FOOD LOSS MONITOR 2020

Flanders
State of the Art

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11 *Authors:*
Ann Braekevelt, Eline Sonneveld, Mieke Vervaet (OVAM)
Kris Roels, Simon Storms, Tom Van Bogaert, Mart Vanhee, Marjan Van Loo (Department of Agriculture and Fisheries)

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Summary overview

Purpose and approach

Rising food prices and mandatory sustainability reporting are making us all more careful with our resources and food losses. After all, food loss also has an environmental and climate impact.

The prevention of food losses and the optimal valorisation of food waste and food residues have become priority objectives internationally (Sustainable Development Goal 12.3), at the European level (circular economy), and in Flanders. This Food Loss Monitor is in implementation of the Food Loss Action Plan 2021-2025 with the goal of reducing food losses by 30% through prevention and valorisation by 2025 compared to 2015. This report monitors figures relating to the prevention, origin and valorisation of food loss and food waste/residues throughout the chain.

It provides insight into the efficiency with which the agri-food chain handles food raw materials in 2020. This is a follow-up measurement to the 2015 baseline measurement and the 2017 measurement (Flemish Food Supply Chain Platform for Food Loss, 2017, 2019). This report contains figures for all links: fisheries, agriculture, producer organisations, food industry, retail, horeca, catering and households. In the process, several efforts were made to improve data collection and enable comparison with 2015. There is no new figure yet for food consumption, hence the same figure for 2015 and 2020.

Caution should be exercised in interpreting the results. Due to the complexity of the subject matter and the dependence on the availability of quantitative and qualitative data, the monitoring also contains a number of assumptions and uncertainties. Despite these limitations and the impact of the coronavirus crisis, these are currently the best available figures on the subject, although there is always room for improvement.

The terms have been defined for the purposes of the Monitor. When food is not consumed by humans, we speak of food loss. Food losses and side streams together make up food waste and food residues. Side streams are the non-edible streams (e.g. peels). The goal is to valorise food waste and food residues as highly as possible on the value retention cascade.

The chain gives priority to efforts to prevent food losses (prevention). The many efforts to prevent food loss at the source and reprocess surpluses into new food products have not been identified in this report. A recent overview of actions taken aimed at prevention and valorisation can be found in the publication 'Action plan circular food loss and biomass (residual) flows 2021-2025: Progress and achievements 2021-2022' on the website https://ovam-english.vlaanderen.be/bio-food .

Results

Figure 1 summarises the results for all sectors in the agri-food chain, from producer to consumer. Of the 3 million tonnes of food waste and food residues in Flanders, 86% is valorised, 13% is incinerated via residual waste).

Food waste and residues consist of 2.2 million tonnes of side streams (= non-edible food waste/residues) and 884,000 tonnes of food losses (= edible food waste/residues).

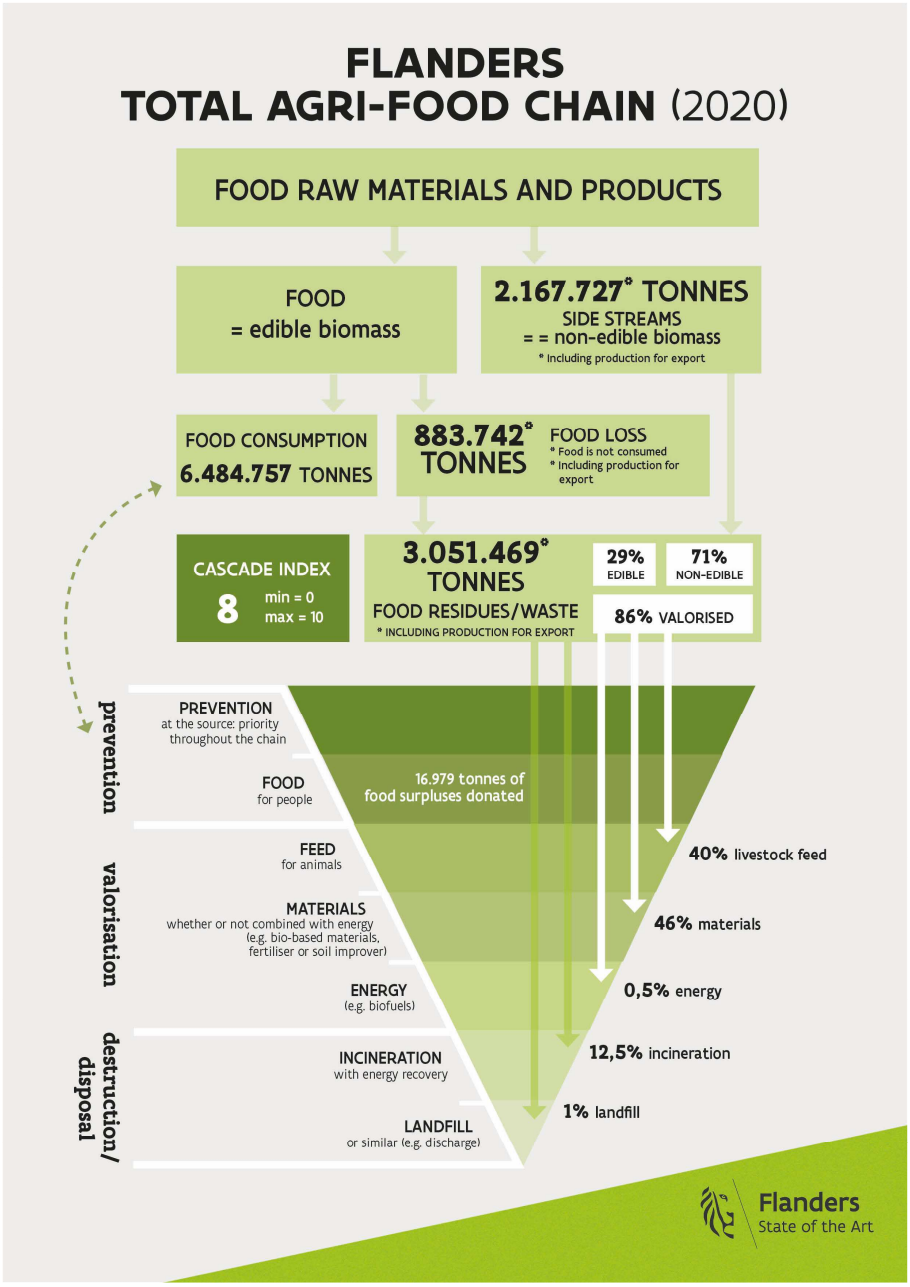

Figure 1: Valorisation of food waste/residues from the entire agri-food chain, Flanders, 2020

Nearly 17,000 tonnes of food surpluses were donated by auctions, the food industry and retail to social distribution platforms/food banks. This is 600 tonnes more than in 2015, with most of this coming from retail during the corona pandemic. The observation here is that if large food surpluses are generated in a short period of time in a crisis situation, such as a pandemic or a hot summer, it is a logistical challenge to be able to process them in a short period of time for donation/human consumption, because most have a limited shelf life. Donation (human consumption) is subject to specific conditions from the Federal Agency for the Safety of the Food Chain (FASFC) to ensure continued food safety.

Figure 2 summarises the results for all sectors in the agri-food chain for the 2015 baseline measurement. A small correction for the 2015 data was carried out to be able to compare Figures 1 and 2. We see decreases in tonnages, which are shown in more detail by sector in Table 1.

In the destinations, we see some shifts by chain link that are detailed in Chapter 3 of this report.

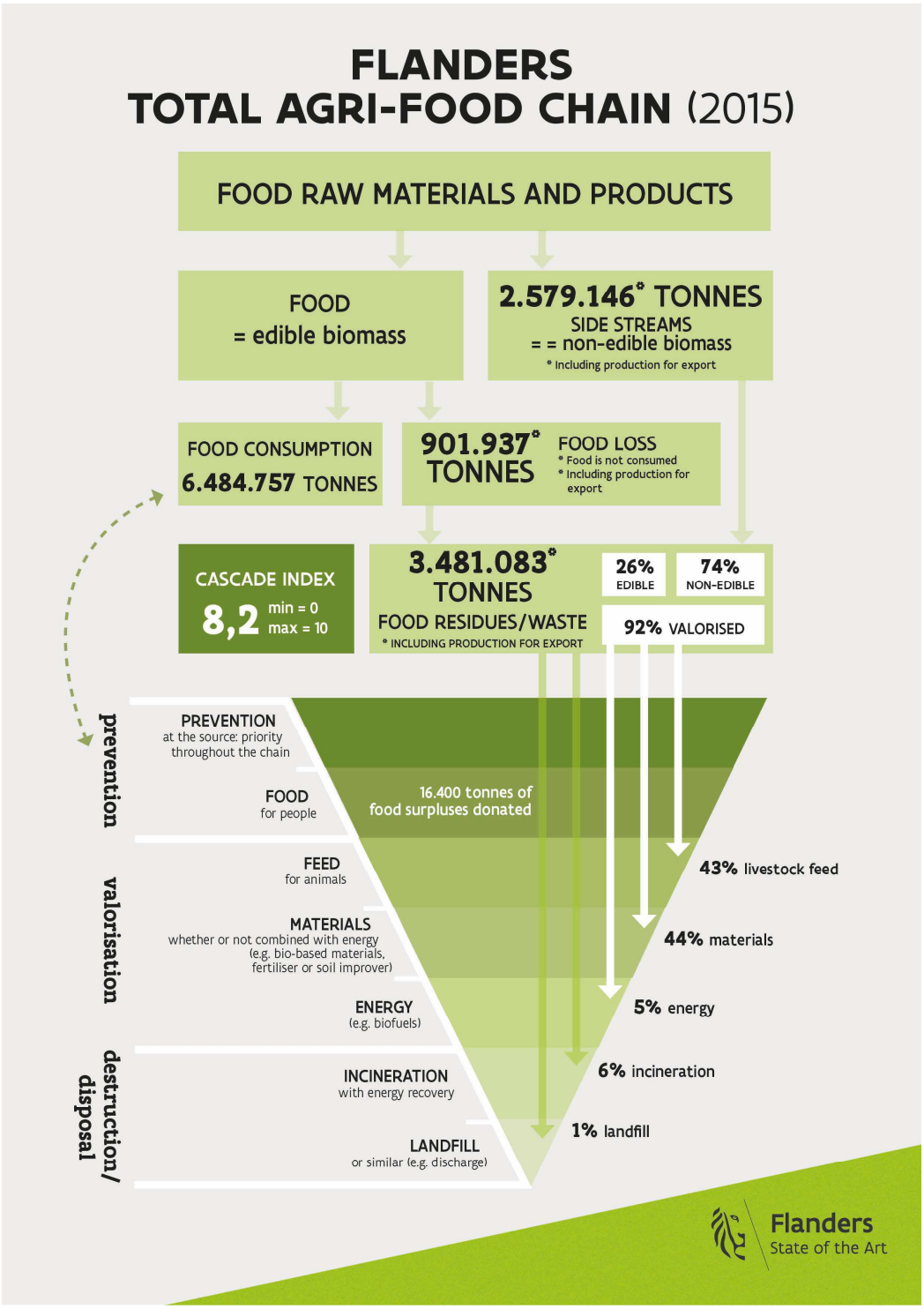

Figure 2: Valorisation of food waste/residues from the entire agri-food chain, Flanders, 2015

	Food losses (= edible food waste/ residues)	Evolution compared to 2015	Side streams (= non-edible food waste/residues)	Evolution compared to 2015
	amount in tonnes 2020	%	amount in tonnes 2020	%
Fish auctions	104	+104%	104	+104%
Agriculture	348,786	+16%	130,309	+9%
Producer organisations	15,156	+3.6%	798	+2.3%
Food industry	229,240	+2.3%	1,770,143	-20%
Retail	37,381	-10.6%	48,421	+130%
Horeca	19,054	-0.3%	29,951	-38%
Catering	9,994	-81%	14,589	+434%
Households	224,027	+5%	173,412	+5%
Total 2020	**883,742**	**-2%**	**2,167,727**	**-16%**
Total 2015	901,937		2,579,146	

Table 1: Food losses and side streams per link, (tonnes) and evolution (%), Flanders, 2020

From Table 1, we infer that there will be 883,742 tonnes of food loss in Flanders in 2020. Table 2 shows that 73% of that food loss fraction is already being collected separately/valorised in Flanders. Agriculture, the food industry and households generate the greatest amount of food loss. In the food industry, 99% of the food loss fraction is valorised. Among households, 22% is valorised, and 78% (175,498 tonnes) of food loss still ends up in residual waste. Of all food loss throughout the chain, 27% of the food loss fraction still ends up in residual waste and is incinerated, and 1% has another destination.

Across the agri-food chain, there has been a reduction in food loss by 2% and in side streams by 16% compared to 2015. The tables also indicate that there are many differences between the different links in the food chain. The increase in agriculture and producer organisations can largely be explained by a higher production. Due to the requirement of separate collection, the share of separate collection is significantly higher in the retail and healthcare sectors in 2020 than in 2015. In horeca and school catering, we see a decrease in quantities as a result of the closure due to the coronavirus in 2020.

At a minimum, the results indicate that progress is being made in both prevention and separate collection. It is up to all stakeholders to continue the efforts made and shift up a gear to achieve the target of 30% of food losses prevented, reprocessed as food or collected separately and valorised better compared to 2015 by 2025.

The amounts of side streams (non-edible) are logically highest in the food industry, because in Flanders many food companies focus on processing raw materials into finished food products, but 99% of these are valorised. Of all side streams in the agri-food chain, 92% is already being collected/valorised.

Chapter 2 provides a synthesis of the results for each link.

Table 2: Food losses and side streams per link, (tonnes), collected separately and in residual waste/incinerated, Flanders, 2020

In tonnes	**Food losses (= edible food waste/ residues)**		**Side streams (= non-edible food waste/ residues)**	
	Collected separately	In residual waste/incinerated	Collected separately	In residual waste/incinerated
Fish auctions	104		104	
Agriculture	320,040**	28,746*	130,309	
Fruit and vegetable producer organisations	14,550	606***	766	32***
Food industry	227,206	2,034	1,763,132	7,011
Retail	26,897	10,484	45,195	3,226
Horeca	2,587	16,467	11,673	18,278
Catering	4,377	5,617	7,661	6,928
Households	48,529	175,498	37,565	135,847
Total in tonnes	644,290	239,452	1,996,405	171,322
%	73%	27%	92%	8%

* Discharge, other destination. ** Mainly ploughing into the soil. *** Incineration or other destination.

1 PURPOSE AND APPROACH OF THE MONITOR

1.1 PURPOSE

The prevention of food losses and the optimal valorisation of food waste and food residues have become priority objectives internationally (UN, SDG 12.3), at the European level (circular economy), and in Flanders. This Food Loss Monitor is in implementation of the Action plan circular food loss and biomass (residual) flows 2021-2025. The goal of the action plan is to reduce food losses by 30% through prevention and valorisation by 2025 compared to 2015. This report monitors figures relating to the prevention, origin and valorisation of food loss and food waste/residues throughout the chain.

This is a follow-up measurement to the 2015 baseline measurement and the 2017 measurement carried out in the context of the food supply chain roadmap on food loss 2015-2020 (Flemish Food Supply Chain Platform for Food Loss, 2017 & 2019). Thus, in addition to being an initial measurement under the action plan, this measurement is also the final measurement of the food supply chain roadmap on food loss.

It provides insight into the efficiency with which the agri-food chain handles food raw materials in 2020. This report contains figures on amounts and destinations for all links: fisheries, agriculture, producer organisations, food industry, retail, horeca, catering and households. In the process, several efforts were made to improve data collection and enable comparison with 2015. For each link in the chain, the data collection is explained.

Caution should be exercised in interpreting the results. Due to the complexity of the subject matter and the dependence on the availability of quantitative and qualitative data, the monitoring also contains a number of assumptions and uncertainties. We see that the monitoring is moving chain partners to better map and align data within their sectors. Despite these limitations, these are currently the best available figures on the subject, and there is always room for improvement.

The chain gives priority to efforts to prevent food losses (prevention) and reduce food waste/residues. Where prevention is not possible, the focus is on valorisation in accordance with the cascade of value retention.

The many efforts to prevent food loss at the source and reprocess surpluses into new food products have not been identified in this report. A recent overview of actions taken aimed at prevention and valorisation can be found in the publication 'Action plan circular food loss and biomass (residual) flows 2021-2025: Progress and achievements 2021-2022' on the website https://ovam-english.vlaanderen.be/bio-food .

Further monitoring in the coming years should reveal progress.

1.2 TIMELINE

This Monitor presents the results for the calendar year 2020.
In 2017, the baseline measurement of the monitoring, which referred to 2015, was published. The 2019 follow-up report covered the results for 2017. This report also shows the evolution of quantities and destinations in 2020 compared to 2015, because 2015 is the reference year for the objectives of the Food Loss Action Plan.

The Food Loss Action Plan provides for continued monitoring with biannual reporting at the level of Flanders and annual limited reporting on food waste to Europe.

1.3 DATA SUPPLIERS/EXPERTS

This report has been produced with the help of the following data suppliers and experts:
Lynn Biermans, Ann Braekevelt, Gil Gram, Eline Sonneveld, Mieke Vervaet (OVAM)
Kris Roels, Simon Storms, Tom Van Bogaert, Mart Vanhee, Marjan Van Loo, Aranka Delombaerde, Karel Vanhulle, Peter Blancquaert, Isabel Maene (Department of Agriculture and Fisheries)[1]
Nathalie Bernaert, Bart Van Droogenbroeck (ILVO)
Diane Schoonhoven (Belgian National Farmers Union)
Ann De Craene (Association of Belgian Horticultural Cooperatives)
Liesje De Schamphelaire (Belgian Food Industry Federation Flanders)
Sophie Compère (COMEOS Flanders and UBC)
Eve Diels (Horeca Vlaanderen)
Etienne Rubens (Belgian Federation of Food Banks)
Arnout Vercruysse, Elke Olivier (social food distribution platforms Foodsavers)
Sien Vandenbroucke (Too Good To Go)
Elfriede Anthonissen, Wim Vanden Auweele (Flemish compost organisation)

1.4 MAIN TERMS AND DEFINITIONS

Figure 3 schematically shows the various food-related streams in the agri-food chain. In the baseline monitoring report, the various concepts covered are explained in detail and illustrated with examples. We will briefly go over the main terms and definitions.

When a raw material or product is given the destination of human food consumption, we refer to it as a food raw material or product. A food raw material or product consists of an edible fraction (= food) and a non-edible fraction (= side stream).

[1] For the agricultural sector, the Department of Agriculture and Fisheries and ILVO consulted numerous experts in the field: researchers, businesses, federations, etc.

When food is ultimately not consumed by humans, we speak of **food loss**. This is the term and definition in Flemish, which is used in the Food Loss Action Plan. 'Loss' indicates a loss of food for human consumption. It does not mean that this will not be given a useful destination or valorisation (e.g. as feed for animals, for material and/or energy applications).

Food raw materials or products also contain a portion of non-edible (for humans) biomass, which is discarded during their processing or consumption. We call this a **side stream**. It is non-edible organic material associated with food, but is not part of the food (e.g. a non-edible peel).

Food losses and side streams that are given a non-human destination are collectively called **food waste/residues**.

Figure 3: Diagram of food-related streams in the agri-food chain
Source: Food Loss Action Plan, 2021

The cascade of value retention (see Figure 4) is the guide used by the Government and the chain in dealing with food surpluses (prevention part) and food waste/residues (valorisation part). Both edible food waste/residues (food losses) and non-edible food waste/residues (side streams) can still be valorised in some way with a view to value retention. This way, material flows are put to good use and the environmental impact remains limited. The goal is to put food waste and food residues as highly as possible on the value retention cascade. The higher the destination is on the cascade, the higher the value retention.

