

SimaPro 7

Database Manual

The Dutch Input Output 95 library



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SimaPro Database Manual

Dutch Input Output Database 95

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Dutch Input Output Database 95

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1 Introduction

Each country has an economic input output table that specifies the value of the purchases between sectors within the country and abroad (the imports), as well as the supplies to other sectors and the exports. Furthermore all other major costs and revenues are specified.

These tables have been used by several LCA experts to compile input output (IO) databases (1). Environmental data per sector is divided by the total value, resulting in an environmental load per unit of value. These ratios can be used to link the environmental load to all supplies through the economy, enabling us to get a total environmental load of the outputs of all sectors.

1.1 Data collection and data treatment

The Dutch Input Output Database 95 is the result of a project commissioned by the Dutch government. The project originates from the desire to be able to trace the impacts of its policy on the environmental load of private consumption on a national level.

To determine the environmental load of a Dutch sector, a link was made between the 105 industrial sectors, as defined in the Dutch economic input output table, and input output tables in other parts of the world, as shown in the graph below.

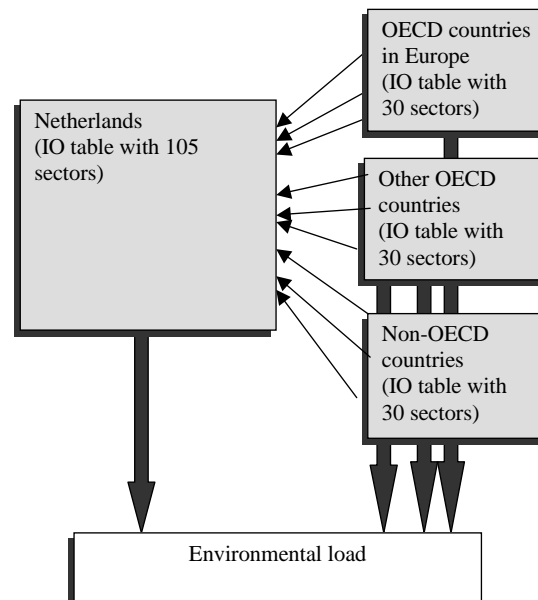


Figure 1 Overview of the financial flows throughout the economies to the Dutch sectors.

1.1.1 The Dutch input output matrix

The Dutch input output matrix has 105 sectors. The National emission registration system maintains a detailed data inventory for industrial activities (2). This database has been used to run queries that produce datasheets per sector.

1.1.2 The input output matrices of other countries

The “rest of the world” is split up into three regions:

1. OECD countries in Europe
2. Other OECD countries
3. Non OECD countries

Input output tables of the 3 foreign regions were derived from the GTAP database (3). The GTAP project consists of a global database describing bilateral trade patterns, production, consumption and intermediate use of commodities and services. This database divides world output into 66 countries and 57 sectors. The 66 countries make it possible to define the 3 foreign regions as described above and the 57 sectors makes it

