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Harmonization of all SEEA Physical Flow Accounts into an organic and SNA-coherent system in the light of the OECD Guidance Manual on Material Flow Accounts

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in cooperation with OECD and EUROSTAT

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1 Introduction

1.1 Background

This paper is an updated version of 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 that was presented by the Danish and the German statistical office at the 2nd UNCEEA meeting in June 2007 in New York. The paper summarises the main points where the terminology and general conventions for physical and material flow accounts of the SEEA 2003 differ with respect to the EW-MFA as treated in the OECD guide and the Eurostat Methodological guide and suggests solutions for harmonizing the deviating approaches.

In that meeting UNCEEA generally agreed with the recommendations presented in the paper and requested the London Group to include the "harmonization point" into the list of issues for the SEEA revision. The UNCEEA also recommended: (1) the preparation of a document (SEEA-MFA) – based on the OECD Guidance Manual, but with all SEEA accounts fully harmonized; and (2) the submission of the SEEA-MFA document to the UN Statistical Commission for its adoption. The SEEA-MFA is expected to be jointly published by the UN, Eurostat and OECD.

The purpose of this updated joint issue paper by Karl Schoer (Consultant UNSD), Ole Gravgård (Statistics Denmark) and Aldo Femia in cooperation with OECD and Eurostat is to introduce the latest version of recommendations for harmonization. The draft outline for the SEEA-MFA document is presented in a separate paper. The London Group is asked for discussion and approval or amendment of the proposals of this paper.

This updated version of the paper reflects the results of the discussion with the experts of the Eurostat-MFA task force in November 2007 on the issues of "residence versus territory principle", "cultivated trees" and "waste" as well as contributions by OECD and Eurostat.

1.2 A general premise

SEEA Physical Flow Accounts are not just conversions of the corresponding monetary accounts of the SNA, but substantial extensions of them, as they describe more flows. Indeed, a pure conversion would mean showing only the flows of products in physical terms. In SEEA Physical Flow Accounts two kinds of flows that do not appear at all in the SNA are:

1) flows from the environment (of ecosystem inputs, of natural resources and in some exceptional cases even of residuals) and to the environment (of residuals)
2) internal flows of the economic system which are not flow of products (i.e. flows of residuals).

This premise is essential for understanding the meaning and usefulness of SEEA Physical Flow Accounts, and should be kept in mind throughout the process of their revision.

2 Terminology

2.1 General remarks

Regarding the terminology there appear to be two significant differences between the SEEA 2003 and the OECD guidance manual, the first one refers to using the term physical flow accounts against material flow accounts in the OECD manual for denoting the system of accounting the flows of material between the economy and the environment and within the economy. The second difference refers to using the term economic system in the SEEA against socio-economic system in the OECD manual.

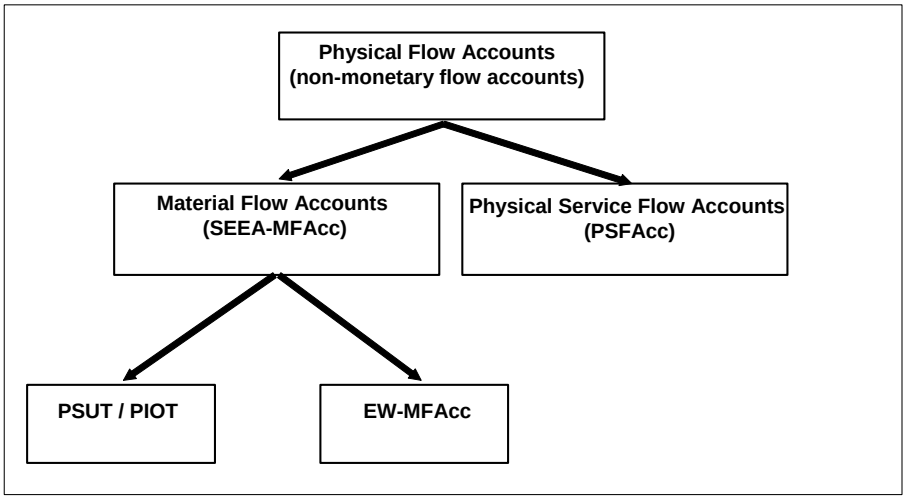
2.2 Physical flow accounts versus material flow accounts (MFAcc)

