SMED Report No 2 2026

Waste Composition Analyses in Sweden

Current Practices, Results and Alignment with EU Requirements

Jurate Miliute-Plepiene, Linn Due, Alexandra Almasi, Henric Lassesson,
IVL Swedish Environmental Institute

Agreement: NV-25-035825

Commissioned by the Swedish Environmental Protection Agency

Agreement: NV-25-035825

Commissioned by the Swedish Environmental Protection Agency

Publisher: Swedish Meteorological and Hydrological Institute

Address: SE-601 76 Norrköping, Sweden

Start year: 2006

ISSN: 1653-8102

SMED (Swedish Environmental Emissions Data), is a collaboration between IVL Swedish Environmental Research Institute, Statistics Sweden (SCB), Swedish University of Agricultural Sciences (SLU) and the Swedish Meteorological and Hydrological Institute (SMHI). The collaboration commenced in 2001 with the long-term aim of gathering and developing the competence in Sweden within emission statistics. SMED is, on behalf of the Swedish Environmental Protection Agency and the Swedish Agency for Marine and Water Management, heavily involved in the work related to Sweden's international reporting obligations on emissions within six subject areas (air, water, waste and hazardous substances). Environmental statistics is also produced for national and regional needs, where SMED compiles data for both milestone targets and environmental quality objectives. SMED also develops new methods and produces statistics for follow-up of Sweden’s National Waste Plan and Waste Prevention Program. For more information, visit the SMED website www.smed.se (in Swedish).

Table of contents

Summary

The focus on waste composition analyses of mixed waste is increasing in EU policies and legislation. While such analysis have for several years been used voluntarily as supporting method for reporting on municipal waste, and as a verification and cross-checking method for packaging, they have more recently also become an obligatory method for monitoring and reporting on batteries and textiles.

This report forms part of an assignment to support the Swedish Environmental Protection Agency in meeting new EU requirements related to waste composition analyses and reporting. The study reviews the current Swedish system for waste composition analyses and presents key results from recent analysis. The report covers packaging waste, textile waste and battery waste, as well as municipal waste more broadly.

The study combines several data sources and methods. Available data were compiled through a desktop study, interviews with key actors in the waste sector, and existing datasets held by SMED. Waste composition data for residual household waste were obtained from Avfall Web, a Swedish web-based system for reporting municipal waste data and complemented with additional sorting analyses to address specific data gaps. Data on bulky municipal waste were collected from municipal composition analysis protocols, while results for mixed commercial and industrial waste and separately collected streams were based on existing national studies and data from producer responsibility organisations.

The findings show that Sweden has a long-established and comprehensive system for conducting standardized waste composition analyses of household residual waste, covering a large share of the mixed municipal waste stream. Compositional analyses of municipal bulky waste are also conducted but in a more limited and less systematic manner.

A comparison between existing Swedish manuals for waste composition analyses and relevant EU requirements shows minor methodological differences in the sorting of textiles and batteries. The complementary analyses conducted within this study indicate that these differences have little impact on reported results. The main exception concerns footwear. Overall, variations in results are primarily explained by the inherent variability of waste composition analyses, particularly for smaller waste fractions.

Municipal waste generated by commercial activities are currently not analysed in Sweden on a regular basis. However, a large national study

carried out for the Swedish Environmental Protection Agency in 2024–2025 included this waste stream and provides new insights into its composition, as well as into mixed commercial and industrial waste more broadly.

Further development of national data collection could improve data quality, transparency, and future EU reporting. Potential improvements include updating national manuals to incorporate footwear classified as textiles, providing guidance on batteries embedded in WEEE for sorting contractors, increasing the coverage of municipal bulky waste analyses, and establishing regular analyses of mixed commercial and industrial waste. Together, these measures would strengthen the overall data basis for waste composition reporting.

Keywords: Waste composition analysis, mixed waste, municipal waste, industrial and commercial waste, textiles, batteries, packaging, WEEE, Sweden

Terms and abbreviations

Portable battery: a battery that is sealed, weighs 5 kg or less, is not designed specifically for industrial use and is neither an electric vehicle battery, an LMT battery, nor an SLI battery.

