SIXTH FRAMEWORK PROGRAMME
PRIORITY [policy-oriented research priority SSP 5A]

SPECIFIC TARGETED RESEARCH OR INNOVATION PROJECT

FORWAST

Overall mapping of physical flows and stocks of resources to forecast waste quantities in Europe and identify life-cycle environmental stakes of waste prevention and recycling

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Indirect procedures for estimation of transfer coefficients

Authors:
Gerold Hafner, Heiko Schuller

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1. Introduction

This subreport compares and describes the function of the Product transfer coefficients.
The objective of WP3 is to obtain detailed, validated data for four specific countries. Germany, Austria, Denmark and France. The data mining in WP3 contains the following steps:

- Definition of the operational data structure in relation to WP1 und WP2.
- Collection of statistics and other data in Austria, Denmark, France and Germany.
- Comparison and verification of the acquired data.
- Identification of missing data.
- Collection / substitution of missing data for individual sectors.
- Check for plausibility and perform data reconciliation.
- Elaboration of coefficients and indicators for subsequent working packages (esp. WPs investigating scenarios and forecastings).
- Identification of potentials and difficulties for completing the data collection.

The deliverables within WP 3 are:

- D3-1: Report chapter describing data processing and validation.
- D3-2: Databases of material flows and stocks for the four countries.
- D3-3: Report chapter containing indirect procedures for estimations of transfer coefficients.
- D3-4: Report chapter describing potentials and difficulties for completing the data collection.

2. Context within FORWAST

As mentioned in the previous chapter, the objective of WP3 is to obtain detailed, validated data for the specific countries: Austria, Denmark, France and Germany. The ambition is to create a core of data which will be more detailed than for the EU 27. Within the project structure of FORWAST, WP3 interacts with the other working packages as shown in Erreur ! Source du renvoi introuvable..

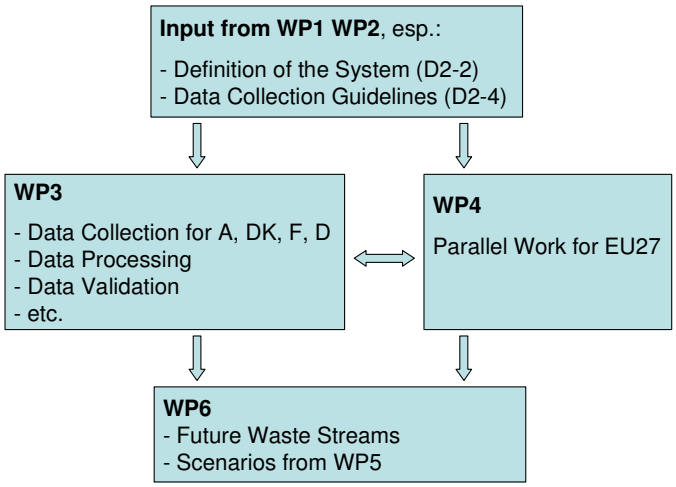

Figure 1 Project Structure

Relevant outcomes for WP3 (and WP4 as well) - resulting from WP1 and WP2 – are, among others:

- Overall Calculation Model
- Identification of relevant Materials and Products
- Definition of Terms
- Definition of Data Structure
- Definition of System Boundaries
- Harmonisation of Data

Interaction between WP3 and WP4 is necessary in order to ensure a congruent and coherent data base for EU27. Therefore partners of WP3 and WP4 exchange experiences within periodical project meetings and data mining-workshops. Exchange of experiences and synergetic effects result from the interaction not only within WP3 and WP4 but also by giving feedback to WP2.
Outcome of WP3 is a verified and coherent data base for the above mentioned four countries, suitable to be used for the estimation of future waste streams (WP6) within scenarios elaborated in WP5.

3. Indirect procedures for generating the transfer coefficients

Within the FORWAST-model several transfer coefficients are used which are represented by the respective matrices. Within the context of this deliverable two of them are focused: Product transfer coefficient matrix (D) and Resource transfer coefficient matrix (F_0).

The product transfer coefficients are calculated within the D-Matrix. Therefore transfer coefficients from D_1-Matrix are used. In most cases the exact transfer coefficients are not known. In that case, the transfer coefficients have to be generated by indirect procedures.

This is controlled by user input in the $\mathbf{D_1}$-matrix. Either the exact transfer coefficient is filled in or one of the values [0] and [1].

For each product supplied by an activity, the proportion of the total resource input to the activity present in the product (excluding the amount that is lost as direct emissions).
The respective data is filled in the $\mathbf{F_0}$-matrix and used for further calculations as described below (cf chapter 3.2). The functionality of the FORWAST-model related with the transfer coefficients of resources is the same as described above for the $\mathbf{D_1}$-matrix: either the exact transfer coefficient is filled in or one of the values [0] and [1].

The subsequent chapters describe the function of the above mentioned matrices in detail.

3.1 Input data for product transfer coefficients (D_1)

In order to calculate the D matrix first the $\mathbf{D_1}$-matrix is needed.

The $\mathbf{D_1}$-matrix shows for each product input used by an activity, whereas the product will be present in the product supplied by the activity ($\mathbf{V'_T}$). In the $\mathbf{D_1}$-matrix mostly two values can be found: 0 and 1. The value = 0 means that the product is not present in the supply table $\mathbf{V'_T}$, the value = 1 means that the product will be present in the supply table $\mathbf{V'_T}$. If the value is between [0] and [1] this indicates, that the share of product input used by an activity is known and given. Nearly nowhere in the $\mathbf{D_1}$-matrix of Austria, Denmark, France and Germany a cell with a value between [0] and [1] can be found – apart from a few cells.

The above mentioned supply table (**V**) contains product supply per human activity. There are different types of supply tables which specify the product supply in monetary (here: million Euro in the year 2003 MEUR2003) or physical units (here: Giga gram Gg) for all materials. For calculating the $\mathbf{D_1}$-matrix we use the supply table in physical units ($\mathbf{V'_T}$).