In SEEA 2003 **physical flow accounts** is used as the general term for describing accounts for flows of natural resources, ecosystem inputs, products (including energy) and residuals. The basic physical flow accounts in SEEA 2003 include physical supply and use tables (PSUT) and physical input-output tables (PIOT). These are, as far as product flows are concerned, "conversions" of the corresponding monetary tables known from SNA into physical quantity units (not only kg, but also units like Joules, cubic metres are applicable). However, the substantial extension is the inclusion of flows between the economy and the environment (ecosystem, inputs, natural resources, residuals) which are more or less related to monetary flows but which do not have a direct monetary equivalent. The **Economy-wide Material Flow Accounts** are included as a sub-account of the physical flow accounts.

The OECD guidance manual uses the term **Material Flow Accounts** and introduces the new acronym **MFAcc** for the accounts it describes. It wants to reserve the term MFA for material flow analysis. The SEEA type physical flow accounts, which concentrate on providing macro- and meso-economic figures at a national level, are included among the MFAcc, but the OECD Guidance Manual takes a broader view by including also other types of material flow accounts at a more detailed level, like specific substance flow accounts, specific ecosystem accounts or life cycle accounts and firm level accounts.

Figure1

Terminology: SEEA Physical Flow Accounts



In relation to the terminologies used by the SEEA 2003 another important but until now almost over-looked issue has to be raised. In the SEEA physical flow accounts are generally defined as non-monetary accounts. Non monetary accounts may in principle include accounts on flows of material as well accounts on service flows in non-monetary units between the environment and the economy as well as environment related service flows

within the economy (**physical service flow accounts**). For example in the German physical flow accounts variables as the use of area (settlement area, living space, traffic area) and transport services (kilometres driven and ton-or person kilometres) have been included by organizing them according to the PSUT format. Also further service flows, like eco-system services, which are difficult to measure, could be covered as well. The inclusion of those variables widens the scope of the accounts towards politically relevant sustainable development indicators. However in the SEEA 2003 chapter 3 there is no explicit mentioning of including physical service flow accounts. This current gap should be considered when deciding on adjusting the terminology for physical flow accounts.

The proposed terminology is summarised in figure 1.

Recommendations:

It is proposed to:

1. *avoid generally any terminological differences between the OECD manual and the SEEA completely.*
2. *use the term "physical flow accounts" in the new SEEA as a generic term for both material flow accounts and physical service flow accounts.*
3. *adopt the acronym SEEA-MFAcc in the new SEEA for material flow accounts, which then will include PSUT, PIOT and EW-MFAcc.*
4. *adopt the acronym EW-MFAcc as proposed by the OECD manual also for the respective sub-module of the SEEA-MFAcc.*
5. *adopt the acronym PSFAcc for physical service flow accounts.*

2.3 Socio economic system versus economic system

The SEEA 2003 gives a clear description of the economic and the environmental sphere:

"The economic sphere is defined in relation to flows covered in the SNA. This means that all flows related to the three types of economic activity in national accounts (production, consumption and accumulation) are included. All products originate within an economy, specifically as the outcome from productive activities. Products may incorporate natural resources. Products are destined to be used in the same period in which they are produced in the production of other products (intermediate consumption), to satisfy final needs (final consumption) or to be used as capital in production of other products over a period of time (accumulation). Each of the three activities can generate residuals, among others, by burning fuel, by contaminating water or simply by discarding products in whole or in part when they are not longer wanted.

The environmental sphere includes all physical entities other than products."[1]

So for the purpose of the SEEA-MFA the economic system is constituted by the production and use of products, i.e. the flow of products. The interaction between the economic and the environmental sphere covers all environmental material flows (eco-system inputs, natural resources and residuals) that are related to product flows.