LMT battery: Light Means of Transport batteries. A battery that is sealed, weighs 25 kg or less and is specifically designed to power light means of transport, including e-bikes and e-scooters.

NUTS 2 level: refers to the basic regions in the Nomenclature of Territorial Units for Statistics, used by the EU. In Sweden, NUTS 2 corresponds to a set of eight groups of counties, see Appendix 6.3.

EEE: electrical and electronic equipment.

WEEE: waste electrical and electronic equipment.

Waste paper: in Swedish "*returpapper*", refers to non-packaging paper consisting of newspapers or newsprint. According to the definition of newspapers, this includes newspapers, magazines, advertising materials, catalogues and similar paper products.

Avfall Sverige - Swedish Waste Management: A stakeholder and trade association in the field of waste management and recycling.

Avfall Web: Web--based system for reporting municipal waste data, managed by Avfall Sverige.

1. Introduction and background

At the EU level, several directives require Member States to compile and report data on collection and treatment of different waste fractions. This reporting is used to track progress towards EU targets for recycling and preparation for reuse and support the development of measures aimed at increasing recycling among other purposes.

The focus on waste composition analyses for mixed waste is increasing in EU policies and legislation, where such analyses are used - or will be used - as a primary or supporting method for reporting and monitoring across several waste streams. For municipal waste, these analyses have for several years been used on a voluntary basis as supporting method for reporting. They have also served as a verification and cross-checking tool for packaging waste, including the identification of non-recycled plastic packaging used to calculate financial contributions to the EU budget. More recently, waste composition analyses have been explicitly identified as an obligatory method for monitoring and reporting on batteries and textiles.

This report forms part of an assignment to support the Swedish Environmental Protection Agency in meeting new EU requirements for conducting waste composition analyses and reporting the composition of selected waste streams. The work contributes to improving national knowledge about waste generation and composition and to ensuring that Sweden can fulfil its reporting obligations.

1.1. Aim

The report aims to:

- map and describe how waste composition analyses are currently organised and carried out in Sweden, and to assess how well these practices align with existing and forthcoming EU requirements, and
- present key results from the most recent composition analyses for selected waste streams.

The scope of the report includes portable batteries and batteries for light means of transportation (LMT), textiles, packaging, and municipal waste in general.

1.2. EU-requirements: waste flows covered and data needed

Several EU regulations explicitly identify waste composition analyses as a method for determining or estimate the composition of waste streams. The following subchapters describe the regulatory requirements related to batteries, textiles, packaging and municipal waste.

Batteries

The EU battery regulation 2023/1542[1] requires Member States to carry out a compositional analysis[2] of collected mixed municipal waste and waste electrical and electronic equipment (WEEE) streams to determine the share of waste portable batteries and waste LMT batteries therein (article 69 p.5). The compositional analysis should be carried out by 1 of January 2026 and every five years thereafter and cover the waste streams for the preceding calendar year. The surveys should be carried out on at least NUTS 2 level (recital 106). Based on the surveys, authorities may require that respective producer responsibilities take corrective action to increase their network of collection points and carry out information campaigns.

Textiles

The revised Waste Framework Directive 2025/1892[3], (referred to as the revised WFD) sets out that Member States should carry out a compositional analysis[4] of collected mixed municipal waste to determine the share of waste textile, textile-related and footwear products, where appropriate, in accordance with a list of CN codes (article 22d, p.6), see Appendix 6.1. The results of the analyses should be available to the public in contrast to compositional requirements for other waste streams where public availability is not explicitly required. The analyses should be carried out on at least NUTS 2 level (recital 36). Based on the analyses, authorities may require that producer responsibility organizations take corrective action to increase their network of collection points and carry out information campaigns.

