



# New food waste data for reference year 2022 from manufacturing sector and from retail and distribution sector in Sweden

Deliverable “D1.1 Project report” of the project SWEFOODWASTE

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# Preface

The project has been carried out by SMED (Swedish Environmental Emissions Data) on behalf of Swedish Environmental Protection Agency (SEPA). The work has been carried out with the supervision by Christina Anderzén and Fredrik Khayati, Environmental pollutants and waste statistics unit.

The project was funded by European Union. Views and opinions expressed are however those of the authors only and do not necessarily reflect those of the European Union or HaDEA. Neither the European Union nor the granting authority can be held responsible for them.

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The project group has consisted of Johan Hultén (project leader), Maria Ahlm and Elisabeth Pernmyr (IVL Swedish Environmental Research Institute). Annika Gerner, Sandra Gralde Stålhandske, Martin Villner and Tommy Lindkvist (SCB Statistics Sweden). Mattias Eriksson and Amanda Sjölund (SLU Swedish University of Agricultural Sciences).

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# Executive summary

The purpose of this project was to improve the capacity and quality of food waste reporting in Sweden, specifically for two sectors: Processing and Manufacturing, and Retail and other distribution of food.

During the first reporting year (reference year 2020) of the collection of food waste data, several challenges were found within these two sectors. In the Processing and Manufacturing sector, there was a need for improvement due to uncertainties according to the EU food waste definition<sup>1</sup> in terms of what residues ought to be classified as food waste, food loss, by-product or other waste. There were also uncertainties how water content should be reported according to the EU food waste reporting obligation. For the Retail and other distribution of food sector, data from only few actors were available for wholesalers, convenience stores, and e-stores which affected data quality.

## **Processing and Manufacturing**

To improve reporting and data quality from the food processing and manufacturing sector, a survey was produced asking about food waste and other residues that may constitute food losses. This was to get self-reported data from a large random sample of respondents and to better understand food loss and waste flows in this sector.

The survey of Processing and Manufacturing revealed a large volume of previously unknown food waste. 305 000 tonnes of food waste were reported for reference year 2022 compared to 53 000 tonnes for 2020. This is attributed to a better representation of the reality rather than an actual increase in food waste generation.

Amounts of food losses seem to be even larger. However, these amounts are also very uncertain due to few respondents from most sectors. Apart from food waste, the dairy and ice cream sector accounted for 180 500 tonnes of food loss, which mainly is whey that goes to feed. Food loss from other sectors cannot be published due to high uncertainties and risk of revealing respondents.

The new results on food waste generation, corresponding to 29 kg food waste per capita 2022, align better with international figures. In a European context, the Swedish food waste generation in the industry was low, with 5 kg per capita in 2020 compared to the EU27 average of 27 kg per capita.

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<sup>1</sup> As defined in Waste Framework Directive (EU) 2008/98/EC 'food waste' means all food as defined in Article 2 of Regulation (EC) No 178/2002 of the European Parliament and of the Council that has become waste.

The new method of self-reporting by respondents improves the accuracy of results, as they know their own operations best. However, there was a challenge in aligning the new EU common definition of food waste with the common understanding of food waste in the Swedish food sector.

The different types of food waste to include in the food waste definition were broadened to better align with the intent of EU legislation. The EU definition was for this study interpreted to include most parts of animals and plants that have entered processing as food and become waste. This is a change from former interpretation and the main reason for accounting larger amounts of food waste than previous years. The survey was also designed to enable the distribution of the resulting quantities between different subsectors of manufacturing and processing, as they are grouped by “NACE-codes” in the Business register.

### **Retail and other distribution of food**

Most national and regional wholesalers, convenience store chains and e-stores were contacted but unfortunately only a few were able or willing to provide data. This study revealed 13 800 tonnes of food waste from these businesses 2022. This is less compared to 18 200 tonnes in 2021. Note that both these numbers exclude retail and that no scaling occurred for wholesale or e-stores. Although several smaller companies started sharing data, a few large wholesalers did not submit data for 2022 as in 2021 which is the reason for the decrease of reported amounts.

Data collection in the wholesale sector yielded limited insights due to only a few companies providing data, and mostly aggregated data. This seems to be due to low technical maturity of their internal data collection and sharing. However, these companies collectively constitute a substantial portion of the wholesale sector in Sweden. It is challenging to precisely quantify their contribution, since many food industry and retail entities also engage in wholesale activities without being formally registered as wholesalers.

