

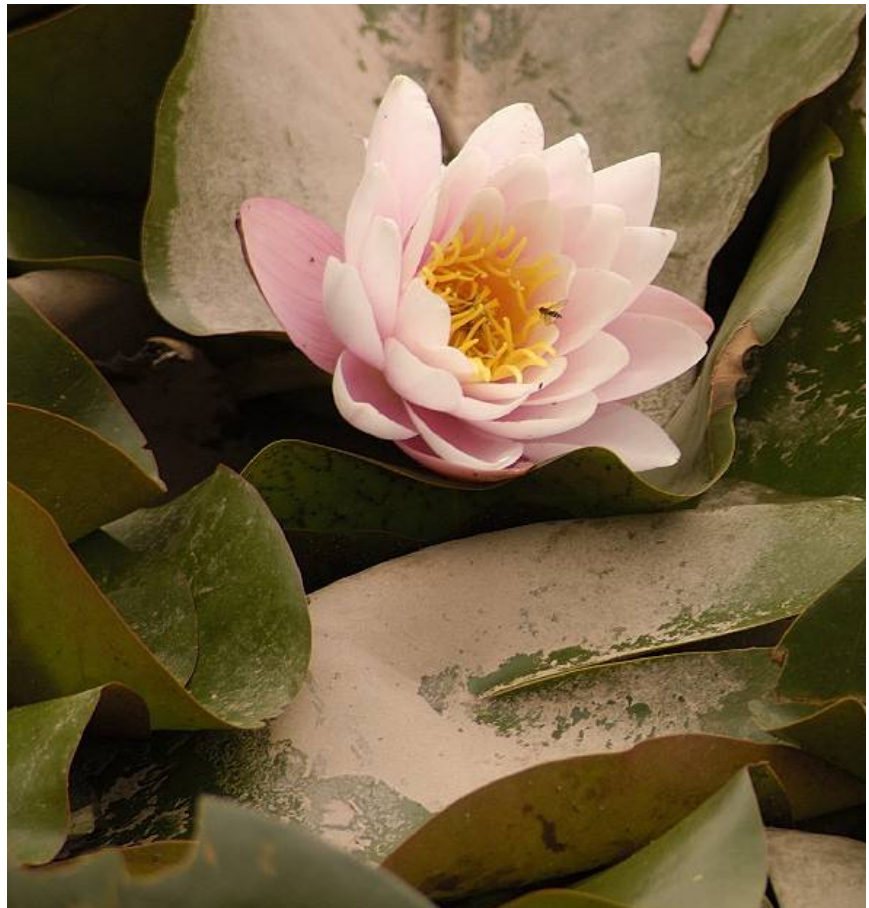


FINAL REPORT

ASSESSMENT OF THE OPTIONS TO IMPROVE THE MANAGEMENT OF BIO-WASTE IN THE EUROPEAN UNION ANNEX D: Industrial biowaste

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MANAGEMENT OF BIO-WASTE IN THE EUROPEAN
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LIST OF ABBREVIATIONS

AD	Anaerobic digestion
MBT	Mechanical biological treatment
ABPR	Animal By-Products Regulation
ACR+	Association of Cities and Regions for Recycling and Sustainable Resource management
BAT	Best available techniques
BIR	Bureau of International Recycling
BMW	Biodegradable municipal waste
BREF	BAT Reference Documents
CEWEP	Confederation of European Waste-to-Energy Plants
EEA	European Environment Agency
EEB	European Environmental Bureau
ETC/SCP	European Topic Centre on Sustainable Consumption and Production
FEAD	European Federation of Waste Management and Environmental Services
FGW	Fruit and garden waste
IPPC	Integrated Pollution Prevention and Control
ITT	Invitation to tender
LCA	Life cycle analysis
MSW	Municipal solid waste
VFG	Vegetable fruit and garden waste

A The waste Statistics Regulation and industrial bio-waste

A.1 Analysis

The definition of bio-waste used in the Waste framework Directive is: “biodegradable garden and park waste, food and kitchen waste from households, restaurants, caterers and retail premises and comparable waste from food processing plants”. It includes waste with following properties:

