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The structure of the SEEA-MFA manual

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I. Introduction

The UNCEEA recommend at its 2nd meeting in July 2007 the preparation of a document (SEEA-MFA) – based on the OECD Guidance Manual, but where all accounts dealt with are fully harmonized with the SEEA. The SEEA-MFA document shall be submitted to the UN Statistical Commission for its adoption and it is expected to be jointly published by the UN, Eurostat and OECD.

The purpose of this paper is to present a draft outline for the SEEA-MFA document (which includes short summary of the content of the main sections of the SEEA-MFA) and which provides a preliminary draft of standard tables and accounts as well as classifications for MFA consistent with those in the SEEA-2003 and its revision. The paper has been prepared on request of UNSD. The main proposals of this draft are coordinated with OECD and Eurostat.

As far as the structure of the SEEA-MFA document is concerned, this paper takes up the proposals for restructuring the *OECD guidance manual made in the paper* on "Clarifications and recommendations concerning differences between the *OECD guidance manual on material flows and resource productivity, Volume II* and the *SEEA 2003"* which was presented at the 2nd UNCEEA meeting in June 2007 in New York. In that meeting UNCEEA generally agreed with the recommendations of the paper.

The purpose of the SEEA-MFA document will be similar to the SEEA Water manual (SEEAW). It will provide a comprehensive conceptual framework for organizing the material flow accounts in practice in detailed, coherent an consistent manner, based on the SEEA standard and the SNA, including a set of standard classifications and standard tables in order to encourage countries to compile material flow accounts in an internationally comparable manner. It is intended to align the respective documents of OECD and Eurostat on material flow accounts in future fully to the SEEA standard and the SEEA-MFA.

The London Group is asked for discussion and approval or amendment of the proposals of this paper.

II Overview over the general structure of the SEEA-MFA

The Johannesburg London Group meeting suggested that for the compilation of the SEEA-MFA the OECD MFA manual volume II be taken as a basis but restructured by using the SEEA as the basic building block and adding blocks, which are not part of the SEEA-2003, when needed, rather than starting from describing the MFAcc system as a more general system and then establish the links with the SEEA.

The OECD manual with its parts I and II covers a much broader range of analytical and accounting approaches than the SEEA type material flow accounts (SEEA-MFAcc). It starts with a general frame that includes various approaches of material flow accounting at the macro, meso and micro level that are based on the accounting principle of mass balancing. Within that system the SEEA-MFAcc are described as an important special case characterised by specific system boundaries and accounting rules that closely link that system to the SNA.

However, the major part of the OECD manual part II is devoted to describing SEEA-MFAcc. Only chapter 1 presents a general material flow accounting framework valid for accounting of material flows of any kind of entity and at all aggregation levels. The presentation of the

SEEA-MFAcc in the OECD manual includes a general and complete framework for national material flow accounts (NMFAcc), and the presentation of the two most widespread kinds of actual application of NMFAcc. These are the breakdown by activity of the inputs and outputs of the national economic system (including their analytical use for calculating indirect flows) and the economy wide material flow accounts (EW-MFAcc). The description of the NMFAcc as a framework and of the breakdown by activity of the inputs and outputs in the manual is fully in line with the SEEA 2003, except for some terminological issues that are discussed in the separate paper on harmonization, presented to this meeting as well. For the EW-MFAcc some demarcations deviating from perfect coherence with the SNA are highlighted. These deviations should be removed as far as possible (see paper on harmonization). With relation to the SEEA-MFAcc the OECD paper presents a very logical and rich approach which goes far beyond the existing SEEA 2003 in theoretical stringency, detail and coverage.

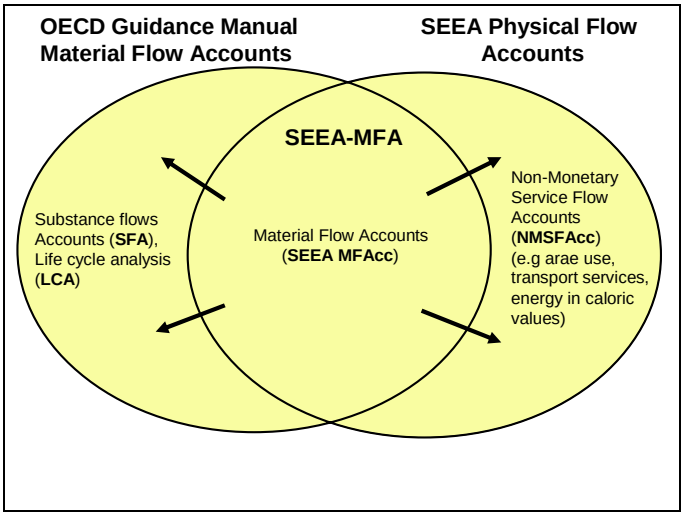
However the special role of the SEEA as an international statistical standard and the importance and usefulness of the SEEA as the only approach that consistently links the environment related material flows to the economic driving forces should be pointed out more clearly in the new SEEA-MFA manual.

To support that goal it is suggested here to consider for the purpose of the SEEA-MFA manual a slight change of the structure of the OECD guide. It is proposed to move the order of presentation. Instead of presenting the SEEA-MFAcc as a special case it is proposed to start with the systematic description of the SEEA-MFAcc.

The general MFAcc approach which makes use of the accounting principle of mass balancing and of the generalisation of the SNA tools of supply-use and input-output tables for describing interrelationships within a system should then be explained subsequently.In the manual it should also be made clear that the SEEA/SNA concept in fact primarily is a macro/meso approach. But the concept allows for deeper disaggregation of all dimensions included (region, type of material and type of activity). As far as the detailed accounts follow the principal concept of the SEEA-MFAcc they can be classified as belonging to that family of accounts. Establishing those accounts, i.e. building on further disaggregation of the SUT / IOT has enormous advantages, as the results are consistently embedded into the whole accounting framework.