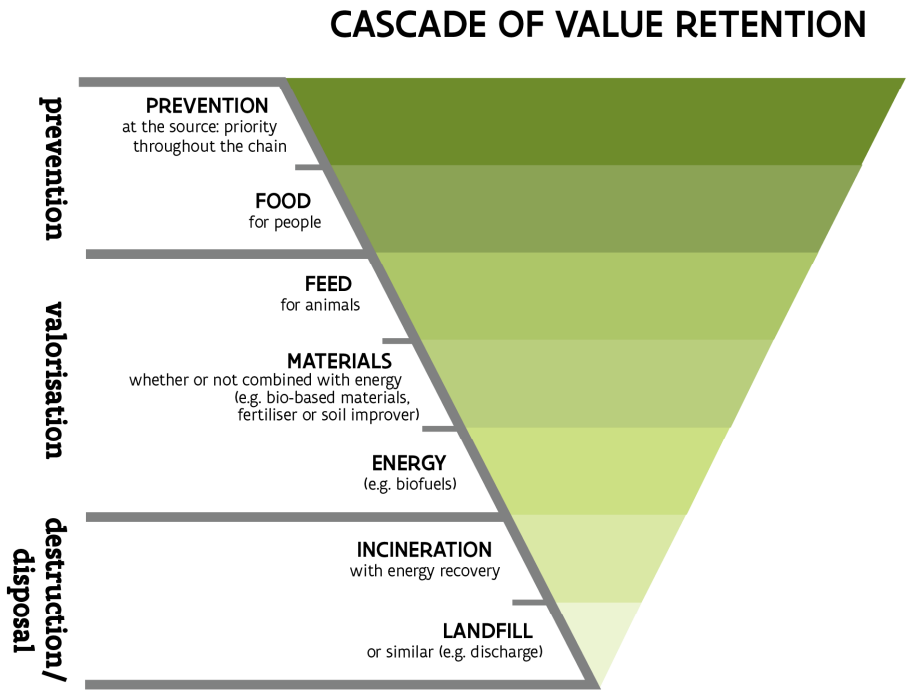

Figure 4: Cascade of value retention

Diagram 1 indicates that the agri-food chain starts at the moment when food raw materials are ready to enter the food system: they are ready for harvest or slaughter. The end point of the agri-food chain is when food has been consumed or when the food residue/waste has been valorised or removed from the chain.
The diagram below also indicates the relationship between the Flemish and European frameworks. The green and grey boxes are food waste and food residues according to Flemish terminology. Food loss is the edible fraction of the green and grey boxes, side streams are the non-edible fraction of the green and grey boxes.

For Europe, the green boxes in destinations are food waste (edible and non-edible fraction). The definition and delineation of food waste according to the FAO (Sustainable Development Goals) is very similar to that of Europe.

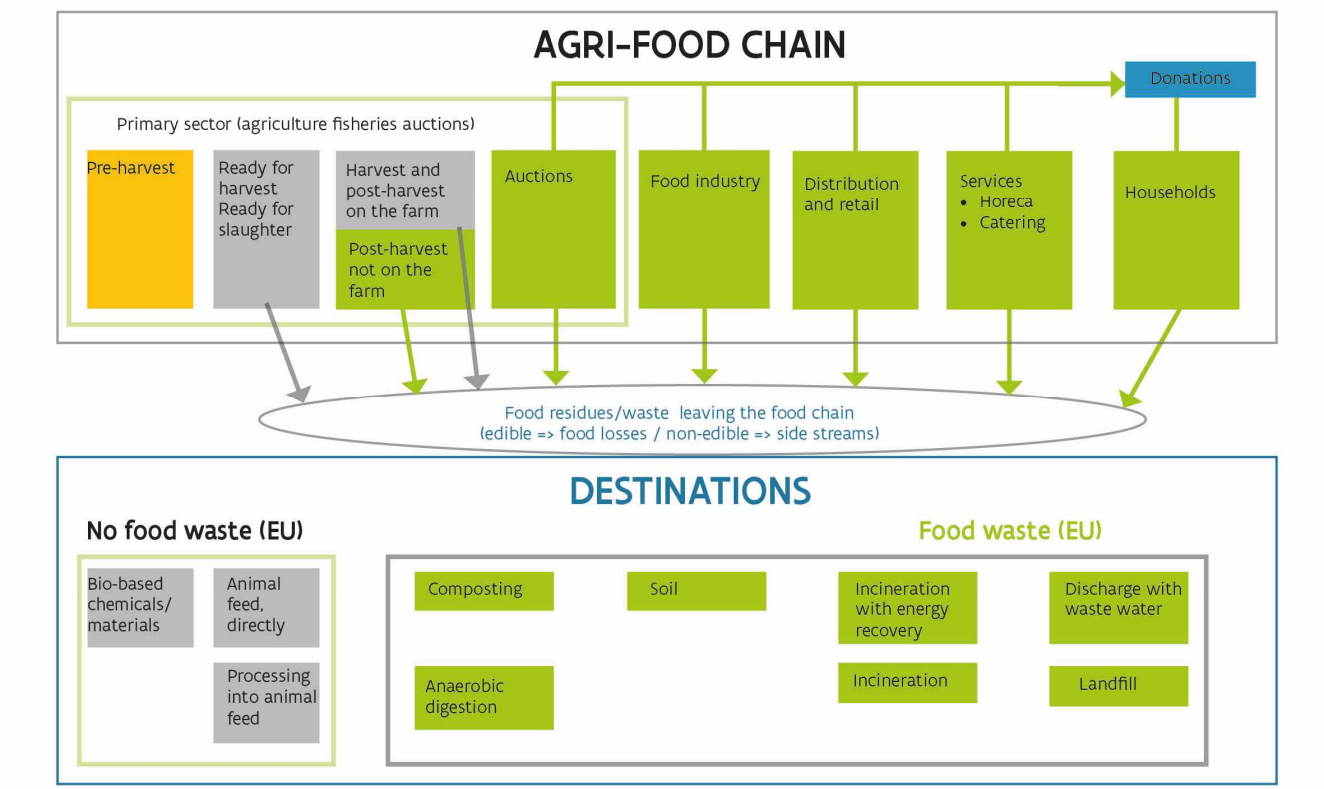

Diagram 1: Flemish and European frameworks for food waste and the respective destinations (source: Food Loss Action Plan, 2021)

2 SYNTHESIS OF RESULTS

This chapter and Chapter 3: 'Results by chain link' are structured according to the logic of the cascade of value retention.

First, the prevention of food losses is discussed. Second, we discuss the valorisation of food waste and food residues according to the different steps of the value retention cascade: as feed for animals, as materials (whether or not combined with energy), and as energy. Third, we monitor food losses.

2.1 PREVENTION

2.1.1 Prevention at the source

Data on prevention at the source is unavailable from the sectors or of low reliability. An overview of efforts undertaken at the sector level, within the framework of the Food Loss Action Plan, can be found in the publication 'Action plan circular food loss and biomass (residual) flows 2021-2025: Progress and achievements 2021-2022'. The website highlights some great examples (see https://ovam-english.vlaanderen.be/bio-food).

2.1.2 Donation of food surpluses

Below, we zoom in on donations from fruit and vegetable producer organisations, the food industry, wholesale and retail.

In 2020, 1,632 tonnes of fruit and vegetables from producer organisations, reached free distribution, including food banks and social distribution platforms (VBT, 2022).

According to data from food banks and social distribution platforms, the Flemish food industry and wholesalers donated 5,697 tonnes of products in 2020. According to a survey by Comeos, supermarkets donated 9,706 tonnes of food in 2021. Especially from wholesale distribution and supermarkets in Flanders, we observe an increase. Due to the raw material shortages and rising prices in the food industry, production was adapted to orders rather than stock demand, so there were less finished product surpluses in the food industry to donate.

Table 3: Overview of donations to food banks and social distribution platforms

Sector	Donation/redistribution through food bank/social distribution platform (tonnes)
Fruit and vegetable producer organisations	1,632*
Food industry	2,428
Food wholesalers and distribution centres	3,269
Supermarkets	9,706*
Total	**17,035**

* Donation and other free distribution (see Chapter 3 for more info)

2.2 VALORISATION

2.2.1 Origin of food waste and food residues

The table below shows the evolution of quantities per link in the chain for the period 2015-2020. There is an 11% decrease in food waste and food residues across the chain compared to 2015.

As of 1 January 2019, there is a general landing obligation for fish species subject to catch limits (quota species), which means that catches of these fish species may no longer be discarded. Consequently, further tracking of discard volumes in fisheries is no longer an issue (n/a).

The slight increase in **agriculture and producer organisations** can largely be explained by a higher production. The quantities of withdrawals from the market did fluctuate in the period 2015-2020. In 2015 and 2016, these quantities were still exceptionally high due to crisis measures taken because of the Russia crisis (embargo). In 2020, there was the coronavirus crisis, which caused demand to fluctuate widely.

The impact of the coronavirus crisis in 2020 made itself felt in a number of sectors. The **food industry** saw a decline in production and sales volumes. Some subsectors are highly export-oriented. Production for export is included in the figures. A decline in demand in 2020 was felt in the beverages, oils and fats, meat processing and prepared meals subsectors. A decrease in the side streams is also the result of better detailed reporting in the annual integrated environmental report (IMJV), which also allowed water treatment sludge to be better separated.

Food residues/waste in **retail** increased in 2020. The fact that food shops were allowed to remain open during the pandemic has an impact on higher sales and related potential food surpluses. New supermarket chains have also entered the market. For supermarkets, food loss has become a major sustainability concern. We see this in the positive evolutions in terms of the number of donations and the increase in the separate collection of food waste. More accurate measurement by the retail industry itself also seems to explain the higher numbers.

In **horeca and catering**, we see a clear impact of the closure during the pandemic.

Among **households**, there was a slight increase in food waste in 2020, on the one hand due to an increase in the tonnage of residual waste as a result of the 'stay at home' measures during the pandemic, and on the other hand due to a higher share of vegetable, fruit and garden waste in residual waste (40%) in a new residual waste sorting analysis in 2020.

Some data from 2015 were slightly adjusted to allow correct comparison with 2020 data. As a result, the total food waste and food residues in the chain in 2015 changed slightly from 3,485,157 to 3,481,083 tonnes**.** More information can be found under data collection by chain link in this report.

Table 4: Overview of food waste and food residues in the agri-food chain in Flanders, tonnes, 2015 and 2020

Sector	**Food waste/residues (food losses + side streams)**		
	2015	**2020**	**Evolution**
	tonnes	*tonnes*	*%*
Fisheries	10,402	n/a	
Fish auctions	102	208	+104%
Agriculture	449,352	479,095	+7%
Fruit and vegetable producer organisations	15,277	15,954	+4%
Food industry	2,442,711**	1,999,383	-18.1%
Retail	62,574**	85,802	+37%
Horeca	67,450	49,005	-27%
Catering	54,632**	24,583	-55%
Households	378,685**	397,439	+5.5%
Total chain	**3,481,083****	**3,051,469**	**-12%**

** Data was adjusted to allow comparison with 2020

2.2.2 Valorisation of food waste and food residues

Table 5: Destinations of food waste/residues, in tonnes and % compared to the sector total, Flanders, 2015-**2020**

Sector		Animal feed	Bio-based materials/ biochemistry	Soil	Anaerobic digestion/ composting	UFOs/biodiesel	Animal waste processing	Incineration	Other	Total
Fisheries	2015	-	-	-	-	-		-	-	10,402
	2020	-	-	-	-	-		-	-	0
Fish auctions	2015	100%								102
	2020	**100%**								208
Agriculture	2015	11%		70%	8%			1%	10%	449,352
	2020	**19%**		**69%**	**6%**				**6%**	479,095
Fruit and vegetable producer organisations	2015	36%	-	28%	28%	-		-	8%	15,277
	2020	**80%**	-	**0%**	**16%**	-		**4%***	**0%**	**15,954**
Food industry	2015	49%	0.5%	3%	18%	1.5%	27%	0.5%	-	2,442,711
	2020	**56%**	**1%**	**2%**	**16%**	**0.5%**	**24%**	**0.5%**	-	**1,999,983**
Retail	2015	4%	2%	-	67%	-		27%	-	62,574
	2020	**17%**	**0.3%**	**-**	**66.5%**	-		**16%**	-	**85,802**
Horeca	2015				31%			69%		67,450
	2020	**3.5%**			**23%**	**0.1%**		**71%**	**2.5%**	**49,005**
Catering	2015				24%			76%		54,632
	2020				**48%**			**51%**	**1%**	**24,583**
Households	2015				20%			80%		378,685
	2020	unknown			**22%**			**78%**		**397,439**
Total primary sector**	2015	55,023		318,758	40,311			4,494	56,547	475,133
	2020	**103,999**		**330,576**	**31,299**			**638**	**28,745**	**495,257**
Total food industry to households	2015	1,205,467	14,614	77,578	592,005	35,407	671,760	409,212	-	3,006,052
		40%	0.5%	3%	20%	1%	22%	14%		
	2020	**1,125,056**	**28,815**	**44,384**	**477,650**	**11,180**	**485,912**	**381,515**	**1,701**	**2,556,213**
		44%	**1%**	**2%**	**19%**	**0.4%**	**19%**	**15%**	**0.1%**	
Total	**2020**	**1,229,055**	**28,815**	**374,960**	**508,949**	**11,180**	**485,912**	**382,153**	**30,446**	**3,051,469**
		40%	**1%**	**12%**	**17%**	**0.5%**	**16%**	**12.5%**	**1%**	**100%**

* Incineration or other destination

** Includes fisheries, fish auctions, agriculture, fruit and vegetable producer organisations

2.2.2.1 Animal feed

In the primary sector, animal feed (directly and after processing) remains an important market. It is feasible for farmers to use larger batches as animal feed. Animal feed has also become an important destination for fish and fruit and vegetable producer organisations. Quantities fluctuate according to the quantities of products withdrawn from the market.

Food waste and food residues in the food industry are diverse in composition and often need to be able to be disposed of in a short period of time to maintain continuity in process operations. Animal feed (directly or after processing, GMP+ scheme) remains the most important market (56%).

2.2.2.2 Animal waste processing

Animal waste and animal by-products (from slaughterhouses, butchers, etc.) follow a specific processing route. More about this can be found in the biomass market analysis (OVAM, 2023).

2.2.2.3 Anaerobic digestion

From agriculture and fruit and vegetable producer organisations, 31,299 tonnes of food residues/waste goes to anaerobic digestion/composting. 16% of food residue/waste from the food industry and what is collected separately from retail, horeca, catering and households go to anaerobic digestion/composting. From the IMJV, we deduce that a total of 477,650 tonnes of food residue/waste from the food industry, retail, horeca, catering and households in Flanders were anaerobic digested/composted in 2020.

Making a comparison of the supply to digesters in Flanders is not as easy as it seems. OVAM and Vlaco mapped the supply to digesters in Flanders in 2020 based on the registers of the digesters (Vlaco-OVAM, 2022). Figure 5 shows the routes of different types of input streams. The figure tells us that other streams than those mapped in this Monitor through the IMJV 2020 are supplied as well. The proportion of packaged input streams from retail/distribution centres and the food industry that went to Flemish digesters via Flemish depackagers with a certificate of use (GA) in 2020 was 94,179 tonnes. In addition, 79,023 tonnes of food waste, mostly depackaged, from outside Flanders came to Flanders for anaerobic digestion.

1,352,811 tonnes of depackaged, Vlarema-conform food waste go to anaerobic digestion in Flanders, either directly or after pre-treatment. These also include a lot of water treatment sludge from the food industry (see 3.5.1) and batches of imported fruit at the ports that are, for example, too ripe (bananas, kiwis, etc.) to be sold by retail. They may also be lots rejected by the FASFC.

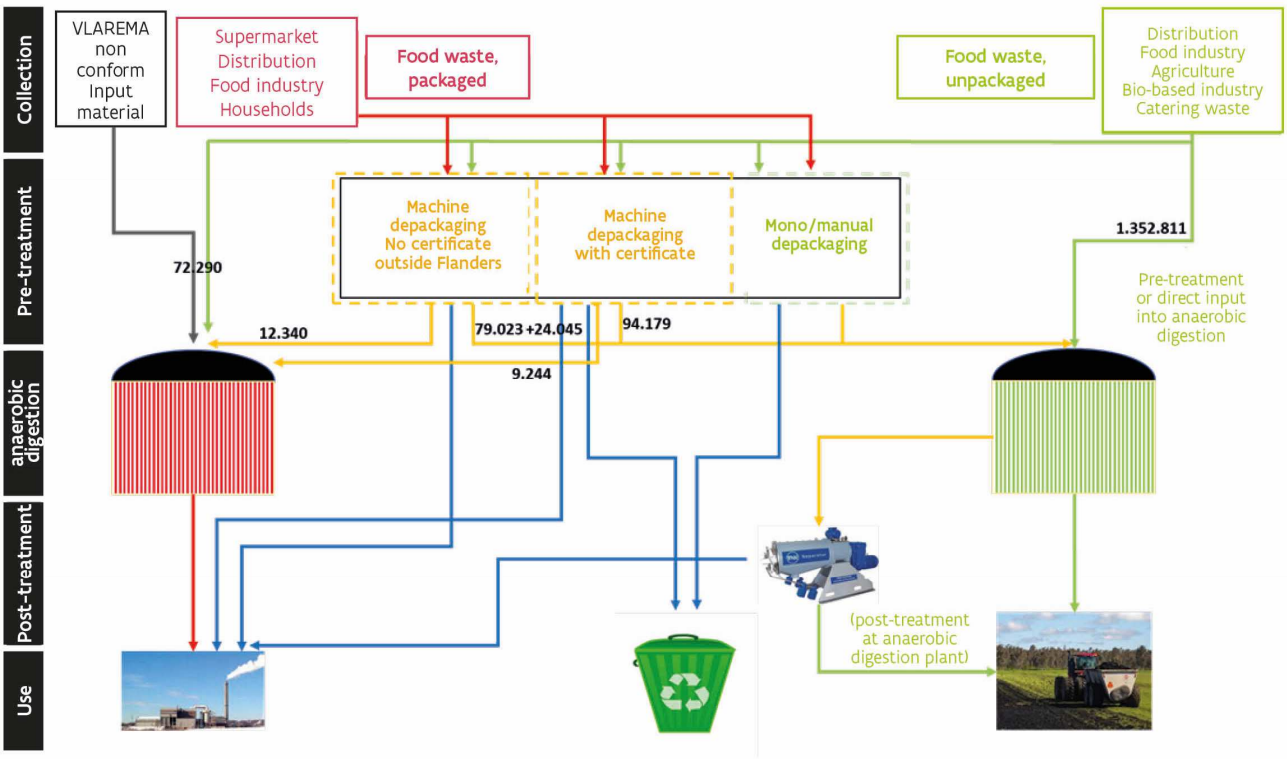

Figure 5: Schematic overview of quantities of separately collected and processed food waste, including food and kitchen waste in Flanders in 2020 (in tonnes)
(Source: Vlaco-OVAM (2022) C-MART Life C13 project)

2.2.3 Cascade index

To express the valorisation of food waste and food residues in a scale, we calculate a cascade index. This index weighs the food waste and food residues produced in a sector according to their position on the value retention cascade. Prevention of food waste and food residues could not be included because few figures are available. Therefore, it only refers to the valorisation of food waste and food residues. More information on the calculation of the cascade index can be found in the appendix.

Table 6 shows the cascade index by sector. The primary sector scores high because a lot goes to animal feed. What is ploughed in the soil is considered a soil application, but can still be improved from a sustainability point of view. The food industry has scored high on the cascade index for years, as 99.5% is valorised (over 55% is sold for animal feed) and only 0.5% is incinerated. In retail and catering, the index score has risen due to the increase in the separate collection of food waste in certain subsectors (supermarkets, healthcare).

Table 6: Cascade index, value per chain link, Flanders, 2015-2020

Sector	Value on cascade index*	
	2015	2020
Fish auctions	10	10
Agriculture	7.9	8.4
Fruit and vegetable producer organisations	8.1	9.3
Food industry	8.9	9.1
Retail	6.3	7.4
Horeca	3.9	3.8
Catering	3.4	4.9
Households	3.2	3.3

* Minimum (worst possible score) = 0, maximum (best possible score) = 10

2.3 FOOD LOSSES AND SIDE STREAMS

When we distinguish between the edible and non-edible fractions within food waste and food residues, we gain insight into food losses and side streams.