- Nature or process of origin: garden/park waste OR food waste OR kitchen waste
- Properties of the waste: biodegradability
- Origin or industrial sector of origin: households OR restaurants OR catering OR retail premises OR food processing industry

The Waste Statistics Regulation 2150/2002/EC details in its annex I

- Waste categories (section 2): based upon the European Waste List but aggregated into specific waste statistics categories
- Origin or industrial sector of origin (section 8): based upon grouped divisions or sections of NACE rev.2

Important waste categories containing bio-waste are:

- Cat 32: 09 Animal and vegetal wastes (excluding animal waste of food preparation and products; and excluding animal faeces, urine and manure)
- Cat 33: 09.11 Animal waste of food preparation and products
- Cat 34: 09.3 Animal faeces, urine and manure
- Cat 35: 10.1 Household and similar wastes
- Cat 36: 10.2 Mixed and undifferentiated materials.
- Cat 40: 11 Common sludges (excluding dredging spoils)

Household waste (cat 35) needs to be excluded, because we are focussing on industrial waste.

Bio-waste can be composed as the sum of cat 32 and 33. But this would disregard the fact that a considerable fraction of bio-waste can be included in the sludges of category 40 or in the industrial mixed waste fraction of category 36.

Important origin categories are

- Cat 1: Division 01 Crop and animal production, hunting and related service activities + Division 02 Forestry and logging
- Cat 4: Division 10 Manufacture of food products + Division 11 Manufacture of beverages + Division 12 Manufacture of tobacco products
- Cat 18: Service activities: Section G, except 46.77 Wholesale and retail trade; repair of motor vehicles and motorcycles + Section H Transportation and storage + Section I Accommodation and food service activities + Section J Information and communication + Section K Financial and insurance activities + Section L Real estate activities + Section M Professional, scientific and technical activities + Section N

Administrative and support service activities + Section O Public administration and defence; compulsory social security + Section P Education + Section Q Human health and social work activities + Section R Arts, entertainment and recreation + Section S Other service activities + Section T Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use + Section U Activities of extraterritorial organisations and bodies

- Cat 20: Waste generated by households

Household waste or waste generated by households (cat 20) needs to be excluded as we are focussing on industrial waste.

The origins specified in the definition in the Waste Framework Directive correspond to

- households – cat 20, not considered here
- restaurants = NACE Rev. 2 Section H Hotels and restaurants, including hotels, camping sites, restaurants, bars, canteens and catering. The Section H referred to in Regulation 2150/2002/EC refers to Section I in the amended NACE Regulation 3037/90/EC. This section is included in origin cat 18.
- catering = NACE Rev. 2 class 55.52, part of section H/I mentioned above. Included in origin cat. 18.
- retail premises = NACE Rev. 2 division 52 Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods. This division is a part of section G and is included in origin cat. 18
- food processing industry = NACE Rev. 2 division 15 Manufacture of food products and beverages. This corresponds grosso modo with category 4.

A.2

Conclusion

Industrial bio-waste cannot be retrieved from the available categories in the waste Statistics Regulation. Theoretically It would result from the generation of waste codes cat 32 + 33¹ from the sum of the sectors cat 4 + x% of cat 18. x% refers to the relative

¹ corresponding to EWL codes

02 01 02 animal-tissue waste, 02 02 01 sludges from washing and cleaning, 02 02 02 animal-tissue waste, 02 01 01 sludges from washing and cleaning, 02 01 03 plant-tissue waste, 02 03 01 sludges from washing, cleaning, peeling, centrifuging and separation, 02 03 03 wastes from solvent extraction, 02 03 04 materials unsuitable for consumption or processing, 02 03 99 wastes not otherwise specified, 02 04 99 wastes not otherwise specified, 02 07 01 wastes from washing, cleaning and mechanical reduction of raw materials, 02 07 02 wastes from spirits distillation, 02 01 99 wastes not otherwise specified, 02 02 03 materials unsuitable for consumption or processing, 02 02 99 wastes not otherwise specified, 02 03 02 wastes from preserving agents, 02 05 01 materials unsuitable for consumption or processing, 02 05 99 wastes not otherwise specified, 02 06 01 materials unsuitable for consumption or processing, 02 06 02 wastes from preserving agents, 02 07 04 materials unsuitable for consumption or processing, 19 08 09 grease and oil mixture from oil/water separation containing only edible oil and fats, 20 01 08 biodegradable kitchen and canteen waste, 20 01 25 edible oil and fat, 20 03 02 waste from markets, 02 01 07 wastes from forestry, 20 02 01 biodegradable waste

