which specific other subsidies on production						- 1			- 1
D4 + Property income	- 5 000					5 000			5 000
D45 of which rent	- 5 000					5 000			5 000
B.5g = National income, gross	48 470	901	9 542	6 132	7 891	5 258	5 419		83 613
P6 - Consumption of fixed capital (cofc)	5 084	780	4 415	1 962	3 435	0	0		15 676
B.5n = National income, net	43 386	121	5 127	4 170	4 456	5 258	5 419		67 937
4. Gross fixed capital formation	4 721	604	4 300	1 500	1 941				
of which Mineral exploration and evaluation	634								
Terminal costs	100		200	50	300				

1) Taxes and subsidies specific for the mining industries.

6.54. Subsidies are not payable to final consumers, and current transfers that governments make directly to households as consumers are treated as social benefits. Subsidies also do not include grants that governments may make to enterprises in order to finance their capital formation, or compensate them for damage to their capital assets, such grants being treated as capital transfers (SNA 2008, 7.99). See Section G for information on the recording of social benefits and capital transfers related to energy use and production.

6.55. Specific taxes and subsidies are in SEEA-E defined as those taxes and subsidies that only the extraction industry pay and receive, respectively, cf. Chapter 4, Section E.3. The specific taxes are presented explicitly in Table 6.8 since they are of particular interest in relation to the resource rent calculations as described in Chapter 4 and in Section F.1 below.

6.56. The third part of the table shows the allocation of the primary income. The allocation of primary income account shows where the items payable in the generation of income account are receivable and also includes the amounts of property incomes receivable and payable. First, it presents the operating surplus allocated by the industries. The compensation of employees is allocated to the households, and all taxes and subsidies are allocated to the government. Subsidies are recorded by negative entries for the government since they reflect amounts paid by government.

6.57. Rent payments (royalties) paid by the extractor to the owner of the energy resources are recorded under property income by subtracting the amount paid from the extractor's (ISIC B) account and adding it to the owner's account. In the example presented in the table, it is assumed that the government is the owner of the energy resources, but other entities may in principle be the owner and receiver of the rent payments. In such cases the recording should be done accordingly. Rent payments are described in more detail in Section E.2 below.

6.58. By adding up the operating surplus, the taxes less subsidies and property income, the national income is obtained. Similar to value added and operating surplus, the national income can be calculated both gross and net of the consumption of fixed capital.

6.59. It should be noted, that, generally, the account for allocation of primary income is only presented for institutional units and sectors and not related to the production activities, since it is not always appropriate to charge property income paid out by an enterprise as chargeable against operating surplus and the assets used in production (SNA 2008, 7.15). However, in the simple example in Table 6.8 with all property income related to the use of the energy resources in production, the breakdown by industries have been maintained.

6.60. The last two columns of table 6.8 show for each row in the corresponding account whether the item is a resource or a use for the economic units. Thus, for the production account the output is resources for the units, while the intermediate consumption is a use of resources. In the generation of income account the taxes paid are uses, while the same taxes are resources for the government in the allocation of primary income account. The rent payments (property income) are uses for ISIC B, and a resource for the government as owner of the energy resources.

6.61. The fourth part of the table presents the gross fixed capital formation of the industries. Gross fixed capital formation is measured by the total value of a producer's acquisitions less disposals of fixed assets during the accounting period plus certain specified expenditure on services that adds to the value of non-produced assets (SNA 2008, 10.32). Fixed assets consist of goods and services that are used in production for more than one year, for instance, buildings and structures, machinery and equipment, research and development, and mineral exploration and evaluation.

6.62. Principal mineral exploration and evaluation activities are provided on a fee or contract basis to the mining and quarrying industries by the ISIC division 09 Mining support service activities. In addition, the mining industries may carry out mineral exploration and evaluation activities on their own account.

6.63. In the national accounts, mineral exploration and evaluation activities are regarded as leading to fixed capital formation, since the information obtained from exploration influences the production activities of those who obtain it over a number of years. The expenditures incurred on exploration within a given accounting period, whether undertaken on own account or not, are therefore treated as expenditures on the acquisition of an intellectual property product and included in the enterprise's gross fixed capital formation. (SNA 2008, 10.107).

6.64. In relation to Table 6.8 it has been assumed that all exploration and evaluation activities are carried out by the ISIC division 06 Extraction of crude petroleum and natural gas, and consequently no fixed capital formation is recorded for ISIC division 09 Mining support service activities.

6.65. Terminal costs constitute a specific kind of gross fixed capital formation and consumption of fixed capital. Terminal costs are, for instance, the costs associated with the decommissioning of assets at the end of its productive life, e.g. the dismantling and removal of an oil rig. It should be noted, that the consumption of fixed capital associated with the terminal costs are recorded during the lifetime of the related asset (e.g. the oil rig), i.e. before the decommissioning costs actual occur. Terminal costs and the recording of those are described in more detail in Chapter 4, Section J.

E. Depletion adjusted accounts

1. Resource rent

6.66. As described in Chapter 4 the so-called *resource rent* is used as a measurement of the value of an energy resource in the ground i.e. before the resource has been extracted, if no observable market price exists. The resource rent is calculated by subtracting the costs of extraction activities from the output resulting from the extraction. Most of the items used for the calculation of the resource rent can be found in the production account and in the generation of income account, cf. Table 6.8 above.

6.67. The resource rent calculation is presented in Table 6.9. The calculation starts with the output of the extraction activities. From the output, intermediate consumption, compensation of employees, other taxes on production, consumption of fixed capital and a return on fixed capital is subtracted in order to get the resource rent. The resource rent corresponds to the gross operating surplus after subtraction of consumption of fixed capital and a return to fixed capital, i.e.

Resource rent =

Gross operating surplus
- consumption of fixed capital
- return to fixed capital

6.68. The resource rent can be calculated inclusive or exclusive of adjustments for specific taxes and subsidies. Specific taxes are taxes, which are related to the extraction activities and paid by the extracting industry, only. Similarly, specific subsidies are subsidies related to the extraction activities and received by the extraction industries, only.

6.69. The resource rent exclusive of adjustments for specific taxes represents the surplus accrued by the extracting industry after it has paid all taxes and received all subsidies, inclusive of those specific to the industry. This resource rent is relevant in relation to an assessment of the actual surplus of the extraction industry after it has paid all taxes and received all subsidies.

6.70. In contrast, the resource rent inclusive of adjustments for specific taxes and subsidies represents the “pure” surplus of the extraction activities, i.e. the surplus before any re-allocation due to specific taxes and subsidies has taken place. In Chapter 4 the adjusted resource rent was used for estimating the total value of the energy resource. Thus, the estimated value of the energy resources is independent of any re-allocations due to the specific taxes and subsidies.

6.71. Observe that the adjustment for specific taxes and subsidies involves the adding back of taxes less subsidies to the unadjusted resource rent, since the specific taxes less subsidies have been extracted from the output together with the intermediate consumption at purchasers' prices and the other taxes less subsidies on production.

