

02-04: Odd biomass fractions – Resources

As pointed out in 01-04, the basis for “odd biomass fractions” is non-hazardous waste, mainly from households but also from some industrial processes.

Waste is – per definition – “*substances or objects which are disposed of or are intended to be disposed of or are required to be disposed of by the provisions of national law*” (quoted from the Basel convention. The key words are “substances” and “objects”.

Waste is a physical entity, it is a material or a product originating from somewhere, so it has been produced and/or processed prior to becoming a waste. Thus, it is natural that there is a direct correlation between economic growth (i.e. consumption of resources) and generation of waste. For the European federation, the strategy for sustainable development (CEC 2001b) emphasises the strategic object to break t link between economic growth, the use of resources, and the generation of waste. Therefore natural resources and wastes is one of four key environmental priorities described in the 6th European Action Programme. The objective is to decrease the amount of waste generated and achieve a relative decoupling between economic growth and generation of waste. So far, this has not been successful. On the whole, the trend is that the total waste volumes increase while in some states there have been minor disturbances to this trend for shorter periods. Hence the statistics from 2008 as available from the Eurostat database can be used to give indicative values for the total resources.

The total amount of waste generated in the European federation exceeds 2 billion tonnes (2 620 million tonnes in 2008) whereof approximately 35 % is non-mineral (data from Eurostat). Out of this, more than 200 million tonnes (7.7 %) was household waste, more than 100 million tonnes (4.4 %) was animal and vegetal, 70 million tonnes (2.6 %) was woody waste and almost 60 million tonnes was paper and cardboard waste.

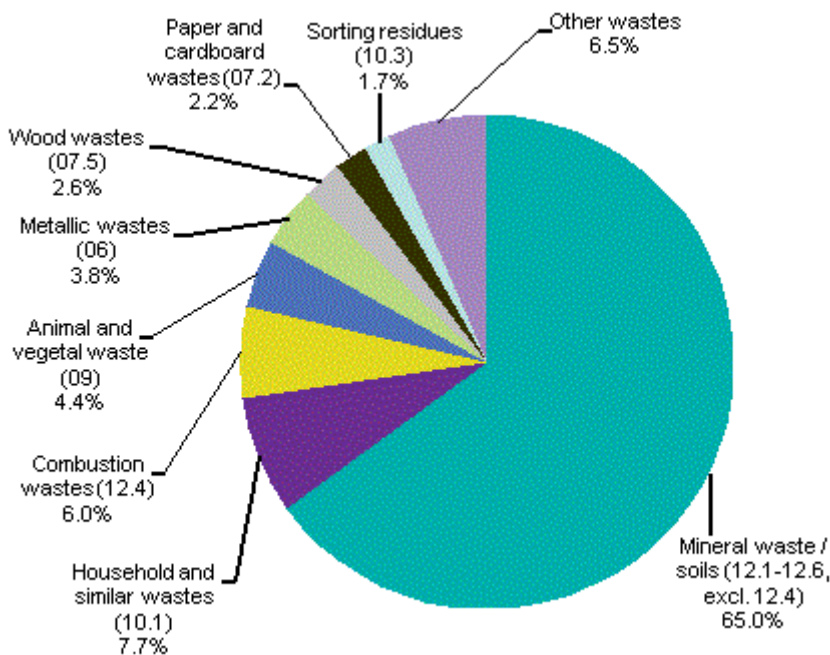


Figure 02-04 1: Distribution of total waste (2008) into categories

02-04-01: Household waste and organic waste

The households are responsible for 60-90 % of the total municipal waste generated while the remainder can be attributed to the commercial- and service sectors. With proper information to the households, to commercial enterprises and to the actors in the service sector, all the municipal waste may well fall within the non-hazardous category as defined in the Basel convention.

In 2008, the total amount of municipal waste was 254 million tonnes corresponding to 506 kg per year and person.