presence of restaurants, caterers and retail premises in category 18. We could assume that the other fractions, perhaps with exemption of wholesale, do not generate much bio-waste, and that therefore we could use the whole of category 18.

A.3 Results

Table A.3.1 generated industrial bio-waste in 2004 and 2006, according to EUROSTAT data

waste: origin	2004				total	2006				total
	cat 33 cat 18	cat 4	cat 32 cat 18	cat 4		cat 33 cat 18	cat 4	cat 32 cat 18	cat 4	
EU27	-	7.117,93	-	32.775,62	39.893,56	1.400,48	8.144,68	10.174,64	29.162,90	48.882,69
EU25	-	7.083,81	-	32.253,58	39.337,39	1.399,75	8.108,32	9.061,65	28.352,81	46.922,53
EU15	-	5.035,89	-	24.871,11	29.906,99	1.266,72	5.410,19	8.514,74	21.803,53	36.995,17
BE	39,76	396,17	359,67	3.739,79	4.535,38	44,40	3.710,97	428,11	1.940,88	6.124,35
BG	0,32	32,15	8,88	314,19	355,54	0,73	5,65	25,39	353,04	384,80
CZ	3,68	75,96	51,26	348,42	479,32	-	54,10	44,11	307,71	405,92
DK	18,01	81,87	-	-	99,89	-	-	17,77	101,65	119,42
DE	-	353,44	754,89	1.255,01	2.363,35	-	351,01	657,40	1.497,87	2.506,28
EE	0,01	47,21	25,33	363,66	436,21	-	13,24	25,67	224,01	262,93
IE	-	289,86	284,94	455,66	1.030,45	-	221,03	249,75	244,92	715,69
GR	-	13,48	1.269,00	766,52	2.049,00	-	2,36	1.269,00	70,72	1.342,08
ES	-	726,00	2.586,77	2.115,92	5.428,69	604,14	986,37	1.713,07	1.184,54	4.488,12
FR	236,63	-	1.240,22	-	1.476,85	236,63	553,00	1.240,22	73,00	2.102,85
IT	17,23	131,99	159,75	5.267,40	5.576,37	7,07	96,50	84,18	5.566,34	5.754,08
CY	7,08	23,53	13,32	145,56	189,49	7,08	58,59	13,32	128,33	207,32
LV	0,23	3,99	0,95	75,79	80,96	-	13,26	7,08	112,37	132,71
LT	0,06	5,58	2,88	279,95	288,47	0,05	36,52	7,46	185,69	229,71
LU	2,41	0,20	10,09	8,25	20,95	2,52	0,48	17,28	2,19	22,46
HU	7,22	74,92	195,02	725,26	1.002,41	94,48	342,91	181,09	814,51	1.432,99
MT	-	1,63	4,84	0,62	7,09	-	0,27	2,84	-	3,11
NL	-	673,75	728,04	5.731,36	7.133,16	-	548,52	746,35	5.863,81	7.158,68
AT	-	351,35	1.222,59	14.193,33	15.767,27	25,84	45,50	360,79	528,04	960,16
PL	7,20	1.770,75	86,93	5.197,02	7.061,89	26,83	2.132,23	194,37	4.433,83	6.787,26
PT	112,43	266,32	1.750,54	352,14	2.481,43	26,24	279,20	319,07	353,20	977,71
RO	-	1,99	919,48	207,85	1.129,31	-	30,71	1.087,60	457,05	1.575,36
SI	1,96	21,36	21,56	10,37	55,25	-	25,39	59,36	16,68	101,43
FI	-	241,65	57,91	186,89	486,45	92,76	256,88	16,97	333,56	700,17
SE	0,19	76,14	428,51	373,65	878,48	0,19	145,01	428,51	456,31	1.030,02
UK	114,89	1.432,66	2.407,72	3.207,23	7.162,50	226,93	1.553,35	2.234,03	3.589,51	7.603,82