In **Figure 2 D1-matrix (screen shot of the German Table)** you can see a part of a $\mathbf{D_1}$-matrix. Every cell includes the value [0] or [1]. It shows for example, that there is “Bovine meat an milk” in the products supplied by the production of Bovine meat and milk or there are also “Grain crops, Crops n.e.c., fish, meat and fish products, dairy products, fruits and vegatables, flour, sugar, animal feeds, food preparations n.e.c. and beverages” but no for example “forest products” in the products supplied by the production of Bovine meat and milk.
As mentioned above, the D1-Matrix defines which products are used by an activity and which intermediate products stay present in the final good.

As an example, the surplus of biomass regarding cattle originates from animal feeds and grazing which means, these goods, like animal feed and other biomass, which are eaten by cattle, stay present in the end product. Due to the fact, that the proportion is unknown a “1” is entered in these cells.

Another example are process chemicals and fuels. These materials are very important for the industry but do not stay present in the final good. Therefore a “0” has to be entered in these cells.

According to this methodology every column for each aktivity in the $\mathbf{D_1}$-matrix is build.
As mentioned above e.g. the French $\mathbf{D_1}$-matrix includes just a few values between [0] and [1]. For example the product fish is presented to 36.8 % (0.368) in the product supplyed by the activaty meat and fish products. You can see this in **Figure 3** D1**-matrix (screen shot of the French Table)** the marked cell.

Service activities like agriculture services or recycling services have no physical output, (except emissions and waste) which can be sold. They need a product input but they are not building products. So these columns of the $\mathbf{D_1}$-matrix simply consist of [0].
Services also cannot be a physical product. The product recycling does not exist. The raws of this “service products” are marked gray that means, that corresponding value always has to be [0] (see **Figure 2 D1-matrix (screen shot of the German Table)** and **Figure 3**, agriculture service and recycling of waste).

The $\mathbf{D_1}$-matrix was developed by 2.-0 LCA consultants. The main target was to generate a product transfer coefficient matrix with default values. Each partner was asked to make adjustments or recommendations.
The project partners were allowed to adapt the $\mathbf{D_1}$-matrix to the national production. In the German and Austria Supply and Use Tables it was absorbed from Denmark without changes. Only some French values of $\mathbf{D_1}$-matrix have been adapted.

		Activity No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
NACE No.	Product No.	Activities / Products	Bovine meat and milk	Pigs	Poultry and animals n.e.c.	Grain crops	Crops n.e.c.	Agricultural services n.e.c.	Forest products	Recycling of waste wood	Fish	Coal, lignite, peat	Crude petroleum and natural gas	Iron ores from mine	Bauxite from mine	Copper from mine	Metals from mine n.e.c.	Sand, gravel and stone from quarry	Clay and soil from quarry	Minerals from mine n.e.c.	Meat and fish products	Dairy products	Fruits and vegetables, processed	Vegetable and animal oils and fats	Flour	Sugar
Input data for Product Transfer Coefficients (D_1)																										
1.21	1	Bovine meat and milk	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
1.23	2	Pigs	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
01.24+01.25	3	Poultry and animals n.e.c.	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
01.1(disaggr.)	4	Grain crops	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
01.1(disaggr.)	5	Crops n.e.c.	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1
01(disaggr.)+01.4+01.5	6	Agricultural services n.e.c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	7	Forest products	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
90(disaggr.)	8	Recycling of waste	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	9	Fish	1	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
10	10	Coal, lignite, peat	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	11	Crude petroleum and natural gas	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
13.1	12	Iron ores from mine	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
13.2(disaggr.)	13	Bauxite from mine	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
13.2(disaggr.)	14	Copper from mine	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
13.2(disaggr.)	15	Metals from mine n.e.c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
14.1+14.21	16	Sand, gravel and stone from quarry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
14,22	17	Clay and soil from quarry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
14.3+14.4+14.5	18	Minerals from mine n.e.c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
15.1+15.2	19	Meat and fish products	1	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0
15,5	20	Dairy products	1	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0
15,3	21	Fruits and vegetables, processed	1	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
15,4	22	Vegetable and animal oils and fats	1	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0
15,6	23	Flour	1	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
15.83	24	Sugar	1	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1
15,7	25	Animal feeds	1	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15.8(ext.)	26	Food preparations n.e.c.	1	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
15,9	27	Beverages	1	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	28	Tobacco products	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	29	Textiles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure 2 D1-matrix (screen shot of the German Table)

		Activity No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
NACE No.	Product No.	Activities / Products	Bovine meat and milk	Pigs	Poultry and animals n.e.c.	Grain crops	Crops n.e.c.	Agricultural services n.e.c.	Forest products	Recycling of waste wood	Fish	Coal, lignite, peat	Crude petroleum and natural gas	Iron ores from mine	Bauxite from mine	Copper from mine	Metals from mine n.e.c.	Sand, gravel and stone from quarry	Clay and soil from quarry	Minerals from mine n.e.c.	Meat and fish products	Dairy products	Fruits and vegetables, processed	Vegetable and animal oils and fats	Flour	Sugar	Animal feeds	Food preparations n.e.c.	Beverages	Tobacco products
Input data for Product Transfer Coefficients (D_1)																														
1.21	1	Bovine meat and milk	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0
1.23	2	Pigs	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	1	0	0
01.24+01.25	3	Poultry and animals n.e.c.	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0
01.1(disaggr.)	4	Grain crops	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	0
01.1(disaggr.)	5	Crops n.e.c.	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	1	1	1
01(disaggr.)+01.4+01.5	6	Agricultural services n.e.c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2 (disaggr.)	7	Forest products	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2 (disaggr.)	8	Recycling of waste wood	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	9	Fish	1	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0,368	0	0	1	0	0	1	0	0	0
10	10	Coal, lignite, peat	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	11	Crude petroleum and natural gas	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13,1	12	Iron ores from mine	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13.2(disaggr.)	13	Bauxite from mine	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13.2(disaggr.)	14	Copper from mine	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13.2(disaggr.)	15	Metals from mine n.e.c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
14.1+14.21	16	Sand, gravel and stone from quarry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1	0
14,22	17	Clay and soil from quarry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0

Figure 3 D1-matrix (screen shot of the French Table)

3.2. Resource transfer coefficient matrix (F_0)

The F_0-matrix (see **Figure 5**) shows for each product supplied by an activity, the proportion of the total resource input to the activity present in the product. The emissions of resources which are lost during the production process will be substract from the resource entering the process. So you can calculate the F_0-matrix entries like this:

Resource present in products / (total resource input – emissions of resources)

The values for the cells are given in a range between [0] and [1]. Similar to the product transfer coefficients, this matrix provides data concerning the question if a resource is present in the final good or not. If a zero is entered the resource is not present in the final good. If a "1" is entered the resource is present in the final good, but the proportion is unknown. Each other value between zero and 1 shows the exact proportion of the resource which ends up in the final good.