Table 7 shows the food loss (edible food waste/residues) and the side streams (unavoidable non-edible food waste/residues) for each link in tonnes. A significant portion of this food waste/residue is valorised.

Table 7: Food losses and side streams per link, (tonnes) and evolution (%), Flanders, 2020

	Food losses (= edible food waste/residues)	**Evolution compared to 2015**	**Side streams (= non-edible food waste/residues)**	**Evolution compared to 2015**
	amount in tonnes 2020	%	amount in tonnes 2020	%
Fish auctions	104	+104%	104	+104%
Agriculture	348,786	+16%	130,309	+9%
Fruit and vegetable producer organisations	15,156	+3.6%	798	+2.3%
Food industry	229,240	+2.3%	1,770,143	-20%
Retail	37,381	-10.6%	48,421	+130%
Horeca	19,054	-0.3%	29,951	-38%
Catering	9,994	-81%	14,589	+434%
Households	224,027	+5%	173,412	+5%
Total 2020	**883,742**	**-2%**	**2,167,727**	**-16%**
Total 2015	901,937		2,579,146	

Table 8: Food losses and side streams per link, (tonnes), collected separately and in residual waste/incinerated, Flanders, 2020

In tonnes	Food losses (= edible food waste/ residues)		Side streams (= non-edible food waste/ residues)	
	Collected separately	In residual waste/incinerated	Collected separately	In residual waste/incinerated
Fish auctions	104		104	
Agriculture	320,040**	28,746*	130,309	
Fruit and vegetable producer organisations	14,550	606***	766	32***
Food industry	227,206	2,034	1,763,132	7,011
Retail	26,897	10,484	45,195	3,226
Horeca	2,587	16,467	11,673	18,278
Catering	4,377	5,617	7,661	6,928
Households	48,529	175,498	37,565	135,847
Total in tonnes %	644,290 73%	239,452 27%	1,996,405 92%	171,322 8%

* Discharge, other destination. **Mainly ploughing into the soil. *** Incineration or other destination

Agriculture, the food industry and households generate the greatest amount of food loss. In agriculture, the food loss fraction is mainly ploughed in the soil. In the food industry, 99% of the food loss fraction is valorised. Among households, 78% of food loss still ends up in residual waste. 73% of food losses in the chain are collected separately and valorised. 27% still ends up in residual waste and is incinerated or given another destination.

The amounts of side streams are logically highest in the food industry, because in Flanders many food companies are active which process raw materials into finished food products. 99% of the side streams is valorised. Of all side streams in the chain, 92% is collected/valorised.

Table 9 shows the edible fraction of food waste and food residues for each link. This food loss fraction decreased in retail and catering and remained fairly constant in the other sectors in the chain over the 2015-2020 period.

Table 9: Share of food losses in the total food waste and food residues, by link, Flanders, 2015-2020

Link	Edible fraction of the food waste (= food losses) (%)	
	2015	*2020*
Fish auctions	50%	50%
Agriculture	74%	74%
Vegetable/fruit producer organisations	96%	95%
Food industry	9%	11%
Retail	67%	44%
Horeca	28%	39%
Catering	95%	41%
Households	56%	56%

2.4 FOOD WASTE – COMPARISON WITH EU

In the context of the mandatory reporting on 'food waste' to Europe from 2020, Europe has made a first comparison of 'food waste' production in the EU countries (Table 11). The difference with the figures reported to Europe lies in the fact that the scope for Europe is narrower than that included here in the Monitor report. The European figures refer to food waste (edible and non-edible fraction) with specific Eural codes that include only the destinations of composting/anaerobic digestion, animal waste treatment and incineration (and landfill/discharge if necessary). The data varies widely by country. Countries with a highly developed food industry have more food waste, shown in tonnes and kg/capita in the table. Europe points out that this is an initial reporting from the EU countries. Europe notes that there is still work to be done for 'food waste' reporting in the different Member States.

In the comparative European overview, food waste data from Flanders were included. The data used for this is summarised by sector in Table 10. Flanders scores below the European average for households.

Table 10: Overview of food waste by processing method in Flanders, by sector, 2020

Tonnes of food waste	Composting/ anaerobic digestion	Animal waste processing	Incineration/ other	Total tonnes	Total kg/cap (6,653,062 inh.)
Agriculture	28,746			28,746	4
Fruit and vegetable producer organisations	2,553		638*	3,191	0.5
Food industry	311,700	485,912	9,045	806,657	121
Retail	51,947		13,835	65,782	10
Horeca	7,039		34,745	41,784	6
Catering	10,914		12,545	23,459	4
Households	46,812 39,282**		311,345	358,157	54 6**

* Incineration in incinerator or other destination

** Home composting

Table 11: Comparison of food waste* production in kg/capita in Flanders and in Europe, 2020

Country/region	Total in kg/cap	Primary food production	Processed food and beverages	Retail and other distribution of food	Restaurants and food services	Households
Flanders	195	1	122	2	9	61
Belgium	250	3	162	6	8	71
EU-27	127	14	23	9	12	70
Bulgaria	86	33	23	2	2	26
Czech Republic	91	3	9	6	4	69
Denmark	221	11	102	17	11	79
Germany	131	2	19	9	22	78
Estonia	125	18	24	15	8	61
Ireland	155	14	44	12	36	48
Greece	191	35	35	14	21	87
Spain	90	18	30	7	4	30
France	133	16	29	12	16	61
Croatia	71	10	2	1	4	53
Italy	146	21	9	6	3	107

Country/region	Total in kg/cap	Primary food production	Processed food and beverages	Retail and other distribution of food	Restaurants and food services	Households
Cyprus	397	49	190	56	30	71
Lithuania	137	29	10	10	2	86
Luxembourg	147	12	17	14	14	91
Hungary	93	2	19	4	2	66
The Netherlands	161	27	59	12	5	59
Austria	136	2	19	9	23	83
Poland	106	18	14	8	5	60
Portugal	184	10	6	21	23	124
Slovenia	68	0	5	7	20	36
Slovakia	83	13	1	3	1	65
Finland	116	9	29	10	14	53
Sweden	87	2	5	9	9	61
Norway	143	30	5	11	18	78

* Focus of European monitoring on specific Eural codes and destinations

2.5 CONCLUSION

We see positive signs in the monitored links compared to the 2015 baseline:

- The donation and redistribution of food surpluses through food banks and social distribution platforms is on the rise in producer organisations and retail.
- The landing obligation/banning of discards has made monitoring of food losses in the fisheries sector irrelevant. Food residues/waste at fish auctions are minimal.
- The impact of the coronavirus crisis is reflected in lower quantities of food waste and food residues in 2020 from the affected food industry, horeca and catering.
- Sectors such as supermarkets and healthcare catering are climbing the value retention cascade through the separate collection and better valorisation of their food residues/waste.
- For most sectors, including households, cascade index scores have been maintained or increased.

The slight increase in food waste in retail is likely due primarily to sales growth, the coronavirus crisis and more accurate measurement. The slight increase in food losses in agriculture is due to increases in acreage for certain crops.

The above results are due to a combination of four factors:

- Changing market conditions
- Methodological improvements to data collection
- Social awareness on food loss has grown significantly. Knowledge is power.

- The impact of awareness raising and targeted efforts by chain links and Government to avoid food losses and valorise food waste and food residues in a high-quality manner. Due in part to mandatory separate collection from 2021 in a number of sectors, there is increased attention to food waste.

It is not possible to estimate the relative importance of the various factors.

The results indicate that progress is being made in both prevention and separate collection. Continued efforts are important to achieve the target of 30% of food losses prevented, reprocessed as food or collected separately and valorised better compared to 2015 by 2025.

3 RESULTS BY CHAIN LINK

The sector chapters are structured as follows:

- Results according to the logic of the cascade of value retention
    - Prevention: the focus is on donation/redistribution of food surpluses, as a quantifiable sub-aspect of prevention efforts
    - Valorisation: food residues/waste destinations and cascade index
    - Food losses (absolute and relative) and side streams
- Data collection
- Findings and evolution compared to 2015 baseline measurements.

3.1 FISHERIES

This chapter was created in collaboration with Bart Vanelslander (ILVO) and the Fisheries Service (Department of Agriculture and Fisheries).

Flemish demersal[2] fisheries are mixed fisheries, fishing multiple stocks simultaneously. The fleet specialises in flatfish.

3.1.1 Results

3.1.1.1 Prevention

Figures on prevention at the source are not available. An example of a prevention effort in fisheries is adjusting vessel equipment to refine gear selectivity by size and species to reduce or prevent unwanted by-catch. An example of such a selectivity measure is the introduction of the Flemish panel (use is mandatory in beam trawling), through which undersized fish can escape.

Importantly, the landing obligation (see below) has also led to more selective fishing whereby unwanted species are simply left in the sea where, for example, undersized specimens can grow into sizeable, commercialisable specimens. In an indirect way, this also leads to an avoidance of food loss, but this is not quantifiable.

Equally important is the raising of awareness among fishermen and ship owners that has ensured that concepts such as more selective fishing, optimal treatment of specimens to be released, etc., are increasingly being applied. This again contributes to (non-quantifiable) prevention of food loss.

[2] Demersal fish species are those that depend on proximity to the bottom for their survival.

3.1.1.2 Valorisation

Origin of food residues/food waste

On 1 January 2016, the landing obligation (LO) for fish species subject to catch limits in all fisheries, including demersal fisheries, came into effect. It was introduced gradually over the period 2016-2018. Since 1 January 2019, there is a full landing obligation for fish species subject to catch limits (quota species). As described earlier in this Monitor, the introduction of the landing obligation aims to reduce discards by encouraging more selective fishing (prevention).

The LO or landing obligation basically means that catches of quota species may not be discarded by the vessel in question. Undersized specimens (BMS - Below Minimum Size) of species covered by the LO may also no longer be thrown overboard, but must be separated from other catches, weighed and recorded, and stowed in the hold separately from the compliant fish. After landing, undersized specimens should be reserved for non-direct human or non-human consumption (fish meal, preparations, fish oil, animal feed, etc.). Since these undersized specimens can be considered 'not ready for slaughter' (and therefore outside the scope of the Monitor), and given their negligible volumes, they are not included in this Monitor.

Some catches are still returned to the sea. These include species subject to a fishing ban or species exhibiting predator-induced damage. In addition, species subject to the landing obligation may also be discarded under certain specific circumstances. These are species for which the best available scientific advice indicates a high survival rate when discarded, or species for which achieving greater selectivity is very difficult or involves exceptionally high costs. These exceptions are defined in triennial discard plans (which can, however, be changed each year). As these are exceptions to the landing obligation, they are not discussed further in this Monitor.

3.1.2 Findings and evolution compared to 2015

As mentioned above, as of 1 January 2019, there is a general landing obligation for fish species subject to catch limits (quota species), which means that catches of these fish species may no longer be discarded. Consequently, further tracking of discard volumes is no longer an issue (N/A). Since then, there has been an even stronger focus on prevention to avoid any food losses.

Table 12: Evolution of total food residues/waste, food losses, side streams and cascade index, fisheries, tonnes, Flanders, 2015-2020

	2015	2017	2020	Evolution 2015-2020	Evolution 2017-2020
Total food residues/waste	10,402	2,823	N/A	N/A	N/A
Food loss	5,201	1,417	N/A	N/A	N/A
Side streams	5,201	1,417	N/A	N/A	N/A
Cascade index	0	0	N/A	N/A	N/A

Source: ILVO, 2020; Department of Agriculture and Fisheries, 2020

3.2 FISH AUCTIONS

This chapter was created in collaboration with the Fisheries Service (Department of Agriculture and Fisheries). This is the first measurement in which we include figures on food residues/waste at fish auctions, which is why we provide a detailed time series for 2015-2017-2020.

The Flemish Fish Auction operates two auctions located in the 2 Flemish fishing ports of Zeebrugge and Ostend. The mission of the Flemish Fish Auction is to bring together the supply and demand of fresh wild fish with the goal of obtaining the best price for producers and buyers. The fish landed is sold in real time via the Internet on a network connecting 3 clocks, in Zeebrugge, Ostend and Nieuwpoort. Each year, around 17 million kg of fish finds its way through wholesale to consumers throughout Europe (Flemish Fish Auction, 2022).

3.2.1 Results

3.2.1.1 Prevention

Figures on prevention at the source are not available. Possible preventive measures include cold chain monitoring, limiting manual handling, etc. In other words: quality control.

3.2.1.2 Valorisation

Origin of food residues/waste

From the year 2014, the retention of fishery products is no longer compensated by EU support, this due to the new Common Fisheries Policy and the new Common Market Organisation in particular, which ended the EU withdrawal scheme. Retained fish is fish offered that obtains too low a price on the auction clock and is consequently withdrawn from the market. The industry now organises on its own initiative the withdrawal of

these quantities from the market for subsequent removal to non-human consumption (fish meal, preparations, fish oil, animal feed, etc.). In practice, these fish residues are given the destination of animal feed.

In addition to retained fish, it also happens sporadically that landed fish was found to be unfit for human consumption when inspected by the FASFC. This rejected fish is removed and processed into animal feed. These very limited quantities are no longer officially reported (there is no compensation for them) and are therefore not included in this Monitor.

A total of 208 tonnes of fish was retained in 2020, accounting for 1.6% of total landings. This is higher than in 2015 and 2017, but remains relatively limited. Landings were lower in 2020, while the amount of fish retained was higher. The decline in landings is not a new phenomenon and can be explained for 2020 in part by the compensation for the temporary cessation of fishing activities worked out for the fishing industry as part of the COVID crisis. The decline in landings was not offset by better fish prices. Table 13 shows that the retained quantities in 2020 were largest for the other demersal fish species, rays, dab and pouting. Relative numbers were highest for conger eel and hake. In 2015 and 2017, sharks stand out in particular, both in absolute and relative terms.

Table 13: Retained quantities of fish in Belgian ports relative to total landings in tonnes, by fish species, 2015-2017-2020

Fish species	Landings (tonnes)			Retained (tonnes)			% retained relative to landings		
	2015	2017	2020	2015	2017	2020	2015	2017	2020
Haddock	138.4	115.3	98.9	3.4	2.7	6	2.5	2.3	6.1
Whiting	254.0	186.7	201.7	2.2	9.0	3.3	0.9	4.8	1.6
Hake	44.1	69.2	56.5	1.7	2.0	10	3.9	2.9	17.7
Pouting	300.6	289.9	187.3	1.0	9.7	15.6	0.3	3.3	8.3
Plaice	5,840.0	5,417.7	2,163.2	0.5	1.1	1.8	0	0	0.1
Flounder	286.7	105.1	148.8	0.2	0.2	1.6	0.1	0.2	1.1
Dab	285.2	139.1	153.1	3.7	0.9	16.3	1.3	0.6	10.6
Rays	1,210.9	1,026.3	1,430.6	6.4	3.1	35.9	0.5	0.3	2.5
Gurnards	988.9	1,417.8	628.1	10.3	0.6	4.9	1.0	0	0.8
Conger eel	34.9	44.0	30.2	0.1	0.9	8.7	0.3	2.0	28.8
Sharks gen.	719.4	631.6	524.9	58.2	41.7	0.9	8.1	6.6	0.2
Other demersal species	6,185.1	4,926.9	4,815.3	3.1	1.3	94.1	0	0	2
Pelagic species	91.2	57.3	98.1	0	0.4	0	0	0.7	0
Crustaceans and molluscs	1,997.2	2,301.1	2,258.9	11.0	6.1	8.5	0.6	0.3	0.4
Total	**18,376.5**	**16,728.0**	**12,795.6**	**101.8**	**79.7**	**207.6**	**0.6**	**0.5**	**1.6**

Source: Department of Agriculture and Fisheries, 2020

Thus, a total of 208 tonnes of food residues/waste are generated at fish auctions (2020). This is about double the amount in 2015 (102 tonnes) and 160% more than in 2017 (80 tonnes).

Valorisation of food residues/waste and cascade index

The retained and rejected fish are given the destination of animal feed. In both the baseline and final measurements, 100% goes towards animal feed.

Table 14: Destinations of food residues/waste at fish auctions, % compared to the sector total, Flanders, 2020

Sector	Animal feed	Bio-based materials	Soil	Anaerobic digestion	Composting	Energy	Incineration with energy recovery	Landfill/ discharge*	Unknown destination	Total
Fisheries	100 %	-	-	-	-	-	-	-	-	100 %

* Discharge includes discards in fisheries

The cascade index weighs the food residues/waste produced in a sector according to their position on the value retention cascade. The cascade index for fisheries is 10, the highest possible score.

Table 15: Cascade index for fish auctions, Flanders, 2020

Sector	Value on cascade index*
Fisheries	10

* Minimum (worst possible score) = 0, maximum (best possible score) = 10

3.2.1.3 Food losses and side streams

When we distinguish between the edible and non-edible fractions within food residues/waste , we gain insight into, respectively, food losses and side streams. The edible fraction of food residues/waste varies between 40 and 65% (Rehbein & Oehlenschläger 2009). For now, no species-specific data is available for Flemish fisheries, so a fixed proportion of 50% was taken. Of the 208 tonnes of food residues/waste at fish auctions, 104 tonnes are estimated to be food losses and 104 tonnes side streams. The relative food loss, or the ratio of food losses to total fish landings, is 0.8%. At baseline, this was 0.3%.

3.2.2 Data collection

The amount of fish retained at Belgian fish auctions is reported on annually in the report 'De Belgische zeevisserij. Aanvoer en besomming. Vloot, quota, vangsten, visserijmethoden en activiteit' of the Department of Agriculture and Fisheries. More information on the delineation of food residues/waste and the classification edible – non-edible is explained in the baseline report under section 4.3.1. (fisheries).

3.2.3 Findings and evolution compared to 2015

Compared to 2015, the food residues/waste increased by 106 tonnes in 2020. The proportion of the various fish species does vary from year to year. Food loss is relatively low. The high cascade score remains the same over the years considered.

Table 16: Evolution of total food residue/waste, food losses, side streams and cascade index, fish auctions, tonnes, Flanders, 2015-2020

	2015	2020	Evolution
Total food residue/waste	102	208	+104%
Food loss	51	104	+104%
Side streams	51	104	+104%
Cascade index	10	10	=

Source: Department of Agriculture and Fisheries, 2020

Market fluctuations determine the price of fish and therefore the amount of fish retained. The retained fish may not enter the fresh market, but may be used in a non-direct manner for human nutrition. Today, this fish is processed into animal feed.

3.3 AGRICULTURE

Flemish agriculture, together with the fishing industry, constitutes primary production. The sector is divided into horticulture, arable farming and livestock farming. Flemish agriculture is characterised by specialisation, scale increase, broadening and innovation. For more information on the sector, please visit https://landbouwcijfers.vlaanderen.be/, the portal of the Department of Agriculture and Fisheries for figures on agriculture in Flanders.

This chapter was created in collaboration with Nathalie Bernaert and Bart Van Droogenbroeck (ILVO) and the Department of Agriculture and Fisheries.

3.3.1 Results

3.3.1.1 Prevention

Figures on prevention at the source are not available. An example of a prevention effort in agriculture is the optimisation of and innovation in harvesting and storage techniques. This allows for more accurate and efficient harvesting and storage, further reducing losses during harvest (as well as during storage and further processing).

Donation does occur in practice, but figures are not available so far. However, donations in agriculture are expected to be less common than in sectors such as auctions, industry or retail, because in those sectors the products have already been collected/processed/packaged, and social organisations can more easily tap into existing logistics networks.

'Gleaning' is the practice where volunteers harvest fields that have been 'abandoned' (as non-harvestable) by farmers (for various reasons), with permission, and donate the harvest to social organisations. However, this is a phenomenon of marginal magnitude in Belgium.

3.3.1.2 Valorisation

Origin of food residues/waste

In the entire agricultural sector, an estimated 479,000 tonnes of food residues/waste are generated, of which 65% in horticulture, 32% in arable farming and 3% in livestock farming. This is a fairly similar distribution to 2015. The high tonnage of food residues/waste can be explained by the large volume of production (high per capita production compared to other countries), which is increasing due to the strong and increasing export orientation. A significant (but unknown) portion of agricultural food residues/waste is attributable to production for foreign markets.