Figure 1:

Overlap between the OECD manual and the SEEA physical flow accounts

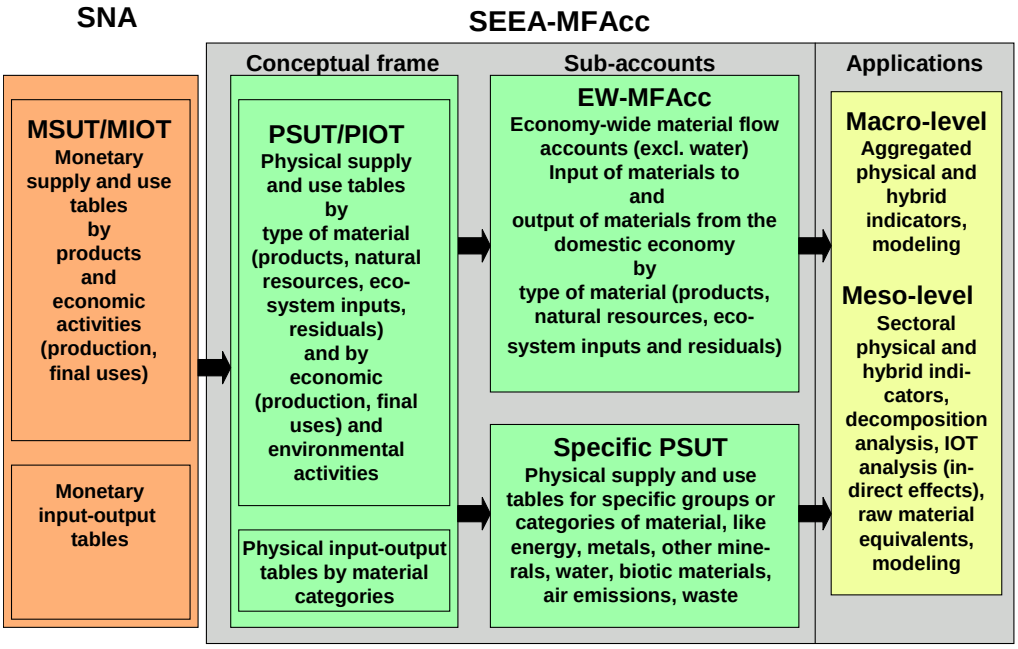


The relations and the overlap between the SEEA physical flow accounts, the proposed SEEA-MFA and the OECD manual can be illustrated by figure 1, where the arrows indicate that the core principles from use of PSUT can be extended to be used in other areas than for (monetary and) material flows.

As far as the presentation of the SEEA-MFAcc itself is concerned it is proposed to take the close relationship between the SNA and the SEEA-MFAcc as a starting point. The system character of the SEEA type material flow accounts should be emphasized. For that purpose it seems useful to introduce the SEEA-MFAcc with the following diagram as it is presented in figure 2. That chart should guide the further description of the module in the manual.
The figure 2 shows the relationship between the SNA and the SEEA-MFAcc.

Figure 2:

Linking the material flows of the SEEA to the economic flows of the SNA



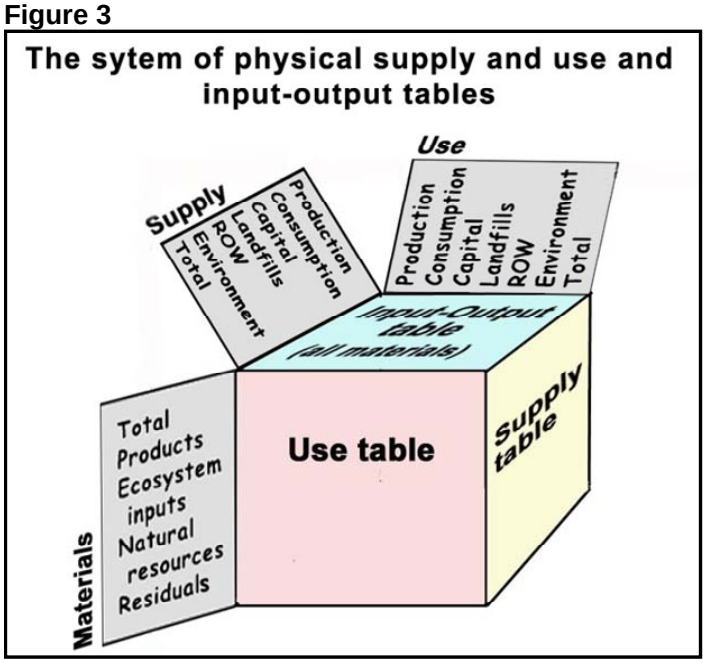
Those parts of the monetary accounts that are of particular relevance for the material flow accounts are the monetary supply and use tables (MSUT) and the monetary input-output tables (MIOT) which can be calculated on basis of the MSUT. The tables show the supply and use of all products by economic production (branches) and final use activities, like private consumption, capital formation and exports. Those tables are normally published in a standard break down at a meso-level of aggregation by about 60-100 product groups and branches. However the published material usually is based on very detailed tables. For example for Germany and Denmark the MSUT are disaggregated internally down to a level of 1500 and 2300 products, respectively.

The principal approach – the conceptual frame - of the SEEA-MFAcc satellite system is based on physical supply and use tables (PSUT) and physical Input-Output tables (PIOT). The PSUT / PIOT firstly mirror the monetary product flows in physical terms. Secondly and more important, they supplement the depiction of products flows within the economy and with the rest of the world (ROW), with residual flows within the economy and with physical flows from the environment to the economy (natural resources and ecosystem inputs) and from the economy to the environment (residuals). PSUT can also be converted into PIOT, like MSUT into MIOT. It has to be noted that the standard breakdown by products is a starting point for the physical description, but the degree of detail of the standard disaggregation may not be

sufficient for addressing certain specific environmental problems. Moreover, the classifications in use in national accounting have to be supplemented in order to include, as for the materials, natural resources, ecosystem inputs and residuals and, as for the "activities" among which the materials flow, the environment and its media or functions.