Sectors foreign regions	Sectors Netherlands	
1 Arable farming	1 Arable farming	
2 Horticulture	2 Horticulture	
3 Animal husbandry/Cattle breeding	3 Animal husbandry/Cattle breeding	
4 Rest arable farming, forestry and hunting	4 Rest arable farming	6 Forestry and hunting
5 Fishery	5 Gardening & agrarian services	
6 Oil and Gas extraction	7 Fishery	
7 Extraction of other minerals	8 Oil and Gas extraction	
8 Production of food for humans, animal based	9 Extraction of other minerals	
9 Production of other food for humans	10 Slaughtering & meat processing industry	13 Manufacturing of dairy products
10 Beverages and tobacco	11 Fish processing industries	
11 Textile and clothing	12 Vegetables & fruit processing	16 Coffee-roasting & tee-packing
12 Leather industry	14 Manufacturing cattle food	18 Tobacco processing
13 Wood industry	17 Beverages	
14 Paper, cardboard and publishing	19 Textiles	20 Garments/clothing
15 Oil industry	21 Leather industry	
16 Chemical, rubber and plastics industry	22 Wood, cork, cane & plaiting	
17 Building material industry	23 Pulp, paper & cardboard	25 Publishing & printing
18 Base metal industry	24 Paper and cardboard goods	26 Reproduction of tapes, disks, CD's, cassettes
19 Metal products industry	27 Oil refinery & nuclear fuel production	
20 Machine and electrical equipment industry	28 Base chemicals	31 Artificial fertilisers
21 Car and transport equipment industry	29 Inorganic chemicals	32 Chemical end products
22 Furniture and other industry	30 Petrochemistry	33 Plastics & fibres
23 Electricity companies	34 Building materials industry	
24 Gas distribution	35 Base metals industry	
25 Water production and distribution	36 Metal products	
26 Building and installation industry	37 Machines & appliances	41 Video-, audio- and telecommunication appliances
27 Trade	38 Household appliances	42 Medical, measuring & regulating equipment
28 Transport services	39 Office appliances & computers	45 Railway machinery, space & aircraft's
29 Business services	40 Other electric machinery	46 Other transport means
30 Public (government) and other services	43 Car industry	49 Preparation for recycling
	44 Shipbuilding industry	
	47 Furniture & mattresses	
	48 Other goods, unspecified	
	50 Electricity production	
	51 Gas distribution	
	52 Water collection & distribution	
	53 Building area preparation	56 Buildings installation
	54 Housing, commercial & industrial buildings	57 Final building processes
	55 Ground-, water- & road construction	58 Rental of equipment for building & demolition
	59 Wholesale trade of cars	62 Wholesale trade
	60 Retail trade of cars	63 Retail trade
	61 Car service companies & gas stations	64 Pubs, restaurant, hotels and catering services
	65 Public transport	68 Shipping transport
	66 Freight transport over land	69 Inland freight transport by ship
	67 Pipeline transport	70 Aviation
	71 Transport services (land)	82 Computer services
	72 Transport services (water)	83 Innovation & development companies
	73 Transport services (air)	84 Legal, accounting & economic services
	74 Travel agencies	85 Engineers & architects
	75 Post & telecommunication services	86 Advertising companies
	76 Banking services	87 Employment agencies and job placement services
	77 Insurance companies	88 Cleaning services for buildings
	78 Financial services	89 Other commercial services
	79 Exploitation of houses	
	80 Other real estate services	
	81 Rental of movable goods	
	90 General administration, national	98 (Public) welfare services
	91 General administration, regional	99 Commercial environmental services
	92 Other administration services & social insurance	100 Public environmental services
	93 Defence	101 Culture, sports, recreation, radio & television services
	94 Scientific education	102 Gambling
	95 Private and special education	103 Other services
	96 Other subsidised education	104 Household services
	97 Medical services	105 Other services unspecified

1.2 Selection of elementary flows

The Dutch government specified a list of 20 elementary flows or “stressors”. These are:

- Emissions of CO₂, CO, CH₄, NO_x, SO_x, N₂O, HFC/HCFC, non methane VOC, benzene, PAHs, heavy metals, nitrogen, phosphate, PM10 (dust).
- Land use, water consumption, wood use, fish extraction, use of pesticides.
- Truck, car and moped kilometres, especially to assess the nuisance caused by noise.

The emission data per region were collected from a wide range of databases. Data from the Netherlands were derived from the National emission registration database.

The environmental data from the remaining regions were found in different databases such as the EDGAR (4) and GEAS (5) database. Furthermore emission and consumption data from UN (FAOSTAT) (6), EPA (USA, Canada) (7), World resource institute (8), Statistical Abstract USA (9) and Corinair (10) have been used.

The environmental data consist of a wide range of emissions and raw materials use defined by the Dutch government. In order to make these consistent with the substance names in SimaPro a few had to be changed. These changes are given below:

The Dutch project	The Dutch Input Output Database 95
Land use III	Occup. as integrated arable land
Land use IV	Occup. as Contin. urban land
Land use Forestry	Conv. to integrat. arable land
Wood	Wood (Volume)
N	N-tot
P	P-tot
PAH	PAH's
PM10	Dust (PM10)
HFC/HCFC	HCFC 22*
NMVOG	Non methane VOC
CH4	Methane
Truck km	Noise from truck kilometre
Van km	Noise from van kilometre

* HCFC 22 is the most produced fluorocarbon world wide thus estimated to be representative for the group HFC/HCFC. See also: http://www.afeas.org/production_and_sales.html

Furthermore the emissions of heavy metals to soil have been distributed between agricultural and industrial soil.