Convenience stores provided data that could be upscaled to the national level together with data from retail, showing that these do not add up much food waste compared to retail stores. For specialized e-stores selling food, their contribution to food waste is estimated to be minimal, as their operational models and product types result in low waste generation compared to other retail sectors. A large portion of e-stores selling food are part of the retail sector and already included in reported food waste amounts from retail.

Keywords: Food waste, food loss, food industry, manufacturing, distribution, e-store, wholesale, convenience store.

# 1. Background

The Swedish Environmental Protection Agency (SEPA) is responsible for collecting and reporting of food waste data referred to in Article 9 (5) and 37 (3) of the Waste Framework Directive (2008/98/EC).

During the first reporting year (reference year 2020) of collection of food waste data, several challenges were found within various parts of the supply chain. The purpose of this project is to improve Sweden's capacity for future monitoring and reporting of food waste quantities within the sectors Processing and Manufacturing as well as Retail and other distribution of food.

In Processing and Manufacturing, SEPA has noticed that there was a need for improvement since there were uncertainties in terms of what residue should be classified as food waste, by-product or other waste.

In reporting for year 2020, data gathered according to the Waste Statistics Regulation (2150/2002/EC) (WStatR) was adapted to also account for food waste. There, food waste is part of the waste types animal and mixed food waste (European Waste Code (EWC) 09.1) or vegetable waste (EWC 09.2). Translating what fractions of those two waste types are food waste causes uncertainty, as this is not the intention of WStatR.

For the sector of Retail and other distribution of food, there is a need to increase the coverage and hence obtain more representative data for the sector. For the first reporting year of 2020, high quality data was gathered from retail, but there was a lack of data from wholesalers, convenience stores and e-stores. SEPA had indications that these generate considerable amounts of food waste as well.

Wholesalers, convenience stores and e-stores operate quite differently from retail, and from each other. Therefore, it is not appropriate to upscale retail data further to cover these companies as well. Instead, data is needed from a larger number of companies. To enable scaling of data also more knowledge of the total population is needed.

Processing and Manufacturing as well as Retail and other distribution of food are two sectors where SEPA see a lack of coverage and a need for improvement. There is a need to develop EU-wide data collection and methods to enable reliable scaling for both sectors, and for sharing knowledge between countries.

## 2. Objectives

The aim of the project was to improve the capacity and quality for food waste reporting in Sweden, specifically for two sectors: “Processing and Manufacturing”, and “Retail and other distribution of food”.

- Collect and compile self-reported food waste data from approximately 260 food processing and manufacturing companies using questionnaires.  
Baseline value: No data for 2020 from questionnaires.  
Target value: 260 companies
- Collect and compile self-reported food waste data representing at least 50 food distribution actors (wholesalers, convenience stores and e-stores).  
Baseline value: 2 wholesale actors for 2020  
Target value: 50 actors



# 3. Processing and manufacturing

## 3.1. Overall methodology

In order to investigate food waste and food loss in the food industry, food companies were asked to fill in a survey regarding the reference year 2022. The knowledge gathered from the food waste data collection project for reference year 2020 was used.

Statistics Sweden’s Business register was used to retrieve a population, a list of companies and their workplaces. A random sample of 498 out of these companies received a digital survey, and the answers were collected in a digital database.

Reporting on food waste is mandatory according to Swedish legislation. The reporting on other residues is also encouraged to map food loss but it is not mandatory. The respondents were asked to briefly explain the content of each residue in free text.

The answers were reviewed one by one, to make sure that they followed the EU definition of food waste. The collected data was then upscaled using statistical methods.

The target population for the survey are workplaces within the manufacture of food and beverages (SNI 10 and 11) sectors, see Table 1.