The relationship between the supply and use tables and the input-output tales is shown in a schematic way in figure 3. The front side of the cube shows the use table (all used materials by all activities), the right side the supply table (all supplied materials by all activities) and the lid represents the physical input-output table for the total of materials (by adding up the tons). The slices below the lid cover the PIOT for individual materials (or categories of materials).

Figure 3



Due to the large data requirements it seems not to be feasible to fill the conceptual frame of the cube with data at a much detailed level on a regular basis and even datasets on basis of highly aggregated material categories, like energy, water and the rest, have so far been put into practice by rather few countries and not at a regular basis. The main reasons are that the compilation of the full physical tables is rather data demanding and resource consuming and only of limited use. Compared to that, most important environmental issues can be covered very well and even more adequate by a number of sub-accounts and some analytical approaches like hybrid tables, which are based on the sub-accounts.

It should be noted that while the information in the PSUT is derived from various basic statistics/observations the PIOT – whether full or for specific material - can normally only be constructed on the basis on the PSUT by applying various assumptions. This is equivalent to what holds for the monetary SUT and IOT.

However, the conceptual frame of complete PSUT/PIOT is important for organizing the sub-accounts, which are fully consistent to the monetary reference figures, in a coherent manner. The sub-accounts typically are often calculated at an annual basis.

There are two principal types of SEEA-MFAcc sub-accounts, the economy wide material flow accounts (EW-MFAcc) and the specific PSUT. The EW-MFAcc shows the input of materials into the domestic economy from the environment and from the ROW and the output of materials from the economy to the environment and the ROW by type of material, but typically without any breakdown by economic activities and excluding water. Insofar the EW-

MFAcc represent a specific aggregation of the total PSUT. In addition, the EW-MFAcc can also include indirect trade flows (raw material equivalents), which can be thought of as analytical extensions of hybrid accounts based on MIOT and PSUT.

The special PSUT tables cover a material or a group of materials, like energy carriers, water and agricultural products or different types of residuals. That is, they cover some selected but most relevant slices of the whole cube. Those tables use the standard breakdown or an expanded break down by economic activity.

In a last module of the manual the analytical applications that are based on the SEEA-MFAcc and especially the combination of the physical and the monetary accounts (hybrid accounts) should be covered. It is of special importance to demonstrate the approaches and the usefulness of hybrid (physical/monetary) analysis.

III. Classifications and standard tables

1. Classifications

In this paper the basic classifications and standard tables of the manual are addressed (see also Annexes A and B).

As far as the classifications for the physical flow accounts are concerned a special subgroup of the LG (Roel Delahaye, Mark de Haan and Sjoerd Schenau) deals already with that issue and has prepared a specific issue paper for this meeting. All relevant classifications are listed and discussed there. It is suggested that the classification for this manual will be fully based on the results of that process. However some overlapping with that paper cannot be avoided as some general issues that are relevant with respect to the proposed standard table set have to be addressed in this paper also.

An overriding principle for the work on the classifications should be that it must start from existing classifications (CPC, HS, ISIC, etc,), and that any environment relevant classification for the use in SEEA should be an aggregation of one of these. In certain cases deviations from and special disaggregations of the standard classifications may be unavoidable in order to highlight environment relevant issues. However any such deviation from existing standards must be considered carefully with respect to availability of basic data in the statistical system and with regard to extra work that will be necessary to populate the tables based on such special classifications.

Most important for the physical flow accounts are the classifications for products and industries as a basis for the depiction of **flows within the economy**. The **CPC** will be used for products and the **ISIC** for industries. As a minimum requirement the one-digit level should be adapted for the material flow accounts. However, going beyond, a specific environment related standard breakdown should be defined for both classifications. For that purpose the 2-digit or 3-digit level should be used selectively. If appropriate, specific environment relevant disaggregation of the 3-digit level could be considered in order to show the most environmentally relevant products or industries separately. Such a **standard breakdown for material flow accounting** will necessarily be a compromise between the requirements of different environmental themes as well as the problems associated with introducing new groups which do not exist in the basic statistics and classifications (CPC). The standard breakdown proposed below will serve as a frame for integrating all sub-modules of the material flow accounts and the monetary reference figures. Beyond that it will be recommended to develop more specific disaggregations for the individual sub-modules.

As far as the **flows between the environment and the economy** are concerned it is suggested to use to the classifications developed for the EW-MFAcc of Eurostat, which refer

to the different types of material flows That will be applied as far as possible as the overarching minimum standard for all sub-modules. Certainly the classification for solid waste flows, which is very coarse in the EW-MFA will be much more elaborated for the specific purpose of the sub-module solid waste. Another issue is the classification of products (for imports and exports) of the EW-MFAcc. In future the EW-MFA – after being harmonised with the general material flow accounts – will play a rather central role for the system as it comprises all flows related to the exchange between the economy and the environment whereas the other sub-modules are rather confined to specific materials or activities. Behind that background also a harmonization of the specific EW-MFAcc product classification with the proposed standard classification of products appears to be necessary and should be considered. That may call for more disaggregation of the EW-MF classification in order to allow for segueing from the EW-MFAcc breakdown to the SEEA-MFAcc standard breakdown.

2. Standard tables

It is not possible to provide a complete and detailed set detailed of standard tables for the material flow accounts at this stage. However a general frame and some principal considerations will be presented and the approach of the specific sub-modules, indicating the main element of the standard supply and use tables for each module will be offered. However the details have still to be elaborated.

Table 1 and 2 show the general frames for a supply and a use tables that will be applied for all SUT based standard tables. The included activities cover the production, the final consumption and the capital formation of the domestic economy. In addition the item controlled landfills has been included as a specific activity that refers to the controlled storage of waste. A further economic activity is the rest of the world (imports or exports). Finally,for describing the interaction with the environment a respective item has been included. For industries the above mentioned environment related standard breakdown is proposed. That holds for also for the classification of products.

