

## London group on Environmental accounting

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# SEEA-CF research agenda: a note on Ew-MFA and physical use and supply tables

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### Background and purpose of this paper

The SEEA-CF Central Framework Research Agenda (CF RA) includes among the “implementation issues” to be tackled the following one:

#### **3. Economy wide material flow accounts**

**Lead agency: OECD, ISTAT**

The purpose of economy-wide material flow accounts (EW-MFA) is to provide an aggregate overview, in tonnes, of the material inputs and outputs of an economy, including inputs from the environment, outputs to the environment, and the physical amounts of imports and exports. There are several differences in treatment between EW-MFA and the physical supply and use tables, as described in SEEA CF. SEEA CF now provides a short text on these issues (section 3.3.6). A short note is needed for further clarification of the issue, pointing out the alternative solutions and possibilities for review of the SEEA CF Text. One issue the note should address is the different uses of EW-MFA and PSUTs. This could also be a long-term issue.

*From Schenau, S., “The Research agenda for the SEEA CF”, 2016, page 9,  
<https://unstats.un.org/unsd/envaccounting/londongroup/research.pdf>.*

The present paper provides the required *further clarifications of the differences in treatment*, and reflects on the *alternative solutions and possibilities for review of the SEEA CF text*. We deal with the issue mainly from a conceptual point of view, though showing with a numerical example what the solution we propose could imply in terms of implementation<sup>1</sup>.

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<sup>1</sup> According to the CF RA, “in a lot of cases, the issues of implementation and conceptual issues are closely inter-related and may need to be addressed concomitantly” (page 2). The present one is clearly one of those cases.

It is worth recalling here that the LG tackled the issue before the SEEA CF was written. This was done in occasion of the presentation of OECD's work on MFA and Resource Productivity at the 2007 Johannesburg and Rome meetings and subsequently (and most notably) in 2008 in Brussels, by Karl Schoer, whose issue papers thoroughly dealt with the core aspect of the issue dealt with in the present paper<sup>2</sup>. Also the UNCEEA discussed, in 2007, a paper dealing with the discrepancies between Ew-MFA and the SEEA (2003 – but the issue was not much different then)<sup>3</sup>.

### Causes of the differences in treatment of Ew-MFA and PSUTs

Section 3.6.6 of the SEEA CF states that Ew-MFA are “well aligned with the PSUT” (§3.280), but – due to their specific “macro purpose” and focus on the overall mass of materials and residuals – “practical choices on treatment have been made so that flows within the Ew-MFA system can be estimated more straightforwardly”. These choices would imply some “Differences in treatment between EW-MFA and PSUT” (SEEA CF subtitle at page 92). In this sub-section, only two differences are pointed out<sup>4</sup>. The first one concerns international trade (§3.282), the other concerns flows associated with (cultivated) biological resources (§3.283).

As for the one concerning international trade, it should be noted that the adoption of the residence principle in Ew-MFA, coherently with the general prescription of the SEEA CF, is nowadays explicit both in guidance documents and in compilation exercises (especially in official statistics). It is widely recognized that fuels used in international transport are by far the most important item to be considered for the adjustment of trade statistics figures (usually complying with a territory principle), and indeed the European Regulation and Questionnaire foresee mandatory items for the adjustment of fuel flows between economies. We carried out a comparative analysis of Eurostat's Ew-MFA Methodological Guide of 2001 and the most recent version (2013) of Eurostat's Ew-MFA Compilation Guide, on the one hand, and of the SEEA CF on the other hand, and were not able to identify any significant deviation of Ew-MFA from the general SEEA CF principles of physical accounting in respect of international trade. Also in the practice of Ew-MFA, based on our working knowledge of physical accounts, we see no major deviations. There is in fact no reason why Ew-MFA compilers, willing and able to do so, should not include adjustments other than concerning

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<sup>2</sup> Johannesburg: LG/11/9 *Links between OECD Manual on MFA and SEEA-2003* (A. Femia on behalf of OECD); Rome: LG 12/2 *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* (K. Schoer, O. Gravgård and A. Femia in cooperation with OECD and Eurostat),

[https://unstats.un.org/unsd/envaccounting/londongroup/meeting12/LG12\\_2a.pdf](https://unstats.un.org/unsd/envaccounting/londongroup/meeting12/LG12_2a.pdf);