*Table 1. The subsectors of manufacturing and processing, as they are grouped by “NACE-codes” in the Business register. Some subsectors are grouped together to be able to present results without a risk of revealing individual companies.*

NACE	Sector name
<b>10.1</b>	Processing and preserving of meat and production of meat products
<b>10.3</b>	Processing and preserving of fruit and vegetables
<b>10.5</b>	Manufacture of dairy products
<b>10.6, 10.7</b>	Manufacture of grain mill products, starches and starch products and Manufacture of bakery and farinaceous products
<b>11</b>	Manufacture of beverages
<b>Other (10.2, 10.4, 10.8)</b>	Processing and preserving of fish, crustaceans and molluscs, Manufacture of vegetable and animal oils and fats and Manufacture of other food products

## 3.2. Data collection

A feasibility study based on a recent pilot interview study<sup>2</sup>, was conducted to examine the possibility to use a survey for the Swedish food industry. After deciding on that method, the project designed the survey study, and determined how to stratify the sector and the possibilities to present results. Much effort was spent to formulate the scope and survey questions. A digital survey was then compiled with four different targeted questionnaires with custom instructions for subsectors of manufacturing and processing.

The survey used to measure food waste from NACE 10-11 was a sample survey of local workplaces with one or more employees. The sample design was a stratified random sampling. The population was stratified according to 3-digit NACE or groups of 3-digit NACE, in total 6 groups, and size (number of employees). All local workplaces with 200 or more employees were included in the sample. Proportional allocation was used for the strata containing workplaces with <200 employees, with a minimum sample size of 5 workplaces per stratum. The total sample size was 498 workplaces.

## 3.3. Survey review

Many of the larger companies have previously reported waste amounts, by survey or in environmental reports, but this is the first time they were asked to report specifically on food waste according to the EU definition.

The survey reviews were conducted in two major steps:

1. review at micro level and
2. review at macro level.

At micro level each individual answer was reviewed manually by the project team. To make sure that all team members interpreted the answers in the same way, a guideline was set up and several review meetings were held to discuss definitions and make necessary changes.

Several replies were deemed as outside of the scope and therefore rejected. Some of the companies that provided unclear answers were contacted by phone or e-mail and asked for clarification. Companies that had reported a minimum of 10 tonnes of food waste were selected for clarification if the answer was unclear AND if any of the following terms also applied:

- unknown destination or other destination of the waste
- wet types of waste such as drinks, wash water etc. to ensure the right amount was used

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<sup>2</sup> Jordbruksverket 2023:13 Pilotstudie om matsvinn och restprodukter i livsmedelsindustrin

- quantities that stand out as unreasonably large which could indicate that kilograms were used instead of tonnes

A number of large companies were also contacted because answers indicated waste type and destination but no amount.

When all individual answers had been reviewed, they were combined and scaled up to a total, and a review at macro level was carried out. The macro level review included a comparison with results from former years, both in total and for the largest posts and waste streams.

### 3.4. Upscaling

The response rate was 47% for the whole sample, that is 232 workplaces reporting data. For workplaces with 1-49 employees, the response rate was 40% or less, depending on the stratum. For workplaces with 50 or more employees, the response rate was 75% or more, depending on the stratum.

The so-called HT-estimator was used for upscaling. It produced weights adjusted to compensate for nonresponse, i.e., the weight in each stratum is  $(npop/nresp)$  instead of  $(npop/nsamp)$ .

### 3.5. Accuracy

The relative error for the food waste per NACE is shown in Table 2. The relative error is standard deviation divided by point estimate.

*Table 2. The relative error for food waste from different sectors.*

NACE	Sector	Relative error, %
10.1	Meats and meat products	21
10.3	Fruits, berries and vegetables	8
10.5	Dairy and ice cream	6
10.6 & 10.7	Mills, starch & bakery	12
11	Beverages	15
Others	Others: Seafood Oil and fats Other food production	47
Mean	All sectors	10

Food loss from other sectors than dairy is not reported due to very high relative errors. For food loss from dairy, the relative error was 13 %. More

replies from other industries are needed to better measure quantities of food loss.

### **3.6. Comparison to older methodology**

The new method consisted of a questionnaire that was sent to a selection of registered food manufacturing companies in Sweden. In this questionnaire the mass of food waste was requested, together with information about the destination. If there were any confusion regarding the replies, the companies were contacted to clarify the details.

In the previous method used, the companies' environmental reports were manually reviewed for food waste data, together with surveys of all waste (not just the food waste) that had been generated.

The different types of food waste to include in the EU common food waste definition was for this study broadened to better align with the intent of EU legislation. More water as fresh mass and more inedible food waste was therefor included in the data of reference year 2022 compared to 2020. The change in interpretation of the EU food waste definition was based on discussions with Eurostat and experts in Norway.

## 3.7. Results

After distributing surveys to 498 workplaces, 232 workplaces shared data with sufficient quality, the project target was 260 respondents.