Specific agricultural production conditions also play an important role. After all, farmers are directly dependent on 'natural' production conditions (such as the climate) that are beyond their control. These conditions can have a great impact on e.g. losses during harvest, sorting, and storage. Examples are glassy potatoes due to drought, or apples and pears with hail damage. This can also impact quality and elimination further down the chain.

Table 17: Food residues/waste in agriculture, by sector and subsector, tonnes, Flanders, 2015 and 2020

Sector	Subsector	**Food residues/waste** 2015	Food residues/waste 2020
Horticulture	vegetables, outdoors	228,509	260,180
	vegetables, protected cultivation	21,070	21,434
	fruit	33,242	29,329
	Total	*282,821*	*310,944*
Arable farming	cereals	4,809	3,784
	sugar beets	45,240	48,662
	potatoes	93,103	102,717
	Total	*143,153*	*155,162*
Livestock farming	milk	18,967	12,007
	meat	3,171	N/A
	eggs	1,240	982
	Total	*23,378*	*12,989*
Total agriculture		**449,352**	**479,095**

In horticulture, a rounded 311,000 tonnes of food residues/waste are generated, divided between vegetables outdoors, vegetables in protected cultivation, and fruit. The main horticultural crops in terms of size of food residues/waste are onions (for the processing industry, 25% of food residues/waste in horticulture) and leeks (for the fresh market, 22% of food residues/waste in horticulture).

Arable farming generates a rounded 155,000 tonnes of food residues/waste, 66% of which come from potato cultivation. A rounded 13,000 tonnes of food residues/waste are generated in livestock farming. The largest fraction of food residues/waste comes from dairy farming (mainly non-consumable milk due to mastitis).

The figures for livestock farming are a lot lower than in the previous monitoring report. This is due to two methodological adjustments. Firstly, we no longer count animal mortality during transport to the slaughterhouse in livestock farming, because this is already included in the figure for slaughterhouses (these fall under the food industry chapter). Secondly, the calculation for loss of milk due to mastitis was adjusted. Part of the loss of milk involves production loss and as such falls outside the delineation of food loss.

Valorisation of food residues/waste and cascade index

The main destination of food residues/waste from horticulture is the soil (ploughing), which accounts for 53%. In second place is animal feed (30%). By far the main destination of food residues/waste from arable farming is the soil (ploughing). The main destination of food residues/waste in livestock farming, largely unusable milk due to mastitis, is the soil (via disposal in manure pit). At the level of the entire agricultural sector, 69% of food residues/waste return to the soil, and 19% goes to animal feed (livestock feed). Compared to 2015, the share of the soil remains the same, and the share of animal feed as destination increases (from 11 to 19%).

Table 18: Destinations of food residues/waste in agriculture, % compared to the sector total, Flanders, 2020

Sector	Animal feed	Bio-based	Soil	Anaerobic digestion	Composting	Energy	Incineration with energy	Landfill/discharg	Unknown	Total
horticulture	30%	0%	53%	4%	5%	0%	0%	0%	8%	100%
arable farming	0%	0%	98%	2%	0%	0%	0%	0%	0%	100%
livestock farming	0%	0%	92%	0%	0%	8%	0%	0%	0%	100%
Agriculture (2020)	**19%**	**0%**	**69%**	**3%**	**3%**	**0%**	0%	**0%**	**5%**	**100%**
Agriculture (2015)	11%	-	70%	4%	4%	1%	-	4%	6%	100%

The cascade index weighs the food residues/waste produced in a sector according to their position on the value retention cascade. The cascade index of agriculture is 8. The agricultural sector scores high on valorisation. The valorisation of food residues/waste as soil improvers or animal feed is therefore an integral part of the core process of agriculture. This also contributes to the closing of natural cycles.

Table 19: Cascade index for agriculture, Flanders, 2020

Sector	Value on cascade index*
Agriculture	8

* Minimum (worst possible score) = 0, maximum (best possible score) = 10

3.3.1.3 Food losses and side streams

When we distinguish between the edible and non-edible fractions within food residues/waste, we gain insight into, respectively, food losses and side streams. The 479,000 tonnes of food residues/waste in agriculture consist of 73% food losses (or 349,000 tonnes) and 27% side streams (or 130,000 tonnes).

In horticulture, the food residues/waste can be divided into 78% food losses and 22% side streams. The main horticultural crops in terms of magnitude of food losses are onions (for the processing industry, 22% of total

food losses, mainly in the form of outer layers removed during peeling) and leeks (for the fresh market, 21%, mainly in the form of leek greens that are removed), just like for food residues/waste. Other relevant crops are carrots (processing industry, 7%), cauliflower (processing industry, 7%), leeks (processing industry, 6%) and pears (6%). The other crops account for less than 5% of total horticultural food losses. In arable farming, a rounded 155,000 tonnes of food residues/waste are generated, 60% of which are food losses and 40% are side streams. In livestock farming, a rounded 22,000 tonnes of food residues/waste are generated, the vast majority of which are food losses (93%).

When we express food loss relative to total production, we obtain relative food loss. Relative food loss in agriculture in Flanders is only 4%. In horticulture it is 12%, in arable farming 2%. In livestock farming, the ratio is less than 1%.

Table 20: Food residues/waste and side streams in agriculture, by sector, tonnes, Flanders, 2015-2020

		Food losses (tonnes)		Side streams (tonnes)	
Sector	Subsector	2015	2020	2015	2020
Horticulture	vegetables, outdoors	174,900	197,842	53,609	62,338
	vegetables, protected cultivation	21,015	21,363	55%	71
	fruit	26,997	23,908	6,245	5,421
	Total	*222,912*	243,114	*59,909*	67,830
Arable farming	cereals	4,809	3,784	0	0
	sugar beets	7,872	8,467	37,369	40,195
	potatoes	72,993	80,530	20,110	22,187
	Total	*85,674*	92,781	*57,479*	62,381
Livestock farming	milk	18,967	12,007	0	0
	meat	1,650	-	1,522	-
	eggs	1,116	884	124	98
	Total	*21,732*	12,891	*1,646*	98
Total agriculture		330,319	**348,786**	119,033	**130,309**

Table 21: Share of food losses and side streams in the total food residues/waste, agriculture, Flanders, 2015-2020

		Edible fraction of the food waste (= food losses) (%)		Non-edible fraction of the food waste (= side streams) (%)	
Sector	Subsector	2015	2020	2015	2020
Horticulture	vegetables, outdoors	77%	76%	23%	24%
	vegetables, protected cultivation	100%	100%	0%	0%
	fruit	81%	82%	19%	18%
	Total	*79%*	78%	*21%*	22%
Arable farming	cereals	100%	100%	0%	0%
	sugar beets	17%	17%	83%	83%
	potatoes	78%	78%	22%	22%
	Total	*60%*	60%	*40%*	40%
Livestock farming	milk	100%	100%	0%	0%
	beef cattle	52%	-	48%	-
	eggs	90%	90%	10%	10%
	Total	*93%*	99%	*7%*	1%
Total agriculture		74%	**73%**	26%	**27%**

3.3.1.4 Visual representation of results

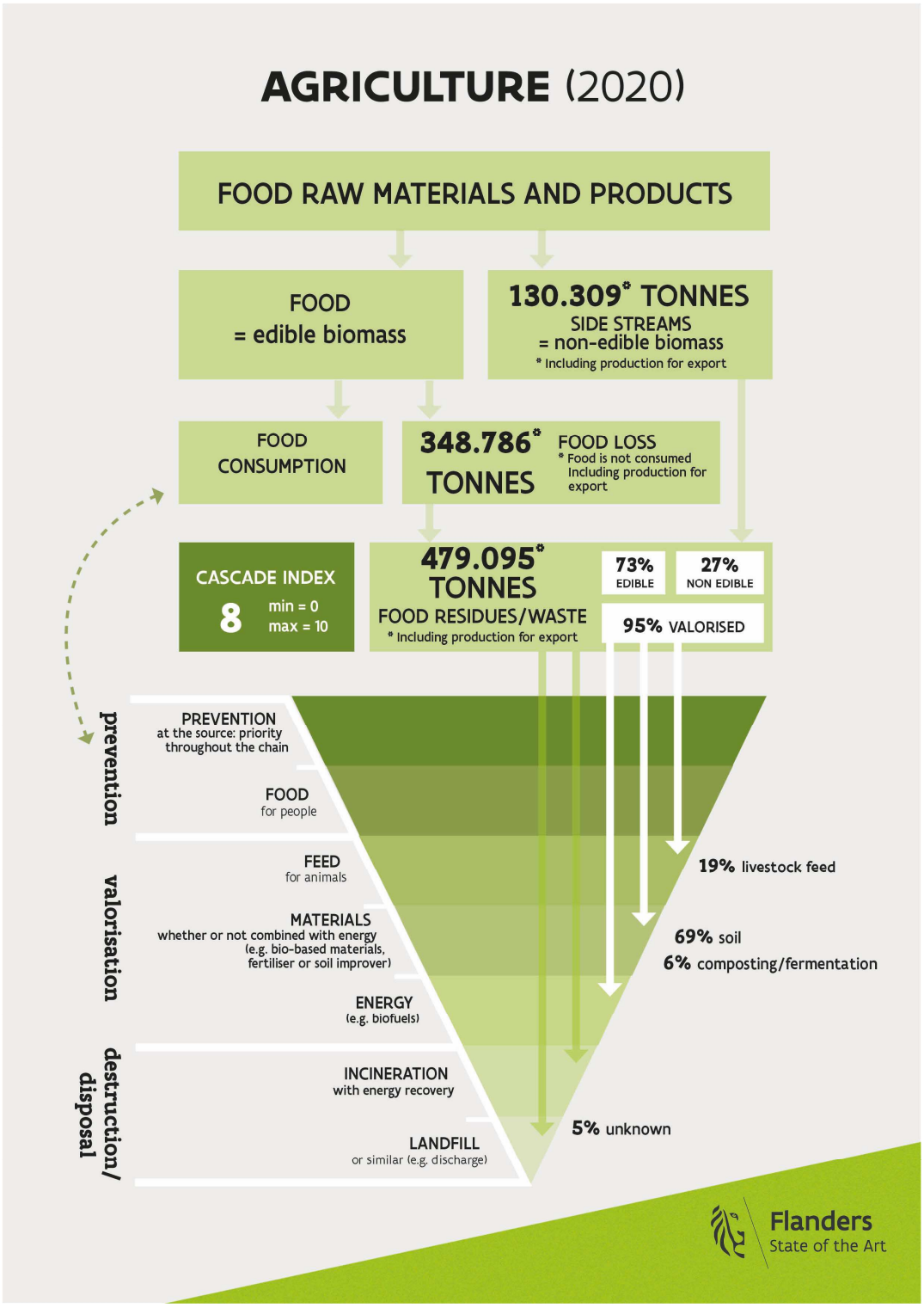

Figure 6: Valorisation of food residues/waste from agriculture, Flanders, 2020

3.3.2 Data collection

The delineation of food residues/waste in the agricultural sector is explained in more detail in the baseline report. The same applies for the methodology.

For the 2020 monitoring, the loss rates and destinations used have been updated where possible. Loss rates and destinations of food residues/waste were derived from measurements (e.g. during research projects) and existing data collections (e.g. from the sectors) where available, and supplemented with expert estimates where necessary. Production figures (acreages, tonnages, etc.) were taken from statistical sources (e.g. Statbel).

3.3.3 Findings and evolution compared to 2015

Table 22: Evolution of total food waste, food losses, side streams and cascade index, agriculture, tonnes, Flanders, 2015-2020

	2015	2020	Evolution
Total food residues/waste	449,352	479,095	+7%
- Food loss	330,319	348,786	+6%
- Side streams	119,033	130,309	+9%
Relative food loss	4%	4%	=
Cascade index	7.4	8	+0.6

Source: Department of Agriculture and Fisheries, 2020

The volumes of food residues/waste and food losses in agriculture and horticulture are large. Important reasons for this are the high volume of production (the higher the production, the more food residues/waste) and the direct dependence on climatic conditions (greater chance of food loss than in controlled environments such as e.g. industrial processes). If we express tonnages in relative terms, we get a more nuanced picture.

Over the measured period, the tonnage of food residues/waste increased slightly, the main reasons being:

- Horticulture: increase in acreage of onions for the industry in horticulture (high production x high loss rates)
- Arable farming: increase in acreage of potatoes (high production)

Some decreases, not visible in the total figure, occur for leeks for the fresh market (lower acreage x high loss rates), milk and meat (adjustments of calculations).

The cascade index improved due to the fact that more food residues/waste were generated for onions for the industry and these ended up in animal feed, as well as a correction for the destination of milk loss.

There is a lack of newly generated data on food residues/waste in agriculture in Flanders, mainly where the vegetable sectors are concerned. In addition, the available figures are rarely based on actual measurements. These are often expert estimates. Therefore, it is recommended to look for methods and means to collect data on agricultural residues/waste in a standardised way, based on actual measurements. Not only is it difficult to

find solid figures on the quantities of residues/waste; finding out what destination they are given is also not an easy task.

The method of data collection used mainly provides insight into the structural food residues/waste and food losses in agriculture and can therefore be seen as a barometer of the technological state of the sector. For example, it offers no insight into temporary food residues/waste that arise from an economic reality or a market condition due to, for example, a crisis situation or climatic conditions.

3.4 FRUIT AND VEGETABLE PRODUCER ORGANISATIONS

Producer organisations (POs) play an important role in the fruit and vegetable chain in Flanders. These POs are cooperatives, which occupy a central position between cooperative producers (supply) and wholesale and retail (demand). POs operate various fruit and vegetable sales systems, including auctioning. The Association of Belgian Horticultural Cooperatives (VBT) is the non-profit organisation that represents the interests of fruit and vegetable marketing cooperatives (www.vbt.eu/en/).

This chapter was created in collaboration with the Association of Belgian Horticultural Cooperatives (VBT), which collected the figures from its members.

3.4.1 Results

3.4.1.1 Prevention

The sales systems of the producer organisations (POs) aim to match supply and demand as much as possible and avoid food losses. Vegetables or fruit withdrawn from the market to neutralise a temporary imbalance between supply and demand are initially offered to social organisations for free distribution. This is usually done through the intervention system under the Common Market Organisation (CMO) for fruit and vegetables. A smaller proportion takes place within the marketing and promotion strategy of the POs.

Of the total supply of over 1.1 million tonnes of fruit and vegetables in 2020, 1.5%, or 17,586 tonnes of product, went unsold. Of this amount, **1,632** tonnes of fruit and vegetables, or 9%, ended up in free distribution.

The POs aim to redistribute these surpluses to social organisations to the maximum extent possible. In practice, however, there are several bottlenecks for this channel: e.g. peak supply, limited capacity of social organisations, or logistical or manpower constraints. As a result, much of the unsold product goes to non-human consumption.

Valorisation

Origin of food residues/waste

The food waste in 2020 amounted to 15,954 tonnes. However, significant annual fluctuations are noted. This can be explained by varying weather conditions affecting yields and the market situation, say supply and demand at home and abroad.

Valorisation of food residues/waste and cascade index

Noteworthy is the high proportion of food residues/waste (fruit and vegetables) going to animal feed (80%) in 2020, the second destination being anaerobic digestion (16%). For 4%, the destination is not known. In 2015, the destinations were more diverse: animal feed 36%, soil 28%, composting 17% and anaerobic digestion 12%.

Since 2019, ploughing (soil) as a possible destination for fruit and vegetables that are withdrawn from the market is no longer allowed, which explains the shift in destination to animal feed.

Table 23: Destinations of food residues/waste, producer organisations, in %, Flanders, 2015-2020

Year	Animal feed	Bio-based materials	Soil	Anaerobic digestion	Composting	Energy	Incineration	Landfill/ discharge*	Unknown destination	Total	Total (tonnes)
2015	36%	-	28%	12%	17%	-	-	-	8%	100%	14,626
2020	80%	-	0%	16%	0%	-	-	-	4%	100%	15,954

Source: calculation based on VBT (2023)

The cascade index weighs the food residues/waste produced in a sector according to their position on the value retention cascade. The cascade index for producer organisations is 9.3. Valorisation was already high and increased in horticulture in 2020. The application of the cascade system in government policy (CMO, OVAM rules) and by the POs is bearing fruit.

Table 24: Cascade index for POs, Flanders, 2020

Year	Value on cascade index*
2015	8.1
2020	9.3

* Minimum (worst possible score) = 0, maximum (best possible score) = 10

3.4.1.2 Food losses and side streams

The food residues/waste consist almost entirely of edible fruit and vegetables (95% of food loss or 15,156 tonnes). The non-edible fraction or the proportion of side streams is 5% and accounts for 798 tonnes. This breakdown was made based on assumptions. In 2020, 1,129,631 tonnes of product was supplied at VBT members. Food loss relative to supply was only 1.3%. This was also the case in 2015.

Table 25: Food losses and side streams, tonnes and % of total, POs, Flanders, 2020

Year	Food losses (= edible food residues/waste) (tonnes)	Side streams (= non-edible food residues/waste) (tonnes)
2015	13,895	731
2020	15,156	798

Source: calculation based on VBT (2023)

3.4.1.3 Visual representation of results

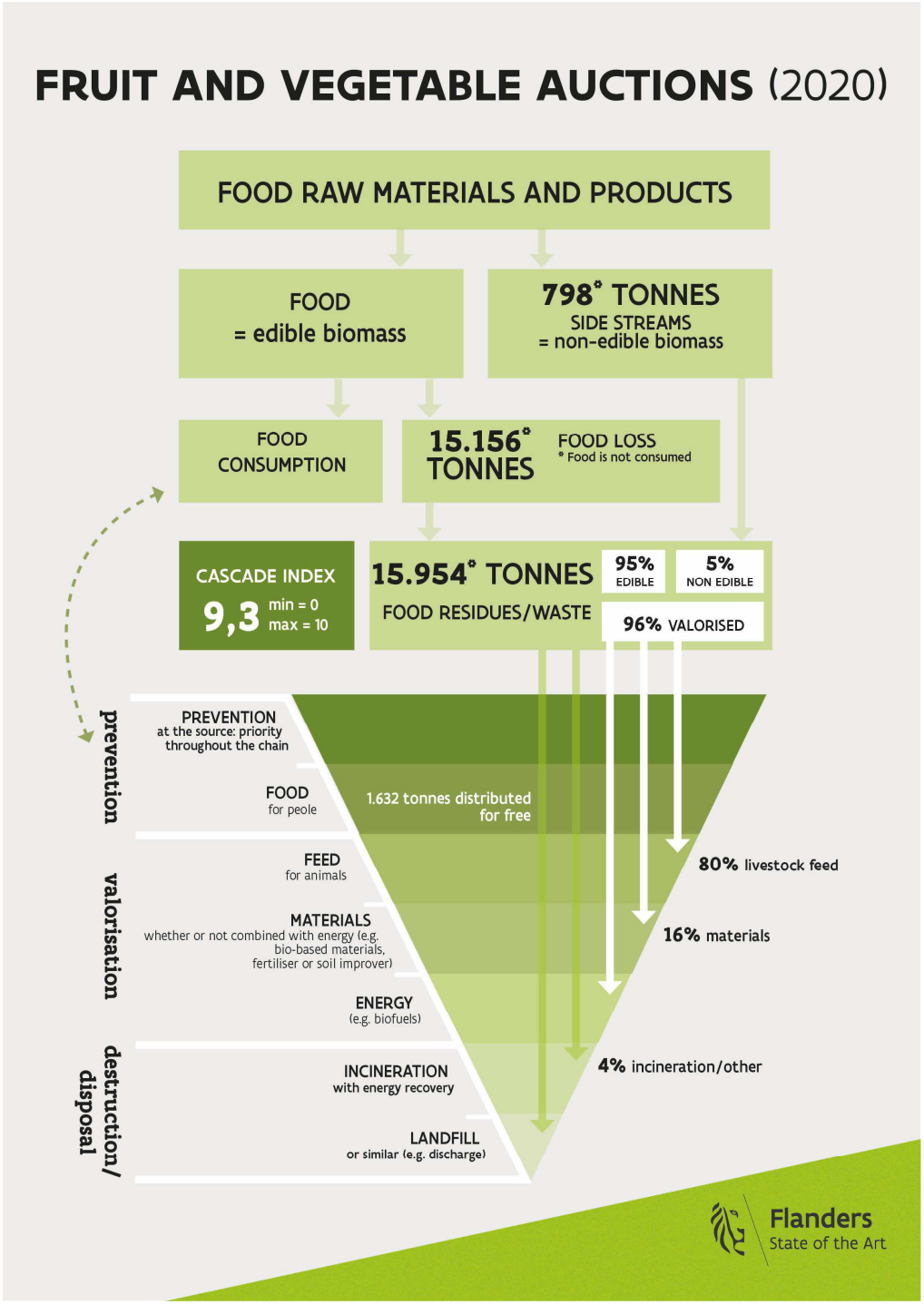

Figure 7: Valorisation of food residues/waste from vegetable and fruit auctions, Flanders, 2020

3.4.2 Data collection

The data collection methodology was modified for simplification. That is why the data differs from that of previous measurements. This time, no additional calculations are made to identify the food residues/waste at producer organisations that are not members of VBT. Thus, the data only refers to VBT members. VBT members account for about 90% of the turnover of all POs (Department of Agriculture and Fisheries, 2023). A new time series was prepared for 2015-2020 for comparison purposes.