Brussels: LG13/2a *Treatment of cultivated biological resources in SEEA-MFA* (K. Schoer, UNSD Consultant) and *Classifications of Material Flows for SEEA-MFA* (K. Schoer, UNSD Consultant)

[https://unstats.un.org/unsd/envaccounting/londongroup/meeting13/LG13\\_2a.pdf](https://unstats.un.org/unsd/envaccounting/londongroup/meeting13/LG13_2a.pdf)

<sup>3</sup> “Clarifications and recommendations concerning differences between the OECD guidance manual on material flows and resource productivity, Volume II and the SEEA 2003”, paper by Karl Schoer and Ole Gravgård presented by the Danish and the German statistical office at the 2nd UNCEEA meeting in June 2007 in New York. [https://unstats.un.org/unsd/envaccounting/ceea/meetings/UNCEEA\\_2\\_11.pdf](https://unstats.un.org/unsd/envaccounting/ceea/meetings/UNCEEA_2_11.pdf)

<sup>4</sup> We do not know of, nor can think of, any additional one, but for the different use of language and especially of the term “unused extraction”, which is in the SEEA CF limited to “resources over which the extractor has no ongoing interest”, excluding “losses during extraction” and “rejections” (see SEEA CF §3.50), which are part of “unused” materials in Ew-MFA.

fuels, as dictated in principle by SNA and SEEA CF methodology, if they deem them relevant enough. Unless some actual case of difference in treatment is identified, our suggestion is therefore to simply **delete §3.282 of the SEEA CF**, where the problem is raised, and emphasize, in the documents specific to Ew-MFA, that their compilation should be fully compliant with the provisions of the SEEA CF (section 3.3), with specific reference to the treatment of goods sent abroad for processing and repair and of merchanting (it can also be noted that the goods travelling for processing are explicitly dealt with in Eurostat's Ew-MFA Compilation Guide of 2013, as a case where Ew-MFA should not deviate from the deviation from SNA principles established by the SEEA CF for the physical accounts).

As for the flows associated with cultivated biological resources, the SEEA CF explains the different approach of Ew-MFA in the following way: “the flow from the environment to the economy is recognized at the point of harvest rather than as growth occurs” (§3.283). It also notes, remarkably, that “Since the harvested amounts can be more easily measured at an aggregate level, the different boundary is appropriate for Ew-MFA purposes”. Indeed, the “standard” PSUTs approach is mechanically coherent with the SNA. According to it, cultivated plants belong to the economic system: the seeds themselves belong to the economic system and do not leave it when they are sown (provided they do germinate); as the seeds start to germinate and as long as they suck substances from the soil and atmosphere through their radical apparatus and leaves, they extract materials and energy from the natural environment and bring them into the economic system to which they belong. Ew-MFA adopts a more pragmatic approach, based on available data on production of cultivated biological resources.

In summary, the *difference in treatment* is due to the adoption of a different system boundary as for cultivated plants<sup>5</sup>. The one important thing to highlight here is that in this case the Ew-MFA outer system boundary is internal to the SNA-coherent one of the PSUT. Since all the other parts of the system boundary coincide, we can say that in general the Ew-MFA boundary is non-external to the PSUT one. The Ew-MFA system boundaries define a sub-system of the wider one described by the PSUT.