The survey of Processing and Manufacturing revealed in total 305 000 tonnes of food waste in 2022. The data available could be broken down in subsectors, see Table 3.

*Table 3. Food waste from different subsectors to different waste treatments. Numbers excluding discharge to sewage.*

	NACE	Food waste (tonnes)
<b>Meats and meat products</b>	<b>10.1</b>	53 900
<b>Fruits, berries and vegetables</b>	<b>10.3</b>	43 400
<b>Dairy and ice cream</b>	<b>10.5</b>	48 800
<b>Mills, starch &amp; bakery</b>	<b>10.6 &amp; 10.7</b>	83 100
<b>Beverages</b>	<b>11</b>	19 900
<b>Others:</b>	<b>10.2</b>	55 900
Seafood	<b>10.4</b>	
Oil and fats	<b>10.8</b>	
Other food production		
<b>Total</b>		305 000

Apart from food waste, the dairy and ice cream sector accounted 180 500 tonnes of by-products, which mainly is whey that goes to feed and may be seen as food loss.

Food loss from other sectors cannot be published due to high uncertainties and risk of revealing some respondents. The uncertainties are due to few respondents. However, those who did respond reported quite large volumes. When some report large volumes and but most report zero, scaling becomes very uncertain.

Reporting of food loss was voluntary, but it is also reasonable to believe that relatively few companies deliver feed, as this is subjected to strict regulation and requires more processes and administration than discarding residual flows as waste. Examples of frequent by-products to feed from other sectors are distillers and brewers spent grains and grain bran.

During the review of survey answers, the project group classified food waste into purely animal or vegetable origin, or mixed, see Table 4. From a few workplaces, it was not possible to do this classification and it was marked as unknown.

*Table 4. Food waste classified as purely animal or vegetable origin, or mixed. Numbers excluding discharge to sewage.*

	Food waste (tonnes)
Animal origin	100 900
Vegetable origin	143 400
Mixed and unknown	60 700
Total	305 000

In the questionnaire the mass of food waste was requested, together with information about the destination. The various destination of food waste, see table 5.

*Table 5. The various destinations of food waste, including discharge to sewage.*

Destination	Food waste (tonnes)
Sewage	21 100
Biodiesel	400
Bioethanol	47 700
Biogas	214 000
Incineration with energy recovery	20 800
Land application	8 000
Composting	2 500
Unknown or other destination	11 500
Total	325 000

### 3.8. Discussion

Although SEPA believe to have gained a much clearer picture of the amount of food waste arising from the Swedish food industry, the results also raise some further questions.

#### **It is assumed that the amount of food waste has not increased**

Although 305 000 tonnes (see **Fel! Hittar inte referenskälla.**) are more than the calculated 53 000 tonnes in 2020, we believe that this is more in line with the EU definition of food waste and is a better representation of the reality, rather than an actual increase in generated food waste.

It is not likely that the food industry in Sweden has changed much during these years. The total turnover of the sector increased only marginally between 2020 and 2021, implying that the industry has not handled more material. The aggregated data for 2022 had not been published at the time of writing this report.

In a European context, the Swedish average generation of food waste in the food industry sector was previously very low, only 5 kg per capita in 2020 as compared to the average 27 kg per capita in the EU27 countries. The new result of 29 kg food waste in the food industry per capita 2022 aligns better with other countries, even though the reported amount for this sector varies considerably between member states<sup>3</sup>.

Large differences in calculated amounts have occurred previously in Swedish food waste accounting, when changing methods. Between 2018 and 2020 there was an increase in the food industry sector due to an increased data collection effort. Also, using self-reported data from the retail sector in 2018 tripled the amounts of food waste, as compared to 2016.

### **The main advantage of the new method is the responsibility of the respondents in identifying food waste themselves**

The change that the waste generator is responsible for classifying the waste, makes the new results better aligned with the EU definition of food waste and with the reality.

The method of using a self-reporting survey was chosen to minimize a former main problem; the uncertainty of the reporting in the environmental reports and surveys on general waste, where food waste can hide in reported amounts of vegetal and animal waste. Self-reporting ought to solve that problem; the respondents should know what is food and what is not considered to be food.