An overview of the data sources per region is shown in the following 3 figures:

Figure 3 Overview of data sources for the OECD Europe region

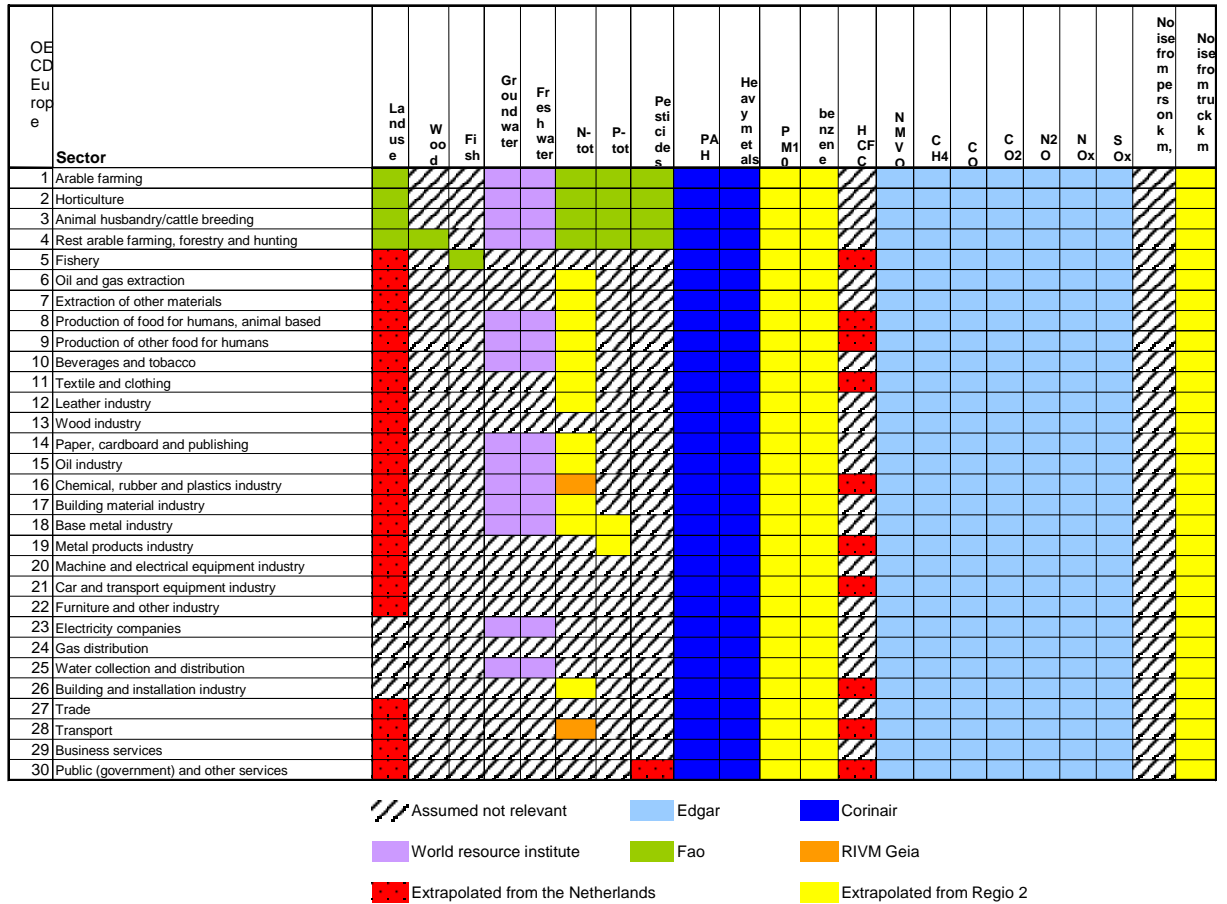


Figure 4 Overview of data sources for the OECD Non-Europe region

OECD Non Europe		Land use	Wood	Fish	Ground water	Fresh water	N-tot	P-tot	Pesticides	PAH	Heavy metals	PM10	benzene	HCFC	NM/OC	CH4	CO	CO2	N2O	NOx	SOx	Noise from person km,	Noise from truck km	
Sector																								
1	Arable farming	Green	Grey	Grey	Purple	Purple	Green	Green	Green	Blue	Blue	Yellow	Yellow	Grey	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Brown
2	Horticulture	Green	Grey	Grey	Purple	Purple	Green	Green	Green	Blue	Blue	Yellow	Yellow	Grey	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Brown
3	Animal husbandry/cattle breeding	Green	Grey	Grey	Purple	Purple	Green	Green	Green	Blue	Blue	Yellow	Yellow	Grey	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Brown
4	Rest arable farming, forestry and hunting	Green	Green	Grey	Purple	Purple	Green	Green	Green	Blue	Blue	Yellow	Yellow	Grey	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Brown
5	Fishery	Red	Grey	Green	Grey	Grey	Grey	Grey	Grey	Blue	Blue	Yellow	Yellow	Red	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Brown
6	Oil and gas extraction	Red	Grey	Grey	Grey	Grey	Yellow	Grey	Grey	Blue	Blue	Yellow	Yellow	Grey	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Brown
7	Extraction of other materials	Red	Grey	Grey	Grey	Grey	Yellow	Grey	Grey	Blue	Blue	Yellow	Yellow	Grey	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Brown
8	Production of food for humans, animal based	Red	Grey	Grey	Purple	Purple	Yellow	Grey	Grey	Blue	Blue	Yellow	Yellow	Red	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Brown
9	Production of other food for humans	Red	Grey	Grey	Purple	Purple	Yellow	Grey	Grey	Blue	Blue	Yellow	Yellow	Grey	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Brown
10	Beverages and tobacco	Red	Grey	Grey	Purple	Purple	Yellow	Grey	Grey	Blue	Blue	Yellow	Yellow	Grey	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Brown
11	Textile and clothing	Red	Grey	Grey	Grey	Grey	Yellow	Grey	Grey	Blue	Blue	Yellow	Yellow	Red	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Brown
12	Leather industry	Red	Grey	Grey	Grey	Grey	Yellow	Grey	Grey	Blue	Blue	Yellow	Yellow	Grey	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Brown
13	Wood industry	Red	Grey	Grey	Grey	Grey	Yellow	Grey	Grey	Blue	Blue	Yellow	Yellow	Grey	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Brown
14	Paper, cardboard and publishing	Red	Grey	Grey	Purple	Purple	Yellow	Grey	Grey	Blue	Blue	Yellow	Yellow	Grey	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Brown