6.72. More details on resource rent calculation are found in Chapter 4, Section E.

6.73. In addition to the calculation of resource rent, Table 6.9 presents information on the physical extraction of energy resources and the per unit resource rent.

6.74. When calculating the resource rent, care must be taken to identify whether data included in the production account and the generation of income account for the extraction industry include secondary activities, which have no direct reference to extraction activities itself. In the numerical example presented in Table 6.8 and 6.9 it is assumed that no such secondary activities take place. Therefore, the numbers for output and intermediate consumption, etc., can directly be transferred directly from table 6.8 to 6.9 for the resource rent calculation. However, if output and intermediate consumption, etc. of the extraction industry include items coming from secondary activity, which is not related to the extraction of the energy resources, such items must be eliminated before the resource rent is calculated.

Table 6.9 Resource rent calculation based on the production account and the generation of income account

	06 - Extraction of crude petroleum and natural gas
	currency units
Output	60 744
- Intermediate consumption	6 487
- Compensation of employees	802
- Other taxes less subsidies on production	- 15
= Operating surplus, gross	53 470
- Consumption of fixed capital	5 084
- return on fixed capital	5 519
=Resource rent, excl. adjustments for specific taxes and subsidies	42 867
+ Specific taxes less subsidies on products	100
+ Specific other taxes less subsidies on production	2
= Resource rent, incl. adjustments for specific taxes and subsidies	42 969
Volume of natural gas (products), Terajoule	369
Volume of oil (products), Terajoule	722
Total volume of extracted products , Terajoule	1 091
Unit resource rent, incl. adjustments (currency units per Terajoule)	39

2. Rent payments (property income)

6.75. Property income accrues when the owners of energy resources put them at the disposal of other institutional units.

6.76. Following the SNA 2008, rent is the term for property income receivable by the owner of a natural resource (the lessor) for putting the natural resource at the disposal of another institutional unit

(a lessee) for use of the natural resource in production. The terms under which rent is payable is expressed in a resource lease. For resources such as subsoil assets they are not all returned to the legal owner at the end of the lease since the purpose of the lease is to permit extraction and disposal of the resource (SNA 2008, 7.109).

6.77. The payments are often described as royalties, but they are essentially rents that accrue to owners of the assets in return for putting them at the disposal of other institutional units for specified periods of time. The rents may take the form of periodic payments of fixed amounts, irrespective of the rate of extraction or, more likely, they may be a function of the quantity or volume of the asset extracted. Enterprises engaged in exploration may make payments to the owners of surface land in exchange for the right to make test drillings or investigate by other means the existence and location of subsoil assets. Such payments are also to be treated as rents even though no extraction may take place. (SNA 2008, 7.160).

6.78. Since the terms are similar, care should be taken not to confuse *rent* and *resource rent*.

6.79. The ownership of subsoil assets such as deposits of minerals or fossil fuels (coal, oil or natural gas) depends upon the way in which property rights are defined by law and also on international agreements in the case of deposits below international waters. In some cases the assets may be owned by the owner of the ground below, which the deposits are located but in other cases they may be owned by a local or central government unit. (SNA 2008, 7.159).

6.80. The lessors of the energy resources could in theory collect the entire resource rent derived from extraction through specific taxes or rents levied on the lessees. However, in practice, the specific taxes and rents tend to understate the resource rent as the lessor is often the government, which may set the specific tax payments or rent payments with other priorities in mind; for instance, implicit price subsidies to extractors, and encouraging employment in the mining and quarrying industry. Also, the rent payments to government may not move in line with market prices for the extracted product though one would expect the resource rent to do so.

6.81. The rent payments (D45) are generally presented in the allocation of primary income account, cf. Table 6.8. The calculation of resource rent was presented in the previous section, cf. Table 6.9.

6.82. When data for both rents and resource rents are available, publishing a comparison of the values may be useful for economic policy analysis. Table 6.10 shows the resource rent accruing to the user of the resource together with the amounts of rent as well as specific taxes less subsidies paid by the user of the energy resource to the owner of the energy resource.

Table 6.10 Resource rents and payments of specific taxes and rents related to energy resources

	05 - Mining of coal and lignite		06 - Extraction of crude petroleum and natural gas		Government		Total	
	Use	Ressource	Use	Ressource	Use	Ressource	Use	Ressource
	Currency units							
Resource rent				42 867				42 867
Specific taxes less subsidies			102		102		102	102
Rent (property income)			5 000		5 000		5 000	5 000
Total			5 102	42 867	5 102		5 102	47 969

3. Depletion

6.83. Depletion is in SEEA-E defined as the value of the stock change caused by the extraction. It is, by convention, measured as the total change in the stock value, which cannot be attributed to neither any of the other physical changes (and consequently changed extraction patterns) nor to revaluation effects due to changes in the resource rent in period t , cf. Chapter 4, Section G.

6.84. When the net present value method is used for estimating the total value of an energy resource, the depletion is estimated in SEEA-E as the difference between two elements: the actual resource rent, $rr_t e'_t$ and the value of the opening stock multiplied by the discount rate. Thus, in terms of the convention and symbols used in Chapter 4, the depletion is calculated as:

$$\text{Depletion} = -rr_t e'_t + r V_t^{\text{opening}}$$

or

$$\text{Depletion} = - \text{Resource rent} + \text{Return to energy resources}$$

where, rr_t and e'_t are the realized per unit resource rent and the realized extraction, respectively, in period t , r is the discount rate and V_t^{opening} is the value of the resource at the beginning of period t .

6.85. A physical removal of energy resources is expected to diminish the total value of the energy resources and therefore the depletion will normally be negative. However, under certain conditions a strict application of the above formula for depletion will lead to a depletion, which is positive, i.e. the effect of the resource extraction is that the value of the resource stock increases. This happens if the resource stock value (and thus the rV_t^{opening} element) is big compared to the resource rent. This means that while a physical extraction always decreases the physical stock, the corresponding depletion can be either positive, zero or negative depending on the relative size of the two elements included in the calculation.

6.86. Table 6.11 presents the calculation of depletion. It should be noted that the depletion is estimated on the basis of the resource rent exclusive of adjustments for specific taxes and subsidies. In the numerical example the return to energy resources has been calculated as 4 per cent of the opening stock values corresponding to the 4 per cent discount rate used for the example calculation in Chapter 4.