The EU definition of food waste is however not established in the Swedish food sector. It is a definition that is more easily understood in the context of household food waste, rather than in the industry context. This means that businesses have difficulties replying to the survey, as they do not fully understand the definition. The companies that measure waste streams probably do it according to other definitions. The survey however provided guidance via customized instructions for different subsectors, and respondents had access to a helpdesk during the reporting period.

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<sup>3</sup> [https://ec.europa.eu/eurostat/databrowser/view/env\\_wasfw/default/table?lang=en](https://ec.europa.eu/eurostat/databrowser/view/env_wasfw/default/table?lang=en)

Based on previous experience, we know that uncertainty is unavoidable the first time a new survey is distributed. When respondents get more used to the questions, answers should be more accurate.

To help the respondents in the future, adding examples based on the accumulated knowledge from this first survey is suggested. It would also be beneficial if respondents had the opportunity to report amounts of discarded products, or parts of these, separate from unavoidable process waste.

The number of respondents increased slightly, from 186 to 232 workplaces, almost reaching the project target of 260. This did probably not affect the results much. The lower response rate of businesses with fewer employees did not affect the results much because these also generate less waste.

### **The main difference in results is due to updated interpretation of EU food waste definition**

Self-reporting makes the results more accurate, but the larger revealed amounts is most likely due to updated interpretation and use of the EU food waste definition.

Defining the different residues in the food industry has been an ongoing work for more than a decade. The most recent guidance document<sup>4</sup> from Eurostat does not provide answers to all questions. Discussions between the project team, the responsible authorities, and companies, developed further guidance for designing the survey.

More examples needing clarification were discovered during the survey review. Questions were asked to Eurostat as well as to Norway, and the answers were important for these conclusions:

- ***Fresh weight of waste with high water content and sludges***

According to Eurostat, the wet weight reported by the respondents is the “fresh weight” that should be accounted. This is true if we can assume they have already subtracted added water. During previous years, factors of food content based on total amount of waste were used, which gave amounts more similar to the dry weight.

This definition has the effect that for example dairies, and workplaces which process vegetables by peeling and pressing, will report increased amounts of waste.

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<sup>4</sup> Eurostat (2022) Guidance on reporting of data on food waste and food waste prevention according to Commission Implementing Decision (EU) 2019/2000, version of June 2022.



- ***“Parts that can be assumed to be eaten” and “inedible food waste”***

The guidance document states that food is a product that is “...intended to be, or reasonably expected to be ingested by humans.” This excludes some parts of plants and animals. At the same time, it says that “food also includes inedible parts...” This creates a grey zone of which parts should be regarded as food waste and not.

After consultation with Eurostat and discussions within the project group, it has been decided to broaden the definition to the following: Except for products or parts that are unsafe to eat (and thereby not considered as food), all parts of animals and plants that have left the farm and entered the slaughterhouse or the vegetable processing are considered to be food.

Here are some examples of parts formerly regarded as “not intended to be eaten” but is now included in the broader definition of food:

- Husks, aleurone and bran from different cereals
- Most waste from processing of vegetables
- Chicken feathers
- Skin from all animals
- Parts of fish except the fillet

### **Future mapping of avoidable and unavoidable food waste**

According to this study the food manufacturing sector represents a much larger share of the total food waste generation in Sweden. A large share of the food waste from this sector is probably inedible, or in the current market unsellable.

The food industry holds the potential for innovation in utilizing the waste streams that today are seen as unavoidable. Inedible parts may become edible with new processing or extraction of nutrients. Unsellable parts may become sellable if new export markets are found or if new products are developed and new markets created.

To understand what the potential for reducing food waste in the industry is, it would be very helpful to distinguish avoidable, potentially avoidable, and truly unavoidable food waste. A closer collaboration, through workshops or interviews with the industry and innovators is necessary to deem what fits into these categories.

### **Food losses are prevalent in the food industry**

The food industry is also a large supplier of animal feed. This is evident even though numbers could not be upscaled other than from the dairy and ice cream sector.

Reported amounts to feed are larger than upscaled amounts of food discarded as waste. Only few of the food industry companies reporting food waste also reported amounts going to feed or other food losses. These companies do however report large quantities of food losses. Sometimes reported food losses has a high water content, but not always. The two major sectors that reported residues to feed are the meat and the beverage sectors.