15	Oil industry	Red	Grey	Grey	Purple	Purple	Yellow	Grey	Grey	Blue	Blue	Yellow	Yellow	Grey	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Brown
16	Chemical, rubber and plastics industry	Red	Grey	Grey	Purple	Purple	Orange	Grey	Grey	Blue	Blue	Yellow	Yellow	Red	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Brown
17	Building material industry	Red	Grey	Grey	Purple	Purple	Yellow	Grey	Grey	Blue	Blue	Yellow	Yellow	Grey	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Brown
18	Base metal industry	Red	Grey	Grey	Purple	Purple	Yellow	Yellow	Grey	Blue	Blue	Yellow	Yellow	Grey	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Brown
19	Metal products industry	Red	Grey	Grey	Purple	Purple	Yellow	Yellow	Grey	Blue	Blue	Yellow	Yellow	Red	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Brown
20	Machine and electrical equipment industry	Red	Grey	Grey	Grey	Grey	Yellow	Grey	Grey	Blue	Blue	Yellow	Yellow	Grey	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Brown
21	Car and transport equipment industry	Red	Grey	Grey	Grey	Grey	Yellow	Grey	Grey	Blue	Blue	Yellow	Yellow	Red	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Brown
22	Furniture and other industry	Red	Grey	Grey	Grey	Grey	Yellow	Grey	Grey	Blue	Blue	Yellow	Yellow	Grey	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Brown
23	Electricity companies	Grey	Grey	Grey	Purple	Purple	Grey	Grey	Grey	Blue	Blue	Yellow	Yellow	Grey	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Brown
24	Gas distribution	Grey	Grey	Grey	Purple	Purple	Grey	Grey	Grey	Blue	Blue	Yellow	Yellow	Grey	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Brown
25	Water collection and distribution	Grey	Grey	Grey	Purple	Purple	Grey	Grey	Grey	Blue	Blue	Yellow	Yellow	Grey	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Brown
26	Building and installation industry	Grey	Grey	Grey	Grey	Grey	Yellow	Grey	Grey	Blue	Blue	Yellow	Yellow	Red	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Brown
27	Trade	Red	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Blue	Blue	Yellow	Yellow	Grey	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Brown
28	Transport	Red	Grey	Grey	Grey	Grey	Orange	Grey	Grey	Blue	Blue	Yellow	Yellow	Red	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Brown
29	Business services	Red	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Blue	Blue	Yellow	Yellow	Grey	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Brown
30	Public (government) and other services	Red	Grey	Grey	Grey	Grey	Grey	Grey	Red	Blue	Blue	Yellow	Yellow	Red	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Brown