B Lithuanian case

B.1 Policy views

Since 2006 Lithuania introduced a prohibition for landfills to accept green, garden and park waste and promoted the construction of sites for composting such waste. Several companies were founded for composting industrial bio-waste generated by catering establishments and food not suitable for human consumption. By the end of 2006, six facilities had been put in operation for the generation of gas from sludge, slurry and other biodegradable waste of industrial origin.

Enterprises that generate biodegradable manufacturing waste, including food waste generated by catering or other enterprises and food products not suitable for consumption, are prohibited from mixing it with other kinds of waste. Where

technologically feasible, industrial bio-waste and other biodegradable waste must be recycled or used in some other way.

Industrial bio-waste management systems must be developed according to the following priorities:

- Waste treatment combined with energy generation and preservation of nutrients;
- Waste treatment without energy generation but with the preservation of nutrients
- Waste treatment by incineration and energy production.

Possible technological solutions are:

- Anaerobic digestion of food waste together with meat industry waste, producing biogas and generating power and heat.
- Source separated collection and anaerobic digestion of kitchen waste together with waste treatment sludge at the existing and of future sludge digestion plants to be established in main cities in the near future. This would improve the organic load of anaerobic (methane) tanks – there would be no necessity to construct new ones.
- Most probably, MBT shall be installed in certain regions in the coming years. After a pre-treatment process of mechanical sieving and sorting, the biodegradable part of waste shall be anaerobically digested in methane tanks, with further composting of the obtained digestate. The part with high calorific value sorted by the mechanical sorting-sieving process will be used as refuse delivered fuel (RDF) in specific co-incineration power plants or at the Akmene cement plant.

B.2 Data on bio-waste and animal by-products from food industry

Juškaitė-Norbutienė et al. (2007) have gathered data on waste and by-product generation, using three different sources: the national waste surveys of waste producers and waste collection or treatment actors, and waste statistics from the food industry. They note that in some regions, data is completely lacking, and there are significant discrepancies between different sources and even within a single source. These gaps and inconsistencies were mainly tackled through in-depth Interviews with stakeholders and extrapolations. Waste of animal origin (WAO) includes both the bio-degradable waste of animal origin from the meat, fish and dairy industry, and some part of the non animal origin waste if this waste fraction was mixed with animal origin waste (for instance catering waste).

The authors estimate that in 2005:

- Butchery generated about 57 Ktonnes of WAO (bones included).
- The fish industry generated 2.65 Ktonnes of animal by-products; 37% of that waste passed to fur farms and hunters, a similar part to farmers for animal feeding, 10% was used in biogas production and 2% was incinerated in a category 1 animal by-product treatment factory. 360 tonnes are passed to treatment facilities that are neither registered as food preparation treatment factories, nor as Category 3 animal by-products treatment factories.
- The dairy industry generated 226 Ktonnes bio-degradable waste (mostly whey, off-spec and end-of-life products), which is significantly more than the national waste accounting data (ranging from 16 to 86 Ktonnes/year).

The authors report that, according to the National Waste Recording data of the period 2000 – 2003, the majority of bio-waste was disposed. From 2004, 62 % of waste was processed in agriculture as liquid manure and only 0.1 % of that waste was dumped, the rest was composted. The other types of waste treatment used in 2005 were: 73 % of waste was passed to farmers as animal fodder, 10 % was passed to the intermediate 3rd category animal by-products treatment facilities, about 7 % was passed to biogas production, 7 % was used as liquid manure and 3 % of bio-waste passed to wastewater. However, some liquid waste is not registered and is discharged into the sewage system.