3.4.3 Findings and evolution compared to 2015

We see a slight increase in unsold product at producer organisations: in 2020 it was 10% more than in 2015. The share of this going to free distribution increased by 23%. The share going to non-human food, i.e. food residues/waste, increased by 9%. This can be explained by weather conditions affecting yields and the market situation, say supply and demand at home and abroad. Product supply in 2020 was about 6% higher than in 2015.

Table 26: Evolution of destinations of unsold product, POs, tonnes, Flanders, 2015-2020

Destination	2015 (tonnes)	Share in 2020	2020	Evolution
Free distribution (human food)	1,323	9%	1,632	+23%
Other destinations (non-human)	14,626 (animal feed, soil, composting/anaerobic digestion)	91%	15,954 (animal feed, anaerobic digestion)	+9%
Total	15,949	100%	17,586	+10%
Cascade index	8.1		9.3	+1.2

Source: calculation based on VBT (2023)

Since 2019, ploughing (soil) as a possible destination for fruit and vegetables that are withdrawn from the market is no longer allowed. As a result, we are seeing a shift towards animal feed.

Table 27: Evolution of total food residue/waste, food losses, side streams, POs, tonnes, Flanders, 2015-2020

	2015	2020	Evolution
Total food residue/waste	14,626	15,954	+9%
- Food losses	13,895	15,156	+9%
- Side streams	731	798	+9%

Source: calculation based on VBT (2023)

Since the residue/waste generated is mainly fruit and vegetables that are still suitable for human consumption, the priority should be on a higher valorisation of fruit and vegetables for human nutrition, i.e. how to move up the cascade. The residues going towards human food are currently limited compared to those going to a non-human destination. In addition to the free distribution of products, processing for human consumption is also being investigated (outside the intervention programme).

3.5 FOOD INDUSTRY

The food industry is a sizeable sector in Flanders. With as many as 27 subsectors, grouped here into about eight subsectors, in which raw materials are processed into finished products, the size (production) and diversity of the food residues/waste is significantly greater in comparison with other sectors. The methodology has been modified since the baseline measurement to factor in the availability of more comprehensive IMJV data for the food industry (see 3.5.2).

3.5.1 Results

3.5.1.1 Prevention

The food industry is focusing on prevention measures, such as better training of personnel, adjusting machinery, reducing machine downtime, and adjusting recipes so that residues/waste can be better processed. Research innovations lead to the upgrading of residues/waste into new products on the market, e.g. cauliflower rice and beer from surplus bread. For an overview with some examples, see: De strijd tegen voedselverlies slaat een volgende weg in (Fevia). The food industry is also making efforts to optimise packaging for a longer shelf life of food stocks and to reach the end user maintaining safety and quality standards.

In 2017, food donations were included in the IMJV for the first time to allow for structural monitoring, but not all food companies are completing this yet. According to figures from the Belgian Federation of Food Banks, the Flemish food industry and wholesalers donated a total of **5,697** tonnes of products to food banks in 2021.

The baseline measurement in 2015 mentioned a figure of around 13,000 tonnes, which had been obtained from a survey of the food industry that included both donation and other free distribution. Due to the coronavirus crisis in 2020, we do not have complete data, which is why the data for 2021 was taken. The figures for 2015 and 2021 cannot be compared because the source for the 2021 data is different. The 2021 figure of the food industry only comprises donations, not other free distribution.

Figures from the Belgian Federation of Food Banks show that the tonnage of donated products from the food industry has decreased from 2021. This is in part due to the raw material shortages and rising prices in the food industry, as a result of which production was adapted to orders rather than stock demand, so there was less to donate.

Table 28: Redistribution of food surpluses from the food industry suitable for human consumption, in tonnes, Flanders, 2021

	Donation/redistribution through food bank (tonnes)
food industry	2,428
wholesale and distribution	3,269
Total	**5,697**

Source: Figures based on data from the Belgian Federation of Food Banks 2021

Not all food surpluses in the industry are suitable for social redistribution. These include e.g. products with quality issues or products with expired use-by dates. In addition, food losses also occur during production processes. These are also usually not suitable for donation due to their nature and quality. There is no insight into the proportion of unsold products still suitable for donation. Finished products are generally easier to donate than intermediate goods.

3.5.1.2 Amount and valorisation

Generation of food residues/waste (sum of food losses and non-edible side streams)

Total food residues/waste in the food industry amounted to nearly 2 million tonnes in 2020, of which around 11% was food waste and around 89% were non-edible side streams. 99.5% of all food residues/waste are collected separately and valorised, as shown in the table below.

Table 29: Food residues/waste (sum of food losses and non-edible side streams), tonnes, food industry, Flanders, 2020

	In residual waste/incinerated (tonnes)	Collected separately	Total (tonnes)	Total (%)
Food loss (tonnes)	2,034	227,206	229,240	11.5%
Non-edible side streams (tonnes)	7,011	1,763,132	1,770,143	88.5%
Total food residues/waste (tonnes)	9,045	1,990,338	1,999,383	100%
Total food residues/waste (%)	**0.5%**	99.5%	**100%**	
Sludge			484,693	

Source: Calculations by OVAM based on IMJV data for production year 2020

The food industry is where the process takes place which, relatively speaking, generates the most non-edible side streams, specifically the processing of raw materials into food products for retail, horeca, catering and consumers. Thus, the generation of side streams is concentrated in this link of processing. Non-edible side streams account for 89% of food residues/waste in the food industry.

The high tonnage of food residues/waste compared to other sectors can in part be explained by the very large volume of production of the food industry (high per capita production compared to other countries), due to the strong export orientation. 48.9% of the food industry's sales come from exports (Belgian Food Industry Federation, Annual Economic Report 2021). Exports are also significantly higher than imports. The Flemish food industry has a positive trade balance of 4.3 billion euros. Hence, a significant portion of the food residues/waste is attributable to production for foreign markets. The figures in terms of food loss in 2020 were also affected by the coronavirus crisis. Indeed, many events and catering establishments inside and outside Flanders suddenly

had to close as a result, causing the food industry to lose an important market overnight. The impact of this varied greatly from company to company.

The IMJV also reported 484,693 tonnes of water treatment sludge and sludge from washing, centrifuging, etc. Sludge is not counted in the total food residues/waste in analogy to the reporting on food residues/waste in the European food waste statistics.

Valorisation of food residues/waste and cascade index

Based on an analysis of the destinations, 99.5% of the food residues/waste are given a useful destination, mainly going to animal feed (55%), anaerobic digestion (16%) and animal waste treatment (24%), as shown in Table 30. Used frying oils and fats (UFOs) are usually used for biodiesel production. Just under 0.5% has to be destroyed, mostly because of legal provisions.

Table 30: Destinations of food residues/waste in the food industry in Flanders, 2020

Tonnes	Animal feed	Biochemistry	Soil	Anaerobic digestion	Animal waste processing	UFOs/Biodiesel	Incineration	Total
Bakery products	31,982	79		4,890			804	37,755
Potatoes, vegetables and fruit	468,535	6,980		174,290		3,016	642	653,463
Beverages	315,365	6,393	148	20,982			277	343,166
Oils, fats	41,381			8,857		7,445	41	57,723
Sugar, chocolate, prepared meals, etc.	92,809		893	31,587	3,589	685	708	130,271
Pasta, diet food, starch, milling products	51,662	45	19	25,980			1,289	78,995
Dairy	57,231		40,855	24,894			238	123,219
Meat, fish and poultry	49,707	15,278	2,220	20,219	482,323		5,045	574,792
Total food residues/waste	1,108,672	28,775	44,134	311,699	485,912	11,146	9,045	1,999,383
%	55.5	1.4	2.2	15.6	24.3	0.5	0.5	100%

Tonnes	Animal feed	Biochemistry	Soil	Anaerobic digestion	Animal waste processing	UFOs/Biodiesel	Incineration	Total
Sludge (tonnes)			unknown	484,693				

Source: Calculations by OVAM based on IMJV data for production year 2020

High-quality valorisation is structurally embedded in the food industry. Important explanations can be found in the nature (e.g. purity) and structural availability of the food residues/waste, which may contribute, for example, to the profitability of certain forms of valorisation. The strong link between agriculture and the food industry also contributes to the widespread, high-quality use of residues/waste in the food chain.

The cascade index weighs the food residues/waste produced in a sector according to their position on the value retention cascade. The cascade index for the food industry is 9.06. The food industry obtains a high score when it comes to valorisation, given that the valorisation of food residues/waste as animal feed or soil improvers is intrinsically intertwined with business operations in the food industry.

Table 31: Cascade index for the food industry, Flanders, 2020

Sector	Value on cascade index*
Food industry	9.06

* Minimum (worst possible score) = 0, maximum (best possible score) = 10

3.5.1.3 Food losses and side streams

Based on a number of assumptions, Table 32 estimates that food residues/waste from the food industry are composed of 11% food loss (229,240 tonnes) and 89% side streams (1,770,143 tonnes). Virtually all food loss is collected separately and valorised (99%).

The main destination is animal feed. A separate collection and Good Manufacturing Practice (GMP)+ control system exists for this purpose.

The industry is committed to research to enable the processing of difficult-to-process food products (e.g. viscous products, products containing nuts-pits-peels, hard-to-digest products, etc.) and complexly packaged food products into high-quality basic raw materials for the animal feed industry.

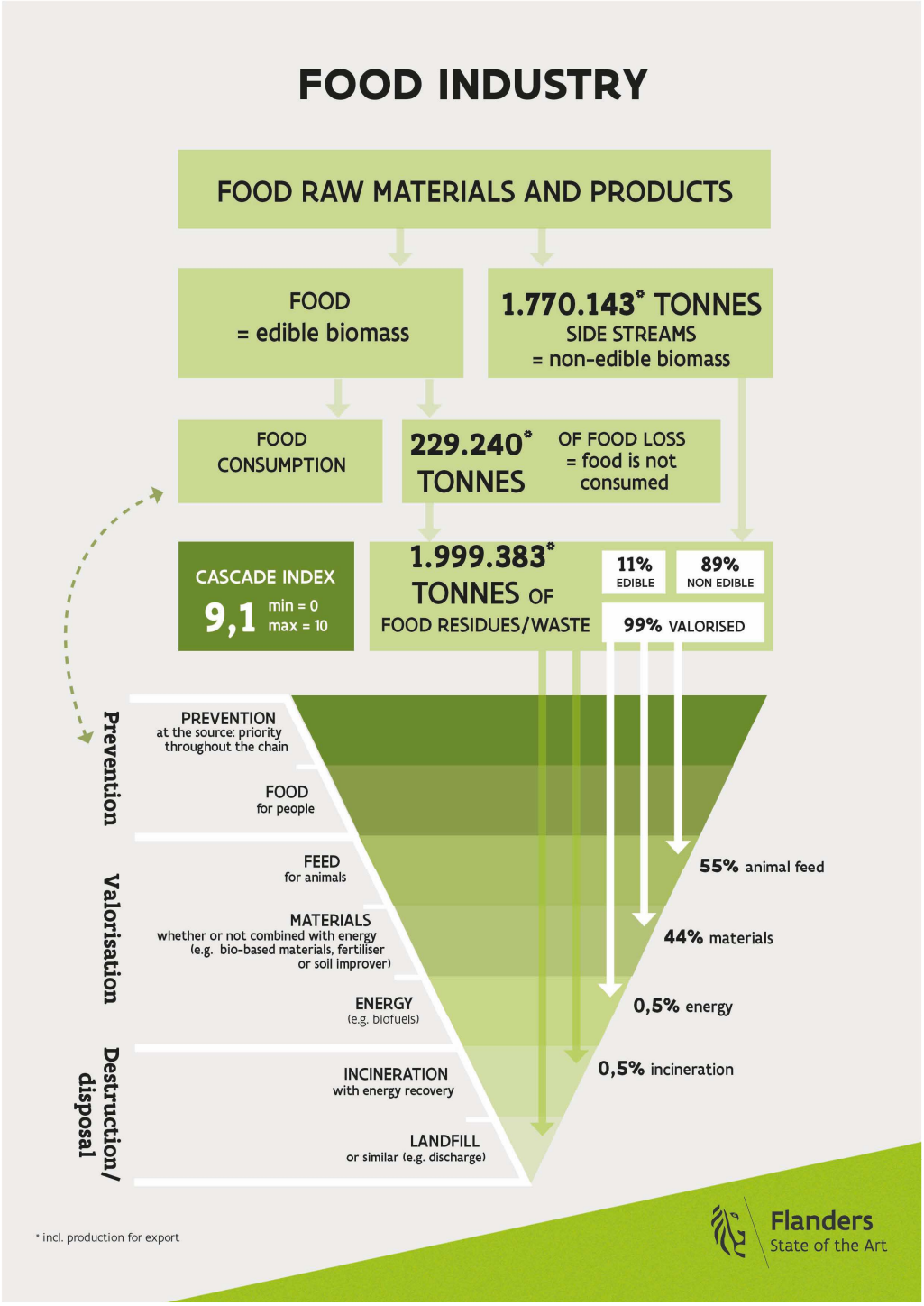

Figure 8: Valorisation of food residues/waste from the food industry, Flanders, 2020

Tonnes	Animal feed	Bio-based	Soil	Anaerobic digestion	Animal waste processing	UFOs/biodiesel	Incineration	Total
Food losses	164,085			63,121			2,034	229,240
%	71.6			27.5			0.9	100%

Table 32: Overview of destinations of food losses in the food industry in Flanders, 2020

Exact figures on the total production of the human food industry are not available. The Belgian Food Industry Federation estimates the production of the Flemish food industry to be in the order of magnitude of more than 15 million tonnes. The ratio of food loss in 2020 to this volume of production, expressed in tonnes, is 1.3%.

3.5.1.4 Visual representation of results

3.5.2 Data collection

The delineation explained in the report with the baseline measurement under Chapter 4.4.2 (Flemish Food Supply Chain Platform for Food Loss, 2017) remains valid for this measurement. However, the methodology has been slightly modified with a view to a structural availability of data for the food industry.

Every two years, companies in the food industry are questioned by OVAM about the amount and destination of 'food waste and food residues/waste' in their company as part of the IMJV (integrated annual environmental report). Companies are required to keep the data and provide it to OVAM upon request. This is a comprehensive sample, the results of which are extrapolated to the level of Flanders. For 2020, all food companies of 50 or more employees were surveyed in the context of the IMJV. All PRTR companies are required to complete the IMJV in any case. For food companies with fewer than 50 employees, there is an OVAM sample that was extrapolated. In order to have a representative sample, the sample was composed in such a way that enough companies are surveyed per subsector and, within each subsector, enough companies of each size (company size based on number of employees). The total number of companies surveyed by subsector is shown in Table 33.

To be clear, the reported data is about the amount of food residues/waste collected, including packaging. What is recycled internally in the food company is not reported. Food residues/waste were mapped for the following 8 subsectors. Some food industry sectors were clustered because of the limited number of companies.

Subsector	NACE-BEL		Size (number of employees)									Total
			size 1 (1-4)	size 2 (5-9)	size 3 (10-19)	size 4 (20-49)	size 5 (50-99)	size 6 (100-199)	size 7 (200-499)	size 8 (500-999)	size 9 (>1,000)	
meat	10.1	Total	127	46	47	74	20	22	3	2	0	341
		Surveyed	53	46	47	61	20	22	3	2	0	254
		Response	43%	50%	51%	54%	75%	86%	100%	100%		56%
fish	10.2	Total	11	4	5	3	3	1	1	0	0	28
		Surveyed	11	4	5	3	3	1	1	0	0	28
		Response	45%	50%	100%	100%	100%	100%	100%			71%
fruit and vegetable processing	10.3	Total	31	6	5	13	11	9	7	4	0	86
		Surveyed	31	6	5	13	11	9	7	4	0	86
		Response	48%	67%	80%	77%	100%	100%	100%	100%		74%
fats and oils	10.4	Total	5	2	4	3	2	2	3	0	0	21
		Surveyed	5	2	4	3	2	2	3	0	0	21
		Response	60%	100%	75%	67%	100%	100%	67%			76%
dairy	10.5	Total	83	9	6	6	6	9	7	1	0	127
		Surveyed	53	9	6	6	6	9	7	1	0	97
		Response	38%	67%	67%	83%	83%	100%	100%	100%		59%
starch	10.6	Total	21	5	4	4	3	4	2	0	0	43
		Surveyed	21	5	4	4	3	4	2	0	0	43
		Response	48%	80%	100%	75%	100%	100%	100%			70%
bakery products	10.7	Total	1,308	384	144	53	26	11	4	2	1	1,933
		Surveyed	53	40	53	41	26	11	4	2	1	231
		Response	43%	65%	51%	73%	85%	100%	75%	50%	100%	62%
other (confectionery, prepared meals, etc.)	10.8 - 11.	Total	207	53	57	43	32	16	7	2	1	418
		Surveyed	53	53	53	43	32	16	7	2	1	260
		Response	25%	47%	51%	72%	94%	100%	100%	100%	100%	58%
beverages	11.0	Total	70	14	10	19	8	5	6	2	0	134
		Surveyed	53	14	10	19	8	5	6	2	0	117
		Response	32%	79%	80%	100%	100%	100%	100%	100%		65%

Table 33: Overview of food industry subsectors – IMJV survey 2020

From 2020, all Member States have to report their food waste figures to Europe annually. OVAM reports on this to Europe, using the methodology established at the European level. This EU reporting is limited to food waste with anaerobic digestion/composting and incineration as destination, which means that sludge and a number of destinations are not included (animal feed, soil, bio-based materials, etc.). For this Flemish monitoring report, sludge is listed separately and the destinations animal feed, biochemistry and biodiesel are also included to identify possible shifts in destination. To enable comparison with 2015, sludge was also removed from the food waste and its respective destinations in the 2015 figures and listed separately.

Since 2017, companies are also asked to track donations of food surpluses through the IMJV. These, of course, are not food residues/waste. The number of companies surveyed was significantly expanded. Still, there will be under- or overestimates here and there. Companies can add more explanation to their residues/waste, for example, fill in a 'common name', which allows data to be better interpreted (food loss) and more often linked to the right destination. However, the figures and a comparison of the figures from the baseline measurement and this measurement are not an exact science. Rather, the differences are methodological and often fall within a margin of error inherent in these figures.

For the breakdown of food residues/waste into food losses (edible) and side streams (non-edible), the description of the material flow/waste (common name) and the destination were used. The better these are completed by food companies, the smaller the margin of error. Given the potential margin of error, it was again decided not to include the breakdown into food losses/side streams by subsector in the monitoring report.

3.5.3 Findings and evolution compared to 2015

Because of the large volume of production and the nature of its activities (processing), the food industry produces a large amount of food residues/waste.