The list of resources can be found in the Resources Matrix (**R**) (see **Figure 4**). It includes data concerning the input of resources per human activity. The **R**-matrix classifies the resources in 13 different categories.
For the resources there is no real price they couldn't be traded.
Using the example of "bovine meat and milk" the resource food carbon means here the grass of the pasture the cows are eating. The activity "bovine meat and milk" also using minerals and oxygen as resource. That means cows breathe oxygen and ingest minerals with their feed. All this things you can't buy on the market there is no real price for this.
The sum of all Resources, used by an activity, listed in the **R**-Matrix is the last, the 14th row of this Matrix. It equals the resource vector ($\mathbf{r_T}$).
The vector $\mathbf{r_T}$ multiplicated with F_0-matrix gives the proportion of the total resource input to the activity present in the product (meaning of the F_0-matrix) an absolute value. This product is part of **Formula 1** (3.3 Product transfer coefficient matrix (**D**)) to calculate the **D**-matrix.

		Activity No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
NACE No.	Product No.	Activities / Products	Bovine meat and milk	Pigs	Poultry and animals n.e.c.	Grain crops	Crops n.e.c.	Agricultural services n.e.c.	Forest products	Recycling of waste wood	Fish	Coal, lignite, peat	Crude petroleum and natural gas	Iron ores from mine	Bauxite from mine	Copper from mine
Resources (R)																
	Material No	Material														
	1	Aluminium	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2	Fibre carbon	0	0	0	1.313	0	0	346	0	0	0	0	0	0	0
	3	Food carbon, (including	2.113	0	0	3.533	641	0	0	0	146	0	0	0	0	0
	4	Coal carbon	0	0	0	0	0	0	0	0	0	67	0	0	0	0
	5	Crude oil and natural gas carbon	0	0	0	0	0	0	0	0	0	0	20.091	0	0	0
	6	Carbonate carbon	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	7	Copper	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	8	Iron	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	9	Metals, n.e.c.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	10	Minerals, n.e.c. (including nitrogen)	643	0	0	1.989	244	0	100	0	85	18	4.256	0	0	0
	11	Oxygen (only in products, but not in H2O)	1.838	0	0	3.708	540	0	417	0	53	41	0	0	0	0
	12	Clay and soil	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	13	Sand, gravel and stone	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	14	Total material (T)	4.594	0	0	10.543	1.424	0	863		285	126	24.347	0	0	0

Figure 4 R-matrix (screen-shot of the Danish Table)

		Activity No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
NACE No.	Product No.	Activities / Products	Bovine meat and milk	Pigs	Poultry and animals n.e.c.	Grain crops	Crops n.e.c.	Agricultural services n.e.c.	Forest products	Recycling of waste wood	Fish	Coal, lignite, peat	Crude petroleum and natural gas	Iron ores from mine	Bauxite from mine	Copper from mine	Metals from mine n.e.c.	Sand, gravel and stone from quarry	Clay and soil from quarry	Minerals from mine n.e.c.	Meat and fish products
1.21	1	Bovine meat and milk	0,0648																		
1.23	2	Pigs		1																	
01.24+01.25	3	Poultry and animals n.e.c.			1																
01.1(disaggr.)	4	Grain crops				0,8															
01.1(disaggr.)	5	Crops n.e.c.					1														
01(disaggr.)+01	6	Agricultural services n.e.c.						1													
2 (disaggr.)	7	Forest products							1												
2 (disaggr.)	8	Recycling of waste wood								1											
5	9	Fish									1										
10	10	Coal, lignite, peat										0,8									
11	11	Crude petroleum and natural gas											0,9								
13,1	12	Iron ores from mine												0,7							
13.2(disaggr.)	13	Bauxite from mine													1						
13.2(disaggr.)	14	Copper from mine														0,2					
13.2(disaggr.)	15	Metals from mine n.e.c.															0,2				
14.1+14.21	16	Sand, gravel and stone from																0,9			
14.22	17	Clay and soil from quarry																	0,9		
14.3+14.4+14.5	18	Minerals from mine n.e.c.																		0,5	
15.1+15.2	19	Meat and fish products																			1
15,5	20	Dairy products																			
15,3	21	Fruits and vegetables, processed																			
15,4	22	Vegetable and animal oils and fats																			

Figure 5 F_0-matrix (screen shot of the French table)

3.3 Product transfer coefficient matrix (D)

The **D**-matrix specifies the proportion of the product input which is present in the final goods supplied by an activitiy. In contrast to the $\mathbf{F_0}$ matrix the D-Matrix includes the amount, which is lost as direct emissions.
The **D**-matrix expresses the amount of physical use ($\mathbf{U_T}$) becoming supply of products without subtraction of residuals and emissions. It is used to describe, which inputs in the $\mathbf{U_T}$ matrix are becoming outputs in the $\mathbf{V'_T}$ matrix.
The cells of **D**-matrix are allowed to take a value in an interval from [0] to [1].

In order to calculate the **D**-matrix the $\mathbf{D_1}$-matrix is need. If the value of a cell in the $\mathbf{D_1}$-matrix is [0] (means the product is not presented in the product supplied by the activity ($\mathbf{V'_T}$)) the value of the corresponding cell in the **D**-matrix is [0], too.
If the value of a cell in the $\mathbf{D_1}$-matrix ranges between [0] and [1] (which means that the share of product input used by an activity is known and given) the cell in the **D**-matrix takes the same value. Like mentioned in 3.1 this case does not often occur.
If the value of a cell in the $\mathbf{D_1}$-matrix is [1] (which means that the product will be present in the product supplied by the activity ($\mathbf{V'_T}$), but the proportion is unknown) the value of the corresponding cell in the **D**-matrix has to be calculated.