Table 6.11 Depletion of energy resources

	Coal and Peat	Petroleum Resources
	Currency unit	
- Resource rent, excl. adjustments for specific taxes and subsidies		42 867
+Return to energy resources (= 4 per cent of opening stock value)		10 138
= Depletion of energy resources		-32 729
Opening stock of energy resources		253 450

6.87. By rearranging the formula for the depletion, a decomposition of the actual resource rent into two elements is obtained:

$$rre'_t = -\text{Depletion} + rV_t^{\text{opening}}$$

or

Resource rent = - Depletion + Return to energy resources

6.88. The first element is the depletion (with opposite sign), and the second element is the rV_t^{opening} , which can be interpreted as a return to the natural resources. In other words, by definition, the surplus of the extraction activity, i.e. the resource rent, corresponds exactly to what is needed to compensate for the depletion and in addition give an income (return to the energy resources) corresponding to rV_t^{opening} . This interpretation is unfolded further in the following section.

4. Attributing gross operating surplus to fixed capital and energy resources

6.89. By combining the above expressions for resource rent and depletion, it is possible to obtain a principal decomposition of the gross operating surplus into the underlying fixed capital and energy resource factors, which can be considered to have contributed to the operating surplus. The decomposition is illustrated in Figure 6.1 and Table 6.12 presents the decomposition by using the numbers from the previous tables.

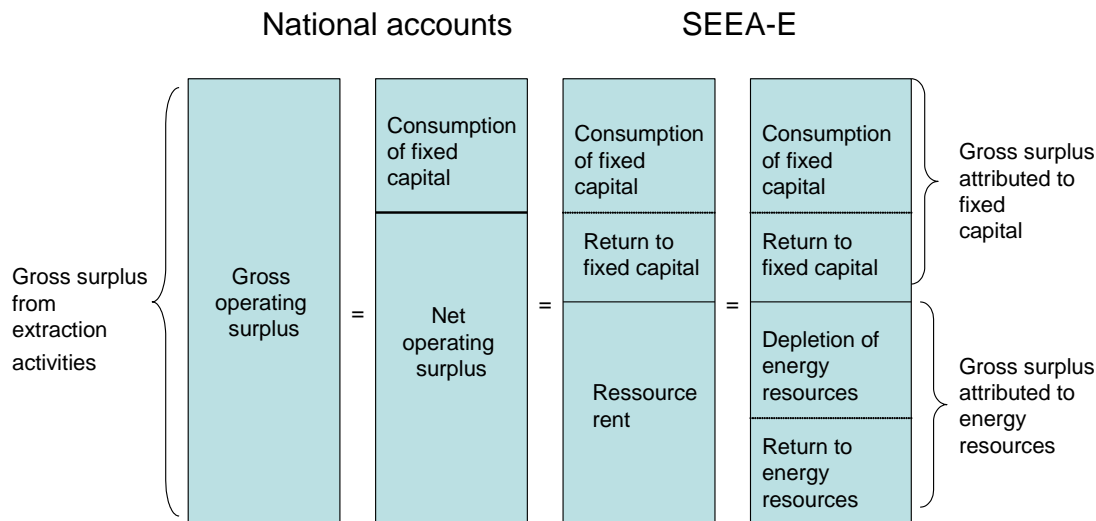
6.90. Starting with the gross operating surplus we get first the standard SNA 2008 breakdown into consumption of fixed capital and a net operating surplus.

6.91. For production, which, unlike natural resource extracting industries, does not require any other inputs than labour and fixed capital, the net operating surplus can be considered as corresponding entirely to a return to the fixed capital. Correspondingly, the resource rent is zero.

6.92. In contrast, for extracting industries, the net operating surplus can further be divided into a part allocated as a return to the fixed capital accruing to the fixed capital owner and the resource rent, i.e. the part, which in SEEA-E is assumed to have its origin in the use of the natural resource for production. The resource rent can then be broken down by a part corresponding to a return to the energy resources and a part corresponding to the depletion of the energy resources.

6.93. The general understanding behind the SEEA-E definition of depletion and the decomposition of the gross operating surplus into the four components is that the use of natural resources is regarded in parallel to the use of fixed capital.

6.94. The economic surplus arising from the use of a fixed assets in production is partitioned into an element representing the decline in value of the asset, the consumption of fixed capital, and the remaining element, the return to fixed capital, which is considered to be an income arising from the use of the asset and which is incorporated in the net operating surplus of the unit. Similarly, the resource rent is partitioned into an element representing a decline in value of the natural resource due to the extraction, the depletion, and the return to its use, i.e. an income related to the use of the natural resource in production.

Figure 6.1 Decomposition of gross operating surplus

Note: Depletion is normally negative since it represents the change in the value of the stock of energy resources caused by extraction. In the decomposition of gross operating surplus it is entered with opposite sign (normally positive), since it represents the part of operating surplus, which needs to be set aside to compensate for the depletion.

Table 6.12 Decomposition of gross operating surplus

	ISIC 05 Mining of coal and lignite	ISIC 06 Extraction of crude petroleum and natural gas
	Currency units	
Gross operating surplus		53 470
=		
Consumption of fixed assets		5 084
Net Operating surplus		48 386
=		
Consumption of fixed assets		5 084
+ return to fixed assets		5 519
+ ressource rent		42 867
=		
Consumption of fixed assets		5 084
+ return to fixed assets		5 519
+ (-) Depletion		32 729
+ return to energy resources		10 138

Note: see note to Figure 6.1

6.95. It should be noted that none of the four elements, the consumption of fixed capital, the return to fixed assets, the return to energy resources or the depletion is directly observable, and that each of them, and, subsequently, the decomposition of the gross operating surplus into these four elements, need to be estimated based on assumptions.

6.96. Often, the national accounts' estimate of the consumption of a specific kind of fixed capital is based on an estimate of the corresponding stock of fixed capital as well as on assumptions about the life time of the specific type of capital and the functional relationship between the age of a capital stock and the decay of the market value due to age.

6.97. If, in addition, it is assumed that the return to fixed capital for manufacturing industries is the same independently of whether they use natural resources or not, it is possible to use the rate of return for the resource independent industries as basis for the estimate for the resource extracting industries.

6.98. Thus, a rate of return on fixed assets used by the general non-financial sector, excluding agriculture, etc. and the extraction industries can be calculated as the net operating surplus divided by the value of the net fixed capital stock used by the same industries. This rate of return may then be multiplied by the net fixed capital stock of the resource extracting industries in order to calculate a return on fixed assets for those industries. In the example presented in Table 6.9 it is simply assumed that the rate of return on fixed assets is 8 per cent.

6.99. For the rate of return on natural resources, the discount rate should normally be used. This allows for a consistent recording across the asset accounts based on the net present value method, cf. Chapter 4, and the current accounts presented in this chapter.

6.100. Once the three elements have been estimated, the fourth element, the depletion, can be calculated as a residual by subtracting the return to energy resources from the resource rent.

6.101. When this method is used to estimate the components of the gross operating surplus for an extracting industry it is at the same time assumed that no other factors than fixed capital and energy resources contribute to the surplus of the extraction activity. However, such an assumption need not be correct, since, for instance, certain human capital inputs or other natural resources (water, air), contributing to the operating surplus, may not have been properly taken account when the operating surplus is calculated. To the extent that such factors contribute to the economic result of the extracting industry, and to the extent that the depletion is estimated as a residual, the latter will include also the contribution to the operating surplus from these factors, and the depletion will be correspondingly overvalued, at least if it is assumed that the consumption of fixed capital and the returns to fixed capital and energy resources have been estimated correctly.