Table 1:

Physical supply table (PST)

Tons

Material category	**Classification**	Domestic economy						Rest of the world	Environ-ment	Total
		Production	Final consumption			Gross capital formation	Controlled landfills	Imports		
		Industries (ISIC)	Current final consump-tion	Consumer durables	Total					
Products	CPC									
Ecosystem inputs	EW-MFA questionnaire									
Natural resources	EW-MFA questionnaire									
Residuals	EW-MFA questionnaire									
Total										

Table 2:

Physical use table (PUT)

Tons

Material category	**Classification**	Domestic economy						Rest of the world	Environ-ment	Total
		Intermediary consumption	Final consumption			Gross capital formation	Controlled landfills	Exports		
		Industries (ISIC)	Current final consump-tion	Consumer durables	Total					
Products	CPC									
Ecosystem inputs	EW-MFA questionnaire									
Natural resources	EW-MFA questionnaire									
Residuals	EW-MFA questionnaire									
Total										

Table 3

Combined physical supply and use table

Tons

Use / Supply		Domestic economy							Rest of the world	Environ-ment	Total
		Intermediary consumption		Final consumption			Gross capital formation	Controlled landfills	Exports		
		Products (CPC)	Industries (ISIC)	Current final consum-ption	Consumer durables	Total					
Production	Products (CPC)										
	Industries (ISIC)										
Final consump-tion	Current final consumption										
	Consumer darables										
	Total										
Gross capital formation											
Controlled landfills											
Rest of the world	Imports (CPC)										
Environment											
Total											

Generally it is also useful to integrate the supply and use tables into a combined supply and use table or an input-output table, which directly describe the interactions between the activities (See Table 3). Those tables will also be discussed as far as applicable throughout the handbook. The symmetry between the supply and the use table and between the rows and columns of the PIOT is almost perfect, as all activities appear in both elements of the two pairs

The specific PSUT to be defined for the individual sub-accounts will use the general format of the above supply and use tables. They will deviate from the general format in two aspects:

1. Only selected materials or groups of material will be included
2. The standard breakdown by material or industries might be specifically disaggregated for each sub-account.

The following figure 4 gives an overview over the present state of considerations about the content of the proposed standard tables. Annex B presents some already specified tables (on EW-MFAcc) and some example tables from external sources, to be elaborated further and to be fully integrated into the general framework.

Figure 4:
Standard tables in the SUT format for specific subaccounts

Nb	Module	Supply table	Use table	Material breakdown	Industry breakdown	Tables (see anex)	Remarks
1	**EW-MFAcc**	x	x	All materilas in a detailed breakdown	All flows between the economy and the environment and the rest of the world. No disaggregation by Industry and final use aktivities.	Standard ables	
2	**Agiculture**	x	x	**Products**: all agricultural outputs by type (e.g. food, fibres), important agricultural inputs **Residuals**: selected residuals that are relevant for agricultural production	Disaggregation of the agricultural sector and important delivering (e.g chemical industry, food indudustry) and purchasing sectors (e.g. food industry)		
3	**Forestry**	x	x	**Products**: diferent types of wood (e.g. standing timber, saw logs) and wood products (e.g. sawnwood, pulp, paper,othner wood products) Recycling of wood	Disaggregation of woof production (e.g. manufacture of wood products, pulp, paper, printing, recycling)	Example tables	
4	**Energy**	x	x	**Products**:energy carriers by type in tons and joules **Residuals:** air emissions (see module on air emissions)	Disaggregation of energy relevant sectors (e.g. mining, coal, oil, gas, metal industry, chemical industry, power generation)	See Eurostat Namea Manual for example tables	Results of the respective subgroup will be integrated
5	**Metals**	x	x	**Products**: metals and metal products by type of metal (e.g. metal ores, basisic and fabricated matals), energy inputs	Disaggregation of industries for mining of metal ores, basic metals, fabricated metals by type of metal,	Schematic example table for copper	
6	**Ohter minerals**	x	x	**Products**: other minerals and mineral products by type of mineral (e.g. glas, ceramics, construction materials), energy inputs **Residuals**: selected residuals that are relevant for production of other minerals and related products	Disaggregation of industries for other minerals and related products		
7	**Water and waste water**	x	x	Total water flow (natural resources, product, residual) by type of wate(	Disaggregation of water related activities (ISIC 36, 37, 39)	See example Tables from the SEEAW	To be coordinated with SEEAW
8	**Air emission**	x		Residuals: air emissions by type	Disaggregation of energy relevant sectors (e.g. mining, coal, oil, gas, metal industry, chemical industry, power generation)	See Eurostat Namea Manual for example tables	Results of the respective subgroup will be integrated
9	**Solid Waste**	x	x	The whole waste flow within the economy and to the environment will be shown with a detaqiled breakdown by type of waste	Disaggragation of the specific activities related to waste (ISIC 38)	See example Table from the SEEA 2003	Results of the respective subgroup will be integrated
10	**Water emissions**	x	x	Waste water by degree of treatment	Disaggregation of water related activities (ISIC 36, 37, 39)	See example Tables from the SEEAW	To be coordinated with SEEAW

IV. Structure of the manual

The intended structure of the SEEA-MFA manual is presented below in more detail with a short annotation of the proposed content of each chapter.

Chapter 1 Introduction to the SEEA-MFA

This chapter should cover items like objective and features of SEEA-MFA, political purposes, overview over the accounting system, implementation of the accounts, areas for future work.

Chapter 2 The SEEA-MFA framework

2.1 Basic concepts, principles and characteristics of SEEA-MFAcc

This chapter will widely be based on chapter 1 (General conceptual and methodological framework) and 2 (Characteristics of national material flow accounts) of the OECD manual, but it will be less general and more focussed on the principal task of the SEEA type material

flows accounts of linking the environmental and the economic sphere by coherent hybrid accounts. This chapter will also draw on chapter 3B of the SEEA 2003 (accounting rules).