This calculation is generated by using following formula (**Formula 1**):

$$D_{ij} = \begin{cases} D_{1,ij} = 0 & \rightarrow \quad D_{ij} = 0 \\ D_{1,ij} =]0,1[& \rightarrow \quad D_{ij} = D_{1,ij} \\ D_{1,ij} = 1 & \rightarrow \quad D_{ij} = [V'_T - (F_0 * r_T) - (D_{1,ij=]0,1[} * U_T)] / (D_{1,ij=1} * U_T) \end{cases}$$

Formula 1

For $D_{1,ij} = 1$ in formula 1 ($D_{1,ij=1} * U_T$) can't be 0. This only happened if $U_{T,ij} = 0$. Therefore **Formula 1** has to be expanding with **Formula 2**:

$$\text{If } (D_{1,ij=1} * U_T) = 0 \text{ then}$$
$$D_{ij} = [V'_T - (F_0 * r_T) - (D_{1,ij=]0,1[} * U_T)] / (D_{1,ij=1} * U_T) = 0$$

Formula 2

In **Figure 6** a screen shot of the French **D**-matrix is provided. It attracts attention to the fact that the cells of each column have the same value, if they are not [0], or a cell in the corresponding column in the **D_1**-matrix has a value between [0] and [1]. This means that proportion of product input which is present in the product supplied by an activity is the same for each product of an activity.
E.g. there are 15.11 % of the entered "Bovine meat and milk" supplied in the products of the activity "Bovine meat and milk". 15.11 % of the intermediate good "bovine meat and milk" stay present in the final good. The residuals become waste or emissions. Similar to that consideration 15.11 % of the used "Grain crops, Crops n.e.c., fish, meat and fish products, dairy products, Fruits and vegatables, flour, sugar, animal feeds, food preparations n.e.c. and beverages" remain present in the final product of the activity "Bovine meat and milk".
This does not cover the reality in detail, but it is a simplification model output. In the end the **D**-matrix is much easier to calculate and to include in the model.

			Activity No.	1	2	3	4	5	6	7
D	NACE No.	Product No.	Activities / Products	Bovine meat and milk	Pigs	Poultry and animals n.e.c.	Grain crops	Crops n.e.c.	Agricultural services n.e.c.	Forest products
	1,21	1	Bovine meat and milk	0,1511	0	0	0	0	0	0
	1,23	2	Pigs	0	0,20845	0	0	0	0	0
	01.24+01.25	3	Poultry and animals n.e.c.	0	0	0,16339	0	0	0	0
	01.1(disaggr.)	4	Grain crops	0,1511	0,20845	0,16339	0	0	0	0
	01.1(disaggr.)	5	Crops n.e.c.	0,1511	0,20845	0,16339	0	0,99999	0	0
	01(disaggr.)+01.4+01.	6	Agricultural services n.e.c.	0	0	0	0	0	0	0
	2 (disaggr.)	7	Forest products	0	0	0	0	0	0	5,89918E-15
	2 (disaggr.)	8	Recycling of waste wood	0	0	0	0	0	0	0
	5	9	Fish	0,1511	0,20845	0,16339	0	0	0	0
	10	10	Coal, lignite, peat	0	0	0	0	0	0	0
	11	11	Crude petroleum and natural gas	0	0	0	0	0	0	0
	13,1	12	Iron ores from mine	0	0	0	0	0	0	0
	13.2(disaggr.)	13	Bauxite from mine	0	0	0	0	0	0	0
	13.2(disaggr.)	14	Copper from mine	0	0	0	0	0	0	0
	13.2(disaggr.)	15	Metals from mine n.e.c.	0	0	0	0	0	0	0
	14.1+14.21	16	Sand, gravel and stone from qua	0	0	0	0	0	0	0
	14,22	17	Clay and soil from quarry	0	0	0	0	0	0	0
	14.3+14.4+14.5	18	Minerals from mine n.e.c.	0	0	0	0	0	0	0
	15.1+15.2	19	Meat and fish products	0,1511	0,20845	0,16339	0	0	0	0
	15,5	20	Dairy products	0,1511	0,20845	0,16339	0	0	0	0
	15,3	21	Fruits and vegetables, processe	0,1511	0,20845	0,16339	0	0	0	0
	15,4	22	Vegetable and animal oils and fa	0,1511	0,20845	0,16339	0	0	0	0
	15,6	23	Flour	0,1511	0,20845	0,16339	0	0	0	0

Figure 6 Screen shot of the French D-Matrix table)

4. Comparing of the product transfer coefficients

Table 1 Comparison of the values of the D-matrixes

	Activity	Values in the D-matrix				comments
		Germany	Austria	Denmark	France	
1	Bovine meat and milk	0,14910	0,13119	0,14790	0,15110	Biggest Difference ca. 0.02 (2%)
2	Pigs	0,26651	0,51063	0,30480	0,20845	Biggest Difference ca. 0.30 (30%) AUS big variance to the others
3	Poultry and animals n.e.c.	0,08745	0,28722	0,12211	0,16339	Biggest Difference ca. 0.20 (20%)
4	Grain crops	0,09989	0,29037	-6,03E-15	0,00000[3)]	Biggest Difference ca. 0.19 (19%); negative value in DEN can't be true; value [0] in FRA[1)]
5	Crops n.e.c.	0,08115	0,00000[6)]	-2,29E-15	0,00000[3)]	value [0] in AUS and FRA[1)]; negative value in DEN can't be true
6	Agricultural services	0,00000[2)]	0,00000[2)]	0,00000[1)]	0,00000[1)]	Service, no physical products-