5. Depletion adjusted accounts

6.102. Based on the idea that the gross operating surplus of an mining industry can be attributed to the use of not only fixed capital but also to the energy resources on which the mining industry rely, it is natural to highlight the use of both of these types of assets in the generation and allocation of income accounts for the extraction industries.

6.103. Table 6.13 depicts the same information as Table 6.8 but highlights and adjusts some of the main aggregates related to the mining industry in order to take the depletion of energy resources into account. For the non-mining industries no adjustment to the information in Table 6.8 is made.

6.104. The first block, the Production Account, corresponds exactly to the one presented in Table 6.8.

6.105. The next block, the Extended Generation of Income Account, presents the same gross operating surplus as Table 6.8, but subtracts not only the consumption of fixed assets but also the depletion from the gross operating surplus in order to reach the net operating surplus, now called Depletion Adjusted Operating Surplus, net.

6.106. The interpretation of the Depletion Adjusted Operating Surplus, net, is that it is the amount left over from the economic surplus after all costs, including the costs of using up fixed capital as well as

energy resources have been subtracted. The Depletion Adjusted Operating Surplus of the mining industry can be split into a return to the fixed assets and a return to the energy resources. In both cases it is recorded as income to the mining industry.

6.107. Carrying both the subtraction of the consumption of fixed capital and the depletion forward to the third block of Table 6.13, i.e. the extended Allocation of Primary Income, and subtracting both items from the gross national income, results in the Depletion Adjusted National Income, net.

6.108. As for the national income, it should be noted that it is, in principle, appropriate to present the depletion adjusted national income for institutional units and institutional sectors only and not for industries, since national income, in contrast to value added, is only partly related to a production process. However, in line with Table 6.8, Table 6.13 presents nevertheless the income by industries, since the items included in the example does in fact only relate to income directly linked to the production activities, and to the rent payments from the extracting industries to the owner of the energy resources.

6.109. The depletion adjusted accounts extends the SNA 2008 accounts by including the use of non-produced assets, i.e. the energy resources, in the generation of income accounts. Unlike the SNA 2008, the extended SEEA-E accounts charges the depletion against the operating surplus. The result is that in most cases, when the extraction affects the stock value negatively (i.e. when the return to the energy resources is less than the resource rent), the adjusted net operating surplus and the adjusted net national income will be lower than the conventional (i.e. SNA 2008) counterparts.

Table 6.13 Production account and depletion-adjusted accounts for generation and allocation of income

	ISIC B		ISIC C	ISIC D			Government	Households	Total	
	05 - Mining of coal and lignite	06 - Extraction of crude petroleum and natural gas	19 - Manufacture of coke and refined petroleum products	351 - Electric power generation, etc.	352 - Manufacture of gas; distribution, etc.	353 - Steam and air conditioning supply			Use	Resources
Currency units										
1. The Production Account										
P1 Output	60 744		28 415	23 891	19 622	13 542				146 214
P2 - intermediate consumption	6 487		27 160	11 567	12 933	4 623			62 770	
D21 of which non specific taxes on products	20		10	31	5	58			124	
D21 specific taxes on products 1)	100								100	
D31 non specific subsidies on products	- 52								- 52	
D31 specific subsidies on products 1)										
B1g = Value added, gross	54 257		1 255	12 324	6 689	8 919			83 444	
P6 - Consumption of fixed capital	5 084		780	4 415	1 962	3 435			15 676	
of which terminal costs	40								40	
B1n = Value added, net	49 173		475	7 909	4 727	5 484			67 768	
2. The Extended Generation of Income Account										
B1g = Value added, gross	54 257		1 255	12 324	6 689	8 919				83 444
D1 - Compensation of employees	802		343	2 752	530	992			5 419	
D29 - Other taxes on production and imports	15		11	130	27	99			282	
of which specific other taxes 1)	3								3	
D39 - Other subsidies on production and imports	- 30			- 100		- 63			- 193	
of which specific other subsidies 1)	- 1								- 1	
B2g = Operating surplus, gross	53 470		901	9 542	6 132	7 891			77 936	
P6 - Consumption of fixed capital (cofc)	5 084		780	4 415	1 962	3 435			15 676	
of which cofc on terminal costs	40								40	
- Depletion of energy resources	32 729									
B2n = Depletion adjusted operating surplus, net	15 657		121	5 127	4 170	4 456			29 531	
of which return to fixed capital	5 519		121	5 127	4 170	4 456			19 393	
return to energy resources	10 138								10 138	
3. The Allocation of Primary Income Account										
B2g Operating surplus, gross	53 470		901	9 542	6 132	7 891				77 936
D1 + Compensation of employees								5 419	5 419	
D21 + Taxes on products							224		224	
D29 of which specific taxes on products							100		100	
D31 + subsidies on products							- 52		- 52	
D31 of which specific subsidies on products										
D29 + Other taxes on production and imports							282		282	
of which specific other taxes on production and imports							3		3	
D39 + Other subsidies on production and imports							- 193		- 193	
of which specific other subsidies on production							- 1		- 1	
D4 + Property income	-5 000						5 000		5 000	5 000
D45 of which rent	-5 000						5 000		5 000	5 000
B.5g = National income, gross	48 470		901	9 542	6 132	7 891	5 261	5 419	83 616	
P6 - Consumption of fixed capital (cofc)	5 084		780	4 415	1 962	3 435			15 676	
- Depletion of energy resources	32 729								32 729	
B.5n = Depletion adjusted national income, net	10 657		121	5 127	4 170	4 456	5 261	5 419	35 211	
4. Gross fixed capital formation	4 721		604	4 300	1 500	1 941				
of which Mineral exploration and evaluation	634									
Terminal costs	100			200	50	300				

F. Economic transfers, etc.

6.110. This section deals with the transfers, etc. related directly or indirectly to production and use of energy. The governments use taxes and other transfers as economic instruments either for raising revenues or for regulating the production and use of energy. The counterpart to such transfers is other institutional units, which pay or receive the amounts transferred to or from the government. Transfers, etc. related to production and use of energy may in addition take place between non-governmental institutional units.

6.111. Within SNA 2008, the term transfer is used to denote a transaction in which one party provides a good, service or asset to the other but does not receive recompense in return. Taxes and social assistance benefits are examples of such transfers.

6.112. The most widespread economic instruments used by governments are taxes and subsidies. Taxes are compulsory, unrequited payments, in cash or in kind, made by institutional units to government units. They are described as unrequited because the government provides nothing in return to the individual unit making the payment, although governments may use the funds raised in taxes to provide goods or services to other units, either individually or collectively, or to the community as a whole (SNA 2008, 7.71).