A survey might not be the optimal method for measuring the rather vaguely defined food loss. Instead, a set of interviews or looking at administrative data for feed may render more accurate statistics on food loss in the food industry. It would be of special interest to map “former foodstuffs”<sup>5</sup> sent to feed, as this is food that would have been suitable for humans if it had been treated differently.

The large volume of feed that is produced indicates some business rationale in doing that, instead of wasting the material. But if food that is intended for humans is instead sold as feed, it is likely that there is an economic and environmental loss.

### **Detailed data that cannot be published from this survey**

Data from the survey could be broken down in subsectors which provides knowledge of where food waste is generated, see Table 3. The results could be further broken down into more detail, for example by looking at different kinds of waste treatments in different sectors. But the sample size was too small to be able to do that with accuracy and without revealing actors. A higher response rate at follow-up surveys might provide new opportunities.

The mapping of waste types as animal, vegetable or mixed waste was possible, but did not add much knowledge as it corresponded to the sector from which it originated.

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<sup>5</sup> EU Catalogue of Feed Materials (Regulation (EU) No 2017/1017)

## 4. Retail and other distribution of food

### 4.1. Overall methodology

When it comes to wholesalers, convenience stores and e-stores, they are not considered to be technically mature enough to retrieve the data via a digital survey, therefore surveys were done by e-mails and personal contacts to explain what data that was required.

Reaching the right contact persons and understanding what data they have is by experience the first stage in collecting data. Finding these respondents was done in two ways. First, the Statistics Sweden's Business register was used to retrieve the population (NACE 46.3), a list of companies and their workplaces. Secondly, further respondents were found using web searches and business contacts.

When this sector becomes more mature in data collection, a digital survey or a format using APIs could be developed to collect data. With better knowledge of the size and actors within the sectors (the total population), it may be possible to upscale results.

### 4.2. Investigated areas and data collection

#### **Wholesalers**

To collect data from the wholesale sector, a total of 37 wholesale companies that were not classified as food industries or retailers were asked via e-mail if they had records of food waste to share. After some additional communication to specify the scope of the data needed, 3 companies sent information on wasted mass of food.

#### **Convenience stores**

To collect data from convenience stores a total of seven companies (or company groups) that were not classified as food retailers were asked via e-mail if they had records of food waste to share. After some additional communication to specify the scope of the data needed, two companies, representing 1144 convenience store outlets, sent information on wasted mass of food. This information could be used for upscaling the data for the whole subsector. The data was upscaled based on the average mass of food waste per store outlet, and the total number of store outlets in Sweden.

## **E-stores**

E-stores selling food only accounts for a small portion of all Swedish e-stores and do not have their own NACE-codes. The market for E-stores was instead mapped using web-searches and business contacts, finding 19 companies. Some of these sold dry foodstuffs in combination with other products, but most of them delivered a full assortment of fresh, chilled, and frozen food.

The companies were asked via e-mail if they had records of food waste to share. After some additional communication to specify the scope of the data needed, two companies sent information.

A majority of the contacted companies said that they did not measure food waste specifically and that the amounts were very small. They explained that this as a natural consequence to their business model; just ordering what they knew had been sold or would be sold.

## **4.3. Survey review**

In order to verify the collected data, the data was compared with previous years. The exact scope of investigation was also discussed with some of the respondents, and it turned out that they did not report all categories of beverages during previous years. This was due to a miscommunication on the scope of the study, that also beverages can be food waste. Therefore, the material was updated with all categories of drinks for the convenience sector.

## **4.4. Upscaling**

There is an undercoverage of wholesalers. Upscaling was deemed not possible due to unknown population. In the Business register, wholesale companies are listed as either wholesale, distribution, or industry. Industry companies that also have a wholesale business are probably accounted for in the study of the industry.

Neither is specific upscaling possible for e-stores selling food. Like the situation for wholesalers, the population is not known. In the business register, these share categories with other types of e-stores. However, a large portion of e-stores also exist as physical retail stores and thereby included in the food waste amounts from retail.

Companies running convenience stores were contacted to obtain data on their food waste and the number of workplaces, which enabled upscaling. The amount of food waste per store was calculated (tonnes/store) for each

service retail chain. This quota was multiplied by the total number of workplaces the contacted service trade chains have in NACE 47 (Retail trade, except for motor vehicles and motorcycles) to obtain a total amount of food waste for the service trade.

## **4.5. Accuracy**

The total population is not known because most companies are not listed as wholesalers, convenience stores or e-stores for food, but rather as food industries, gas stations or general e-stores.