The basis concepts and principles of accounting for material flows will be provided: units, types of flows, determining the origin and destinations of flows (system boundaries), the material balance principle and law of matter conservation, used and unused materials, direct and indirect flows.

Scope and limitations of the SEEA type material flow accounts will also be discussed.

2.2 The economic system of the SNA

This chapter will mainly draw on chapter 2D of SEEA 2003 (SNA flow accounts). The chapter will give a short description of the features of the SNA accounts that are relevant with respect to SEEA-MFA: demarcation of the economic system, residence principle, economic transactions, products, economic activities, the tool of monetary supply and use tables (SUT) and the input-output tables (IOT), accounting matrix.

2.3 Material flows and the economy

Based on §§ 4.1 (Value flows and material flows: two distinct aspects of human activities), 4.2 (Relation of the economic categories of production, consumption and capital formation to material transformation and accumulation), 4.3 (The importance of production activities in socio-economic material metabolism) and 5.2 (Roles of the different production activities in the circulation of materials by kind) of chapter 3 of OECD volume II.

2.4 The general conceptual framework of physical supply-use and input-ouput tables (PSUT/PIOT)

Physical representation of the monetary SUT, extension by including material flows from and to the environment, matrix style accounts including a general introduction to hybrid flow accounts.

This chapter will mainly be based on chapter 3 (A complete and exhaustive framework for NMFACC) of the OECD manual volume II. It will also regard chapter 3D (Basic supply and use tables for physical flows) and 4A (Introduction to hybrid flow accounts) of the SEEA 2003.

Chapter 3 SEEA-MFA sub-accounts

The practical implementation of the SEEA-MFA is based on a number of specific sub-accounts of the general PSUT framework (the “cube”). The included sub-accounts cover those parts of the system that are most relevant in practice and where practical experiences exist.

For each of the following specific sub-accounts the following topics should to be covered:
- Purpose
- Concept
- standard tables and classifications
- Main accounting aggregates

The issue of main accounting aggregates will be dealt with as a specific research item (see paper by Sjoerd Schenau: Indicators in the SEEA: Identifying the main aggregates in SEEA. This manual will mainly draw on that results.

3.1 EW-MFAcc

This chapter will widely be based on chapter 5 (economy-wide material flow accounting) of the OECD manual, however by applying the “harmonized approach”.

The following issues will be covered: Conceptual issues and the relationship to the general system, main aggregates of the EW-MFAcc, indirect flows and unused materials.

Additionally a section on “raw material equivalents” for trade flows will be provided.

3.2 PSUT for specific materials or group of materials
The specific approaches are described focussing on the specific selection of materials and the disaggregation of products and industries.

3.2.1 Natural resources and related products

3.2.1.1 Agricultural and related products
Reference: German project
t
3.2.1.2 Wood and wood products
Reference: Eurostat forest accounts

3.2.1.3 Energy carriers
Reference: Eurostat NAMEA manual and LG subgroup on energy accounts

3.2.1.4 Metals and related products
Reference: German project

3.2.1.5 Other minerals and related products
Reference: German project

3.2.1.6 Water and waste water
Reference: SEEAW

3.2.2 Residuals

3.2.2.1 Air Emissions
Reference: Eurostat NAMEA manual and LG subgroup energy

3.2.2.2 Waste
Reference: LG subgroup on solid waste

3.2.2.3 Waste water emissions
Reference: SEEAW

Chapter 4 Analytical approaches based on the specific sub-accounts

4.1 Indicators
In this chapter indicators, ratio indicators and indicators derived from economic analysis and modelling, as they will be presented in Part III of the main manual could be addressed. The issues related to this topic will be dealt with in a specific discussion process (see paper by Sjoerd Schenau: Indicators in the SEEA: Identifying the main aggregates in SEEA)

4.2 Hybrid flow accounts.
In this chapter the analytical potential of juxtaposing the data of the physical flow accounts with the corresponding monetary flow accounts will be explored. As precondition it has to be described which monetary flow data are the appropriate reference figures for the material flows. As a basis standard tables for the monetary reference figure have to be specified.

Topics should be: hybrid indicators, decomposition analysis, IOT-analysis, indirect effects, use of hybrid data in scenario modelling. This chapter will mainly draw on chapter 4B (hybrid supply and use tables) and 4C (input-output analysis) of the SEEA 2003 as well as on

chapter 4 (breakdown by activity of the inputs and outputs of the national socio-economic system and the calculation of indirect flows) of the OECD manual.

4.3 Raw material equivalents

The approach for calculating raw material equivalents for trade flows will be described, based on chapter 4 of the OECD manual**.**

Chapter 5 Applying the PSUT tool of SEEA-MFAcc for other types of physical flow accounts

5.1 PSUT for physical service flows (PSFAcc)

The concepts for selected examples of PSFAcc based on the PSUT format will be introduced, like area use and transport services.

5.2 PSUT for material flows related to non-SEEA entities

This chapter will give a short description of non SEEA material flow accounts that are based on the PSUT format, referring to approaches like regional material flow accounts, firm level material flow accounts, substance flow accounts and life cycle analysis and explain its relationship to the SEEA-MFAcc, if applicable. This chapter will mainly draw on chapter 1 of the OECD manual and on OECD manual part I.