The authors also point out that, according to the register of the State Food and Veterinary Service (hereinafter SFVS), there is only one animal by product incineration plant, one category I processing plant, two category II processing plants, four category III processing plants, one biogas plant, sixteen category III intermediate plants, one category I or II animal by-products processing plants, four processed by-product storage establishments, thirteen pet food plants, seven technical products plants, twenty three fur animal rearing establishments and one composting plant in Lithuania. According to the authors, there are some issues of market power abuse.

Waste of non-animal origin is generated mainly in grain processing, flour product, sugar and alcohol manufacturing.

The authors have estimated that in 2005:

- The grain processing industry has generated 24 Ktonnes of non-animal origin waste. 90% of this waste is dumped, and the other 10% is passed to associations of hunters for wild animal feeding.
- The alcoholic beverage industry generated about 323 Ktonnes of biodegradable waste. Brewers generated 40-45 Ktonnes of saladine or malt filtration waste, 8-8.5 Ktonnes of liquid barm and 400-500 tonnes of malt cleaning waste. Saladine waste and malt cleaning waste are sold to farmers for animal feeding. Barm waste can be sold to waste treatment facilities which dry it and sell it as a supplement to forage. Some liquid malt waste is sold to farmers directly. Wine production generates about 1 Kton of fruity squeezed cake and rotten fruit – it is dumped, composted or sold as animal feeding. The 250 Ktonnes of liquid, organic alcohol by-products are mostly sold to farmers or poured on the field as fertiliser. In the future, the liquid part of this waste could be used in bio fuel production, while the dry part is burned.
- Annually, about 4 Ktonnes of waste is generated from the manufacturing of bread and other cereal products. According to the authors, it is currently not possible to evaluate how much of the bio-degradable and by-product from the bread and pastry industries have been used as animal feed.
- The sugar industry generated three types of by-products and bio-degradable waste. Grass/weed, sugar beet leaves and peels correspond to 142-400 Ktonnes/year. This fraction is often given to farmers or used for soil re-cultivation. Sugar beet cake corresponds to 240 Ktonnes per year. This fraction is used as animal feed. Molasses correspond to 30 Ktonnes per year. They are used in the production of fodder, alcohol, yeast and similar products. The amounts of beet cake and molasses depend on sugar content. Depending on the climatic conditions, this can fluctuate by 30%.

B.3 Problems and evolutions

Juškaitė-Norbutienė et al. (2007) point to some problems:

- Each Regional Waste Management Centre (for municipal bio-degradable waste) has their own concepts and different plans for bio-degradable waste management, whereas industrial bio-degradable normally is not included within these plans.
- Landfilling remains the cheapest option. Although the landfilling of biodegradable waste from industry is prohibited, companies still use landfilling.
- Data on waste production, collection, separation and treatments is of low quality.
- Because Category 1 treatment of animal by-products is subsidised, Category 2 animal by products are often mixed with Category 1.
- It is particularly difficult to estimate the generation and the treatment of waste from supermarkets.

Future evolution of industrial bio-waste treatment can be expected to be in phase with developing municipal waste treatment capacity: MBT-plants, treatment of RDF in incineration and co-incineration plants, plants for anaerobic digestion and composting plants will both treat municipal bio-waste and industrial bio-waste that is technically fit for co-treatment with municipal bio-waste. Some installations, like composting plants are focussing on municipal waste like green waste from the maintenance of public areas, and could accept as a side stream both household waste and industrial waste. Some installations like anaerobic digestion of manure and sludge can accept (as a side stream) other industrial bio-wastes or source separated collected municipal bio-waste. More specific waste streams, for which the treatment is not connected to the treatment of municipal or other waste streams and for which the treatment is expected to evolve more autonomously, are animal by-products, for which a treatment infrastructure is being set up in line with the Animal By-products Directive, and a set of specific food processing waste streams that are reused in agriculture, either as soil improver or as feedstock material.