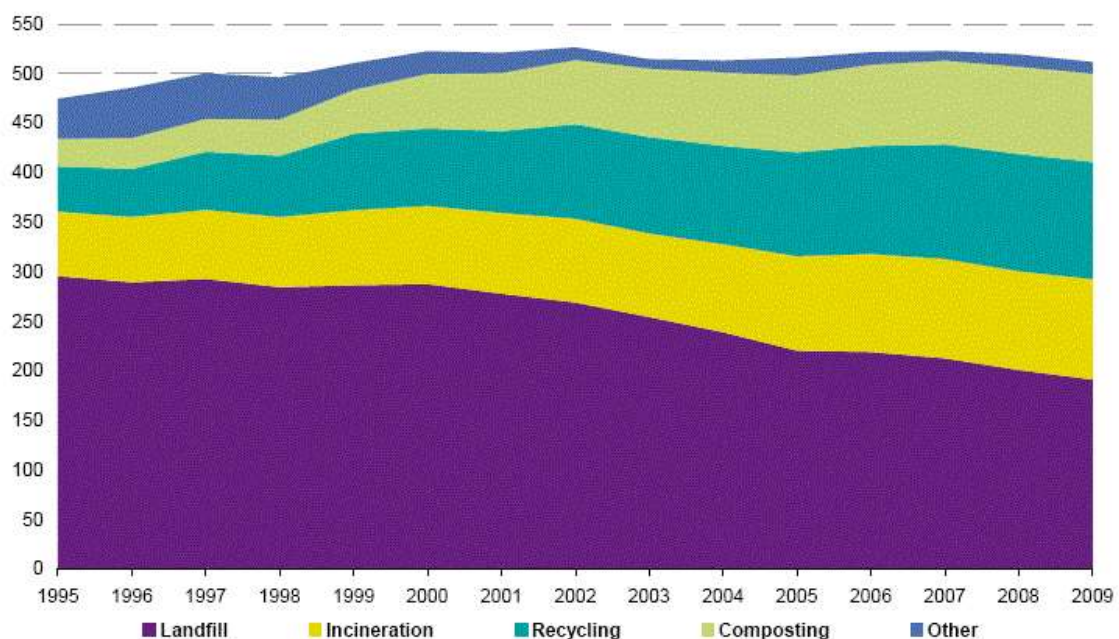


Figure 02-04 2: Main treatments of municipal waste, development over time

As seen from figure 02-04 2, there is still a significant amount of landfilling while the total amounts incinerated have not increased substantially. On this point, current statistics are ambiguous since there is really no clear distinction between incineration aimed for energy production (“incineration with heat recovery”) and incineration aiming only to reduce the volume prior to landfill. However, waste combustion in 2009 supplied approximately 30 TWh of electricity and 55 TWh of heat, approximately 50 % of which was classified as renewable.

A rough estimate based on 70 % thermal efficiency in the plants used and a heating value about 12 MJ/kg would then yield that the total amount used “with heat recovery” would amount to about 30-35 million tonnes or about half the total amount incinerated. This is only just the roughest estimate but it serves to indicate the order of magnitude for the remaining resource: approximately 80-90 TWh on an annual basis.

The routes for treatment are also very different between the individual states, this table being sorted with decreasing fractions of incineration:

	Incineration, %	Recycling, %	Composting, %	Landfill, %
Denmark	54	24	18	4
Sweden	49	35	13	3
Netherlands	39	32	27	1
Belgium	36	35	25	5
Luxembourg	36	25	20	19
Germany	35	48	17	1
France	32	18	15	36
Austria	27	29	40	3
Portugal	19	9	8	65
Finland	17	25	8	50
Czech Republic	13	2	2	83
Italy	11	11	34	44
Slovakia	10	3	5	83
United Kingdom	10	23	12	55
Hungary	9	15	2	74
Spain	9	14	20	57
Ireland	3	32	3	62
Slovenia	1	31	2	66
Poland	1	9	4	87
Bulgaria	0	0	0	100
Cyprus	0	6	36	58
Estonia	0	18	8	75
Greece	0	21	2	77
Latvia	0	6	1	93
Malta	0	3	0	97
Lithuania	0	3	1	96
Romania	0	1	0	99

Table 02-04 1: Main treatments of municipal waste in the individual states, indicative
Table sorted after decreasing fraction of incineration
Values are very insecure and different sources give different results

Looking only at the 13 states where incineration is negligible, less than 10 % of the total amount of waste incinerated, one finds that the total amounts of household waste and agricultural/forest and fishing waste (all reported as “Agric” in the table below) amounts to more than 55 million tonnes and almost 34 million tonnes only in 2008 (Eurostat).

In most of the states in this table, landfilling was the dominant method for waste treatment in 2008 while composting (biological treatment) and incineration both were only used to a minor extent.

	Household waste	Agric. Waste	Haz. Waste	Total waste
Hungary	3 466 000	468 000	671 000	20 080 000
Spain	24 431 000	11 356 000	3 649 000	149 254 000
Ireland	1 677 000	19 000	743 000	23 637 000
Slovenia	714 000	132 000	153 000	5 038 000
Poland	6 879 000	1 350 000	1 469 000	140 340 000
Bulgaria	2 907 000	754 000	13 043 000	286 093 000
Cyprus	433 000	127 000	24 000	1 843 000
Estonia	440 000	240 000	7 538 000	19 584 000
Greece	3 954 000	<i>no data</i>	253 000	68 644 000
Latvia	606 000	75 000	67 000	1 495 000
Malta	169 000	3 000	55 000	1 499 000
Lithuania	1 363 000	1 288 000	116 000	6 835 000
Romania	8 464 000	17 035 000	524 000	189 311 000