Annex A: Classifications

Table A1

Natural resources

A.1 Biomass

- A.1.1 Primary crops
  - A.1.1.1 Cereals
  - A.1.1.2 Roots, tubers
  - A.1.1.3 Sugar crops
  - A.1.1.4 Pulses
  - A.1.1.5 Nuts
  - A.1.1.6 Oil bearing crops
  - A.1.1.7 Vegetables
  - A.1.1.8 Fruits
  - A.1.1.9 Fibres
  - A.1.1.10 Other crops (Spices Stimulant crops, Tobacco, Rubber and other crops)
- A.1.2 Crop residues (used)
  - A.1.2.1 Straw
  - A.1.2.2 Other crop residues (sugar and fodder beet leaves, other)
- A.1.3 Fodder crops incl grassland harvest
  - A.1.3.1 Fodder crops
  - A.1.3.2 Biomass harvested from grassland
- A.1.4 Grazed biomass
- A.1.5 Wood
  - A.1.5.1 Timber (Industrial roundwood)
  - A.1.5.2 Wood fuel and other extraction
- A.1.6 Fish capture, crustaceans, molluscs and aquatic invertebrates
- A.1.7 Hunting and gathering

A.2 Metal ores (gross ores)

- A.2.1 Iron ores
- A.2.2 Non-ferrous metal ores
  - *A.2.2.1.a Copper ores - gross ore (t)*
  - *A.2.2.1.b Copper ores - metal content (t)*
  - *A.2.2.2.a Nickel ores - gross ore (t)*
  - *A.2.2.2.b Nickel ores - metal content (t)*
  - *A.2.2.3.a Lead ores - gross ore (t)*
  - *A.2.2.3.b Lead ores - metal content (t)*
  - *A.2.2.4.a Zinc ores - gross ore (t)*
  - *A.2.2.4.b Zinc ores - metal content (t)*
  - *A.2.2.5.a Tin ores - gross ore (t)*
  - *A.2.2.5.b Tin ores - metal content (t)*
  - *A.2.2.6.a Gold, silver, platinum and other precious metal ores - gross ore (t)*
  - *A.2.2.6.b Gold, silver, platinum and other precious metal ores - metal content (t)*
  - *A.2.2.7.a Bauxite and other aluminium ores - gross ore (t)*
  - *A.2.2.7.b Bauxite and other aluminium ores - metal content (t)*
  - *A.2.2.8.a Uranium and thorium ores - gross ore (t)*
  - *A.2.2.8.b Uranium and thorium ores - metal content (t)*
  - *A.2.2.9.a Other metal ores - gross ore (t)*
  - *A.2.2.9.b Other metal ores - metal content (t)*

A.3 Non metalic minerals

- A.3.1 Ornamental or building stone
- A.3.2 Limestone, gypsum, chalk, and dolomite
- A.3.3 Slate
- A.3.4 Gravel and sand
- A.3.5 Clays and kaolin
- A.3.6 Chemical and fertilizer minerals
- A.3.7 Salt
- A.3.8 Other mining and quarrying products n.e.c.
- A.3.9 Excavated soil, only if used (e.g for construction work)

A.4 Fossil energy carriers

- A.4.1 Brown coal incl. oil shale and tar sands
- A.4.2 Hard coal
- A.4.3 Petroleum
- A.4.4 Natural gas
- A.4.5 Peat

Source: Eurostat MFA questionnaire

Table A2

Imports and exports

B.1 Biomass and biomass products

- B.1.1 primary crops
  - B.1.1.1 Cereals, primary and processed
  - B.1.1.2 Roots and tubers, primary and processed
  - B.1.1.3 Sugar crops, primary and processed
  - B.1.1.4 Pulses, primary and processed
  - B.1.1.5 Nuts, primary and processed
  - B.1.1.6 Oil bearing crops, primary and processed
  - B.1.1.7 Vegetables, primary and processed
  - B.1.1.8 Fruits, primary and processed
  - B.1.1.9 Fibres, primary and processed
  - B.1.1.10 Other crops (Spices Stimulant crops, Tobacco, Rubber and other crops), primary and processed
- B.1.2 Crop residues
  - B.1.2.1 n.a.
  - B.1.2.2 Other crop residues (sugar and fodder beet leaves, other)
- B.1.3 Fodder crops incl grassland harvest
  - B.1.3.1 Fodder crops
  - B.1.3.2 Biomass harvested from grassland
- B.1.4 n.a.
- B.1.5 Wood primary and processed
  - B.1.5.1 Timber, primary and processed
  - B.1.5.2 Wood fuel and other extraction, primary and processed
- B.1.6 Fish capture, crustaceans, molluscs and aquatic invertebrates primary and processed
- B.1.7 n.a.
- B.1.8 Live animals other than in B 1.6., meat and meat products
  - B.1.8.1 Live animals other than in B 1.6.
  - B.1.8.2 Meat and meat preparations
  - B.1.8.3 Dairy products, birds eggs, and honey
  - B.1.8.4 Other products from animals (animal fibres, skins, furs, leather etc.)
- B.1.9 Products mainly from biomass

B.2 Metal ores and concentrates, processed metals

- B.2.1 Iron ores and concentrates, iron and steel
- B.2.2 non-ferrous metal ores and concentrates, processed metals
  - B.2.2.1 Copper
  - B.2.2.2 Nickel
  - B.2.2.3 Lead
  - B.2.2.4 Zinc
  - B.2.2.5 Tin
  - B.2.2.6 Gold, silver, platinum and other precious metals
  - B.2.2.7 Aluminium
  - B.2.2.8 Uranium and thorium
  - B.2.2.9 Other metals
- B.2.3 Products mainly from metals

B.3 Non metalic minerals primary and processed

- B.3.1 Ornamental or building stone
- B.3.2 Limestone, gypsum, chalk, and dolomite
- B.3.3 Slate
- B.3.4 Gravel and sand
- B.3.5 Clays and kaolin
- B.3.6 Chemical and fertilizer minerals
- B.3.7 Salt
- B.3.8 Other mining and quarrying products n.e.c.
- B.3.9 Excavated soil, only if used (e.g for construction work)
- B.3.10 Products mainly from non-metalic minerals

B.4 Fossil energy carriers, primary and processed

- B.4.1 Brown coal incl. oil shale and tar sands
- B.4.2 Hard coal
- B.4.3 Petroleum
- B.4.4 Natural gas
- B.4.5 Peat
- B.4.6 Products mainly from fossil energy carriers

B.5 Other products

B.6 Waste imported for final treatment and disposal

Source: Eurostat MFA questionnaire

Table A3:

Ecosystem inputs

Balancing items: input side

G.1 Gases

G.1.1 Oxygen for combustion processes

G.1.2 Oxygen for respiration (of humans and livestock)

G.1.3 Nitrogen for Haber-Bosch process

Source: Eurostat MFA questionnaire

Table A4:

Residuals

F.1 Emissions to air

F.1.1 Carbon dioxide (CO2)

F.1.1.1 Carbon dioxide (CO2) from biomass combustion

F.1.1.2 Carbon dioxide (CO2) excluding biomass combustion

F.1.2 Methane (CH4)

F.1.3 Dinitrogen oxide (N2O)

F.1.4 Nitrous oxides (NOx)

F.1.5 Hydroflourcarbons (HFCs)

F.1.6 Perflourocarbons (PFCs)

F.1.7 Sulfur hexaflouride

F.1.8 Carbon monoxide (CO)

F.1.9 Non-methane volatile organic compounds (NMVOC)

F.1.10 Sulfur dioxide (SO2)

F.1.11 Ammonia (NH3)

F.1.12 Heavy metals

F.1.13 Persistent organic pollutantsPOPs

F.1.14 Particles (e.g PM10, Dust)

F.2 Waste land filled

F.2.1.a municipal waste - controlled

F.2.1.b municipal waste - uncontrolled

F.2.2.a industrial waste - controlled

F.2.2.b industrial waste - uncontrolled

F.3 Emissions to water

F.3.1 Nitrogen (N)

F.3.2 Phosphorus (P)

F.3.3 Heavy metals

F.3.4 Other substances and (organic) materials

F.3.5 Dumping of materials at sea

F.4 Dissipative use of products

F.4.1 Organic fertiliser (manure)

F.4.2 Mineral fertiliser

F.4.3 Sewage sludge

F.4.4 Compost

F.4.5 Pesticides

F.4.6 Seeds

F.4.7 Salt and other thawing materials spread on roads (incl grit)

F.4.8 Solvents, laughing gas and other

F.5 Dissipative losses (e.g abrasion from tires, friction products, buildin

Balancing items: output side

G.2.1 Water vapour from combustion

G.2.1.1 from water (H2O) content of fuels

G.2.1.2 from hydrogen (H) content of fuels

G.2.2 Gases from respitration (of humans and livestock)

G.2.2.1 Carbon dioxide (CO2)

G.2.2.2 Water vapour (H2O)

Source: Eurostat MFA questionnaire

Annex B: Standard tables

Table B1:

Economy-wide supply and use of material

Domestic economy

Use (input)			**Supply (output)**		
Material category	Classification	Domestic economy	Material category	Classification	Domestic economy
Products (Imports)	EW-MFA questionnaire (Imports and Exports)		Products (exports)	EW-MFA questionnaire (Imports and Exports)	
Natural resources (Domestic Extraction)[1)]	EW-MFA questionnaire		Residuals (excl. Landfilled waste-controlled and balancing items) Emissions to air Emissions to water Dissipative use of products Dissipative losses Waste landfilled-uncontrolled	EW-MFA questionnaire	
Ecosystem inputs (Balancing items input side)	EW-MFA questionnaire		Residuals: balancing items output side	EW-MFA questionnaire	
Memorandum item: Waste landfilled-controlled Change in inventories of not harvested cultivated trees			Memorandum item: Waste landfilled-controlled		

1) Excluding change in inventories of not harvested cultivated trees

Table B2:

Bridge Tables

Use of primary energy by energy carriers:

Primary energy use by the domestic economy (Domestic extraction + Imports)
- Energy use of resident units outside the national economic territory
+ Energy use of non-resident on the national economic territory
= Energy use on the national economic territory

Air emissions by type of air emission:

Supply of air emissions by the domestic economy
- Supply of air emissions by residents outside the national economic territory
+ Supply of air emissions by non-residents on the national economic territory
= Supply of air emissions on the national economic territory

Table B3:

Basis indicators EW-MFAcc

Indicator	**Deduction**
1 Domestic extraction (used) (DE)	
2 Imports	
3 Exports	
4 Direct material input (DMI)	DMI = DE + Imports
5 Domestic material consumption (DMC)	DMC = DE + Imports - Exports
6 Physical trade balance (PTB)	PTB = Imports - Exports
7 Domestic processed output (DPO)	DPO = Exports + Residuals (excl. Landfilled waste-controlled and balancing items)
8 Net additions to stock (NAS)	NAS = DE + Imports + Balancing items (input side) - Exports - DPO - Balancing items (output side)

Additional Tables for EW-MFAcc in raw material equivalents (RME) will be provided

Table B5:

Physical flow tables for wood and wood products for Germany 2004

Supply

Products (units)	Output of industries							Total	Imports	Total
	Forestry & logging	Manufacture of wood products	Manufacture of pulp	Manufacture of paper	Printing	Recycling	Other			
Standing timber (1000 m3 over bark)	90.244							90.244		90.244
Saw logs (1000 m3)	41.113						0	41.113	2.251	43.365
Fuel wood (1000 m3)	12.501						0	12.501	120	12.621
Pulp wood (1000 m3)	5.445						0	5.445	54	5.499
Sawnwood and wood-based panels (1000 m3)		37.222						37.222	9.606	46.828
Other wood products (1000 m3)		17.044						17.044	4.459	21.503
Pulp (1000 t)			13.956					13.956	4.473	18.429
Paper (1000 t)				20.392				20.392	10.574	30.966
Wood waste as a product (1000 t)		17.869					1.399	19.268	1.017	20.285
Paper waste as a product (1000 t)				1.200	0	13.149	0	14.349	2.566	16.915