Unlike in the SEEA the OECD manual uses the term socio-economic system instead of economic system. It is argued that especially the economic transaction of buying a consumer

[1] See: SEEA 2003, chapter 3, para 3.79 and 3.80

good, as it is registered in the SNA, does not cover the whole range of human activities that are related to the use of consumer goods, which is especially apparent in the case of durable consumer goods. By including the environmental flows that occur after the act of purchasing (generation of residuals and e.g. intake of eco-system inputs by human respiration) a much broader view has to be taken on human activities by including also non-economic aspects of the consumption of products[2]. In many cases an appropriate description of those processes of the use of consumer goods have to be more detailed under an environmental perspective than the monetary flows provided by the SNA approach. As far as production activities are concerned the product flows and the related environmental material flows always occur in the same period. Therefore for production there is a perfect match between product flows and the related environmental flows. That holds only to a limited extent for the consumption and the accumulation processes. For those consumer goods (and capital goods) that are not consumed in the same period the related residual flows and also the related flows of eco-system inputs (e.g. oxygen respiration related to the consumption of food) occur in a later period. In order to indicate that the system of material flows described in the SEEA is not necessarily the same as that of economic flows of the SNA the term "socio-economic system" is used in the OECD manual instead of economic system.

It has to be recognized that the described difficulties are existent regarding the consumption processes. However, if the consumption and the subsequent transformation of those goods into waste, air emission or other materials takes place in the same period it is not arbitrary – though not always very much informative - to relate those output flows to the purchase. Even human respiration can in an economic perspective be related to the consumption of food (goods)[3].

The limited match between the economic and the environmental description reflects the goal conflict between an predominantly economic and an predominantly environmentalist perspective and the fact that the material flow accounts should serve both perspectives. Having in mind that the purpose of material flow accounting is not only to mirror the monetary flows in physical terms, but that it has also to describe the environment related flows in a relevant manner with an appropriate degree of detail and based on the principle of mass balancing, it appears to be useful for the depiction of the material flows to disaggregate consumer goods into durables and non durables, as it is suggested in the OECD manual, even if that type of disaggregation is not a priority for monetary accounting.

As far as the relationship between the economic and the environmental system is concerned, a solution would be either to extend the standard monetary accounts in the framework of the satellite system, e.g. by establishing monetary accounts for the flow of durable consumer goods, or to accept, that not all relevant physical flows are matched by a monetary reference figure.

Another point raised in the OECD guide concerns waste accumulated in landfills. This is another kind of flow for which no direct correspondence with monetary aggregates of the SNA can be found. The flow of waste to landfills was put under the heading of flows to capital

[2] It has to be noted that as far as the direct input of natural resources from the environment to private households is concerned that the SNA production boundary considers the extraction of materials from the environment by private households as production of goods for own final use that do not appear in the market (SNA 4.147). That refers for example to the collection of firewood, other non cultivated plants or animals or the direct use of water. The value of the respective output has to be imputed on the basis of the prices of similar goods or services sold on the market.

[3] Putting in relation the value of purchases for consumption with consumption's material flows has the same meaning of putting in relation the value of intermediate inputs and material flows of production. This is very different from putting in relation the value of output and material flows of production, Only in the latter case, efficiency and intensities can be meaningfully calculated. For a parallel to be established for consumption, it might be more appropriate to relate its material flows to non-material physical measures of its useful outputs (eg. person-km travelled per unit of gasoline purchased).

in the example tables of the SEEA 2003. The OECD guide corrects this by defining the "waste in landfills" stock as a separate one from other forms of accumulation (see below section 3.4).

The use of the term *socio-economic* in contrast to the term *economic* is principally correct and would be useful to underline that the SEEA-MFAcc system, comprising all material flows, is a broader one than that of products circulation. However, it seem not necessary to introduce a new term for the SEEA differently from the OECD guide, as the latter still refers to the same system, though broadening the view and depicting it in more detail.

Changing the terminology to "socio-economic system" appears rather to be a mere question of wording and not of broader coverage. Using the term socio-economic might be appropriate for a stand-alone environmental accounting system. However, in view of closely relating the material flow accounting system to an already existing economic accounting system using the term socio-economic would rather give rise to confusion.