Packaging

In accordance with the Commission Implementing Decision (EU) 2019/665 (amending article 6f of Decision 2005/270/EC), Member States shall take appropriate measures to ensure the reliability and accuracy of data reported

[1] Regulation 2023/1542 concerning batteries and waste batteries, amending Directive 2008/98/EC and Regulation (EU) 2019/1020 and repealing Directive 2006/66/EC
[2] Referred to as" compositional survey" in the regulation.
[3]Directive (EU) 2025/1892 amending Directive 2008/98/EC on waste (Waste Framework Directive)
[4] Referred to as" compositional survey" in the Directive.

on packaging and packaging waste. The article specifies that "*In particular, the amount of packaging waste generated shall be subject to verification and cross checking, including by using data on the amount of packaging placed on the market, relevant data on waste and waste composition analyses of mixed municipal waste"*. In Sweden, existing waste composition analyses are used to verify data reported by producers on packaging placed on the market. These analyses therefore function as a supporting tool for fulfilling reporting obligations under Directive 94/62/EC on packaging and packaging waste, its amendment 2018/852.

The same approach is also used in the context of the EU's so-called own resources system, where Member States contribute to the EU budget based on the amount of plastic packaging waste that is not recycled. Under Council Decision 2020/2053, which has applied since 1 January 2021, Member States must make a financial contribution to the EU budget based on the quantity of plastic packaging waste that is not recycled. The calculation relies on the packaging legislation, where Implementing Decision (EU) 2019/665 specifies that waste composition analyses may support the verification and cross checking of reported data, as described above[5]. However, Commission Implementing Regulation (EU) 2023/595, requires Member States to apply both the placed-on-the-market and the waste analysis approaches when estimating plastic packaging waste. As both methods must be used, the waste analysis approach is mandatory. Waste composition analysis is also listed as a possible method under the Single Use Plastics framework, established by Directive (EU) 2019/904 and further specified in Commission Implementing Decision (EU) 2022/162, and is applied in Sweden for the same purposes as described above.

Municipal waste

Waste composition analyses can also be used to support the annual reporting of municipal waste, in particular to derive material breakdowns of generated waste. They contribute to fulfilling reporting requirements under Commission Implementing Decision (EU) 2019/1004 and to monitoring progress towards material recycling targets set out in the Waste Framework Directive 2008/98/EC. Waste composition analyses are also used for the EU food waste reporting obligation, measuring generated food waste in households. In addition, in Sweden, waste composition analyses of residual municipal

[5] SMED Technical memo 2024 "Rapportering av egna medel 2024"

waste are used to estimate generated paper waste[6] and to support the follow up of its national material recycling targets.

1.3. Current Swedish system, actors and data availability

Although there has been no legal obligation to carry out waste composition analyses in Sweden, Swedish municipalities have a long history of conducting periodical analyses of household waste on a voluntary basis. In addition, private and municipal waste management companies, incineration plants and producer responsibility organizations conduct compositional analyses for specific purposes.

Municipalities

Swedish municipalities have a long history of waste composition analysis on household mixed waste. For instance, waste composition analyses were carried out annually in Stockholm as early as the 1960's. Until about 2005 to 2010, such analyses were mainly conducted within research and development projects[7]. From around 2005 onwards, waste composition analyses became more standardised and were increasingly adopted by municipalities and researchers to support local waste planning, operational optimisation, recycling system development, and voluntary reporting. This development has resulted in a substantial national knowledge base, particularly for mixed household waste, supported by standardised methodologies.

Municipalities mainly conduct composition analyses of mixed household waste, somewhat less frequently of separately collected food waste and, much less frequently, mixed bulky waste. Analyses of mixed household waste are typically carried every two to three years, while analyses of bulky waste are performed more sporadically and only by a few municipalities[8]. For these studies, municipalities usually contract one of the three specialised waste analysis companies operating on the Swedish market. In certain cases, municipalities carry out their own waste composition studies in-house.