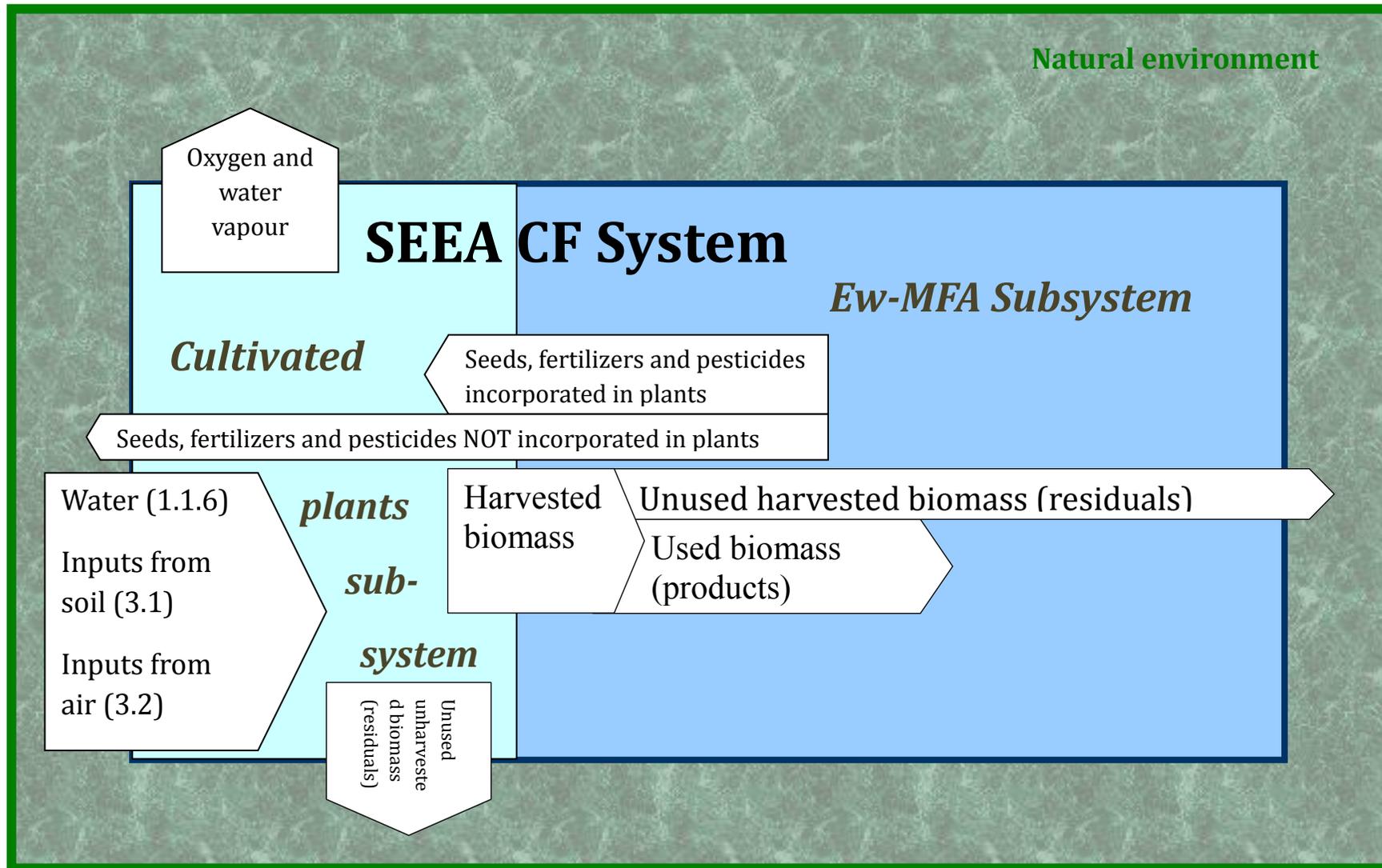
As a consequence, as depicted in figure 1:

- Some flows that are internal for the SEEA CF reference system, are exchange flows with the outer world of the Ew-MFA system (Harvested biomass as inputs; Seeds and fertilizers and pesticides incorporated into plants as outputs).
- Some flows that are cross-boundary for the SEEA CF reference system, are not considered in Ew-MFA, as they are completely external to it (Water, Inputs from soil and from air to cultivated plants; Oxygen and other residuals output to the environment by cultivated plants).

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<sup>5</sup> This clearly has important consequences in terms of implementation (*methods of data collection/compilation*) but in this sense the issue at hand has an exquisitely conceptual aspect.

**Figure 1. The Ew-MFA reference system and cultivated plants as complementary subsystems of the SEEA CF reference system**



Moreover, it can be noted that:

- The flow of harvested biomass entering the Ew-MFA subsystem has two components: products and residuals, respectively called “used” and “unused” biomass in Ew-MFA language.
- The seeds and fertilizers and pesticides that are not incorporated into plants are outputs to nature whatever the system boundary.