A conclusion would be to keep the term economic system, but to make the divergence of economic and environmental transactions in this area more explicit in the SEEA.

Recommendations:

1. *In relation to SEEA-MFAcc it is proposed that the SEEA use only the term economic and not the term socio-economic system.*
2. *It is suggested to disaggregate the material flow accounts in the SEEA by explicitly showing the stocks of consumer durables, as in the OECD guide.*

3 Conceptual issues

3.1 General remarks

As far as the conceptual issues are concerned there appears to be no substantial difference between the OECD guide and the SEEA as far as the SEEA-MFAcc is concerned. But harmonization is required between the SEEA-MFAcc and the EW-MFAcc as it is designed in the OECD manual.

Conceptually the EW-MFAcc has to be viewed as a sub-account of the SEEA-MFAcc, which means that the sub-accounts should follow the same demarcation concepts than the mother accounts. In the SEEA 2003 EW-MFAcc was introduced as an application of SEEA-MFAcc, which implies full conceptual harmonization. However the final recommendation of the SEEA 2003 remained rather vague, as it was mentioned there at several places that in practical accounting there might be some deviation from the strict concepts especially as far as treatment of cultivated crops and trees and the waste disposed in landfills is concerned. The demarcation concepts for EW-MFAcc that are also described in the OECD manual predominantly follow the current deviating accounting practice of Eurostat and of a number of national and international studies in this area.

The principal idea of the SEEA is to extend the monetary description of the economic stocks and flows of the SNA by the environmental dimension. As far as the flows are concerned the SEEA and namely the SEEA-MFAcc aim at including the environmental dimension of economic activities at a detailed level of production and final use activities. That approach relates the material flows from or to the environment to the causing economic activities (economic driving forces). For that purpose it is indispensable that the demarcation of the material flows matches as much as possible the demarcation of the related monetary flows of the System of National Accounts (SNA). The most frequent applications of that type of material flow data refer to the combination of specific PSUT on energy and different types of air emissions with the monetary accounting matrix in the IOT format (hybrid analysis). It is

obvious that mismatch of the demarcations at the branch level, i.e. by applying the residence principle for the monetary and the territory principle to the physical flows, would not yield meaningful hybrid indicators.

Against that EW-MFAcc is used in practice mainly for generating a number of economy wide aggregates which are applied as general indicators for pressures on the environment, like Direct Material Input (DMC), Direct Material Consumption (DMC or Direct Processed Output (DPO)). Those indicators are disaggregated by category of material and are related to GDP only at the economy wide level.

However recent discussions and political strategies, like the European strategy on sustainable development but also several national strategies, e.g. for Germany, stress the importance of those general indicators on material flows, but at the same time demand that those general indicators should be systematically embedded into the accounting system in order to allow for analysing the described pressures in relationship to the causing economic driving forces as an important precondition for designing cost efficient political measures.

The demand for **indicators** that are **embedded in the expanded accounting system** (SEEA / SNA) calls for solving or at least for attenuating the above mentioned goal conflict and to find practical solutions for reconciling both perspectives by harmonizing the demarcation concepts of EW-MFAcc and the SEEA-MFAcc. The opportunity of the SEEA revision process which is now going on should be taken for reconciliation.

For that purpose the current practice of the EW-MFAcc has to be slightly changed in order to make it more coherent with the SNA than it is now. But on the other hand some pragmatic conventions and solutions for the demarcation and implementation of SEEA-MFAcc have to be developed without violating the strict relationship to the SNA.

One important precondition for achieving the proposed **harmonisation** also in **practice** is an intensive cooperation between the national and environmental accountants during the compilation process with the aim of harmonising the basic data, the estimates and assumptions to be employed for calculating the monetary and the physical accounts.