As in 2015, only a relatively small proportion of the total food waste is edible (11%), so the proportion of food loss is relatively low. In terms of valorisation, the sector continues to score well with a cascade index score of 9.1. There is some shift in the material destinations of the food residues/waste. Animal feed and animal waste processing together accounted for 79% in 2020. Relatively more residues/waste (e.g. bakery products) went to animal feed than in 2015. In third place comes anaerobic digestion. After processing animal waste, mainly proteins and fats are generated. The destination of the proteins and fats depends on the origin of the animal waste. The biomass market analysis (OVAM, 2023) elaborates on this. The amount of animal waste processed in 2015 was corrected from the 2015 baseline monitoring report in the table below based on available OVAM data on animal waste and animal waste processing.

Table 34: Overview of the food industry, Flanders, 2015-2020

	2015	2020	Evolution
Donations – tonnes (*)	13,000	5,697	
Total food residue/waste – tonnes (excl. sludge)	2,442,711	1,999,383	-443,328 tonnes due to the pandemic and due to better segregation of sludge data
Top 3 destinations	Animal feed (49%), animal waste processing (27%), anaerobic digestion (18%)	Animal feed (55%), animal waste processing (24%), anaerobic digestion (16%)	
Cascade index	8.9	9.1	Slight increase
Share of food losses	9.2%	11.5%	+2.3 percentage points
Food losses – tonnes	225,481	229,240	+3,759 tonnes
Side streams – tonnes	2,217,230	1,770,143	-447,086 tonnes
Sludge – tonnes	362,534	484,693	

Source: Calculations by OVAM based on IMJV data

* Difficult to compare due to different basis of calculation

3.6 RETAIL

Food retail can be divided into several segments: non-specialty retail, which includes supermarket chains and wholesale distribution, and specialty retail. Markets are not included separately here since market vendors are included in specialised retail.

3.6.1 Results

3.6.1.1 Prevention – redistribution

Based on figures from Comeos, in 2021, supermarkets in Flanders offered an estimated **9,706 tonnes** of food surpluses (including packaging) for social redistribution through distribution platforms, food banks and other social organisations. In recent years, more and more retailers have been making efforts to reduce food loss. Products nearing the expiration date are offered for sale at a discount in-store or through a platform or for social redistribution. **1,664 tonnes** of food were sold through Too Good To Go's platform in 2021.

Table 35: Redistribution of food surpluses from retail suitable for human consumption in Flanders in 2021

	Donation/redistribution through food bank/social distribution platform (tonnes)	Sales via platform (tonnes)
supermarkets	**9,706**	**1,664**

Calculation based on data from Comeos and Too Good To Go, 2021

A number of supermarket chains have committed to the 10-20-30 target. This involves at least 10 of the world's largest food retailers and services taking the target-measure-act approach, and each committing to 20 of its key suppliers doing the same, in order to halve food loss/waste by 2030 compared to 2015.

The multi-year study Superlist: https://www.superlijst.be/ compares a number of supermarkets in Belgium in terms of combating food loss (Questionmark Foundation, 2022). The initial results of this study are shown in the figure below. The focus is on having a concrete and measurable action plan and reporting on food loss reduction in the supply chain and among consumers. It provides an incentive for supermarket chains to focus more on this in their external communications.

Figure 9: Performance of supermarkets on food loss
Source: Questionmark Foundation 2022)

Retailers' sustainability reports include the following food loss prevention initiatives/projects, among others:

- The digital optimisation of the supply system in order to optimise stocks in the shops.
- Creating partnerships to recover crop losses.
- Accelerating the flow of good practices.
- Reducing food waste in all retail links: warehousing, supermarkets and transportation
- Donating unsold food to food banks and charities
- Separate collection of food no longer fit for human consumption, for animal feed and composting/anaerobic digestion.

3.6.1.2 Origin and valorisation of food residues/waste

84% of food residues/waste from retail are collected separately. For wholesale distribution and supermarkets, this is 90%. Among neighbourhood grocery stores and food retail, it is 48%. The proportion of food waste still found in residual waste is based on the recent OVAM residual waste sorting analysis (OVAM, 2022c). More information about this is included in 3.6.2. By the end of 2023, all food shops will be required to collect food waste separately. Part of these food residues is still suitable for animal feed and is collected separately and – if packaged – depackaged by the processor. Most of it is food waste: packaged food waste that has passed the

expiration date or is no longer marketable. After the separate collection, this food waste goes to a depackaging plant, where it is depackaged. The biomix obtained then goes to anaerobic digestion. Of the 66,903 tonnes collected separately from wholesale distribution and supermarkets, 5,030 tonnes are grease sludge. In food retail, this is about 40 tonnes of grease sludge.

Table 36: Food residues/waste in retail, by collection method, Flanders, 2020

Sector	In residual waste		Collected separately		Total food residues/waste
	tonnes	%	tonnes	%	tonnes
Wholesale distribution and supermarkets	7,739	10%	66,903	90%	74,642
Food retail	6,096	55%	5,064	45%	11,160
Total	**13,835**	**16%**	**71,967**	**84%**	**85,802**

Source: calculation based on IMJV, OVAM, 2020

From Tables 37 and 38, we can see that what is collected separately mainly goes to animal feed and anaerobic digestion. 17% of all food residues/waste from retail (e.g. bread) goes to animal feed, 67% is anaerobic digested.

The food waste that is not collected separately, i.e. that is still included with residual waste, go to incineration. What is rejected by the FASFC for food safety reasons can go to anaerobic digestion or must sometimes be incinerated.

Table 37: Destinations of food residues/waste in retail, in tonnes and %, Flanders, 2020

Sector	Animal feed	Anaerobic digestion	Anaerobic digestion of grease sludge	Biodiesel	Incineration	Other	Total
Wholesale distribution and supermarkets	14,659	46,923	5,030	40	7,739	251	74,642
Food retail	unknown	5,024	40	0	6,096	0	11,160
Total food residues/waste (tonnes)	**14,659**	**51,947**	**5,070**	**40**	**13,835**	**251**	**85,802**
	17.1%	**60.5%**	**5.9%**	**0.05%**	**16.1%**	**0.3 %**	**100%**

Source: calculation based on IMJV, OVAM, 2020

Table 38: Destinations of food losses in retail, in tonnes and %, Flanders, 2020

Sector	Animal feed	Anaerobic digestion	Anaerobic digestion of grease sludge	Biodiesel	Incineration	Other	Total
Wholesale distribution and supermarkets	1,663	22,179	0	0	4,917	0	28,759
Food retail	0	3,055	0	0	5,567	0	8,622
Total food residues/waste (tonnes)	**1,663**	**25,234**	**0**	**0**	**10,484**	**0**	**37,381**
	4%	**68%**	**0%**	**0%**	**28%**	**0%**	**100%**

Source: calculation based on IMJV, OVAM, 2020

The cascade index weighs the food residues/waste produced in a sector according to their position on the value retention cascade. The cascade index of retail is 7.4.

Table 39: Cascade index for retail, Flanders, 2020

Sector	Value on cascade index*
Retail	7.4

* Minimum (worst possible score) = 0, maximum (best possible score) = 10

3.6.1.3 Food losses and side streams

Retail produces 85,802 tonnes of food residues/waste, of which an estimated 43.6% is food loss.

Figures on the total amount of food products purchased and traded by retail in Flanders are not available. Compared to 2015, supermarket chains are making strong efforts to reduce food losses to less than 2% of sales due to rising costs.

Table 40: Food losses and side streams in retail, in tonnes and %, Flanders, 2020

	Food losses (= edible food residues/waste) (tonnes)	Side streams (= non-edible food residues/waste) (tonnes)
collected separately	26,897	45,070
not separately	10,484	3,351
total (tonnes)	**37,381**	**48,421**
%	**44%**	**56%**

Source: calculation based on OVAM, 2020

3.6.1.4 Visual representation of results

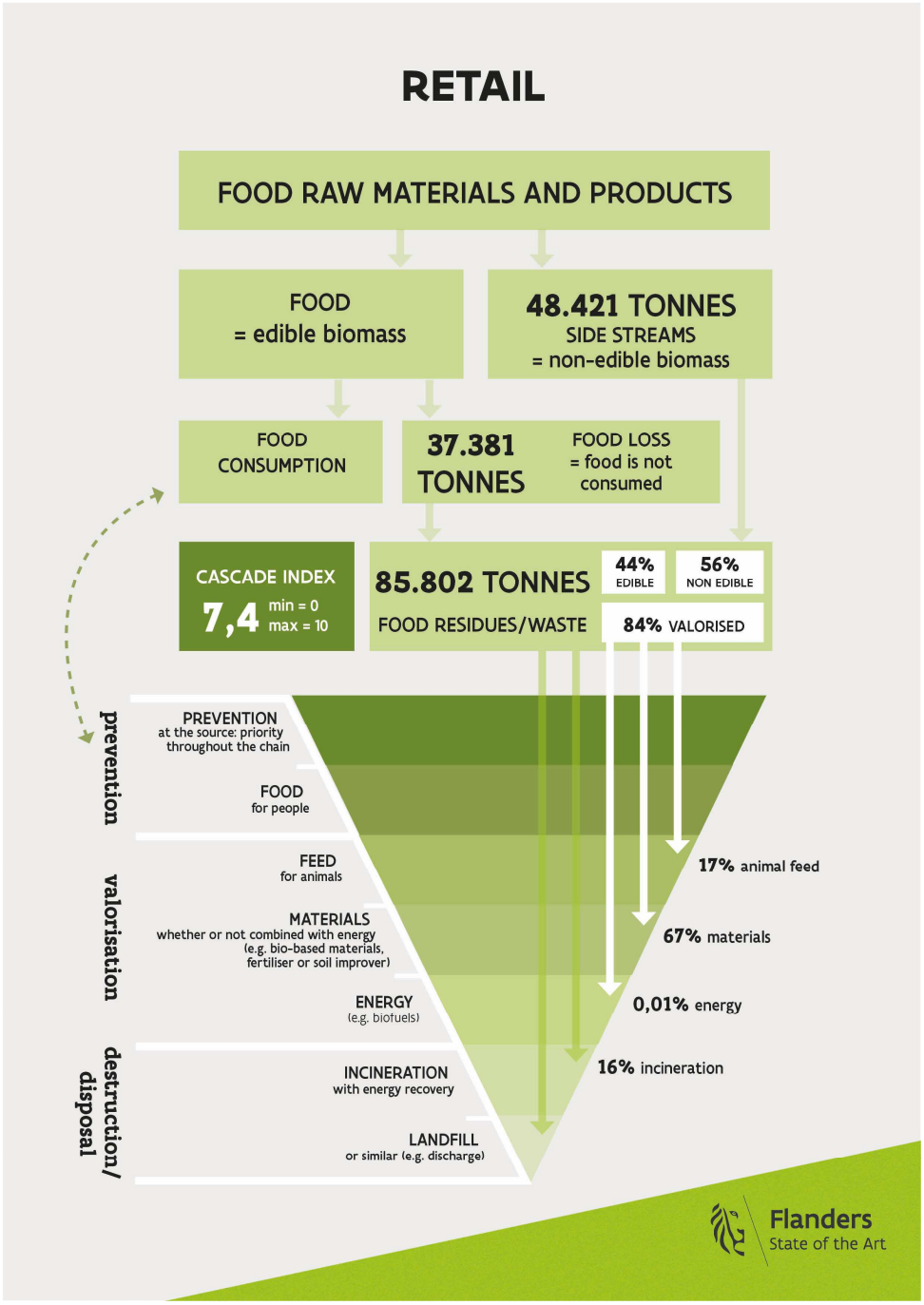

Figure 10: Valorisation of food residues/waste from retail, Flanders, 2020

3.6.2 Data collection

The delineation explained in the report with the baseline measurement under Chapter 4.5.2 was simplified for this measurement. The previously used methodology of Nielsen (classification and market share of retail based on sales figures) could no longer be used due to a different classification.

The outline of the methodology was retained. The survey of neighbourhood grocery stores from the previous Monitor was not repeated. OVAM's IMJV sample was expanded and is shown in the table below.

Table 41: Overview of share of companies that participated in the IMJV survey and whose data were used to extrapolate the totals in the retail and distribution subsectors

Subsector		Size (number of employees)									Total
		size 1 (1-4)	size 2 (5-9)	size 3 (10-19)	size 4 (20-49)	size 5 (50-99)	size 6 (100-199)	size 7 (200-499)	size 8 (500-999)	size 9 (>1,000)	
Wholesale distribution and supermarkets	Total	2,265	898	1,177	549	230	41	23	5	3	5,191
	Surveyed	212	210	172	163	92	41	23	5	3	921
	Response rate	63%	83%	91%	102%	82%	80%	83%	100%	100%	83%
Food retail	Total	2,386	712	211	40	1	0	0	0	0	3,350
	Surveyed	53	53	53	40	1	0	0	0	0	200
	Response rate	49%	81%	85%	85%	100%					75%

Figures from a sector survey conducted by Comeos were used to estimate the amount of donations. This was a survey of supermarkets comprising 72.5% of Belgium's market share. This figure was extrapolated to the whole of Belgium, and based on the market share in Flanders, the Flemish figure was calculated. A minor correction was carried out for the 2015 data (data from markets and non-food retail were taken out because there are no data on these for 2020) to be able to compare the 2015 and 2020 data.

The assumptions for the proportion of food losses and waste in the residual waste from supermarkets and smaller food shops are based on the sorting analysis conducted by OVAM in the period 2019-2021. The sample for the smaller food shops was conducted during 2 periods at 8-10 small supermarkets falling under the heading of 'retail trade in non-specialised shops where food and beverages predominate' (OVAM, 2022c).

Table 42 shows that residual waste from small supermarkets is 40.4% food waste, mainly edible food waste (36.7%). For large supermarkets that collect waste separately, the proportion of food waste in residual waste is based on the result of the non-sector-specific sorting analysis for businesses. This is in line with Comeos' data.

Table 42: Share of food losses and side streams in total residual waste, Flanders, 2020-2021

Residual waste sorting analysis	Food losses (= edible food waste) (weight%/total residual waste)	Side streams (= non-edible food waste) (weight%/total residual waste)	**Total %**
Retail/food shops	36.73	3.66	40.4
Businesses	4.92	4.48	9.4

Source: OVAM, 2022c

3.6.3 Findings and evolution compared to 2015

Donations from supermarkets increased by 8,576 tonnes compared to 2015. According to COMEOS, this sharp increase can be explained by increased efforts from the sector to make unsold food available as well as better monitoring by the sector. 98% of all unsold food surpluses still suitable for human consumption are donated to distribution platforms and food banks, according to Comeos. The positive evolution in the volume of donations shows that the increased efforts are being rewarded.

Food loss was down 10.6% in 2020 compared to 2015. This is in line with expectations to meet the 2025 Food Loss Action Plan target. This stipulates that the entire chain aims to prevent, reprocess as food or better valorise 30% of food losses compared to 2015.

The non-edible food waste (mussel shells, etc.) increased by 27,639 tonnes compared to 2015. This is according to a new 2020 sorting analysis of residual waste from businesses. Part of the increase can be explained by sales growth. According to the industry, there are more players in the market and large supermarket chains have been added in Flanders. Which leads to more supply through more shops and consequently a higher risk of food surpluses/waste. Recalls by the FASFC also lead to an additional food waste.

In terms of valorisation of food waste, there is a positive evolution. The cascade index score has increased from 6.3 to 7.4 due to better separate collection at supermarkets and the reduction in residual waste as a result.

Separate collection is a prerequisite for higher-quality valorisation of food waste. From 1 January 2021, separate collection of food waste is mandatory for larger retailers with a net sales area of at least 400 m^2.

All food retailers will be required to collect food waste separately from the end of 2023. The adaptation of collection modalities by collectors to the circumstances of smaller sectors and businesses could further boost the percentage of separate collection in retail.

Table 43: Overview of retail, Flanders, 2015-2020

	2015	2020	Evolution
Donations (supermarkets) – tonnes	1,130 tonnes	9,706 tonnes	+8,576 tonnes
Donations wholesale distribution - food industry warehouses		3,269 tonnes	
Donations (supermarkets) – in % of all unsold food surpluses still suitable for human consumption		98%	
Total food waste	62,574 tonnes	85,802 tonnes	+37%
Share of separate collection in total food waste	77% 49,723 tonnes	84% 90% for supermarkets and wholesale distribution 72,400 tonnes	Separate collection at large supermarket chains rose sharply ahead of the requirement for separate collection starting in 2021. In retail, it is up to the collectors to activate separate collection.
Top 3 destinations	Anaerobic digestion/ composting (67%), animal feed (4%), incineration (27%)	Anaerobic digestion/composting (66%), animal feed (17%), incineration (16%)	Processing into animal feed (GMP route) becomes more visible in the figures. Anaerobic digestion remains the same in percentage terms, incineration decreases markedly due to separate collection.
Cascade index	6.3	7.4	The industry has a higher cascade score
Share of food losses in total food waste	66.8%	43.6%	-23.2%
Total food losses	41,792 tonnes	37,381 tonnes	-10.6% or 4,411 tonnes
Separately collected food losses		27,205 tonnes	
Total side streams	20,782 tonnes	48,421 tonnes	+27,639 tonnes

Source: calculation for 2020 based on OVAM, 2020; Comeos, 2020

3.7 HORECA AND CATERING

Food reaches consumers through two major channels. On the one hand, there is the retail channel (3.6). On the other hand, there are food services, which have grown significantly in recent decades. These are meals prepared outside the home (hence also the term 'out-of-home'). It is a very diverse sector with vastly different subsectors, which makes data collection 'extra' challenging and highlights the importance of understanding the sector. We treat horeca and catering together. In the IMJV, event catering is contained in a NACE code for the horeca.

Due to the coronavirus pandemic, 2020 was a year of much uncertainty for the horeca and catering, with capacity reduction measures and mandatory closures in the mid-March-early June period and in the autumn. Takeaway/meal delivery could continue under certain conditions. Events were severely restricted.

3.7.1 Results

3.7.1.1 Prevention

Without fixating on the year 2020, we can indicate that since the previous food loss monitoring, entrepreneurs in the **horeca** have been encouraged to reduce food loss. Think of the separate choice of vegetables, for example, or an extra portion of chips, the take-home box, the doggy bag, or the 'No Food To Waste' campaign of Horeca Vlaanderen. Because of the diversity in the field, it is difficult to assess the impact of these initiatives.

In **catering**, the major caterers measure and take actions to reduce food losses. A number of caterers (such as Sodexo and IKEA Food) have committed to the 10-20-30 target, which involves at least 10 of the world's largest food retailers and services taking the target-measure-act approach, and each committing to 20 of its key suppliers doing the same, in order to halve food loss/waste by 2030 compared to 2015.

In the restaurants of the Flemish government, managed by the Facility Management Company, monitoring has been carried out and measures have been taken since 2014, for example to reduce surplus sandwiches or freeze food surpluses. At the end of 2019, another food loss survey was conducted in the 10 restaurants. Food loss, in terms of **loss per passage,** declined further from 65 grammes in 2014 and 50 grammes in 2018 to 37 grammes in 2019. This represents a 43% decrease from 2014. Of all the food produced, 8% is still lost.

The horeca and catering are also looking to donate to social initiatives. This is relatively limited. Within the horeca and catering, there is the specific problem that it is difficult to donate prepared food given the strict food safety requirements.

3.7.1.2 Collection and valorisation

Origin of food waste

Total food waste in the horeca is estimated at 49,005 tonnes in the pandemic year 2020. Nearly 79% of food waste in the horeca comes from eating and drinking establishments. 29% of food waste from the horeca was collected separately in 2020.

Table 44: Food waste in horeca, Flanders, 2020

(Sub)sector	**Separate collection**	**In residual waste/incinerated**	Total food waste (tonnes)	**%**
Eating and drinking establishments	11,157	27,361	38,518	78.6
Accommodation	2,461	6,368	8,829	18
Amusement	642	1,015	1,658	3.4
Total horeca	**14,260**	**34,745**	49,005	100
Total horeca	**29.1%**	**70.9%**	**100%**	

Source: IMJV, OVAM, 2020

In the catering, the volume of food waste in the pandemic year was relatively low for a number of sectors, as a lot of catering activities, whether at schools, governments, businesses or events, could only continue on a limited basis for most of the year. The most significant volume was produced in catering in healthcare and education. The intention in the 2020 IMJV survey was to focus on certain subsectors with internal/external catering that became subject to the separate food waste collection requirement in 2021.