C Flemish case

C.1 Statistical methodology

The Flemish region of Belgium has developed a system to gather data from the industrial waste producers, unlike many other regions or Member States where the data is gathered indirectly through the waste collectors or treatment plants or where the quantities are assessed based on market indicators or product throughput.

The reporting system in Flanders connects detailed data on the industrial sectors, through five digit NACE-codes (NACEBEL, based on NACE rev.2), with detailed data on the nature of the waste (through EWL-codes) and more aggregated definition on the waste treatment methods. Waste treatment is classified as either sorting, other preparatory activities, reuse, material recycling, composting, incineration or landfill. About 15.000 companies, equally spread over all industrial sectors and all company sizes are sampled. The sampling and the extrapolation is optimised for specific groupings of NACE sectors, and the data are represented using groupings of EWC-codes.

Relevant NACE-groupings for this case study are:

- Waste treatment industry
- Wholesale
- Hotel and catering industry
- Retail
- Municipal authorities
- Super markets
- Production and treatment of meat
- (other) Food sector

Relevant EWC groupings are:

- **Waste from animal or vegetal origin** : 020102, 020103, 020106, 020107, 020203, 020303, 020304, 020501, 020601, 020701, 020702, 020704, 040101, 040210, 200108, 200125, 200201
- **Mixed waste**: 030307, 190801, 200203, 200301, 200302, 200303, 200307, 200399. This contains a fraction of bio-waste but for which no separate statistics can be extrapolated.
- **Waste from (waste)water treatment**, This contains a fraction of bio-waste but for which no separate statistics can be extrapolated.
 - Following bio-waste categories are included: 020101 (*wastes from agriculture, horticulture, aquaculture, forestry, hunting and fishing - sludges from washing and cleaning*), 020201 (*wastes from the preparation and processing of meat, fish and other foods of animal origin - sludges from washing and cleaning*), 020204 (*sludges from on-site effluent treatment*), 020301 (*wastes from fruit, vegetables, cereals, edible oils, cocoa, coffee, tea and tobacco preparation and processing; conserve production; yeast and yeast extract production, molasses preparation and fermentation - sludges from washing, cleaning, peeling, centrifuging and separation*), 020305 (*sludges from on-site effluent treatment*), 020403 (*wastes from sugar processing - sludges from on-site effluent treatment*), 020502 (*wastes from the dairy products industry - sludges from on-site effluent treatment*), 020603 (*wastes from the baking and confectionery industry - sludges from on-site effluent treatment*), 020705 (*wastes from the production of alcoholic and non-alcoholic beverages except coffee, tea and cocoa - sludges from on-site effluent treatment*), 190809 (*grease and oil mixture from oil/water separation containing only edible oil and fats*)
 - Following other EWL categories are included: 030311, 040106, 040107, 040219, 040220, 050109, 050110, 050113, 050114, 050604, 060502, 060503, 070111, 070112, 070211, 070212, 070311, 070312, 070411, 070412, 070511, 070512, 070611, 070612, 070711, 070712, 100120, 100121, 100126, 100212, 100328, 100410, 100509, 100610, 100708, 100820, 101119, 101120, 101213, 190805 (*sludges from treatment of urban waste water*), 190811, 190812, 190813, 190814, 190902, 191105, 191106, 191303, 191304, 191305, 191306

C.2 Generation and treatment of industrial bio-waste

The **waste treatment sector** generates mainly secondary waste, as defined in the OECD/EURIOSAT joint questionnaire: Waste from secondary sources, i.e. waste generated in a process that is known as a waste treatment operation. Includes residual materials originating from recovery and disposal operations, such as incineration and composting residues. N.B.: In accordance with the definition of waste, waste from sewage treatment (i.e. sewage sludge) is considered as primary waste. The waste treatment sector is by far the largest generator of industrial waste in Flanders, with a total of 9.478 Ktonnes in 2005, or 12.863 Ktonnes in 2006. 3% of the secondary waste is waste from animal or vegetal origin.

The **wholesale sector** produced 594 Ktonnes in 2005, or 360 Ktonnes in 2006, of which between 18% and 22% is mixed waste, and between 9% and 4% is waste from animal or vegetal origin.