With regard to the EW-MFAcc, depending on data availability, it might not be possible in all cases to fill the new concepts with data in a perfect way. In those cases – comparable to SNA compilation practice - collaboration with all contributing data developers (environmentalists, environmental- and national accountants, and other statisticians) will be required for bridging gaps between the demarcation of the basic statistics and the environmental accounts. Especially important will be a close cooperation with the economic accountants in those cases. If estimates with a rather high degree of uncertainty have to be applied for closing a conceptual gap or if there are no information at all it is very important to assure comparability of the monetary and physical aggregates by at least harmonizing the respective assumptions for compilation. As far as the conceptual changes of the EW-MFAcc are concerned that are proposed below, namely the shift to the residence concept and to the modified harvest approach, it is very likely that estimates can be utilized that have already been developed for the purpose of monetary accounting and which very often may be based on information in physical terms.

The currently existing differences are discussed below.

3.2 Residence versus territory concept

The physical flow accounts of the SEEA2003 follow the residence concept as system boundary which is fully in line with the demarcation of the system boundary of the economy in the SNA. Against that the current EW-MFA as they are carried out by Eurostat and many National Statistical Institutes follow the territory concept.

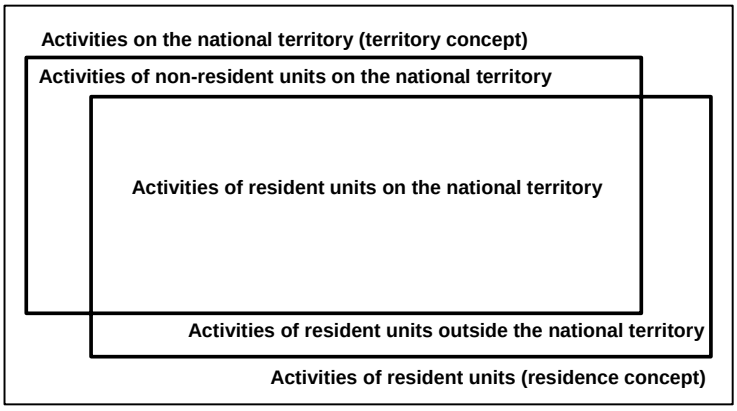
At the Eurostat MFA task force meeting in November 2007 it was agreed that OECD and Eurostat will adopt the residence principle for their respective EW-MFA manuals. Insofar this outstanding harmonization issue can be considered as being solved by now.

The residence concept covers the economic activities of all units that are resident on the national territory (see figure 2). Compared to that, the territory concept includes all economic activities on the national territory. For deducing the residence concept from the territory concept the activities of non-resident units on the territory have to be subtracted and the activities of resident units outside the national territory have to be added.

The difference between the concepts is related mainly to international transport activities (goods and persons) of resident economic units (production branches and private households) and vice versa[4]. In quantitative terms usually only the differences arising from the energy use and air emissions in relation to international transport (especially ships and air planes) may be relevant.

Figure 2

Demarcation of production and consumption activities by the territory and the residence concept



For many countries the quantitative difference between the two concepts may not be very significant. However, at least for Denmark the difference is rather vast for energy due to the substantial amount of fuel bunkered abroad by Danish ships. But also for Norway and the Netherlands the conceptual difference is of high relevance.

Besides international transport as a production activity and related emissions, there are also some other areas like transport by private cars, where the differences between the two approaches might be significant. Some flows other than energy and energy related air emissions, like tyre rub-off, food consumption of private households outside the territory, flows related to embassies, consulates and operation of international organization and flows concerning other non resident units operating in a country for less than one year seem to be rather marginal and could hardly be quantified. They might therefore be neglected in practice.

As far as the figures for energy and air emissions are concerned usually basic figures (e.g. energy balances, emission inventories) that are rather demarcated according to the territory principle are the starting point for the calculations and the conversion into the residence principle is then carried out by using internal material from the national accounts and/or foreign trade balance statistics (among other information on bunker fuels). In some cases an

[4] As an example of a bridge table see the Danish contribution to the last London Group meeting http://unstats.un.org/unsd/envaccounting/londongroup/meeting11/LG11_8a.pdf

accurate conversion might be difficult due to lack of appropriate information in physical or monetary terms. In those cases it should be tried to assure the comparability of physical and related monetary flows as far as possible by coordinating the applied data sources, estimates and assumption of the physical and monetary calculations.