Based on this, **we propose that Ew-MFA be recognized as an application of the SEEA CF. This means showing how Ew-MFA characteristic aggregates (DE, DMC, DMI, DPO...) fit in, and can be derived from, PSUTs.**

### Karl Schoer’s work

The conclusions we reached so far are not new. Indeed, they are the same as those reached 10 years ago by Karl Schoer. He proposed the following schemes (Figures 2 and 3) to depict the difference between the SNA-coherent “ecosystem approach” and the “harvest approach” (the figures in the arrows are a numerical example derived from the 1990 PSUT for Germany):

Figure 2

### Material flows of plant cultivation: “ecosystem approach”

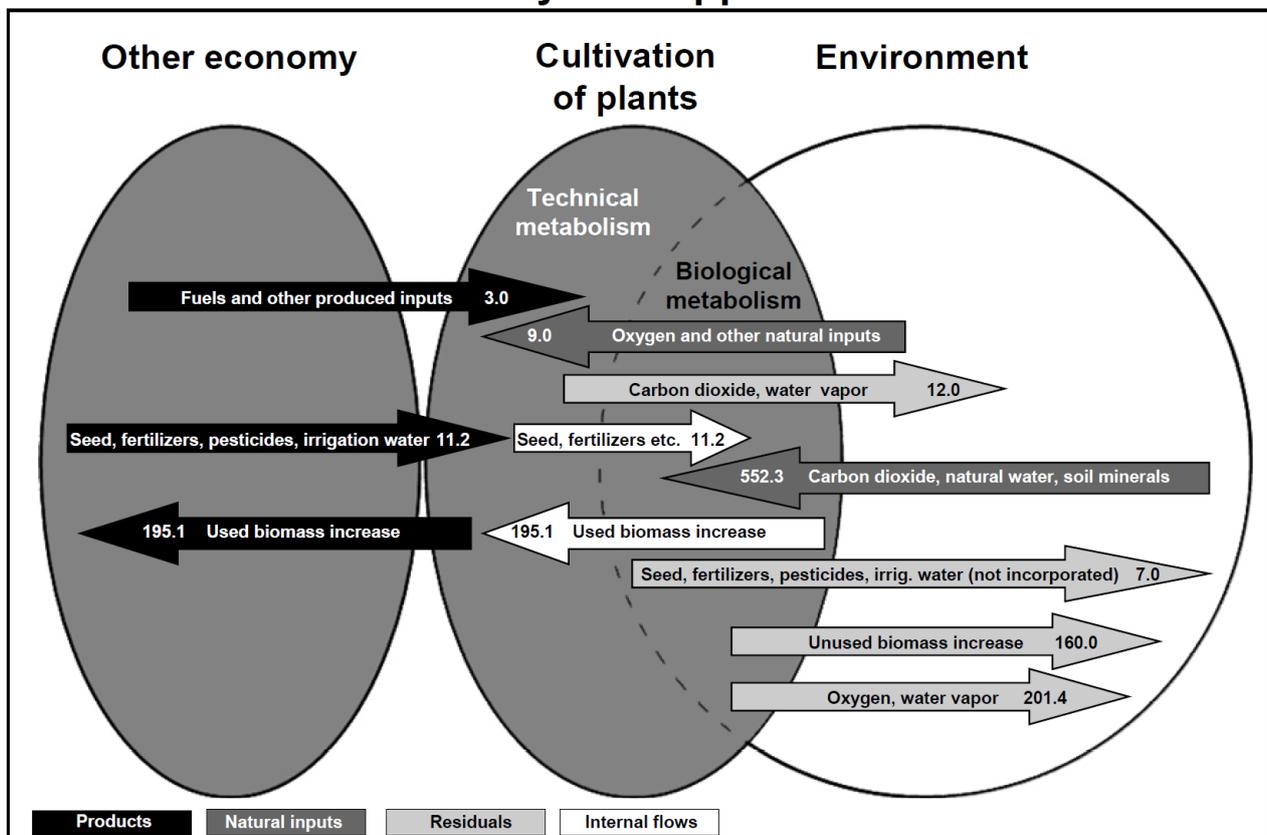
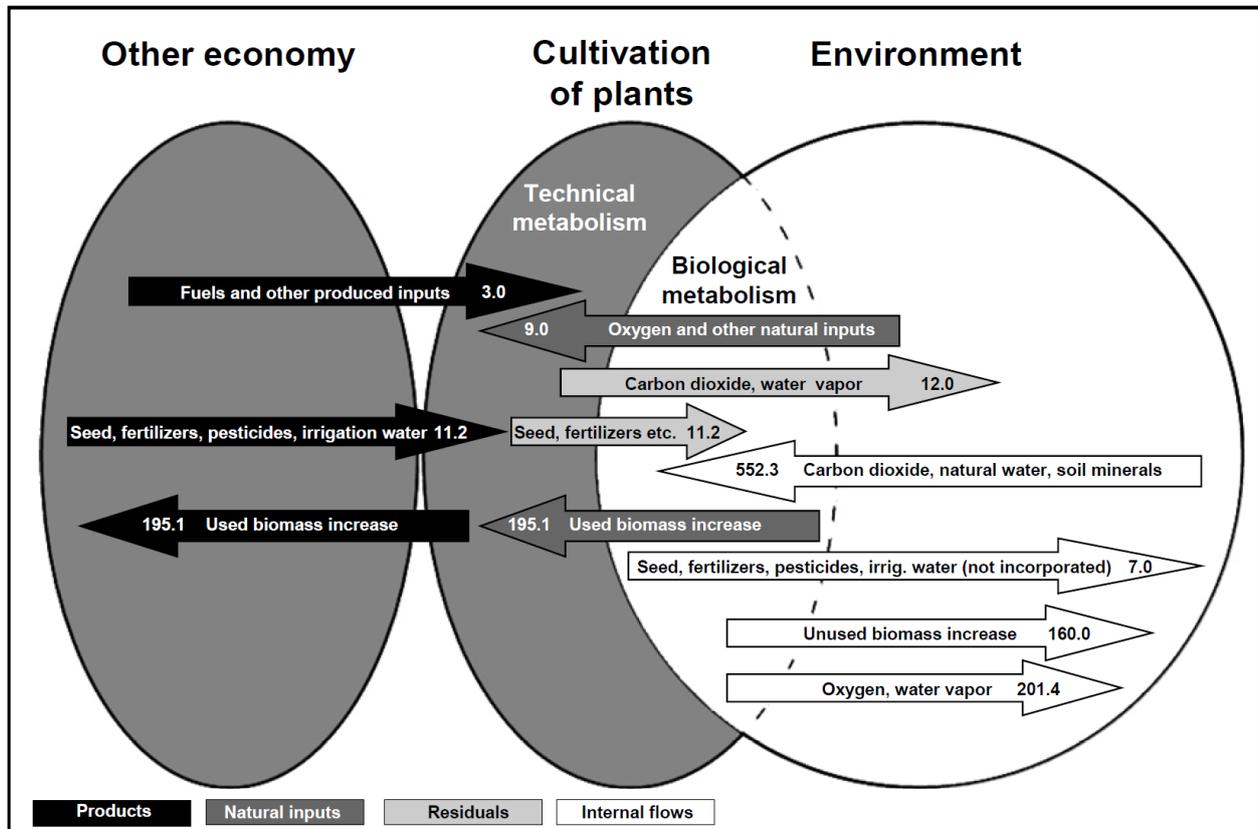