	n.e.c.					> D-matrix value [0]
7	Forest products	0,73780	0,06377	0,10419	0,00000[2)]	Biggest Difference ca. 0.70 (70%); value [0] in FRA
8	Recycling of waste wood	0,00000[1)]	0,00000[1)]	0,00000[1)]	0,00000[1)]	Service, no physical products-> D-matrix value [0]
9	Fish	0,61513	0,00000[3)]	0,00000[3)]	0,00000[3)]	value [0] in AUS, DEN, FRAU
10	Coal, lignite, peat	0,04839	0,15819	0,00000[3)]	0,00000[3)]	Difference ca. 0.11 (11%); value [0] in DEN and FRA
11	Crude petroleum and natural gas	0,01439	0,17746	0,00000[3)]	0,00000[3)]	Difference ca. 0.16 (16%); value [0] in DEN and FRA
12	Iron ores from mine	0,00000[1)]	0,00000[3)]	0,00000[1)]	0,00000[1)]	No iron mining in GER, AUS, DEN -> value [0] also value[0] in FRA
13	Bauxite from mine	0,00000[1)]	0,00000[1)]	0,00000[1)]	0,02798	Bauxite mining only in FRA -> value [0] in GER, AUS, DEN
14	Copper from mine	0,00000[1)]	0,00000[1)]	0,00000[1)]	0,00000[1)]	No cropper mining -> value [0] in GER, AUS, DEN,FRA
15	Metals from mine n.e.c.	0,00000[1)]	0,00000[3)]	0,00000[1)]	0,00000[3)]	No mining of other metals in GER, DEN -> value [0] also value[0] in AUS, FRA
16	Sand, gravel and stone from quarry	0,06631	0,03252	0,00000[3)]	0,00000[3)]	Difference ca. 0.03 (3%); value [0] in DEN and FRA
17	Clay and soil from quarry	0,01795	0,00200	0,00000[3)]	0,00000[3)]	Difference ca. 0.015 (1.5%); value [0] in DEN and FRA
18	Minerals from mine n.e.c.	0,10146	0,14373	0,00000[3)]	0,00000[3)]	Difference ca. 0.03 (4%); value [0] in DEN and FRA
19	Meat and fish products	0,42690[5)]	0,96498	0,88439[5)]	0,89933[5)]	Biggest Difference ca. 0.54 (54%); GER big variance to the others
20	Dairy products	0,53297	0,88973	0,95317	0,99076	Biggest Difference ca. 0.46 (46%); GER big variance to the others
21	Fruits and vegetables, processed	0,57317	0,99098	0,77540	0,95227	Biggest Difference ca. 0.42 (42%)
22	Vegetable and animal oils and fats	0,73010	0,89663	0,97928	0,93000	Biggest Difference ca. 0.25 (25%); GER bigger variance to the others
23	Flour	0,68240	0,70827	0,79772	0,88686	Biggest Difference ca. 0.20 (20%);
24	Sugar	0,73013	0,79300	0,66826	0,58135	Biggest Difference ca. 0.21 (21%);
25	Animal feeds	0,59108	0,99315	0,97670	0,78753	Biggest Difference ca. 0.40 (40%);
26	Food preparations n.e.c.	0,70895[5)]	0,38885[5)]	0,41986[5)]	0,26832[5)]	Biggest Difference ca. 0.44 (44%); GER big variance to the others
27	Beverages	0,15800	0,68266	0,72331	0,25719	Biggest Difference ca. 0.56 (56%); GER and FRA big variance to AUS and DEN
28	Tobacco products	0,66108	0,91299	0,37380	0,85816	Biggest Difference ca. 0.54 (54%);
29	Textiles	0,89000	0,92200	0,83942	0,76888	Biggest Difference ca. 0.15 (15%);
30	Wearing apparel and furs	0,97226	0,93360	0,84171	0,84203	Biggest Difference ca. 0.13 (13%);
31	Leather products, footwear	0,90413	0,82231	0,48864	0,95962	Biggest Difference ca. 0.47 (47%); DEN big variance to the others
32	Wood products, except furniture	0,90805	0,40895	0,82767	0,97494	Biggest Difference ca. 0.57 (57%); AUS big variance to the others
33	Pulp, virgin	0,69878	0,59134	0,00000[1)]	0,26682	Biggest Difference ca. 0.43 (43%); FRA big variance to the others No Production of virgin pulp in DEN -> value [0]
34	Recycling of waste paper	0,00000[2)]	0,00000[2)]	0,00000[2)]	0,00000[2)]	Service -> D-matrix value [0]
35	Paper and paper	0,31404	0,56710	0,78988	0,95350	Biggest Difference ca. 0.64