Table 45: Food waste in catering, Flanders, 2020

(Sub)sector	**Separate collection**	In residual waste/incinerated	Total food waste (tonnes)
Health care	9,658	4,203	13,861
Health care	70%	30%	
Education	1,168	7,517	8,685
Education	13%	87%	
Prisons and defence	1,212	825	2,037
Prisons and defence	59%	41%	
Other			unknown
Total catering	**12,038**	**12,545**	**24,583**
	49%	51%	

Source: IMJV OVAM, 2020

Valorisation of food waste and cascade index

Nearly a third of food waste in the **horeca**, specifically 29% or 14,260 tonnes, is collected separately. Most of it goes to anaerobic digestion. 5,463 tonnes come from mandatory fat collection*, 75% of which goes to anaerobic digestion. 1,725 tonnes (bread, fruit and vegetable scraps) go to animal feed. The rest of the food waste (71%) still ends up in residual waste and are incinerated or, to a limited extent, have to be incinerated for food safety reasons.

In **catering**, separate collection has not yet taken off equally everywhere. In the health care sector, 70% of food waste was collected separately in 2020. Kitchen waste and food scraps go to anaerobic digestion. In catering in education, 13% was collected separately and taken to anaerobic digestion in the pandemic year 2020.

Table 46: Destinations of food waste in horeca and catering, 2020

Sector	Animal feed	Anaerobic digestion	UFOs/Biodiesel	Incineration	Water purification	Total
Horeca	1,725	7,039 4,081*	34	34,745	1,382*	49,005 tonnes
Horeca	3.5%	22.7%	0.1%	70.9%	2.8%	100%
Catering in health care		8,754 647*		4,203	257	13,861 tonnes
		67.8%		30.3%	1.9%	100%
Catering in education		948 158*		7,517	62	8,685 tonnes
		12.7%		86.5%	0.8%	100%
Catering in prisons and defence		1,212		825		2,037
		59.5%		40.5%		100%
Total** catering		10,914 805*		12,545	319	24,583 tonnes
		48%		51%	1%	100%

* Fat collection, fat separator sludge

** No complete data from catering in other businesses Source: IMJV OVAM, 2020

The cascade index weighs the food waste produced in a sector according to their position on the value retention cascade. Separate collection of food waste is relatively high in catering in health care and relatively low (compared to other sectors) in horeca and catering in education in 2020, and this is also reflected in their cascade

index. Since the destination animal feed is not allowed by law for mixed food waste from the horeca and catering industry, the cascade index will increase primarily through separate collection instead of incineration via residual waste.

Table 47: Cascade index for horeca and catering, Flanders, 2020

Sector	Value on cascade index*
Horeca	3.81
Catering in health care	6.18
Catering in education	2.81

* Minimum (worst possible score) = 0, maximum (best possible score) = 10

3.7.1.3 Food losses and side streams

Total food waste in the horeca is estimated at 49,005 tonnes in the pandemic year 2020. The proportion of food loss is about 39%, or about 19,054 tonnes. Most food waste in the horeca occurs at restaurants during preparation in the kitchen and consist of non-edible parts of meat (e.g. bones) and vegetables (e.g. peels), among others. There are also restaurants that use (partially) ready-to-eat preparations and/or semi-finished products, which impacts food waste.

For the catering sector (subsectors education and health care) we estimate the amount of food loss to be about 9,994 tonnes. Food loss accounts for 41% of the total amount of food waste in the catering sector. The composition varies and depends greatly on whether the catering service works with in-house (pre-)preparation in the kitchen.

Table 48: Food losses and side streams in horeca and catering, tonnes, Flanders, 2020

Subsector	Food losses (= edible food waste) (tonnes)	Side streams (= non-edible food waste) (tonnes)
Total horeca	19,054	29,951
Health care	6,123	7,738
Prisons and defence	900	1,137
Education	2,971	5,714
Businesses	unknown	
Total catering	9,994	14,589

Source: calculation based on OVAM, 2020

Table 49: Share of separately collected food losses and side streams in the total food waste, horeca and catering, Flanders, 2020

	Edible fraction of the food waste (= food losses)	Non-edible fraction of the food waste (= side stream)
Collected separately	2,587	11,673
Not separately	16,467	18,278
Total horeca	19,054 (39%)	29,951 (61%)
Collected separately	4,377	7,661
Not separately	5,617	6,928
Total catering	9,994 (41%)	14,589 (59%)

Source: calculation based on OVAM, 2020

3.7.1.4 Visual representation of results

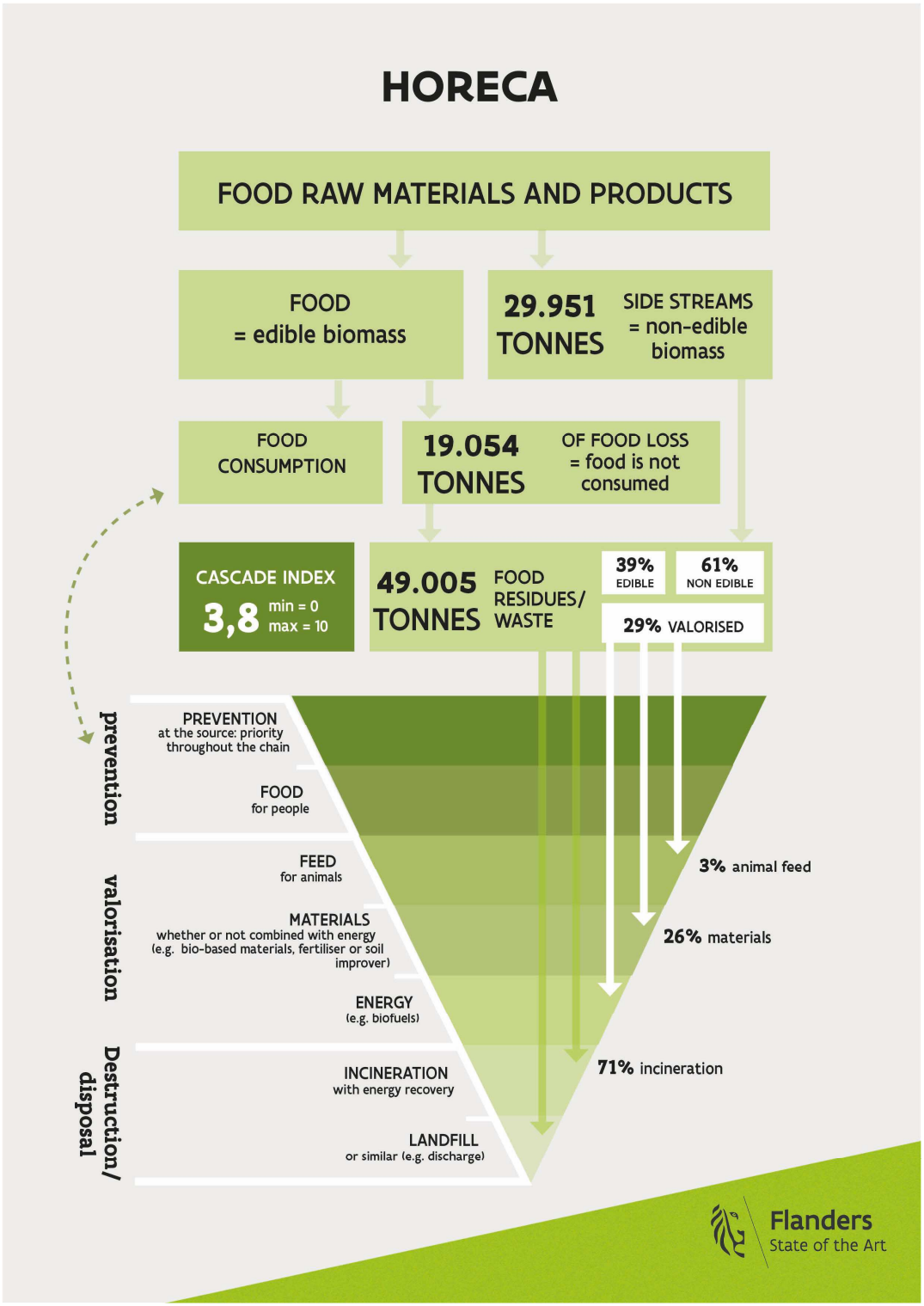

Figure 11: Valorisation of food waste from horeca, Flanders, 2020

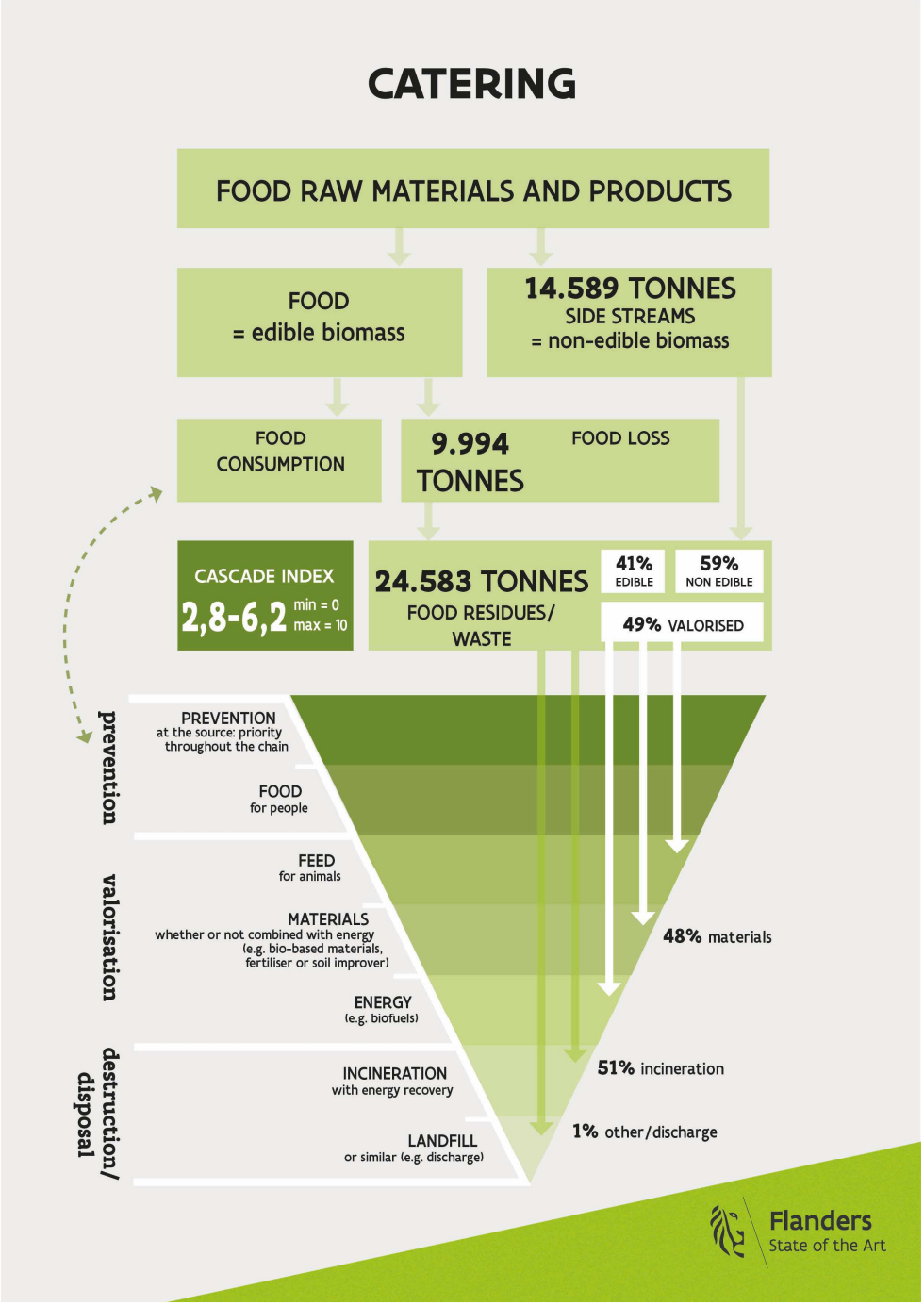

Figure 12: Valorisation of food waste from catering, Flanders, 2020

3.7.2 Data collection

3.7.2.1 Delineation

The Belgian food service sector consists of the horeca, catering and impulse subsectors (Foodservice Alliance, 2016). The best known branch is the horeca, which includes drink providers (e.g. pubs), accommodation providers (e.g. hotels), 'full service' and 'quick service' restaurants, and leisure businesses (e.g. nightlife). Catering consists of catering to business and industry, education, government and non-profit and health care institutions. The impulse branch includes sales points in shops (e.g. kiosk) and sales points on the road (e.g. gas station).

This monitoring has focused on the main subsectors: horeca and catering in health care and education.

Food waste is generated during storage (inventory management), meal preparation, as well as during consumption (e.g. scraps from plates). This food waste during on-site consumption is also attributed to the food services. Takeaway food that is taken away by consumers and given a destination other than human consumption does fall under households.

3.7.2.2 Methodology

The data collection as part of this monitoring focuses on the main food service channels: the horeca channel and catering (in health care and education). The impulse channel was not included. This delineation broadly covers 85-90% of the market. OVAM's IMJV served as the basis for data collection. No representative data were available from the Belgian Catering Union (Comeos).

Food waste was categorised by collection method: what is collected separately and what ends up in residual waste (and is incinerated). To distinguish between edible (food loss) and non-edible (side streams) in residual waste, the data obtained in the framework of OVAM's sorting analysis of residual waste from businesses was used, as shown in the table below.

OVAM conducted a residual waste sorting analysis in a number of specific sectors where there is a requirement for separate collection of food waste from 2021. The sorting analysis was conducted during the pandemic, so it was staggered in the 2019-2021 period. Based on the sorting analyses, a picture of the percentage of edible and non-edible food waste in the residual waste was obtained.

The sample in the horeca is based on the residual waste in wheeled waste containers from 6 to 10 horeca businesses during 2 periods. Residual waste from the horeca contains 18.5% edible food waste and 20.2% non-edible food waste, together accounting for about two-fifths of residual waste.
The health care sample is based on residual waste in wheeled containers and underground containers from 4-8 businesses (hospitals and residential care centres), which gives a spread in results. Less food waste was found in wheeled containers.

The sample in education is based on residual waste in wheeled containers from 7 schools: 2 schools with less than 300 students and 5 schools with more than 300 students. In schools with more than 300 students that serve hot meals, there is a requirement for separate collection of food waste from 2021. Schools offering freshly prepared meals have more non-edible food waste, such as peels, scraps from plates, etc. in their residual waste.

Table 50: Share of food losses and side streams in total residual waste, horeca and catering, Flanders, 2020-2021

Residual waste sorting analysis	Food losses (= edible food waste) (weight%/total residual waste)	Side streams (= non-edible food waste) (weight%/total residual waste)	Total %/total residual waste
Eating and drinking establishments	18.48	20.24	38.72
Accommodation	Unknown	unknown	unknown
Health care	6.44-11.81	4.06-5.7	10.5-17.51
Government and non-profit	unknown	unknown	unknown
Education	7.53	13.92	21.45
Businesses	4.9	4.8	9.7

Source: OVAM, 2022c

3.7.3 Findings and evolution compared to 2015

Due to the diversity in the food service sector, priority was given in the monitoring to the most important sectors: horeca and catering. Through the IMJV (OVAM), additional data collection for the horeca and catering sector is underway. But 2020 was an exceptional year due to the closure of the horeca and many events due to the pandemic.

Separate collection is a point for improvement in the horeca. Because barely 29% of the food waste is collected separately, most of it disappears into residual waste, resulting in low-quality valorisation (incineration). From 2021, selective collection will be mandatory for larger horeca establishments, and from 2024 for all businesses.

In catering, we see strong differences in 2020. Clear efforts were made in hospitals and residential care centres (health care) to encourage the separate collection of food waste. From 2021, separate collection is mandatory for health care facilities and most schools that serve hot meals, among others. From 2024, the collection requirement applies to all businesses.

Table 51: Overview of horeca, Flanders, 2015-2020

	2015	2020	Evolution
Total food waste	67,450 tonnes	49,005 tonnes	-27%, -18,445 tonnes The decline was strongly driven by periods of mandatory closure of the horeca during the coronavirus crisis. There was a switch to takeaway whenever possible.
Share of separate collection in total food waste	31% 21,119 tonnes	29% 14,260 tonnes	Relatively speaking, separate collection from the horeca remained more or less stable in the pandemic year 2020. Given the requirement from 2021, it is up to the collectors to activate separate collection.
Top 2 destinations	Anaerobic digestion/composting (31%), incineration (69%)	Anaerobic digestion/composting (23%), incineration (71%)	Given that separate collection remained more or less stable, incineration via residual waste also remained roughly the same in percentage terms.
Cascade index	3.9	3.81	Status quo
Share of food losses in total food waste	28%	38.9%	+10.9%
Total food losses	19,108 tonnes	19,054 tonnes	-54 tonnes
Separately collected food losses		3,362 tonnes	
Total side streams	48,342 tonnes	29,951 tonnes	-18,391 tonnes

Table 52: Overview of catering*, Flanders, 2015-2020

	2015	2020	Evolution
Total food waste	54,632 tonnes	24,583 tonnes	-55%, -30,049 tonnes. The decline was strongly driven by the mandatory cancellation of events during the coronavirus crisis.

Share of separate collection in total food waste	24% 13,112 tonnes	70% health care 59% prisons and defence 13% education 12,038 tonnes	The increase in separate collection of food waste from hospitals and residential care centres is evident in 2020. In schools, it is up to the collectors to activate separate collection after the pandemic.
Top 2 destinations	Anaerobic digestion (24%), incineration (76%)	Anaerobic digestion (13-68%), incineration (30-86%)	Anaerobic digestion evolves depending on separate collection. Incineration is clearly decreasing in health care due to separate collection.
Cascade index	3.4	6.18 (health care)	The health care sector has a higher cascade score
Share of food losses in total food waste	95%**	40.7%***	-54.3%
Total food losses	51,900 tonnes	9,994 tonnes	-80.75% or -41,906 tonnes
Separately collected food losses		4,377 tonnes	
Total side streams	2,732 tonnes	14,589 tonnes	+11,857 tonnes

* Catering: only health care, education and prisons/defence data in 2020; 2015 data also limited to those sectors

** UBC 2016 estimate assuming ready meals (contract catering)

*** Taking into account own preparation

3.8 HOUSEHOLDS

At the end of the food chain are the households that consume the food produced, processed and distributed. In 2020, Flanders had 6,653,062 inhabitants (and thus consumers), a growth of 2.7% compared to 2015 (statbel.fgov.be). An average family in Flanders consists of 2.31 persons.

3.8.1 Results

3.8.1.1 Prevention

Figures on prevention at the source are not available. For example, through proper planning of food purchases, storage and preparation, individual households can also do their part in preventing food losses.

The report 'Food loss and consumer behaviour in Flemish households' (Department of Environment and Spatial Development, 2019) provides insight into key household practices and also indicates that numerous factors influence the amount of food loss in Flemish households.

3.8.1.2 Origin and collection method of food waste

Table 53: Collection method of food waste from households, Flanders, 2020

	kg/cap	Total food waste (tonnes) (= food loss + side streams)	%
For domestic animals		unknown	
Home composting	5.9	39,282	9.9
Separate collection via vegetable, fruit and garden waste	7	46,812	11.8
In residual waste	46.8	311,345	78.3
Total households	**59.74**	**397,439**	**100**

Source: OVAM 2021

A Flemish household has edible and non-edible food waste. Per person, this amounts to an average of about 60 kg of food waste per year. A total of 397,439 tonnes of food waste was measured, of which 56% or 33.67 kg per capita was edible (= food loss, see 3.8.1.4).

Nearly 10% of food waste is composted at home, including fruit and vegetable peelings and coffee grounds, according to MAS research commissioned by Vlaco (Vlaco, 2018). Based on a sorting analysis of separately collected vegetable, fruit and garden waste, 12% ends up in this waste (Vlaco, 2022). This includes fruit and vegetable waste, prepared food scraps, meat and fish scraps.

However, 78.3% still ends up in household residual waste in 2020. In the pandemic year 2020, households had about 5% more residual waste than in 2021 or 2019, making the calculated food waste in residual waste higher as well.