At the European level **bridge tables** were developed and applied between the residence and the territory concept for NAMEA energy and air emissions (specific PSUT for energy and air emissions) – but not for other kinds of physical flow accounts. The NAMEA energy and air emissions tables (breakdown by industry) are demarcated according to the residence concept, but the totals are also available for the territory concept. The reason for showing also results for the territory concept was to provide a clear link to the national and international reporting systems (energy balances, green house gas emissions UNFCCC), which follow rather the territory principle. More comprehensive bridge tables are offered in the OECD manual.

Recommendations

1. It is proposed that the EW-MFAcc are fully demarcated according to the residence principle.
2. In order to provide a link to the national and international reporting systems (energy balances, green house gas emissions UNFCCC), which follow the territory concept, bridge tables from the residence to the territory concept should be provided for energy and air emissions.

3.3 Cultivated crops and trees

It is the aim of the EW-MFAcc to show the inputs of material from the environment to the economy and outputs from the economy to the environment at an economy-wide level. Generally also the current EW-MFAcc applies the system boundary between the economic and the environmental system as it is defined by the SNA concept, except for cultivated crops and trees (semi-natural production).

The growth of cultivated crops and trees is regarded in the SNA as a production process in the economic sense, as the process is organized, managed and controlled by an institutional unit. That concept for cultivated crops and trees is followed by the SEEA 2003 as well as the OECD manual as far as PSUT and PIOT are concerned. Against that, the current EW-MFAcc of Eurostat and as it is designed in the OECD manual uses the “harvest concept” and not the “production concept” of the SNA.

The different approaches for the treatment of cultivated crops and trees are shown in figure 3.

In the **SNA** the produced inputs and the produced output of crops and trees - comprised of the harvested products and the change in inventories – are covered in monetary terms.

The **SEEA** follows that approach by showing the product flows in physical units and by adding the flows related to the production processes from the environment, which are exclusively eco-system inputs like carbon dioxide, nutrients and non produced water, and the residuals which go to the environment - with the exception of some waste flows - (air emissions, waste and produced inputs that are not incorporated to crops and trees).

Against that the current **EW-MFAcc** disregards from the eco-system inputs and instead considers the harvest of crops and trees as in input from the environment to the economy. Thus the borderline between the nature and the economy is defined by the harvest of the

crops and felling of trees. ("harvest approach"). The produced inputs of seed, fertilizers and pesticides and irrigation water for cultivating the crops and trees, which in reality are at least partly incorporated into the plants, are fully regarded as dissipative output to the environment in order to avoid double counting.

There are two reasons for that specific EW-MFAcc approach, the first one refers to the analytical purpose and the second one to data availability. The main purpose of the EW-MFAcc is to provide indicators for the pressure or impact on the environment. The amount of harvested crops and trees appears to be a much more appropriate indicator for the pressures or impacts related to the inputs from the environment than the ecosystem inputs itself. As far as data availability is concerned data on harvested crops and trees are easily accessable. Against that it is difficult to find accurate data on the related ecosystem inputs and the proportions of the produced inputs which are incorporated and which are not incorporated by the cultivated crops and trees[5].

In the following a new accounting convention is proposed for a harmonized SEEA as well as a harmonized EW-MFAcc that tries to reconcile both approaches as far as possible. This proposal takes also up the results of the discussion of the Eurostat MFA task force in November 2007 on the treatment of the production of cultivated trees.

The new convention adopts the "harvest approach" as it is currently used by the EW-MFAcc for semi-natural production processes as a general approach for the SEEA-MFAcc, but in a modified manner. According to the SNA convention the output consists not only of harvested/felled products but includes also the change in inventories. In order to keep coherence with that concept of production the change in inventories of cultivated crops and trees have also to be included into the respective physical flows on the output as well as on the input side[6]. It has to be noted that the change in inventories of output may be of particular relevance for forestry due to the very long production cycles that usually cover some decades. On the other hand, it does not seem likely that other non-harvested crops that are inventories in the SNA sense are of noteworthy relevance in quantitative terms.