	products					(64%);
36	Printed matter and recorded media	0,98324	0,74841	0,84201	0,83404	Biggest Difference ca. 0.24 (24%);
37	Refined petroleum products and fuels	0,89948	0,90265	0,97366	0,17426[5)]	Biggest Difference ca. 0.80 (80%); FRA big very variance to the others
38	Recycling of waste oil	0,00000[2)]	0,00000[1)]	0,00000[1)]	0,00000[1)]	Service, no physical products-> D-matrix value [0]
39	Fertiliser, N	0,91138	0,81797	0,94759	0,38701[5)]	Biggest Difference ca. 0.56 (56%); FRA big variance to the others
40	Fertiliser, other than N	0,99909	0,82407	0,87103	0,58570	Biggest Difference ca. 0.41 (41%); FRA variance to the others
41	Plastics basic, virgin	0,81451	0,74228	62,18851	0,86309[5)]	Biggest Difference ca. 0.12 (12%); value in DEN > 1 this can't be true
42	Recycling of plastics basic	0,00000[2)]	0,00000[2)]	0,00000[2)]	0,00000[2)]	Service, no physical products-> D-matrix value [0]
43	Chemicals n.e.c.	0,78226	0,66567	0,68240	0,80676[5)]	Biggest Difference ca. 0.14 (14%);
44	Rubber and plastic products	0,97710	0,87921	0,89856	0,73080	Biggest Difference ca. 0.25 (25%);
45	Glass, mineral wool and ceramic goods, virgin	0,67747	0,16993	0,53326	0,78691	Biggest Difference ca. 0.62 (62%); AUS big variance to the others
46	Recycling of glass, mineral wool and ceramic goods	0,00000[2)]	0,00000[2)]	0,00000[2)]	0,00000[2)]	Service, no physical products-> D-matrix value [0]
47	Cement, virgin	0,53261	0,33029	0,36186	0,90727[5)]	Biggest Difference ca. 0.58 (58%); FRA big variance to the others
48	Recycling of slags and ashes	0,00000[2)]	0,00000[2)]	0,00000[2)]	0,00000[2)]	Service, no physical products-> D-matrix value [0]
49	Concrete, asphalt and other mineral products	0,65240	0,62357	0,86667	0,99770[5)]	Biggest Difference ca. 0.37 (37%); DEN and above all FRA has a big variance to GER and AUS
50	Recycling of concrete, asphalt and other mineral products	0,00000[2)]	0,00000[2)]	0,00000[2)]	0,00000[2)]	Service, no physical products-> D-matrix value [0]
51	Bricks	0,96119	0,61283	0,83382	0,87613[5)]	Biggest Difference ca. 0.35 (35%); AUS big variance to the others
52	Recycling of bricks	0,00000[1)]	0,00000[1)]	0,00000[1)]	0,00000[1)]	Service, no physical products-> D-matrix value [0]
53	Iron basic, virgin	0,57189	0,42639	0,00000[1)]	0,00000[6)]	Biggest Difference ca. 0.14 (14%); value [0] in DEN and FRA
54	Recycling of iron basic	0,00000[2)]	0,00000[2)]	0,00000[2)]	0,00000[2)]	Service, no physical products-> D-matrix value [0]
55	Aluminium basic, virgin	0,27767	0,29100	0,00000[1)]	0,27173	Biggest Difference ca. 0.02 (2%); value [0] in DEN
56	Recycling of aluminium basic	0,00000[2)]	0,00000[2)]	0,00000[2)]	0,00000[2)]	Service, no physical products-> D-matrix value [0]
57	Copper basic, virgin	0,99817	0,26922	0,90707	0,00000[1)]	Biggest Difference ca. 0.73 (73%); AUS big variance to the others; value [0] in FRA
58	Recycling of copper basic	0,00000[2)]	0,00000[2)]	0,00000[2)]	0,00000[2)]	Service, no physical products-> D-matrix value [0]
59	Metals basic, n.e.c., virgin	0,99821	0,22727	0,00000[1)]	0,00000[1)]	Difference between GER and AUS ca. 0.77 (77%); value [0] in DEN and FRA
60	Recycling of metals basic, n.e.c.	0,00000[1)]	0,00000[2)]	0,00000[1)]	0,00000[2)]	Service, no physical products-> D-matrix value [0]
61	Iron, after first processing	0,99995	0,78433	0,93009	0,79167	Biggest Difference ca. 0.21 (21%);

62	Aluminium, after first processing	0,99926	0,91343	0,87696	0,56590	Biggest Difference ca. 0.43 (43%); FRA big variance to the others
63	Copper, after first processing	0,00000[1)]	0,28287	0,78094	0,93131	Biggest Difference ca. 0.65 (65%); AUS big variance to the others; value [0] in GER
64	Metals n.e.c., after first processing	0,99927	0,69958	0,00000[1)]	0,21915	Biggest Difference ca. 0.78 (78%); FRA big variance to the others; value [0] in DEN
65	Fabricated metal products, except machinery	0,85183	0,93524	0,38527	0,98307	Biggest Difference ca. 0.60 (60%); FRA big variance to the others
66	Machinery and equipment n.e.c.	0,91369	0,90115	0,93472	0,95091	Biggest Difference ca. 0.05 (5%);
67	Office machinery and computers	0,97207	0,49591	0,54942	0,86678	Biggest Difference ca. 0.48 (48%); AUS and DEN big variance to GER and FRA
68	Electrical machinery n.e.c.	0,73697	0,61794	0,92573	0,98272	Biggest Difference ca. 0.37 (37%);
69	Radio, television and communication equipment	0,98470	0,92165	0,32919	0,95314	Biggest Difference ca. 0.66 (66%); DEN big variance to the others
70	Instruments, medical, precision, optical, clocks	0,83761	0,70136	0,83999	0,65083	Biggest Difference ca. 0.19 (19%);
71	Motor vehicles and trailers	0,99365	0,99087	0,16536	0,99845	Biggest Difference ca. 0.83 (83%); DEN very big variance to the others
72	Transport equipment n.e.c.	0,12961	0,84121	0,10935	0,97104	Biggest Difference ca. 0.86 (86%); AUS and FRA big variance to GER and DEN
73	Furniture; other manufactured goods n.e.c.	0,97800[5)]	0,66946	0,86715[5)]	0,84983	Biggest Difference ca. 0.31 (31%);
74	Recycling services	0,00000[2)]	0,00000[2)]	0,00000[1)]	0,00000[1)]	Service, no physical products-> D-matrix value [0]
75	Electricity, steam and hot water	0,00000[2)]	0,00000[2)]	0,00000[1)]	0,13641	Service, no physical products -> D-matrix value [0] only in FRA value
76	Gas	0,99885	0,94230	0,99081	0,95165	Biggest Difference ca. 0.06 (6%);
77	Water, fresh	0,00000[2)]	0,00000[2)]	0,00000[1)]	0,03470	Service, no physical products -> D-matrix value [0] only in FRA value
78	Buildings, residential	0,00000[2)]	0,00000[2)]	0,00000[1)]	0,08018	Service, no physical products -> D-matrix value [0] only in FRA value
79	Buildings, non-residential	0,00000[2)]	0,00000[2)]	0,00000[1)]	0,07169	Service, no physical products -> D-matrix value [0] only in FRA value
80	Infrastructure, excluding buildings	0,00000[2)]	0,00000[2)]	0,00000[1)]	0,02398	Service, no physical products -> D-matrix value [0] only in FRA value
81	Trade and repair of motor vehicles; service stations	0,00000[2)]	0,00000[2)]	0,00000[1)]	0,98777	Service, no physical products -> D-matrix value [0] only in FRA value
82	Wholesale trade	0,00000[2)]	0,00000[2)]	0,00000[1)]	0,79269	Service, no physical products -> D-matrix value [0] only in FRA value
83	Retail trade and repair services	0,00000[2)]	0,00000[2)]	0,00000[1)]	0,05982	Service, no physical products -> D-matrix value [0] only in FRA value
84	Hotels and restaurants	0,00000[2)]	0,00000[2)]	0,00000[1)]	0,00615	Service, no physical products -> D-matrix value [0] only in FRA value