The **hotel and catering industry** produced 224,5 Ktonnes in 2005 and 212 Ktonnes in 2006. More than half is mixed waste but it slightly diminishes. Waste from animal and vegetal origin raises from 2005 to 2006 from 2% to 8%, showing a tendency towards source separated bio-waste collection.

The **retail sector** generates between 448 and 311 tonnes in 2005 and 2006, with an amount of mixed waste that is dropping, and a rather constant fraction of 4% of waste from animal or vegetal origin. **Supermarkets**, that are classified as a different category, produce between 135 and 140 Ktonnes. Waste from animal and vegetal origin is 10%.

Municipal authorities and services generate 234 and 225 Ktonnes non-household waste in 2005 and 2006. Waste from animal and vegetal origin competes with construction and demolition waste as the most important waste fraction from municipal services. The waste is presumably composed of public garden and park waste, churchyard waste and the like. In 2006 this fraction is 33% and in 2005 21%. The difference can be explained as statistical insecurity.

The **food sector** includes fish, potatoes, juices, vegetables, fruit, animal or vegetal oils and fats, dairy, starch, bakeries, sugar, pasta, beverages, breweries, malt, coffee, tea, tobacco and fodder. It is the third largest generator of industrial waste, with a quantity of 1.383 Ktonnes in 2005 and 1.477 Ktonnes in 2006. 32% is waste from animal or vegetal origin, a wide range of waste streams that often can be recycled as fertilizer or as material for animal feed, for example remains of oilseeds from the manufacture of oils, margarines and fats that can be used as secondary raw material as fertilizer, brewery waste that can be used in or as animal feed, waste from fruit and vegetables arises when preparing for conservation or when making prepared meals... 28% to 29% of the waste is sludge from the waste water treatment or the preparatory activities (washing, cutting...) of the raw materials. It usually can be applied as secondary raw material in agriculture.

The **production and treatment of meat** includes preparation of fresh or deep frozen meat products of canned foods. It is the eighth largest industrial waste producer in Flanders. Because of the specific characteristics of this sector, it is split off from the food sector, in order to make reliable extrapolations on the whole industrial population. 634 Ktonnes are generated in 2005 and 642 in 2006. 59% to 64% of waste is waste from animal or vegetal origin (in this case mainly animal waste), and 19% to 14% is wastewater sludge.

Waste from animal and vegetal origin can be divided into four subcategories. "used cooking oils and fats", "waste from vegetable origin", "animal waste" and "waste from vegetable and animal origin". The fraction of vegetable waste is the most important in 2005 and amounts to 735 Ktonnes. The amount of animal waste is 700 Ktonnes and mixed waste 77 Ktonnes. In 2005, 16 Ktonnes used cooking oil and fat is generated.

Animal waste is classified into the three categories of the Animal Byproduct Directive. The end products of the waste treatment must be removed by incineration, usually this is done in cement kilns and power plants. End products of category 3 material can be used in fertilizers, animal feed, pet food and oleochemical applications.

Blood Waste is collected at the place of origin in a storage tank and cooled to 10 ° C. It then is collected and transported in chilled tank. Blood Waste is boiled to blood meal that can be used as a fertilizer or must be incinerated. Blood can also be used in the blood processing industry (as a dye for sausages). Fish waste from the fish processing industry is typically processed as category 3-material. Fish waste is usually transported to France or the Netherlands where fishmeal is made. Plumes and hair can, if separately collected, be used for the production of cushions. In this case, the feathers and hair are not considered waste. Plume and hair waste can also be treated by a thermal treatment under high pressure, converting it into meal which can be applied as a fertilizer. Hides and skins that are transferred to the leather industry are not considered waste. Animal fats category 1 and 2 is incinerated or in case of category 2 used in the oleochemicals industry. Category 3 fats can be used after processing in animal feed, oleochemicals, pet food, fertilizer or it can be incinerated. Mixed animal fats are usually taken to a processing plant for animal wastes and subsequently used in animal feed or oleochemicals. Clean (white) fat is kept separate in the slaughterhouses and can be used for human consumption. This fat is melted and then used as a raw material for cooking oil. The protein that is released is usually taken to a processing plant for animal waste. Bones can be used in gelatin production. Turkey bones and pork rind are pretreated in the same heating process as pork offal. The mixture is then treated in an acid bath to remove the fat and first quality gelatin is prepared out of it. Then the operation is repeated in an even warmer and more acidic bath. The remaining protein fraction can be reused into pet food, fertilizers, reprocessing or incineration. The fat goes to feed or to the oleochemicals industry, the water to a water treatment plant. Water sludge from the meat industry is typically processed in a biogas plant. Waste from vegetable and animal oils consist largely of used frying fats and oils and oil mayonnaise, salads, etc. There are about thirty approved collectors for used frying fats and oils in Flanders. After collection, the fat is melted and refined or separated into a pure and an impure fraction. There are several possibilities for treatment:

- Oleochemicals: the fats are cracked up to be elementary particles and used to fabricate soap
- Use as an adhesive in the timber industry press

- Conversion to biodiesel
- Exceptionally incineration with energy recovery (making an exception to the legal incineration ban in Flanders).

Finally this category also includes food unfit for consumption. These wastes are mainly used as a fodder or as soil conditioners.

Mixed industrial waste is treated as follows:

Ktonnes	2004	2005	2006
TOTAL	1.630,2	1.847,2	2.005,9
Landfill	106,5	205,8	273,9
Incineration	288,4	456,6	679,9
Recycling	1,7	0,5	3,1
Use as secondary material			
Preparatory activities	1.233,6	1.184,3	1.049,0
Non hazardous	1.630,2	1.847,2	2.005,9
Hazardous			
Primary waste	1.303,0	1.421,9	1.244,7
Secondary waste	327,2	425,3	761,2

Waste from animal or vegetal origin is treated as follows:

Ktonnes	2004	2005	2006
TOTAL	1.728,4	1.385,0	1.386,5
Landfill	4,7	6,2	2,8
Incineration	81,8	164,3	74,8
Recycling	689,4	722,7	797,0
Use as secondary material	854,0	271,5	171,4
Preparatory activities	98,6	220,3	340,4
Non hazardous	1.728,4	1.385,0	1.386,5

Hazardous			
Primary waste	1.609,3	1.155,7	1.198,8
Secondary waste	119,0	229,3	187,8

Waste from wastewater treatment is treated as follows:

Ktonnes	2004	2005	2006
TOTAL	2.507	2.402	2.245
Landfill	70	41	95
Incineration	312	409	224
Recycling	144	329	319
Use as secondary material	395	166	228
Preparatory activities	1.584	1.456	1.379
Non hazardous	2.417	2.305	2.103
Hazardous	89	97	142
Primary waste	2.210	2.215	2.060
Secondary waste	297	186	185

C.3

Conclusions

The analysis of the generation and treatment of industrial bio-waste in Flanders illustrates several important conclusions:

- The variation in the different types of industrial bio-waste, and their treatment solutions, is much larger than it is the case for municipal bio-waste. Treatment is either
 - Using the same infrastructure as used for municipal bio-waste, whenever they are comparable in nature, composition and quantity
 - Specific adapted to the nature of the industrial bio-waste. An important field of application is the use as a secondary raw material as or in fertilisers or soil improvers, or as or in fodder or petfood.
 - Animal by-products have their own specific collection and treatment schemes.

- The food and meat industries are responsible for a large fraction of the overall generated industrial waste. It contains a large fraction of sludgy bio-waste. Food industry and meat industry are two different sectors that deserve a specific approach, both on statistics and on policy development.

The expected development of the generation and the treatment of industrial bio-waste will depend upon the evolution of the different industrial sectors, and the development of the legal provisions on end-of-waste criteria because of the large application of bio-waste as a secondary raw material for fertilisers, or the use in animal feed or petfood. Traditional recycling is focussing on the oleochemicals industry and on composting.

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