By the new convention the semi-natural production processes still are viewed as production processes in the SNA sense. The physical figures on the produced inputs and outputs of the SEEA are not changed by the new accounting convention. That is, the full compatibility with the monetary figure of the SNA will not be disturbed. What will be changed regarding the production process for cultivated crops and trees is the view about what is considered as input from and output to the environment. On the input side an input of natural resources is considered instead of an eco-system input. Insofar the treatment is rather analogue to the production process of extracting non renewable natural resources. As cultivated crops and trees are not included in the current classification of natural resources, that classification has to be amended accordingly by the item semi-natural biotic resources, which is treated as a sub category of biotic natural resources. So in future natural resources will not only comprise non-produced resources but also resources generated in semi-natural production processes[7].

[5] An exception in terms of data availability and usefulness may be carbon-binding by growth of trees, as that information has to be included into the inventories of the international green house gas reporting process. That requirement has lead or will lead to an improvement of the statistical basis for calculating those figures

[6] Information on the changes in inventories should be available at least in monetary terms from the national accounts. Most probably the monetary calculations in that area are even based on physical information.

[7] That is already the current practice in the classification of materials applied for the EW-MFAcc.

Figure 3

Production of cultivated crops and trees

Inputs from		Outputs to	
Environment	**Economy**	**Economy**	**Environment**
SNA Monetary flows			
	Produced inputs (e.g energy, pestizides, fertilizers, produced water)	Harvested crops and trees (products)	
		Change in inventories of non-harvested crops and trees (products)	
SEEA Physical flows			
Eco-system inputs (air, soil minerals, non-produced water)	Produced inputs (e.g energy, pestizides, fertilizers, produced water)	Harvested crops and trees (products)	Output of residuals (air-emissions, waste and produced inputs that are not incorporated to crops and trees (dissipative use))
		Change in inventories of non-harvested crops and trees (products)	
EW-MFAcc Physical flows			
Harvested crops and trees (semi-natural resources)			Output of residuals (air-emissions, waste and produced inputs that are not incorporated to crops and trees (dissipative use))
			Produced inputs incorporated into crops and trees
SEEA harmonized Physical flows			
Harvested crops and trees (semi-natural resources)	Produced inputs (e.g energy, pestizides, fertilizers, produced water)	Harvested crops and trees (products)	Output of residuals (air-emissions, waste and produced inputs that are not incorporated to crops and trees (dissipative use))
Change in inventories of non-harvested crops and trees (semi-natural resources)		Change in inventories of non-harvested crops and trees (products)	Produced inputs incorporated into crops and trees
EW-MFAcc harmonized Physical flows			
Harvested crops and trees (semi-natural resources)			Output of residuals (air-emissions, waste and produced inputs that are not incorporated to crops and trees (dissipative use))
Change in inventories of non-harvested crops excluding trees (semi-natural resources)			Produced inputs incorporated into crops and trees

An alternative approach could be to regard the input of harvested crops and trees as an eco-system input and to amend the classification of ecosystem inputs accordingly. However, as ecosystem inputs are rather treated as balancing item and not for establishing relevant environmental indicators the “natural resource approach” should be preferred.

As far as the output side is concerned, for avoiding double counting, it has to be imputed that those fractions of the produced inputs which in reality are incorporated into the cultivated crops are assigned to the residual category of dissipative use. As this new convention

represents a major and principal change it is suggested to take the decision of adopting it at a preliminary basis and to review the consequences for the PSUT and the PIOT again at a later stage of the revision process.

As far as the EW-MFAcc is concerned it is proposed to adopt the modified harvest approach for cultivated crops by including the change in inventories, but to keep the current pure harvest approach for cultivated trees. That means, there will remain a conceptual difference between the SEEA and the EW-MFAcc as far as the treatment of the change in inventories of non harvested trees is concerned. In order to bridge that gap, it is suggested to show that figure in the EW-MFAcc as a complementary item[8].