Use

Products (units)	Intermediate consumption by industries							Total	Final consumption	Capital formation	Exports	Total
	Forestry & logging	Manufacture of wood products	Manufacture of pulp	Manufacture of paper	Printing	Recycling	Other					
Standing timber (1000 m3 over bark)	73.925							73.925		16.319		90.244
Saw logs (1000 m3)		38.730						38.730			4.634	43.365
Fuel wood (1000 m3)							2.504	2.504	10.084		32	12.621
Pulp wood (1000 m3)			4.504					4.504			995	5.499
Sawnwood and wood-based panels (1000 m3)		21.305					13.995	35.299	0	0	11.529	46.828
Other wood products (1000 m3)		0					18.531	18.531	0	0	2.972	21.503
Pulp (1000 t)				17.762				17.762			667	18.429
Paper (1000 t)					9.705	0	9.737	19.442	0		11.524	30.966
Wood waste as a product (1000 t)		15.643	2.470					18.113			2.172	20.285
Paper waste as a product (1000 t)			13.219			80		13.299			3.616	16.915

Table B6:

Physical use table for copper

Material		Use					
		...	Mining of metal ores		Primary processing of		...
			Copper	Other metals	Copper	Other metals	
Metal ores	Copper	physical	physical	physical	physical	physical	physical
	Other metals	physical	physical	physical	physical	physical	physical
Metal ores after primary processing	Copper	physical	physical	physical	physical	physical	physical
	Other metals	physical	physical	physical	physical	physical	physical

Table B7:
Solid waste

Table 3.19 Material flow account for West Germany, 1990

Million tonnes

	Production activities				Consumption activities of households	Produced assets		Non produced natural assets	Rest of the world	Total
	Recycling	External environmental protection services	Other	Total		Consumer durables, inventories, fixed assets, produced natural assets	Controlled landfills			
					Inputs (uses)					
Raw materials	13	3 510	45 707	49 230	280					49 510
Raw matererials used (including. air, minerals)	12	10	1 858	1 880	221					2 101
Raw materials not used			982	982						982
Water raised	1	3 500	42 868	46 369	59					46 428
Products	9	17	5 684	5 710	3 075	854			206	9 845
Residuals	104	4 427	3	4 535			117	49 046	2	53 700
Waste for recycling	104			104						104
Waste for treatment		31	3	34					2	36
Waste for landfill							117			117
Raw materials not used								982		982
Other material discharged								614		614
Waste water for treatment		4 396		4 396						4 396
Waste water discharged								44 847		44 847
Water evaporated								1 566		1 566
Oxygen								226		226
Carbon dioxide								778		778
Other air emissions								34		34
Total inputs	126	7 954	51 394	59 475	3 355	847	117	49 053	208	113 055
					Outputs (supply)					
Raw materials								49 510		49 510
Raw matererials used (including. air, minerals)								2 101		2 101
Raw mat., not used								982		982
Water raised								46 428		46 428
Products	91	0	9 139	9 231		222			393	9 845
Residuals	35	7 954	42 255	50 244	3 355	100				53 700
Waste for recycling	0	6	77	83	4	17				104
Waste for treatment	1	4	18	23	4	8				36
Waste for landfill	1	2	84	87	11	20				117
Raw material, not used			982	982						982
Other material discharged	13	11	515	539	20	56				614
Waste water for treatment	4	0	1 756	1 760	2 636					4 396
Waste water discharged		7 895	36 952	44 847						44 847
Water vaporised	5	22	1 066	1 094	472					1 566
Oxygen			226	226						226
Carbon dioxide	11	12	560	583	195					778
Other air emissions	0	1	19	21	13					34
Total outputs	126	7 954	51 394	59 475	3 355	323		49 510	393	113 056

Source: Stahmer, Kuhn and Braun, 1996.

Source: SEEA 2003

Table B8:
Water emissions

Emission accounts (Chapter 4)

Table A. Gross and net emissions

physical units

Pollutant	Industries (by ISIC categories)							Households	Rest of the world	Total
	1-3	5-33, 41-43	35	36	37	38,39, 45-99	Total			
1. Gross emissions (=1.a+1.b)										
1.a. Direct emissions to water (=1.a.1+1.a.2=1.a.i+1.a.ii)										
1.a.1 Without treatment										
1.a.2 After on-site treatment										
1.a.i To water resources										
1.a.ii To the sea										
1.b. To Sewerage (ISIC 37)										
2. Reallocation of emission by ISIC 37										
3. Net emissions (=1.a+2)										

Table B. Emissions by ISIC 37

physical units

Pollutant	ISIC 37
4. Emissions to water (=4.a+4.b)	
4.a After treatment	
To water resources	
To the sea	
4.b Without treatment	
To water resources	
To the sea	

Source: SEEAW

Table B9

Standard physical supply and use tables for water (Chapter 3)

Physical use table

Physical units

		Industries (by ISIC categories)							Households	Rest of the world	Total
		1-3	5-33, 41-43	35	36	37	38,39, 45-99	Total			
From the environment	**1. Total abstraction** (=1.a+1.b=1.i+1.ii)										
	1.a. Abstraction for own use										
	1.b. Abstraction for distribution										
	1.i. From water resources:										
	1.i.1 Surface water										
	1.i.2 Groundwater										
	1.i.3 Soil water										
	1.ii. From other sources										
	1.ii.1 Collection of precipitation										
	1.ii.2 Abstraction from the sea										
Within the economy	**2. Use of water received from other economic units**										
3. Total use of water (=1 + 2)											

Physical supply table

Physical units

		Industries (by ISIC categories)							Households	Rest of the world	Total
		1-3	5-33, 41-43	35	36	37	38,39, 45-99	Total			
Within the economy	**4. Supply of water to other economic units**										
	of which:										
	4.a. Reused water										
	4.b. Wastewater to sewerage										
To the environment	**5. Total returns** (=5.a+5.b)										
	5.a. To water resources										
	5.a.1. Surface water										
	5.a.2. Groundwater										
	5.a.3. Soil water										
	5.b. To other sources (e.g. sea water)										
6. Total supply of water (=4+5)											
7. Consumption (=3-6)											

Note: Grey cells indicate zero entries by definition.

Source: SEEAW