Assumed not relevant
 Edgar
 Fao
 EPA (Canada, USA)

RIVM (GEIA)
 Extrapolated from the Netherlands
 World resource institute

Extrapolated from regio 1
 Statistical abstract of USA

Figure 5 Overview of data sources for the Non OECD region

Non OECD	Sector	Land use	Wood	Fish	Ground water	Fresh water	N-tot	P-tot	Pesticides	PAH	Heavy metals	PM10	benzene	HCFC	NMVOG	CH4	CO	CO2	N2O	NOx	SOx	Noise from person km,	Noise from truck km
1	Arable farming	FAO																					
2	Horticulture				World resource institute																		
3	Animal husbandry/cattle breeding																						
4	Rest arable farming, forestry and hunting	FAO																					
5	Fishery	Extrapolated from the Netherlands		Fao																			
6	Oil and gas extraction	Extrapolated from the Netherlands																					
7	Extraction of other materials	Extrapolated from the Netherlands																					
8	Production of food for humans, animal based	Extrapolated from the Netherlands																					
9	Production of other food for humans	Extrapolated from the Netherlands																					
10	Beverages and tobacco	Extrapolated from the Netherlands																					
11	Textile and clothing	Extrapolated from the Netherlands																					
12	Leather industry	Extrapolated from the Netherlands																					
13	Wood industry	Extrapolated from the Netherlands																					
14	Paper, cardboard and publishing	Extrapolated from the Netherlands																					
15	Oil industry	Extrapolated from the Netherlands																					
16	Chemical, rubber and plastics industry	Extrapolated from the Netherlands																					
17	Building material industry	Extrapolated from the Netherlands																					
18	Base metal industry	Extrapolated from the Netherlands																					
19	Metal products industry	Extrapolated from the Netherlands																					
20	Machine and electrical equipment industry	Extrapolated from the Netherlands																					
21	Car and transport equipment industry	Extrapolated from the Netherlands																					
22	Furniture and other industry	Extrapolated from the Netherlands																					
23	Electricity companies	Extrapolated from the Netherlands																					
24	Gas distribution	Extrapolated from the Netherlands																					
25	Water collection and distribution	Extrapolated from the Netherlands																					
26	Building and installation industry	Extrapolated from the Netherlands																					
27	Trade	Extrapolated from the Netherlands																					
28	Transport	Extrapolated from the Netherlands																					
29	Business services	Extrapolated from the Netherlands																					
30	Public (government) and other services	Extrapolated from the Netherlands																					

	Assumed not relevant		Edgar		RIVM (GEIA)
	Extrapolated from regio 2		Fao		World resource institute
	Extrapolated from the Netherlands		Extrapolated from regio 1		

In the figures 3-5 it is stated that land use in sector 4 "Rest arable land, forestry and hunting" is derived from the FAO database. However, the data are calculated from the wood consumption per region - from FAO - and then divided with an average wood yield per hectare.

Furthermore the emissions of CO, CO₂, NO_x, SO_x, NMVOG, N₂O and CH₄ do not include emissions from forest fires and savannah burning.

1.3 Data location

The output of the different sectors varies. This affects the distribution of the sectors into the different categories in the SimaPro LCA explorer. If a sector output is a product, the sector is located in the category "materials". Sectors providing services are located in "Processing", transport sectors in "Transport" and energy sectors in "Energy". See figure 6 for a general overview of the different subcategories in SimaPro.