6.113. Taxes and subsidies are often directly related to the production or use of specific energy products, or more generally to the industries' activities when they extract or produce energy. Taxes and subsidies on products (D21 and D31) broken down by types of energy were introduced in Section B. Other taxes and subsidies on products (D29 and D39) were presented in Section D. The payments of those transfers are summarised in Table 6.14 below.

6.114. The table include for each industry, the government, the households and the rest of the world (exports) separate columns indicating whether the amount is "payable" or "receivable". In the example in Table 6.14 taxes are paid by the industries, the households and the rest of the world (exports), while they are received by the government. Subsidies are paid by the government and received by industries and households. The columns for the total economy, including the rest of the world, show that the total payable amounts are equal to the total receivable amounts.

6.115. Payments of rent (D45), often called royalties,, is property income (D4) receivable by the owner of a natural resource. They were introduced in Section E.2, where they were allocated to the mining industries paying the rent. It was noted, that such an allocation is normally not carried out in the national accounts since, commonly, property income is only allocated by institutional units and institutional sectors.

6.116. The payments of rents are also presented in Table 6.15, but now by institutional sectors. The table shows that the rent is paid by non-financial corporations and received by government. In principle, other institutional units may also be the receiver of the rent payments.

6.117. Current taxes on income, wealth, etc. (D5) consist mainly of taxes on the incomes of households or profits of corporations and of taxes on wealth that are payable regularly every tax period (as distinct from capital taxes levied infrequently) (SNA 2008, 8.15). Specific taxes on income, wealth, etc. may be levied on the income of, for instance, non-financial corporations engaging in mining activities in order for the government to appropriate some of the resource rent accruing to the mining industry in addition to that part, which may appropriated by rent payments (D45) to the government.

Table 6.14 Taxes on production and subsidies related to energy production and use

	ISIC B		ISIC C		ISIC D				Other industries		Households		Government		Rest of the world		Total	
	05 - Mining of coal and lignite	06 - Extraction of crude petroleum and natural gas	19 - Manufacture of coke and refined petroleum products	351 - Electric power generation, etc.	352 - Manufacture of gas; distribution, etc.	353 - Steam and air conditioning supply												
	Pay- able	Receivable	Pay- able	Receivable	Pay- able	Receivable	Pay- able	Receivable	Pay- able	Receivable	Pay- able	Receivable	Pay- able	Receivable	Pay- able	Receivable		
	Currency units																	
D2 Taxes on production and imports																		
D21 Taxes on products																		
Energy products		0	0	0	0	0	17	42	63	3	63	63						
Other products		120	10	31	5	58			224		224	224						
D29 Other taxes on production		15	11	130	27	99			282		282	282						
D3 Subsidies																		
D.31 Subsidies on products																		
Energy products								7	8	1	8	8						
Other products		52							52		52	52						
D.39 Other subsidies on production		30		100		63			193		193	193						
Total		135	82	21	161	100	32	157	63	17	42.2	7	253	569	3	1	822	822

Table 6.15 Property incomes, income taxes, social transfers and capital transfers related to energy

	S. 11 Non financial corporations		S.14 Households	S. 13 Government		S.2 Rest of the world	Total	
	Pay-able	Receivable	Pay-able	Receivable	Pay-able	Receivable	Pay-able	Receivable
	Currency units							
D4 Property income								
D45 Rent	5 000				5 000		5 000	5 000
D5 Current taxes on income, wealth, etc.								
D51 Taxes on income	14 158				14 158		14 158	14 158
Social contributions, benefits and transfers								
D62 Social benefits other than social transfers in kind				330	330		330	330
D63 Social transfers in kind				40	40		40	40
D7 Other current transfers								
D74 Current international cooperation					600	600	600	600
D9 Capital transfers								
D91 Capital taxes	50				50		50	50
D92 Investment grants		410			410		410	410
D99 Other capital transfers					100	100	100	100
Total	19 208	410	370	1 480	19 208	700	20 688	20 688

6.118. In Table 6.15 specific taxes on income, wealth, etc. related to mining activities is presented by a payment from the non-financial corporations to the government. To the extent that other taxes on income, wealth, etc. are specifically related to energy production they should be highlighted by entering them in a similar way in Table 6.15.

6.119. Social benefits (D61) and social transfers in kind (D62) received by households are intended to provide for the needs that arise from certain events or circumstances, for example, housing (SNA 2008, 8.17). They include payments or direct delivery of energy products, respectively, from the government to poor families to ensure heating of their houses, etc. Transactions in kind are normally recorded in the accounts as if they are monetary transfers followed by the expenditure by the recipient on the products concerned (SNA 2008, 3.82). In the example presented in Table 6.15, the payments are entered as receivable by the households and payable for the government.

6.120. Other current transfers (D7) consist of all current transfers between resident institutional units, or between resident and non-resident units, other than current taxes on income, wealth, etc., social contributions and benefits, and social benefits in kind. It includes current transfers between different kinds of government units, usually at different levels of government, and also between general government and foreign governments (SNA 2008, 8.19). In the example presented in Table 6.15 an other current transfer in the form of a payment from the government to the rest of the world related to international corporation (D74) is included.

6.121. A capital transfer (D9) is one in which the ownership of an asset (other than cash or inventories) is transferred or which obliges one or both parties to acquire, or dispose of, an asset (other than cash or inventories) (SNA2008, 3.60). They include capital taxes (D91), investment grants (D92) and other capital transfers (D99).

6.122. Capital taxes consist of taxes levied at irregular and infrequent intervals on the values of the assets or net worth owned by institutional units or on the values of assets transferred between institutional units as a result of legacies, gifts inter vivos or other transfers (SNA 2008, 10.207). In principle such taxes could be levied on capital (fixed or natural) related to energy extraction or energy production.

6.123. Investment grants consist of capital transfers in cash or in kind made by governments to other resident or non-resident institutional units to finance all or part of the costs of their acquiring fixed assets. The recipients are obliged to use investment grants received in cash for purposes of gross fixed capital formation, and the grants are often tied to specific investment projects, such as large construction projects (SNA 2008, 10.208).

6.124. Other capital transfers consist of all capital transfers except capital taxes and investment grants. One notable category included here is the cancellation of debt by mutual agreement between the creditor and the debtor. Such a cancellation is treated as a capital transfer from the creditor to the debtor equal to the value of the outstanding debt at the time of cancellation. It includes the cancellation of debt owned by non-residents to residents, and vice versa (SNA 2008, 10.128).

6.125. In the example in Table 6.15 a capital tax payment related to fixed capital used by energy producing corporations are entered as paid by the non-financial corporations and received by government is recorded. Further, an investment grant is transferred from the government to the non-financial corporations, and finally an other capital transfer payment from government to the rest of the world is recorded.

6.126. The last row of table 6.15 includes for each institutional sector the total amounts of property income, income taxes, social transfers and capital transfers received or paid in relation to energy.