Regarding the convenience stores, we received data from two of the largest companies in the industry, and therefore the convenience store sector is relatively well covered by this analysis. The difficulty for this sector is that convenience stores are often run as franchises, where the parent company rents out the brand and the store concept, but that each store is run as separate companies. These companies can be registered as, for example, grocery stores, cafes, tobacconists, or newsagents, which is why it is difficult to precisely define the industry and to clearly define what companies belong to this industry.

## **4.6. Comparison to older methodology**

The methodology is unchanged from last year. However, this year, efforts have been made to contact more companies than before. This effort has resulted in an increase in the number of distribution companies that are included in the study.

The amount of food waste reported is nevertheless lower than reference year 2021. This is due to one large wholesaler didn't provide data regarding year 2022, whereas the few new companies that provided data are smaller.

## **4.7. Results**

### **Small number of respondents**

The target of this project was to retrieve data from 50 actors within these sectors.

For 2022, three actors in wholesale reported data, out of 37 contacted. More were covered by the survey to the industry sector, but food waste from those operations was not possible to distinguish and remain allocated to the industry sector.

The market for e-stores selling food was mapped using web-searches, finding 19 companies, other than retail stores running their e-stores combined with physical stores. Two out of these reported data.

Convenience stores are divided in a few large chains and many small independent stores. The seven largest chains were contacted, and two of them shared useful data representing 1144 stores.

In total, seven companies from wholesale, convenience stores and e-stores shared data.

### **Amount of food waste**

This study revealed 13 800 tonnes of food waste from the Swedish wholesalers, convenience stores and e-stores. This is less than 18 200 tonnes of food waste that was revealed in 2021. The numbers do however not represent the same companies as last year and data representing wholesale and e-stores have not been scaled to account for size of market shares. Only data from convenience stores is scaled.

## **4.8. Discussion**

In the pursuit of data on food waste within the wholesale sector, we reached out to several companies. Unfortunately, only a few companies were able to provide concrete insights into the extent of food waste generated. However, these companies collectively constitute a substantial portion of the wholesale sector in Sweden. It is challenging however, to precisely quantify their contribution, since many food industry and retail entities also engage in wholesale activities without formal registration as wholesalers.

The survey to the food industry sector did not reveal waste specifically from these companies' wholesale operations. Rather, these amounts seem to have been included in aggregated amounts that reported by the food industry. Therefore, it is likely that some waste generated from wholesale operations is instead accounted in the food industry sector.

Among the cooperating companies, some could only provide information regarding discarded items in an aggregated format. Unfortunately, this information didn't allow us to calculate the overall mass of waste. However, there is potential for improvement. If these companies were to share data on a more granular, product-specific basis in the future, we could potentially expand the pool of reporting companies and gain a more comprehensive understanding of food waste in the wholesale sector.

The amount of food waste from e-stores seem to be marginal compared to other parts of retail and distribution. This conclusion can be made even though only a few companies shared their data in this study.

- The major retail chains may have special distribution sites for e-customers, but mostly they pack the bags directly in the regular stores. Therefore, the waste is indistinguishable from waste from the physical stores' operations.
- Pure e-stores that are specialized in food distribution have a mode of operation that means they do not order what they are not sure will be sold. This means very little waste should arise at the e-store. More waste could arise at their suppliers, wholesalers, and industry, and should be accounted there.
- Non-specialized e-stores do typically not sell fresh products, but only things with a long shelf life that do not require chilling. Food waste in those categories should be low.

### **Possibility to use API from the retail sector**

An API, or Application Programming Interface, is used to transfer data back and forth between software in a formalized way. On the web, you send a request to an API to get and send information. A so-called contract needs to be written that are a description of how, and which conditions must be met, in order for an API to be called. You also need to determine how the tables to be sent via the API should look like. API is used a lot by Statistics Sweden as a way for stakeholders to access their statistics.

The project has been in contact with some companies in the sector "Retail and other distribution of food" to ask if they are interested in using an API, but they have not been interested. Either the transfer of data in a short Excel-file is easy for them to make, or they do not aggregate amounts of food waste centrally at all.

In the first case an API would not be too hard to make, but companies do not see the benefit, or are not willing to share detailed data continuously. Even though many state that measuring is a basis for reducing food waste, there is a reluctance to share detailed data.