Tables 53 and 54 show the main food waste found in the residual waste of households in Flanders in the period 2019-2021, with the corresponding seasonal variation. Fruit and vegetables, bread and prepared foods/sauces make up the top 3 in edible waste. There is also a significant fraction of side streams, consisting of e.g. vegetable and fruit peels (inevitably compostable) and mussel shells and bones (inevitably non-compostable). This amounts to 40% inevitable side streams in household residual waste.

Table 54: Seasonal variations of food waste in household residual waste in 2019-2021 in Flanders

Sorting analysis region of Flanders	Autumn	Winter	Spring	Summer	Average	Quantity
Fraction	**Weight%**	**Weight%**	**Weight%**	**Weight%**	**Weight%**	**Kg/cap/year**
Organic	***39.64***	***43.12***	***44.72***	***39.61***	***41.77***	***49.79***
Compostable organic kitchen waste	**34.22**	**39.25**	**40.22**	**34.27**	**36.99**	**44.09**
Vegetables, fruits, seeds, nuts, herbs	5.06	5.03	6.01	5.79	5.47	6.53
Bread	5.03	6.19	4.60	5.25	5.27	6.28
Meat, fish and poultry	2.02	1.95	1.99	1.89	1.96	2.34
Dairy	1.50	2.24	2.19	2.44	2.09	2.49
Desserts, snacks, dry foods	1.61	2.52	2.63	2.07	2.21	2.63
Prepared meals and sauces	4.54	5.26	5.76	4.97	5.13	6.12
Inevitably compostable	14.47	16.06	17.02	11.86	14.86	17.71
Non-compostable organic kitchen waste	**3.36**	**2.03**	**1.17**	**2.53**	**2.27**	**2.71**
Inevitably non-compostable	3.36	2.03	1.17	2.53	2.27	2.71
Garden waste	**2.06**	**1.84**	**3.33**	**2.81**	**2.51**	**2.99**

Source: OVAM 2022b

Table 55: Relative and absolute quantities of food waste in household residual waste in 2019-2021 in Flanders

Sorting analysis Flanders	Average	Average	Average	Quantity	Quantity
Fraction	Weight% in household residual waste	Weight% in organic-biological waste	Weight% in food loss	Kg/cap/year	Tonnes/year
Organic-biological waste	***41.77***	***100.00***	***100.00***	***49.79***	***331,256***
Compostable organic kitchen waste	**36.99**	**88.55**	**100.00**	**44.09**	**293,358**
Vegetables, fruits, seeds, nuts, herbs	5.47	13.10	24.73	6.53	43,412
Bread	5.27	12.60	23.79	6.28	41.756
Meat, fish and poultry	1.96	4.70	8.87	2.34	15,573
Dairy	2.09	5.01	9.45	2.49	16,586
Desserts, snacks, dry foods	2.21	5.28	9.97	2.63	17,496
Prepared meals and sauces	5.13	12.29	23.19	6.12	40,716
Inevitably compostable	14.86	35.57		17.71	117,819
Non-compostable organic kitchen waste	**2.27**	**5.45**		**2.71**	**18,041**
Inevitably non-compostable	2.27	5.45		2.71	18,041
Garden waste	**2.51**	**6.00**		**2.99**	**19,901**

Source: OVAM 2022b

3.8.1.3 Valorisation of food waste

A significant portion of food waste (edible + non-edible) still ends up in residual waste. Part of this is given to animals, but no total tonnage is available for this. Especially the categories of bread and pastry, but also meat, fish, poultry and prepared foods and potato products often find their way to the feed trough (Department of Environment and Spatial Development, 2019).

Nearly 10% is composted at home. Food waste collected through vegetable, fruit and garden waste is composted or pre-digested with post-composting in Flanders.

	Animal feed	Home composting	Composting/ anaerobic digestion	Incineration	Total
Households	unknown	39,282	46,812	311,345	397,439
		9.9%	11.8%	78.3%	100%

Source: OVAM (2021), Vlaco (2022)

Table 56: Cascade index for households, Flanders, 2020

Sector	Value on cascade index*
Households	3.3

3.8.1.4 Food losses and side streams

Based on the residual waste analysis, the food loss fraction in 2020 in Flanders is estimated at 224,027 tonnes, or 56% of all food waste.

Table 57: Food losses and side streams in households, tonnes, Flanders, 2020

	Food losses (= edible food waste) (tonnes)	Side streams (= non-edible food waste) (tonnes)	Total
Animal feed	unknown	unknown	
Home composting	22,142	17,140	39,282
Separate collection	26,387	20,425	46,812
In residual waste (incineration)	175,498	135,847	311,345
Total (tonnes)	**224,027**	173,412	397,439
Total (kg/capita)	**33.67**	26.07	59.74
	56.37%	43.63%	100%

Based on the residual waste sorting analysis (see Figure 13), it appears that especially surpluses/leftovers of bread, fruit, vegetables (incl. potato (products)) and prepared meals/sauces are found in residual waste as food losses and could be avoided. This is in line with the results of the study of the Department of Environment and Spatial Development, 2019.

Figure 13: Composition of discarded food/vegetable, fruit and garden waste in residual waste from Flemish households, 2020

3.8.1.5 Visual representation of results

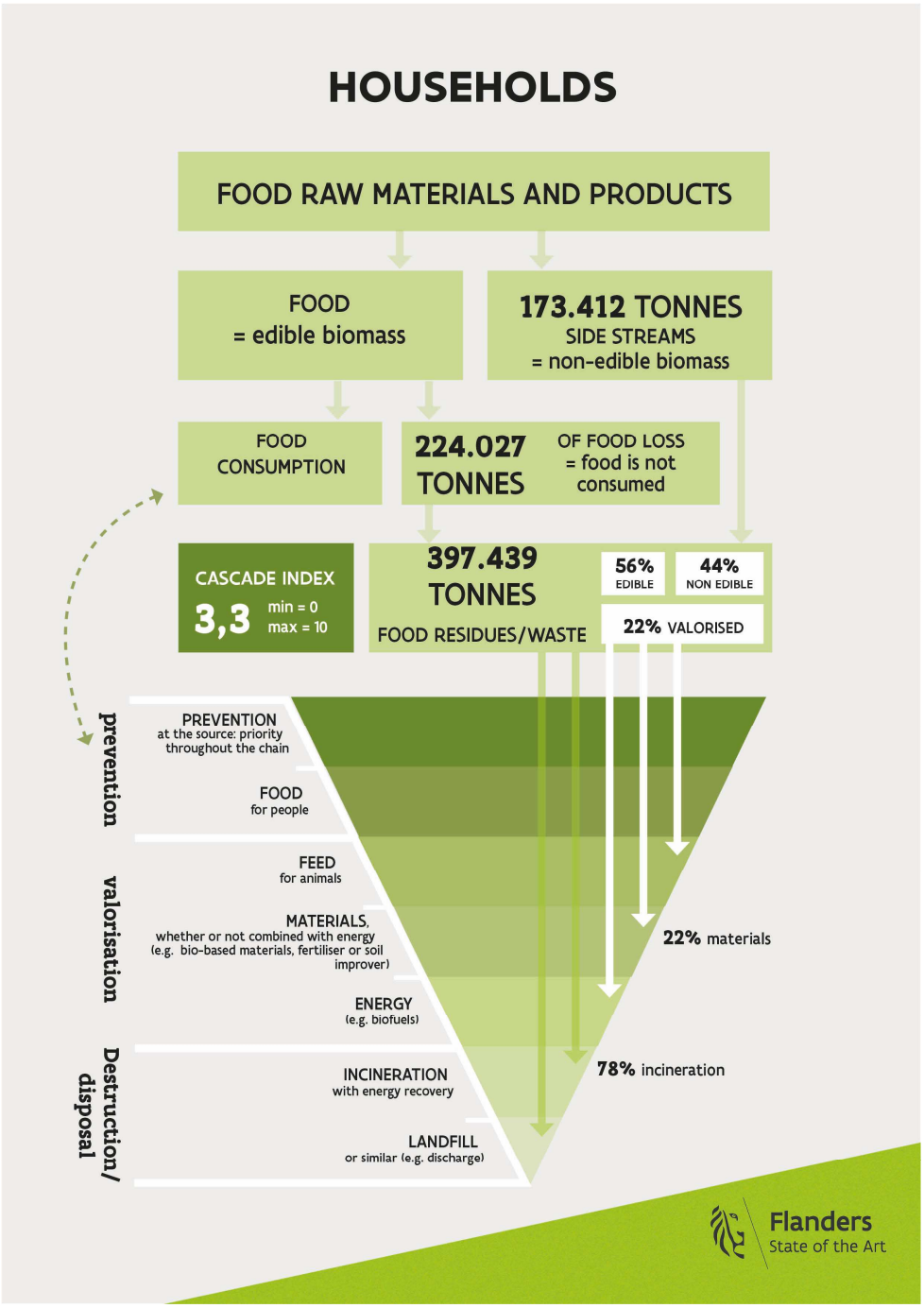

Figure 14: Valorisation of food waste from households, Flanders, 2020

3.8.2 Data collection

The figures for the household sector for the reference year 2015 came from a sorting analysis of food waste in residual waste (OVAM, 2015). To complete the measurement, estimates were then made, based on previous surveys (OVAM, 2012b), of the amounts of food waste that are kept separate, such as the collection of vegetable, fruit and garden waste, home composting, etc.

The study 'Food loss and consumer behaviour in Flemish households' (2017-2018), conducted by GfK Belgium for the Department of Environment and Spatial Development, did not provide quantities, but rather insight into the relationship between the destinations of the edible fraction, food loss, based on a diary survey of a representative group of Flemish households. Side streams were not measured. The results were presented in the 2017 Food Loss Monitoring Report (Flemish Food Supply Chain Platform for Food Loss, 2019).

For 2020, the starting point is data collected at the level of Flanders. Through the IMJV 2020 (household waste survey), municipalities reported the quantities of household residual waste and the tonnages of separately collected vegetable, fruit and garden waste. OVAM conducted a new sorting analysis of the residual waste, also measuring the food waste in the residual waste (OVAM, 2022b). To know how much kitchen waste is in vegetable, fruit and garden waste, Vlaco conducted a representative sorting analysis of the collected vegetable, fruit and garden waste in Flanders (Vlaco, 2022). We do not have exact data on the proportion of edible/non-edible fractions in the food waste in the vegetable, fruit and garden waste and in the home compost heap because it is difficult to distinguish in the sorting analysis and consequently difficult to measure. From the home recycling survey (Vlaco, 2018), we know that people often compost potato peelings, raw vegetable waste, fruit peelings and coffee grounds at home. It is possible that the proportion of side streams is higher than currently assumed in the calculation below. That survey also identifies what is included with the vegetable, fruit and garden waste, specifically in addition to fruit and vegetable peelings, namely also prepared foods and meat and fish scraps. In the tables below, the same composition as measured in household residual waste is assumed for the composition of food loss/side streams, because measured data on the ratio of food loss/side streams are not available for the food waste that is composted at home or disposed of with the vegetable, fruit and garden waste, even though this may result in an overestimation of the proportion of food loss composted at home or disposed of with the vegetable, fruit and garden waste.

What and how much is fed to domestic animals is very diverse and difficult to extrapolate from the 2017 diary survey. It is therefore not included in this monitoring. Feeding domestic animals is not considered food waste and is not mapped by Europe.

Table 58: Share of food losses and side streams in home composting, households, Flanders, 2020

Home composting	Food losses (= edible food waste) (weight%/total)	Side streams (= non-edible food waste) (weight%/total)	**Total food waste on home compost heap**
325,125 tonnes of biowaste			
households	6.81%		
Food loss/side stream ratio Assumption based on residual waste sorting analysis	56.4%	43.6%	
tonnes	22,142	17,140	39,282

Source: Vlaco 2018, OVAM (2022b)

Table 59: Share of food losses and side streams in collected vegetable, fruit and garden waste, households, Flanders, 2020-2022

Sorting analysis of vegetable, fruit and garden waste	Food losses (= edible food waste) (weight%/total vegetable, fruit and garden waste)	Side streams (= non-edible food waste) (weight%/total vegetable, fruit and garden waste)	**Total food waste /total vegetable, fruit and garden waste**
295,159 tonnes			
households			**15.86%**
Assumption based on residual waste sorting analysis	56.4%	43.6%	
In tonnes	26,387	20,425	**46,812**

Source: OVAM (2021 and 2022b), Vlaco (2022)

Table 60: Share of food losses and side streams in total residual waste, households, Flanders, 2020

Residual waste sorting analysis	Food losses (= edible food waste) (weight%/total residual waste)	Side streams (= non-edible food waste) (weight%/total residual waste)	**Total food waste/total residual waste**
793,033 tonnes of household residual waste			**39.26%**
households			36.99% compostable 2.27% non-compostable
Residual waste sorting analysis	56.4%	43.6%	
In tonnes	175,498	135,847	**311,345**

Source: OVAM (2021 and 2022b)

3.8.3 Findings and evolution compared to 2015

Food waste, i.e. the food waste that goes to composting/anaerobic digestion and to incineration (because it is still in the residual waste) was relatively low in Flanders in 2020: 54 kg per capita. If we add the amount of kitchen waste composted at home, we arrive at 60 kg per capita. To compare, the European average is 70 kg per capita. In this regard, Flanders scores better than our neighbouring countries (see section 2.4). Thanks to prevention measures and the sorting behaviour of Flemish households, relatively more food waste is valorised. As a result, the amount of residual waste and also the food waste in residual waste is quite low in Flanders compared to other EU countries, despite the fact that we had a 5% increase in residual waste in Flanders in 2020 due to the pandemic. This Monitor 2020 provides further refinement based on currently available figures.

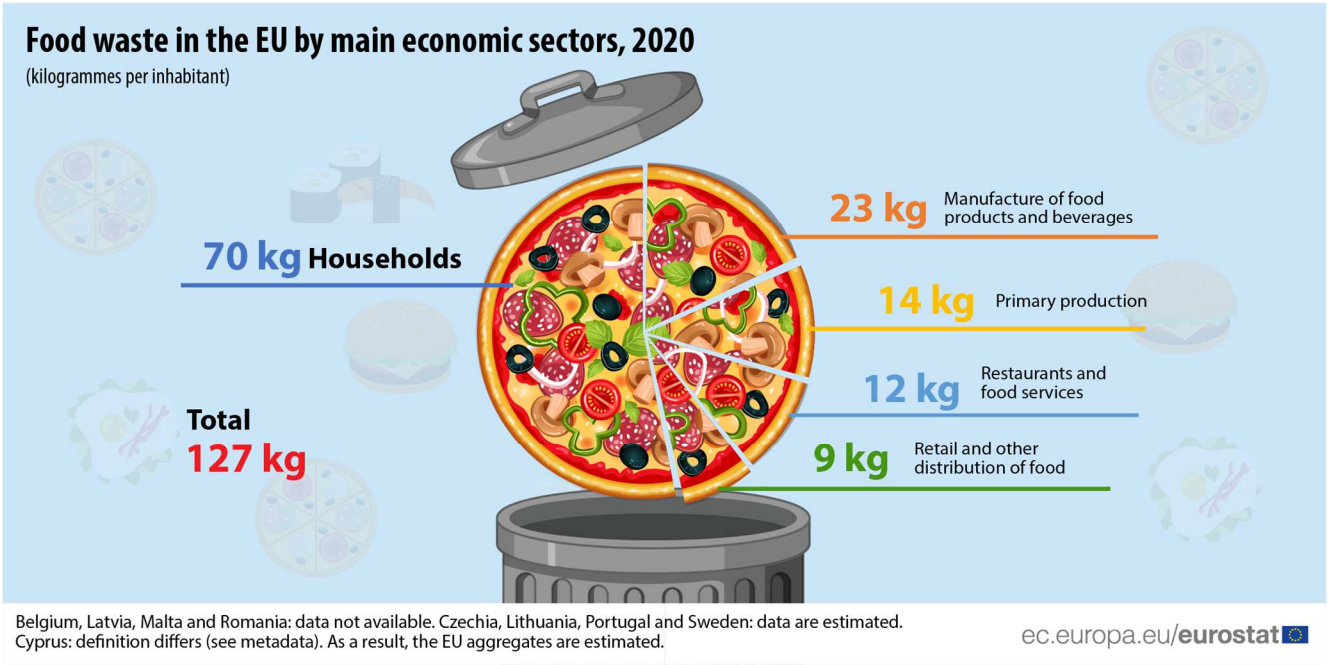

Figure 15: Food loss (kg per capita) in the EU for the main sectors, 2020

Table 61: Overview of households, Flanders, 2015-2020

	2015	2020	Evolution
Total food waste	378,685 tonnes*	397,439 tonnes	+5.5%, +18,754 tonnes
Separate collection of food waste (via vegetable, fruit and garden waste)	40,603 tonnes	46,812 tonnes	Separate collection of food waste via vegetable, fruit and garden waste increased by 6,209 tonnes.
Top 3 destinations	Home composting, anaerobic digestion/composting, incineration (residual waste)	Home composting, anaerobic digestion/composting, incineration (residual waste)	
Cascade index	3.2*	3.3	Slight increase
Total food losses	213,456 tonnes	224,027 tonnes	+10,571 tonnes
Separately collected food losses via vegetable, fruit and garden waste	22,887 tonnes	26,387 tonnes	+3,500 tonnes
Food losses composted at home	20,439 tonnes	22,142 tonnes	+1,703 tonnes
Total side streams	165,229 tonnes	173,412 tonnes	+8,183 tonnes

* Recalculation for 2015 to be able to compare to 2020

From the summary overview, we infer that food waste increased by 5% in 2020 compared to 2015. In the pandemic year 2020, however, household residual waste was about 5% higher than in 2019 and 2021 (OVAM, 2022a), which gives hope for the future evolution of the amount of food waste.

Efforts aimed at food loss awareness are paying off. The growth in home composting of food waste and the increase in the separate collection of vegetable, fruit and garden waste ensure that food waste that cannot be avoided do not end up in residual waste.

The results mentioned in the table above and the related studies (sorting analyses, sorting behaviour, etc.) provide important additional insights about food loss/waste in Flemish households. These will be used to work with all stakeholders involved to improve consumer awareness of food loss prevention and to take more targeted actions. In doing so, the principle 'knowledge is power' remains important.

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Calculation method of cascade index

The cascade index weighs the total food residue/waste produced in a sector according to the position on the value retention cascade. Prevention (the 'pure' prevention of surpluses, but also the social redistribution of food surpluses) could not be included because not enough figures are available, so it only deals with the valorisation of food residue/waste. For most sectors, this involves a combination of types of valorisation. Not all food waste is suitable for one particular type of valorisation.

When a sector valorises all of its food residue as feed, the cascade index is 10 (out of 10). When a sector does not valorise its food waste (incineration, landfill or applications equated with these in this study, such as discharge), the cascade index is 0 (out of 10). We divide the inventoried destinations into 4 categories with a weighting coefficient between 0 and 10. There is no weighting coefficient 6. This was done intentionally to have a sufficient difference between, on the one hand, use as feed or material (whether or not in combination with energy) and, on the other hand, use for energy and destruction. Food waste whose destination is unknown are assigned a score 0.

Table 62: Possible destinations of food residue/waste, examples of applications and weighting coefficient

Possible destinations of food residue/waste	Examples of specific applications	Weighting coefficient
1. FEED	Feeding to livestock unprocessed, processing into livestock feed, feeding to domestic or wild animals by households, etc.	10
2. MATERIALS	Both a material application ... - Production of bio-based materials (e.g. bioplastics, biochemicals, etc.) - Production of soil improver via composting - Returning organic residues to the soil (not harvesting, ploughing, returning to the field) and a combination of a material and energy application: - Production of fertiliser or soil improver and energy by anaerobic digestion (with or without post-composting) No hierarchy is established within these applications.	8
3. ENERGY	Forms of energy generation other than anaerobic digestion, e.g. biofuels	4

4. DESTRUCTION/DISPOSAL	Incineration (with energy recovery)	2
	Landfill or equivalent operations such as discharge (sewers, waterways, toilet, discards in fisheries, etc.)	0