6.127. It should be noted that for property income, income taxes, social transfers and capital transfers it may in practise be difficult to identify which transfers, etc. that can be directly or indirectly related to

production and use of energy. Much of the information on transfers, etc. related to energy support is normally “hidden” in the national accounts, because they are published and reported at a rather high level of aggregation. Therefore, the energy specific information is often collapsed with non-energy specific information. One may know, for instance, that the social benefit assistance shown in the national accounts includes assistance given to poor senior citizens to heat their houses, but the heating assistance is added up with other kind of assistance.

6.128. However, by consulting the underlying government budgets and the legal text behind the tax payments or social benefit payments, it may be possible to identify and highlight the relevant transfers, etc., although the choice on what to include or not may often rely on assumptions and it may involve a considerable amount of work to identify the specific payments.

6.129. When it comes to analysis of the economic regulation of production and use of energy by government, Tables 6.14 and 6.15 can be used to analyse the so-called on budget transfers, etc., i.e. the transfers, etc. which can be identified by looking at the national accounts or directly at the government budgets. In contrast, it is not possible directly to find information on off-budget regulation, which is carried out through preferential treatment of certain institutional units. Examples of such preferential treatment are government guarantees leading to lower interest rates for loans for renewable energy projects, or differentiated product taxes.

G. Environmental activities and expenditures

6.130. Sustainability is an important issue in relation to extraction, production and use of energy, and especially fossil and nuclear energy. Concerns are often raised about the harmful effects on the climate and the environment, prompted by air emissions, for instance. Further, the depletion and increasing scarcity of fossil energy resources are sources of concern.

6.131. Therefore, activities aiming at protecting the environment and managing the energy resources are of relevance and, thus, this section presents shortly main concepts and accounts, which can be used to describe these activities. A more in-depth description of environmental protection expenditure accounts can be found in SEEA and in the so-called SERIEE manual published by Eurostat (European Communities, 2002¹).

6.132. In general, environmental activities can be defined as those which reduce or eliminate pressures on the environment and which aim at managing and making more efficient use of natural resources. Examples are investments in technologies designed to prevent or reduce pollution, restoring the environment after it has been polluted, protecting the economy from a deteriorated environment, recycling, conservation and resource management.

6.133. Environmental activities (and related expenditures) include two main general categories:

- Environmental Protection, aiming at protecting the environment against pollution, losses in quality and any kind of physical degradation (qualitative perspective)
- Resource Use and Management, aiming at managing natural resources and avoiding/reducing their depletion (quantitative perspective)

6.134. Each of these categories is presented in separate sections below.

¹ SERIEE European System for the collection of economic information on the environment — 1994 Version, European Communities, 2002

1. *Environmental protection*

Definition of environmental protection activities and products

6.135. Environmental protection activities are those where the primary purpose is the protection of the environment; that is the prevention, reduction and elimination of pollution as well as any other degradation of the environment caused by economic activities. This definition implies that, in order to be considered environmental protection, activities, or parts thereof must satisfy the primary purpose criterion (*causa finalis*), i.e. that environmental protection is their prime objective. Actions and activities which have a favourable impact on the environment but which serve other goals are not classified as environmental protection. This means, for instance, that measures to save energy are not regarded as environmental protection activities. Such measures are instead categorised as resource management.

6.136. Environmental protection activities are production activities in the sense of national accounts, that is, they combine resources such as equipment, labour, manufacturing techniques, information networks or products to create an output of goods or services. The output of the activities is called environmental protection services.

6.137. In general, environmental protection activities can be classified according to the classification of environmental activities and expenditures (CEA)

Table 6.16 Environmental protection activities - CEA classification

1 Protection of ambient air and climate
2 Wastewater management
3 Waste management
4 Protection and remediation of soil, groundwater and surface water
5 Noise and vibration abatement (excluding workplace protection)
6 Protection of biodiversity and landscapes
7 Protection against radiation (excluding external safety)
8 R&D for environmental protection
9 Other environmental protection activities for environmental protection
9.1 General environmental administration and management
9.2 Education, training and information
9.3 Activities leading to indivisible expenditure
9.4 Activities not elsewhere classified

6.138. Since extraction and production of energy may cause all kinds of adverse environmental effects all industries involved in the extraction of energy resources and the production of energy products may, in principle, be involved in activities within the nine CEA classes. However, in most cases, activities falling within the first CEA class Protection of ambient air and climate are the dominant environmental protection activities related to extraction and production of energy.

6.139. Typically, industries, which extract and produce energy (ISIC 05, 06, 19, 351-153), carry out environmental protection activities as ancillary activities for own use, or, in some cases, as secondary activities for sale to others and for own use.

6.140. When environmental protection activities are carried out as secondary activities, and when other industries carry out environmental protection activities as principle activities, the output is typically sold on the market as environmental protection services. In such cases, a market price for the output of the environmental protection activities, i.e. the services, exist, and the cost for the industries, which uses the services can be taken to be equal to the market price.

6.141. When the activities are carried out as ancillary activities for own use only, no market price for the resulting service is accounted for, and instead the costs of the environmental protection activities are estimated as the cost in respect to the protection measures the industry takes: intermediate consumption, compensation of employees, fixed capital consumption and other taxes less subsidies on production.

6.142. Other industries, than the ones, which extract and produces energy, may also carry out environmental protection activities as ancillary or secondary activities, or they may buy environmental protection services from others in order to mitigate adverse effects on the environment caused by, for instance, the combustion of energy products. The production and use of such protection activities are, however, not described in SEEA-E. The same holds for the use of environmental protection services by households and the government.

6.143. Industries, which extract and produce energy, may for intermediate consumption, in addition to the use of environmental protection services, use so-called connected and adapted products.

6.144. Connected products are products whose use by resident units directly and exclusively serves an environmental protection objective but which are not environmental protection services produced by an environmental protection activity. Adapted (or ‘cleaner’) products are defined as products that meet the following criteria: (a) on the one hand, they are less polluting when consumed and/or disposed than equivalent normal products (equivalent normal products are products that provide similar utility, except for the impact on the environment); (b) on the other hand, they are more costly than equivalent normal products (Eurostat, 2002).

6.145. These products may consist of, for instance:

- expenditure for limestone, etc. for desulphurisation of exhaust fumes from power plants
- expenditure for vehicle carburation and heating system adjustment services,
- expenditure for the purchase of catalytic converters,
- expenditure, valued by extra cost, for the purchase of adapted products (unleaded gasoline, desulphurised fuels, adapted cars, etc.)

6.146. The consumption of connected goods and services does not include expenditure for thermal insulation or energy saving; see instead the section below on resource management.

Accounts for environmental protection expenditures

6.147. In general, national expenditure accounts aim at recording the expenditure of resident units and financed by resident units in order to get a total that corresponds to the effort a nation is making out of its own resources.