The reason for the deviation from the SEEA / SNA concept for that item goes back to the analytical requirements. From an ecological perspective the harvesting of trees represents the main environmental pressure related to the cultivation of trees and a decrease of the specific environmental asset. Against that the growth in the stock of trees can be regarded as an increase of the specific environmental asset. Therefore it seems not to be appropriate to add up those two flows of felling and change in inventories for building a pressure indicator.

In the EW-MFAcc the total **take up of grass by cultivated animals** is also considered as a material input into the economy from the environment. As far a the taking up of wild grass is concerned this would not implicate a deviation from the current SEEA conventions as that flow is already considered as being extraction of natural resources (wild biota). But in addition the taking up of cultivated grass has to be included into the SEEA-MFAcc as well for keeping the consistency of mass balancing which is a constitutive principle for material flow accounting in the SEEA. However, the national accounts do not recognize the uptake of grass by cultivated animals as part of the production value as the production of that grass is considered as an auxiliary activity. So no monetary reference figure is provided by the standard system. However, as that grass is the result of a production process an appropriate solution will be to treat the grass like other crop production. In order to provide appropriate monetary reference figures for the physical accounts the monetary accounts for the agricultural sector within the SEEA satellite have to be disaggregated by showing the production of that grass as a separate production process. Especially from an environmental perspective a disaggeregation of agricultural production activities appears to be very useful anyway.

As far as the distinction used-unused is kept for EW-MFAcc as it is now in the Eurostat guide or extended to the whole of SEEA-MFAcc as in the OECD manual volume II, the items included in practice in EW-MFAcc indicators would not change. It should be clarified on the conceptual level that also so called “unused materials” are activated by economic activities, even though it makes sense to exclude them from some indicators embedded in the system because of their specific meaning.

Recommendations

1. *It is recommended to measure the environmental inputs to the economy for semi-natural production processes (cultivation of crops and trees) in the SEEA generally by the modified harvest approach (harvested biomass plus change in inventories). As this new convention represents a major and principal change for the SEEA-MFAcc it is suggested to take the decision of adopting it at a preliminary basis and to review*

[8]The Eurostat system of forest accounts goes even further. There the forestry branch is split into forestry proper (growing the trees) and a wood harvesting branch, as that institutional setting appears in practice quite frequently. If it is distinguished between harvested and non harvested trees one has all options open for deriving indicators.

the consequences for the PSUT and the PIOT again at a later stage of the revision process.

2. *For the EW-MFA it is recommended in deviation from the general principle not to include the change in inventories of cultivated trees, but to add that figure as a complementary item for assuring consistency with the general SEEA /SNA concept.*

3.4 Waste

The main principle of SEEA 2003 is that the deposition of waste at controlled landfills is regarded as a flow within the economy (destined to the category produced assets)[9]. Waste disposed in controlled landfills does not cross the border to the environment. However emissions from controlled landfill to the environment have to be taken into account.

The OECD Guidance Manual Part II proposes the same approach for the EW-MFA in accordance with the recommendation of Eurostat Task force on Material Flow accounting.[10] But that specific flow is not assigned as change in the stock of produced assets, but to the specific category "controlled land fills". This is a change in relation to how waste flows to controlled land fills earlier on was treated in EW-MFA.

Following the OECD approach on waste flows for EW-MFA will assure full consistency between EW-MFA and the SEEA.

Recommendations

1. *The disposal of waste to controlled landfills should as standard be treated as a flow within the economic system and not as a flow to the environment. It is suggested to introduce in the SEEA the "waste in landfills" kind of stock as separate from other forms of accumulation and explicitly show the flows to this stock, as in the OECD guide.*
2. *In addition it is suggested to add the principal waste flows (waste generation, treatment and recycling) as memorandum item to the EW-MFA.*

[9] However, SEEA 2003 leaves also the option for EW-MFA for treating the waste disposed on controlled landfills as a residual to the environment.

[10] On page 82 this is said explicitly: "*The flow of waste to controlled landfills is in principle considered as an internal flow of the socio-economic system, exactly as in the accounts of Chapter 3*" (i.e. in the PSUT, PIOT).