Table 02-04 2: Total amounts (tonnes) of a few waste fractions

In the above table, from Eurostat, the heading “agric. waste” includes wastes from agriculture, from forestry and from fisheries. In the handbook, you will find these “wastes” mainly treated as ligno-cellulosic biomass (“waste from forestry”) in chapters 01-01, 02-01, 03-01, 04-01 and 05-01, as herbaceous biomass (“waste from agriculture”) in chapters 01-02, 02-02, 03-02, 04-02 and 05-02 and among the putrescible biomass (“waste from fisheries” and other food processing industries) in chapters 01-03, 02-03, 03-03, 04-03 and 05-03.

Municipal solid waste and household waste, though, belong in chapters 01-04, the current chapter, 03-04, 04-04 and 05-04. And so does a number of other waste streams such as demolition and construction waste.

02-04-02: Construction and demolition waste

Obviously, the amounts of construction and demolition wastes are strongly depending on the over-all activity in the building sector and that is again strongly depending on general economic activity. Hence, this is not a stable source for biomass, a source that can be relied upon as a base fuel. However, the amounts may be significant. A survey performed by AvfallSverige in 2009 revealed that during 2004, about 200 000 tonnes of wood-waste was produced by the Swedish building sector. By 2006, the corresponding amount was only about 2 000 tonnes.

Unfortunately, there are no common statistics available for the European federation, due to lack of reporting routines so that data from the states are not comparable. However, the ambition (quoted from the waste framework directive) is that “*by 2020, the preparing for re-use, recycling and other material recovery, including backfilling operations using waste to substitute other materials, of non-hazardous construction and demolition waste, excluding naturally occurring material defined in category 17 05 04 in the list of waste, shall be increased to a minimum of 70 % by weight...*”

What this means is, that routines for reliable and comparable statistics have to come into force and that will make the resource base visible.

The types of material available from the building sector are for example formwork timber – basically stem-wood contaminated by chunks of concrete – as well as interior/exterior woodwork and timber from building frameworks. Parts of this will have been impregnated with anti-rot agents, parts of it will have been painted, but parts will be clean and will serve well as a clean biofuel.

02-04-03: Other sectors

Other industrial sectors – primary producers like agriculture, forestry, food processing and building sectors excluded – producing solid, combustible waste fractions to any extent worth mentioning, are first and foremost the service sector, producing paper-waste, and manufacturing industry in general, producing waste in the form of used and broken wood packaging and pallets.

Again, no reliable statistics are available on the federal European level. The Swedish study mentioned above shows that the manufacturing industry in Sweden produce about 100-150 kg of wood waste per employee and year. The production of non-metallic and mineral products gives rise to 300-500 kg of wood waste per employee and year. These numbers are based only on limited statistics and they reflect only the Swedish situation, but still, they indicate that wood packaging and pallets, basically non-impregnated stem wood, may represent significant amounts of clean wood waste that is “produced” in industrial sectors often is overlooked.

02-04-04: Planning aspects and good examples

Planning for an increased use of waste fractions for energy purposes is double-edged: On the one hand, the total amount of waste from society and from households tends to go hand-in-hand with economic development, but on the other hand a sustainable long-term development must be based on a material management more efficient than the present.

The “waste hierarchy” illustrates in five simple steps what must always be the basis for waste management:

1. The highest priority is to take measures to reduce the total amounts of waste generated in households, in industry and in the public sector.
2. Second priority is to take active measures to re-use the products, for their original purpose or for new purposes.
3. The third step – in case none of the first two is applicable – is to recover the material by sorting, by composting or by digestion.
4. Only if none of the above is feasible does energy recovery by incineration in CHP-plants become a main alternative.
5. If none of the above is applicable, one will finally have to dispose of the material in a landfill.

The consequence of the waste hierarchy is thus that the local planning must be based on an active strive to minimize the total amounts of waste for incineration. At the same time, the fraction finally incinerated shall be as clean as possible. This requires an active participation from the households, and the garbage collection system must be developed to aid the households to actively separate fractions so as to fit the waste hierarchy.

As pointed out in the last paragraph in chapter 01-04, plastics, painted or impregnated wood and any electronic or electric waste must be strictly banned from the waste fraction aimed for energy recovery. Even so, though, the total resource will still amount to at the very least some 100 dry kg of clean fuel per person and year – about 0.5 MWh – summing up to significant amounts of energy in a regional perspective.

Good examples and practices can also be collected from the European Environment Agency at <http://www.eea.europa.eu/>.