6.148. One of the prime objectives of the accounts is to value the national expenditure for environmental protection, i.e. the resources the resident units of an economy are devoting to environmental protection.

6.149. In relation to SEEA-E, the aim of the expenditure accounts is to highlight the economic effort the industries, which extracts energy resources and produces energy products (primarily ISIC 05, 06, 19, 351-153) make in order to protect the environment.

6.150. Table 6.17 presents the account for national expenditure on environmental protection expenditure.

Table 6.17 National expenditure on environmental protection related to extraction of energy resources and production of energy

	Users/beneficiaries							Total
	ISIC B		ISIC C	ISIC D			Other industries ¹⁾	
	05 - Mining of coal and lignite	06 - Extraction of crude petroleum and natural gas	19 - Manufacture of coke and refined petroleum products	351 - Electric power generation, etc.	352 - Manufacture of gas; distribution, etc.	353 - Steam and air conditioning supply		
	Currency units							
Intermediate consumption								
Environmental protection services		450	200	100	75		825	
Connected and adapted products		250	300	400	125	100	1 175	
Gross fixed capital formation (GFCF)								
Environmental protection services		50		75	15	5	145	
Connected and adapted products		50	30	25	10	20	135	
Others GFCF for environmental protection		600	100	300	50	25	1 075	
Specific transfers not included above								
Current		25	10	8	7	3	53	
Capital		100		22			122	
Total uses		1 525	640	930	282	153	3 530	
Of which financed by the rest of the world				30			30	
National expenditure for environmental protection		1 525	640	900	282	153	3 500	

1) Environmental protection activities related to other industries' production of energy can be recorded here. These activities are assumed to be zero in the example tables in SEEA-E.

6.151. The main components of the national expenditure for environmental protection carried out by units extracting energy resources and producing energy are of the following:

National expenditure for environmental protection =
Intermediate consumption of environmental protection services
Plus Intermediate consumption of adapted and connected products
Plus Gross capital formation of environmental protection services
Plus Gross capital formation of adapted and connected products
Plus Gross capital formation of other products
Plus Specific transfers received for environmental protection
Less financing by the rest of the world

6.152. **Intermediate consumption of environmental protection services** by resident units extracting energy resources and producing energy. The intermediate consumption includes the use of own produced environmental protection services and protection services purchased from others.

6.153. However, if, among the (other) industries, which extract energy resources and produce energy, so-called *specialised producers* of environmental protection activities are included, care must be taken not to double count the intermediate consumption of environmental protection services. Specialised producers are defined as those producers, which carry out environmental protection activities as their principal activities.

6.154. Since the use of an environmental protection service (product A) for intermediate consumption by a specialised producer subsequently becomes part of the output (of product B) of the specialised producer, it will implicitly be recorded as intermediate consumption by other industries, when they purchase the output (product B) from the specialised producer. Thus, if both the intermediate consumption of the specialised producer and the other industries are included, the national expenditure for environmental protection services will be overstated.

6.155. Therefore, if any specialised producers of environmental protection services are included among the (other) industries, the intermediate consumption of environmental protection services by these specialised producers should not be included in the numbers recorded in the table.

6.156. **Intermediate consumption of adapted and connected products** by resident units extracting energy resources and producing energy. As in the case for environmental protection services, the intermediate consumption of adapted and connected products by specialised producers should be excluded in order to avoid double counting when the total expenditure is calculated.

6.157. **Gross capital formation of environmental protection services** by resident units extracting energy resources and producing energy. Examples include land improvements by cleaning soil from oil spills.

6.158. **Gross capital formation of adapted and connected products** by resident units extracting energy resources and producing energy. Examples include acquisition of adapted cars.

6.159. **Gross capital formation of other products** by resident units extracting energy resources and producing energy if the purpose is environmental protection. Examples include acquisition of land and buildings, which are going to be used for environmental protection activities.

6.160. **Specific transfers received for environmental protection** by the units extracting energy resources and producing energy. *Specific transfers* are unrequited payments, which contribute to the financing of the environmental protection services and the uses of specific and adapted products. In addition specific transfers may constitute a compensation for income or capital losses related with environmental protection. National expenditure is defined from the side of uses (intermediate and final use of specific products, gross capital formation, etc.) and uses are valued at purchasers' prices or by their cost of production. Therefore, whenever specific transfers lead to lower purchasers' prices or cost of production the specific transfers constitute a component of national expenditure, and they have to be included in order to get the total national expenditure for environmental protection. (European Communities, 2002, § 2039 and 2045). This item includes current and capital transfers for Environmental protection. The scope of both current and capital transfers is explained in Section F above. It should be noted, that specific transfers are recorded here only when they are not already recorded in the items above. This is valid for investment grants to resident units, as gross capital formation is valued at purchasers' prices, or for current transfers to non-market producer units of general government, as non-market output is valued by cost of production.

6.161. The sum of the categories above corresponds to the **total use of environmental protection services**. Since the national expenditure aims at recording the expenditure of resident units and financed by resident units in order to get a total that corresponds to the effort a nation is making out of its own resources, the financing **of the Rest of the world** for environmental protection has to be subtracted from the total domestic use.

Financing accounts for environmental protection expenditures

6.162. The units, which carry out the environmental protection services or invest for environmental protection do not always bear the entire costs, i.e. they are not necessarily the financing units. In some cases users receive transfers from other units (generally the government). These transfers include subsidies on the production of products, investment grants and other transfers that are financed either from government expenditure or from specific taxes.

6.163. This section describes the financing of national expenditure by identifying the financing sector (e.g. which sector is providing the financing) and the beneficiaries (e.g. which units benefit from the financing), as well as the amount being financed.

6.164. Table 6.18 presents the financing accounts for the national expenditure on environmental protection activities carried out by the industries extracting energy resources and producing energy. The columns of Table 6.18 show the same categories of users/beneficiaries identified in Table 6.17. The rows of Table 6.18 show the different financing units (that is, those actually bearing the cost) which are classified according to the institutional sectors of the national accounts: government, corporations and households including non-profit-institutions serving households (NPISHs).

6.165. The establishment of the financing accounts is based on the following assumptions and principles. (European Communities, 2002).

6.166. Units, which pay specific taxes, charges, etc., are considered the financers of environmental protection expenditure financed from the corresponding resources.

6.167. General government is only considered the financer of those outlays made from its general budgetary resources, except therefore those outlays made from resources earmarked for the environment. If the outlays are funded from earmarked taxes, it is assumed that those who pay the taxes (in general households and other producers) are the financing units.