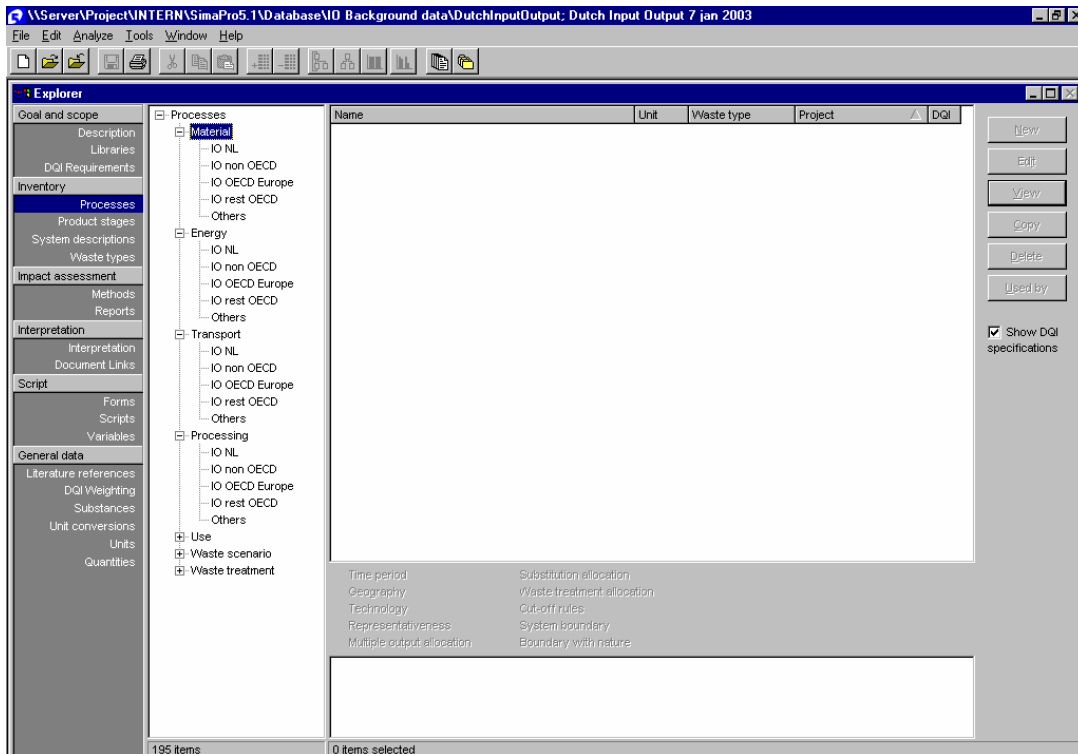


Figure 6 The structure of the Dutch Input Output Database 95 in the SimaPro LCA explorer

1.4 Hints

When using the Dutch Input Output Database, one must be careful when choosing the sectors to represent the product system under study. For example, if you conduct an LCA of a cheeseburger and need data on meat, it is important to realise from where in the production chain of meat products you need data.

A piece of beef in the supermarket usually does not come directly from a farmer, but comes from the slaughtering and meat processing industry. Therefore, data should be taken from the sector "Slaughtering and meat processing industry", even though the sector "Animal husbandry/cattle breeding" is where the meat is "produced". The sector "Slaughtering and meat processing industry" however links to the sector "Animal husbandry/cattle breeding" and thus includes the environmental impacts from this sector.

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⁵GEAS, *Global Environment Assessment Statistics* (see arch.rivm.nl/env/int/coredata/geas).

⁶FAOSTAT, FAO statistical data (see <http://apps.fao.org>).

⁷EPA (Canada, USA). Different EPA web sites in Canada and USA: *PM10 (USA): National Air Pollutants Emission trends, 1990-1998*, (see www.epa.gov/ttn/chief/trends/trends98), *PM10, Benzene and NH₃ (Canada): 1995 Criteria Air Contaminant Emissions for Canada* (see www.ec.gc.ca/pdb/npri/documents/SuppTables95En.pdf).

⁸World Resources Institute, *Water resources and fresh water ecosystems*. (http://earthtrends.wri.org/country_profiles/index.cfm?theme=2).

⁹Statistical abstracts of USA, *1997 Economic Census Vehicle Inventory and Use Survey Geographic Area Series USA*. (see www.census.gov/prod/ec97/97tv-us.pdf).

¹⁰Corinair, the European Union Emission Inventory programme. (see www.emep.int/emis_tables. The html files Stab 8-16 are emission tables of heavy metals).



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