Figure 3

### Material flows of plant cultivation: “harvest approach”



The only difference with our reasoning concerns the representation of the “Unused biomass”, which should at least partly be included in the harvested biomass. Should we use the same representation, we would have an additional “unused biomass – 160.0” leftbound arrow from the overlap area to the grey part of “Cultivation of plants”, and the existing rightbound arrow concerning the same flow – seen as a residual - would start from the “Cultivation of plants” area. This is more in line with the fact that the SEEA CF includes the substances embedded in unused biomass no less than those embedded in used biomass, as well as with our idea that Ew-MFA does not (or should not) only concern used materials, as its holistic (“macropurpose” in the SEEA CF) view is impoverished by this limitation.

Karl Schoer also provided his numerical example in the following tables (Figure 4):

**Figure 4**

**Approaches for recording material flows of plant cultivation**

mn tons

**"Ecosystem approach"**

Inputs		Outputs	
<b>Product flows</b>			
<b>Products</b>	<b>14.2</b>	<b>Products</b>	<b>195.1</b>
Seed, fertilizers, pesticides etc.	11.2	Biomass increase (used)	195.1
Other products	3.0		
<b>Non-product flows</b>			
<b>Natural inputs</b>	<b>561.3</b>	<b>Output to the environment</b>	<b>380.4</b>
Carbon dioxide, natural water, oil minerals etc.to biological metabolism	552.3	Oxygen, water vapor from biological metabolism	201.4
		Seed, fertilizers etc. from biological metabolism (not incorporated)	7.0
		Unused biomass increase from biological metabolism	160.0
Oxygen etc. to technical metabolism	9.0	Carbon dioxide, water vapor from technical metabolism	12.0
<b>Total</b>	<b>575.5</b>	<b>Total</b>	<b>575.5</b>