85	Land transport; transport via pipelines	0,00000[2)]	0,00000[2)]	0,00000[1)]	0,96839	Service, no physical products -> D-matrix value [0] only in FRA value
86	Transport by ship	0,00000[1)]	0,00000[1)]	0,00000[1)]	0,00000[4)]	Service, no physical products -> D-matrix value [0]
87	Air transport	0,00000[1)]	0,00000[2)]	0,00000[1)]	0,10317	Service, no physical products -> D-matrix value [0] only in FRA value
88	Cargo handling, harbours; travel agencies	0,00000[2)]	0,00000[2)]	0,00000[1)]	0,43543	Service, no physical products -> D-matrix value [0] only in FRA value
89	Post and telecommunication	0,00000[2)]	0,00000[2)]	0,00000[1)]	0,11249	Service, no physical products -> D-matrix value [0] only in FRA value
90	Financial intermediation	0,00000[2)]	0,00000[2)]	0,00000[1)]	0,00000[4)]	Service, no physical products-> D-matrix value [0]
91	Insurance and pension funding	0,00000[2)]	0,00000[2)]	0,00000[1)]	0,00000[4)]	Service, no physical products-> D-matrix value [0]
92	Services auxiliary to financial intermediation	0,00000[2)]	0,00000[2)]	0,00000[1)]	0,00000[4)]	Service, no physical products-> D-matrix value [0]
93	Real estate services	0,00000[2)]	0,00000[2)]	0,00000[1)]	0,00000[4)]	Service, no physical products-> D-matrix value [0]
94	Renting of machinery and equipment etc.	0,00000[2)]	0,00000[2)]	0,00000[1)]	0,07723	Service, no physical products -> D-matrix value [0] only in FRA value
95	Computer and related services	0,00000[2)]	0,00000[2)]	0,00000[1)]	0,00340	Service, no physical products -> D-matrix value [0] only in FRA value
96	Research and development	0,00000[2)]	0,00000[2)]	0,00000[1)]	0,41814	Service, no physical products -> D-matrix value [0] only in FRA value
97	Business services n.e.c.	0,00000[2)]	0,00000[2)]	0,00000[1)]	0,01361	Service, no physical products -> D-matrix value [0] only in FRA value
98	Public service and security	0,00000[2)]	0,00000[2)]	0,00000[1)]	0,90952	Service, no physical products -> D-matrix value [0] only in FRA value
99	Education services	0,00000[2)]	0,00000[2)]	0,00000[1)]	0,11060	Service, no physical products -> D-matrix value [0] only in FRA value
100	Health and social work	0,00000[2)]	0,00000[2)]	0,00000[1)]	0,03339	Service, no physical products -> D-matrix value [0] only in FRA value
101	Incineration of waste	0,00000[1)]	0,00000[2)]	0,00000[1)]	0,00000[2)]	Service, no physical products-> D-matrix value [0]
102	Manure treatment	0,00000[1)]	0,00000[2)]	0,00000[1)]	0,00000[1)]	Service, no physical products-> D-matrix value [0]
103	Biogasification of waste	0,00000[1)]	0,00000[2)]	0,00000[1)]	0,00000[1)]	Service, no physical products-> D-matrix value [0]
104	Composting of food waste	0,00000[1)]	0,00000[2)]	0,00000[1)]	0,00000[1)]	Service, no physical products-> D-matrix value [0]
105	Waste water treatment	0,00000[1)]	0,00000[2)]	0,00000[1)]	0,00000[1)]	Service, no physical products-> D-matrix value [0]
106	Landfill of waste	0,00000[1)]	0,00000[2)]	0,00000[1)]	0,00000[1)]	Service, no physical products-> D-matrix value [0]
107	Land application of waste	0,00000[1)]	0,00000[2)]	0,00000[1)]	0,00000[1)]	Service, no physical products-> D-matrix value [0]
108	Unexpected waste	0,00000[1)]	0,00000[1)]	0,00000[1)]	0,00000[1)]	Service, no physical products-> D-matrix value [0]
109	Membership organisations	0,00000[2)]	0,00000[2)]	0,00000[1)]	0,78612	Service, no physical products -> D-matrix value [0] only in FRA value
110	Recreational and cultural services	0,00000[2)]	0,00000[2)]	0,00000[1)]	0,08477	Service, no physical products -> D-matrix value [0] only in FRA value
111	Services n.e.c.	0,00000[2)]	0,00000[2)]	0,00000[1)]	0,07900	Service, no physical products -> D-matrix value [0] only in FRA value
112	Household, to nourish	0,00000[1)]	0,00000[1)]	0,00000[1)]	0,00000[1)]	Service, no physical products-> D-matrix value [0]
113	Household, to clean	0,00000[1)]	0,00000[1)]	0,00000[1)]	0,00000[1)]	Service, no physical products-

						> D-matrix value [0]
114	Household, to transport and communicate	0,00000[1)]	0,00000[1)]	0,00000[1)]	0,00000[1)]	Service, no physical products-> D-matrix value [0]
115	Household, to reside	0,00000[1)]	0,00000[1)]	0,00000[1)]	0,00000[1)]	Service, no physical products-> D-matrix value [0]
116	Household, home composting	0,00000[1)]	0,00000[1)]	0,00000[1)]	0,00000[1)]	Service, no physical products-> D-matrix value [0]
117	Household, unauthorised incineration	0,00000[1)]	0,00000[1)]	0,00000[1)]	0,00000[1)]	Service, no physical products-> D-matrix value [0]