6.168. The financing account does not distinguish financial corporations, thus the financing analysis does not show loans or sums borrowed. As a result any use which enters in national expenditure and which is not financed by specific transfers is, by convention, assumed to be financed by the user. (European Communities, 2002, § 2109)

Table 6.18 Financing of national expenditure on environmental protection related to extraction of energy resources and production of energy

	Users/beneficiaries							
	ISIC B		ISIC C	ISIC D			Other industries ¹⁾	Total
	05 - Mining of coal and lignite	06 - Extraction of crude petroleum and natural gas	19 - Manufacture of coke and refined petroleum products	351 - Electric power generation, etc.	352 - Manufacture of gas; distribution, etc.	353 - Steam and air conditioning supply		
Financing units	Currency units							
Government		125	10	30	7	3		175
Corporations		1 400	630	570	200	130		2 930
Households incl. NPISH ²⁾				300	75	20		395
National Expenditure		1 525	640	900	282	153		3 500
Rest of the world				30				30
Uses of resident units		1 525	640	930	282	153		3 530

1) Environmental protection activities related to other industries' production of energy can be recorded here.

These activities are assumed to be zero in the example tables in SEEA-E.

2) Non-profit institutions serving households

2. Energy resource management

6.169. The above-mentioned nine groups of environmental protection activities within CEA do not describe all activities related to the environment. Activities related to natural resources such as monitoring, control and surveillance, data collection and statistics, costs of the natural resource management authorities at various levels as well as temporary costs for facilitating structural adjustments of sectors concerned, energy-saving measures, and recovery of energy are not included.

6.170. These activities are instead recorded and analysed as natural resource management activities.

6.171. The classes 10-16 within CEA, in general, describe resource management activities. Of these, section 13 and 15 are of specific relevance when it comes to energy resources. Table 6.19 presents these sections of CEA.

6.172.

Table 6.19 Excerpt of resource use and management activities within CEA with specific relevance for energy resources

13	Use and management of fossil energy
13.1	Reduction of the intake
13.2	Reduction of heat and energy losses, and energy savings
13.3	Direct management of the stocks of non-renewable energy sources
13.4	Measurement, control, laboratories and the like
13.5	Other activities
15	Research and development activities for natural resource use and management
15.4	Fossil energy

6.173. Within CEA, Division *13.1 Reduction of the intake* include preventive in-process modifications and Division *13.3 Direct management of the stocks of non-renewable energy resources*, include the mobilization and exploitation, exploration, and extraction, of fossil energy resources. These activities are mainly carried out by the mining and quarrying industry, ISIC B (including Division: 09 - Mining

support service activities) and the transactions related to these activities are to a large extent already covered by the accounts described in Section E (e.g. Table 6.8 and Table 6.13).

6.174. All units in the economy, including the households, may carry out activities within Division 13.2 Reduction of heat and energy losses, and energy savings.

6.175. Savings activities are always executed as ancillary: they consist of modifications in the production process for the purpose of reducing the use of certain inputs (materials, energy). The implicit output is valued by costs of production, i.e. intermediate consumption, compensation of employees, other taxes less subsidies on production and fixed capital consumption, which correspond to the measure of savings.

6.176. Recycling and savings are intimately linked. The only difference is that recycling gives rise to an actual output (classified as related product in the EPEA) when savings does not. In the case of internal recycling, output is not explicitly valued and therefore does not appear as a transaction in the national accounts framework and has to be valued by costs of production or by the market price of equivalent product.

6.177. For some natural resources, activities, which consist of the substitution of non-renewable resources by renewable resources (cf. development of renewable energy) may be analysed as savings activity. (European Communities, 2002, § 10069-10071)

6.178. Activities within Division 13.4 Measurement, control, laboratories and the like are undertaken by the mining industry, ISIC B, itself, but also by specialised producers within, for instance, ISIC M - Professional, scientific and technical activities.

6.179. CEA section 15.4 Research and development activities for natural resource use and management related to fossil energy are partly carried out by the government, partly by private companies.

6.180. In addition to these resource use and management activities also parts of the activities within CEA section 16.1 General administration of natural resources and 16.2 Education, training and information and CEA section may be related to energy.

6.181. As concerns units, groupings of units as well as transactions, the accounting framework for the natural resource use and management account adheres to the main lines of the environmental protection expenditure accounts' framework. The same applies to the definition, description and valuation of various components of the national expenditure for natural resource management (European Communities, 2002, § 10049).

6.182. On the basis of activities involved, expenditure may be divided into the different CEA Divisions. However, such a division is not presented here. Instead a total expenditure and financing account for resource management and use is presented in Table 6.20 and 6.21.

6.183. As in the case of environmental protection expenditures direct double counting must be eliminated, i.e. intermediate consumption of resource use and management products by specialised producers (the mining and quarrying industry) should not be included in the accounts.

Table 6.20 National expenditure on energy resource use and management (CEA 13 and 15.4)

	Users/beneficiaries											
	ISIC B			ISIC C	ISIC D			Other indu- stries	General Govern- ment	House- holds	Rest of the world	Total
	Mining and quarrying	of which		19 - Manufac- ture of coke and refined petroleum products	351 - Electric power gene- ration, etc.	352 - Manufac- ture of gas; distri- bution, etc.	353 - Steam and air condi- tioning supply					
		05 - Mining of coal and lignite	06 - Extraction of crude petroleum and natural gas									
Currency units												
Intermediate consumption												
Ressource management and use services	5 266		5 163	1 183	880	885	226	4 000	2 000	200		14 538
Connected and adapted products	1 015		1 000	175	45	20	5	700		400		1 945
Gross fixed capital formation (GFCF)												
Ressource use and management services	1 085		4 010	35	23	20	103	300	1 000			4 491
Connected and adapted products	640		630				17	50	240			697
Others GFCF for ressource use and management	20		20	15	67			25	760			887
Specific transfers not included above												
Current	71		70	10	8	14	4	700		45		806
Capital	35		35					115				150
Total uses	11 100		10 928	1 418	1 023	939	355	5 890	4 000	645		20 554
Of which financed by the rest of the world	40		40		10							50
National expenditure for resource use and management	11 060		10 888	1 418	1 013	939	355	5 890	4 000	645		20 504

Table 6.21 Financing of national expenditure on energy resource use and management (CEA 13 and 15.4)

	Users/beneficiaries										
	Producers							General Govern- ment	House- holds	Rest of the world	Total
	ISIC B		ISIC C	ISIC D			Other industries				
	Mining and quarrying	of which		19 - Manufacture of coke and refined petroleum products	351 - Electric power generation, etc.	352 - Manufacture of gas; distribution, etc.		353 - Steam and air conditioning supply			
		05 - Mining of coal and lignite	06 - Extraction of crude petroleum and natural gas								
Financing units	Currency units										
Government	300		295	67	120	85	64	1 975	4 000	125	
Corporations	10 760		10 593	1 351	603	719	204	2 950		20	20 504
Households incl. NPISH ¹⁾					290	135	87	965		500	
National Expenditure	11 060		10 888	1 418	1 013	939	355	5 890	4 000	645	20 504
Rest of the world	40		40		10						50
Uses of resident units	11 100		10 928	1 418	1 023	939	355	5 890	4 000	645	20 554

1) Non-profit institutions serving households