**"Harvest approach"**

Inputs		Outputs	
<b>Product flows</b>			
<b>Products</b>	<b>14.2</b>	<b>Products</b>	<b>195.1</b>
Seed, fertilizers, pesticides etc.	11.2	Biomass increase	195.1
Other products	3.0		
<b>Non-product flows</b>			
<b>Natural inputs</b>	<b>195.1</b>	<b>Output to the environment</b>	<b>23.2</b>
Biomass increase ( used) from biological metabolism	195.1	Seed, fertilizers etc.(incorporated and not incorporated)	11.2
Oxygen etc. to technical metabolism	9.0	Carbon dioxide, water vapor from technical metabolism	12.0
<b>Total</b>	<b>218.3</b>	<b>Total</b>	<b>218.3</b>

**Terminology issues**

We have been talking about “unused biomass”, referring to the part of cultivated biological resources that are harvested but not incorporated into products. It should be noted that these are not currently highlighted as an individual item in the SEEA CF and do not belong to the “natural resource residuals” category of the classification of natural inputs (also present in the list of *Groups of residuals* – pp. 51-54). Instead, “vegetable wastes” feature among the typical components of the “solid waste” Group of residual.

Another language problem concerns the fact that Domestic Extraction (DE) of Ew-MFA is often said to measure the inputs “coming directly from the natural environment” to the national economy. This description of the item gives the idea that DE measures Natural Resources extraction. However, it should be noted that, in general, the items composing the aggregate Domestic Extraction (DE) of Ew-MFA are not natural resources: even if the composition of the material still is the same or very similar to the “natural” one, they represent and measure something that has been extracted or harvested, and selected, i.e. that comes after an economic production process. The very data sources we use provide

production data and use classifications of products<sup>6</sup>. The description of the Ew-MF Account as an application (a derived account) of the more general PSUT scheme would be easier if it was acknowledged, once and for all, that this application concerns flows of primary products, as far as the DE is concerned, and of products *tout court* as far as all components of DMC are concerned.

### OECD's 2008 schemes and proposed Ew-MFA/PSUT "bridge tables"

The description of the differences reported above, made by Karl Schoer, in turn built on the work which had been done in 2006 by the OECD and that was published in 2008 in "Measuring Material Flows and Resource Productivity – Volume two: the accounting framework".

At the time that work was done, the European Regulation 691/2011 and the SEEA CF (2012) did not exist. The changes introduced by these two pillars of Environmental Accounting that interests us here are only those having an impact on the correctness of the description of the economic system and its material flows ("societal metabolism") contained in OECD's 2008 document. These concern only:

- the classification of what are now known (SEEA 2012 language) as *Natural Inputs*, formerly known (SEEA 2003 language) as "Ecosystem Inputs" and "Natural Resource Inputs";
- the introduction in Ew-MFA of the adjustments for the residence principle (as mandatory item in the European Regulation). These adjustments were not considered worthy doing in most pre-existing implementations of Ew-MFA, and Eurostat's Methodological Guide of 2001 did not give much importance to these items, suggesting that "the effort to estimate such flows only for purposes of economy-wide MFA and balances could be difficult to justify" (§3.27, page 19)<sup>7</sup>.

The reconciliation tables proposed by the OECD in 2008, as well as the PSUT and PIOTs schemes proposed in that publication, could be easily modified in order to take these changes into account. A reformulation of the rows of these tables using the Ew-MFA classifications now in use would be part of this "reconciliation" exercise of Ew-MFA and PSUTs.

### Questions to the London Group

Is the proposed treatment of cultivated biological resources ok?

Are there other issues of coherence between Ew-MFA and PIOT that need clarification?

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<sup>6</sup> The only exception may concern non-cultivated grass grazed by cultivated animals.

<sup>7</sup> All the rest of the in-depth and extensive treatment of material flows included in that document remains substantially valid, and still provides a useful description of how the flows of materials between different activities within the economic system can be treated in an SNA-coherent way, through PSUTs and PIOTs, at various aggregation levels.