1): There is no physical supply from this activity in the country. That is the reason for the **D**-matrix value [0]. E.g. Service activities often have no physical supply because they are not building physical products. The value of the $\mathbf{D_1}$-matrix is here [0], too. Partly there is no use, too. So the activity does not exist.
2): The cells of the **Formula 1** take the value [0] for this activity but there is a physical supply. So the values of $\mathbf{D_1}$-matrix have to be [0].
3): The value of the **D**-matrix is [0] even though the value of the $\mathbf{D_1}$-matrix is not [0]. Reason there for is the equality of the value from supply table ($\mathbf{V'_T}$) and the Product of the resource vector ($\mathbf{r_T}$) and the $\mathbf{F_0}$-matrix. So the numerator of **Formula 1** becoming [0] and therefore the value of the **D**-matrix will be [0], too.
4): The value of the **D**-matrix is [0] even though the value of the $\mathbf{D_1}$-matrix is [1]. There is a use but no supply and also value of the resource Vector ($\mathbf{r_T}$) is [0]. So the numerator of **Formula 1** becoming [0] and therefore the value of the **D**-matrix will be [0], too.
5): There are cells in the column of the $\mathbf{D_1}$-matrix of this activity which are reaching a value between [0] and [1]. Therefore the **D**-matrix will reach the same value (see **Formula 1**).
6): The result of calculating **Formula 1** gives the value [0]. But there are cells in the **D1**-matrix for this activity having a value between [0] and [1], so there are cells in the **D**-matrix having this value, too.

Values for service activities can be found in the **D**-matrix for France. The reason is that only the french partners filled in the **D**-matrix absolutely correct. That means they also included the fact, that some service activities have a physical supply (in supply table $\mathbf{V'_T}$) of off-diagonal products.
E.g. wholesale trades may produce and trade “sand gravel and stone”, so there is a physical supply. In the German and Austrian supply table $\mathbf{V'_T}$ are also entries in service activities for off-diagonal products (see [2)]) but in the $\mathbf{D_1}$-matrix there are only [0] for service activities producing [0] in the **D**-matrix.
On the other hand, values of the service activities are mainly very small. Here it is more interesting to compare the high volume material consuming activities, e.g.:

- Bovine meat and milk
- Sand, gravel and stone from quarry
- Meat and fish products
- Vegetable and animal oils and fats
- Flour
- Sugar
- Animal feeds
- Food preparations n.e.c.
- Beverages
- Wood products, except furniture
- Pulp, virgin
- Paper and paper products

- Printed matter and recorded media
- Refined petroleum products and fuels
- Chemicals n.e.c.
- Rubber and plastic products
- Cement, virgin
- Concert, asphalt and other mineral products
- Bricks
- Iron basic, virgin (only in Austria and Germany)
- Iron after first processing
- Fabricated metal products, except machinery
- Machinery and equipment n.e.c.
- Gas

This are the activities with a big physical use entered in the **D**-matrix.

In the French **D**-matrix entering three activities with a very high physical use, unaccounted for the **D**-matrix of the other WP-3 counties, can be found:

- Buildings, residential
- Buildings, non-residential
- Infrastructure, excluding buildings

Before comparing the **D**-matrix entries it is to point out, that in such developed industry countries like the WP3 countries are many producing operations look alike. So the numbers in the **D**-matrix should be similar.

A comparison of the **D**-matrix values of the above listed high volume material consuming activities shows partly very big differences. Only four high volume material consuming activities have got differences in the **D**-matrix values less than 10%:

- Bovine meat and milk
- Sand, gravel and stone from quarry
- Machinery and equipment n.e.c.
- Gas

For these activities the producing operations are quite similar.
Nearly a third of the high volume material consuming activities have differences of more than 50%:

- Meat and fish products
- Beverages
- Wood products, except furniture
- Paper and paper products
- Refined petroleum products and fuels
- Cement, virgin
- Fabricated metal products, except machinery

More than a third has differences less than 50% but still more than 20%:

- Vegetable and animal oils and fats
- Flour

- Sugar
- Animal feeds
- Food preparations n.e.c.
- Pulp, virgin
- Printed matter and recorded media
- Rubber and plastic products
- Concert, asphalt and other mineral products
- Bricks
- Iron after first processing

And differences less than 20% and more than 10% can be found within:

- Chemicals n.e.c.
- Iron basic, virgin

Due to the fact that each of the WP3 countries is a very high developed industrial country, containing very effective processes, the partly big differences are noticeable.

One of the main reasons for the very high differences could be the problems during the consolidation of data in the FORWARST supply and use tables. The problems of each D-3 country with the statistic datas are accurately described in Deliverable n° 3-1 (Data Processing and Validation for Austria, Denmark, France and Germany) in the chapters "Methodology and Data Quality".

One big problem is e.g. that many national statistics show use and supply data for the products of many activities only in monetary units. As every physical product has a physical weight it is possible to create data of physical products basing on the corresponding monetary data. "*The procedure for this is to calculate the average price (monetary transactions divided by physical transactions) for the products where physical information is available, and then use this price of the products where no physical information is available."* [1)]

"But the assumption that every good produced or used by an activity has the same price level leads to inconsistencies due to the fact that a price is nothing more than a variable influenced by many factors. Summing up, the calculation of physical values by using price information is a quite poor way of data generation as it bares a high potential of inaccuracies." [2)]

Another problem is that national statistics and also statistics from EUROSTAT are normally not available in the FORWARST-Format (119x119 activities/goods) so before implementing in the FORWARST supply and use tables data have to be aggregated or disaggregated. This conversion processes bare another potential of inaccuracies.

[1)] *: Frome D3-1 4.1.2 Methology and Data Quality (Denmark)*
[2)] *: Frome D3-1 3.1.8 Methology and Data Quality (Austria)*

By reason of a lot of inaccuracies, the supply and use tables are not representing the reality correctly for every activity. So it is not possible to say that the **D**-matrix expresses the real amount of physical use becoming supply of products because it is not sure that the correct data for physical use and supply would be used. Furthermore the mentioned Data are integrated in the calculation of **D**-matrix (see **Formula 1**) what leads to an inaccuracy in the **D**-matrix, also. So the **D**-matrix exactly only says whether a product will be present in the product supplied by an activity or not. This is already shown by the $\mathbf{D_1}$-matrix. The calculated value which gives the percentage of use transferred to the supply is not suitable for representing reality completely.