Household waste composition analyses usually follow national manuals that provide guidance on sampling, sorting, and quality assurance, with separate manuals for mixed household waste and mixed bulky waste. To harmonise methods across municipalities, the Swedish Waste Management Association,

[6] Waste paper, in Swedish "returpapper", refers to non-packaging paper consisting of newspapers or newsprint. According to the definition of newspapers, this includes newspapers, magazines, advertising materials, catalogues and similar paper products.
[7] (Personal communication with Jan-Olov Sundqvist, expert on waste at IVL, 2025)
[8] (Personal communication with three Swedish companies conducting waste composition analyses, 2025)

Avfall Sverige, published the first formal manual for waste composition analysis of household food and residual waste in 2005[9]. The manual established a statistical framework and detailed practical procedures to ensure comparability between municipalities. It has since been revised several times, with major updates around 2017 and a most recent edition published in 2025 (revised October 2025[10]). A separate manual for mixed bulky waste collected at recycling centres was introduced later and updated in 2025[11].

Results from municipal waste composition analyses conducted in accordance with the manuals may be reported on a voluntary basis to Avfall Web, the national data platform used by municipalities to report waste quantities, composition, and related information to the Swedish Waste Management Association. In 2025, 161 out of 290 municipalities reported data from household waste composition analyses for single-family houses, and 135 reported data for multi-apartment houses.

Swedish Environmental Protection Agency

The Swedish Environmental Protection Agency (EPA) does not conduct regular national compositional studies. However, several development projects are carried out in cooperation with SMED to support the agency. For instance, in 2017 and 2024 the Swedish EPA and SMED conducted several waste composition analyses of mixed waste and separately collected food waste from restaurants. The most recent study, carried out in 2024, aimed to derive a factor for food waste from restaurants to support food waste and waste prevention reporting[12]. In 2016, the Swedish EPA and SMED also conducted waste composition analyses of textiles and shoes in non-bulky household waste. Compared with the methodologies used by municipalities, these analyses applied a more detailed categorisation, with textiles and shoes divided into a larger number of sub-categories[13].

In 2023, a pilot project focused on developing sorting methodologies for compositional analyses of commercial and industrial waste streams was carried out. Building upon the pilot project, the Swedish EPA and SMED conducted a large-scale national study on the composition of commercial and industrial waste sent for incineration. The project was carried out during 2024-2025, and the results were intended, among other purposes, to support improvements in waste statistics and reporting to the EU[14].

[9] Report 2005:19
[10] (Avfall Sverige, 2024a)
[11] (Avfall Sverige, 2024b)
[12] SMED Technical memo 2024 ”Livsmedelsavfall 2023, resultat-PM”
[13] (Hultén, Johansson, Olof , & Jensen, 2016)
[14] (Lassesson, o.a., 2025)

In addition, SMED, on behalf of the Swedish EPA, compiles existing sources of waste composition analysis data. This includes an annual compilation of data from Avfall Web to support the reporting of packaging, municipal waste, while food waste data are compiled somewhat less frequently than on annual basis.

Producer responsibility organizations

The Swedish producer responsibility organizations for WEEE and packaging collect data relevant for the EU requirements on waste composition analyses.

WEEE

El-Kretsen is Sweden's largest producer responsibility organization for WEEE, operating a nationwide system for the collection and recycling of WEEE and batteries in collaboration with all Swedish municipalities. The collection system includes municipal collection points, direct collection from businesses, and battery collection containers managed by El-Kretsen[15].

As part of their pre-sorting of collected WEEE, El-Kretsen dismantles specific components, including batteries. Sealed or built-in batteries are removed, unless they are very difficult or impossible to disassemble. The pre-sorting step prepares WEEE for recycling[16] and is also an important measure to reduce fire risks at downstream waste treatment facilities[17]. During this process, El-Kretsen collects data on batteries recovered from collected WEEE.

In addition, random samples of collected WEEE (about 1.5 percent of the total flow) are sent to El-Kersten's facility in Arboga for detailed analysis of waste flow composition. The samples are sorted in 90-100 categories, and the collected data is used for reporting to the Swedish EPA, communication with pre-treaters and as a basis for producer responsibility fees [18,19].

Packaging

There are two[20] producer responsibility organizations for packaging in Sweden; NPA, which has the largest market share (about 89%[21]), and TMR.

[15] (El-Kretsen, n.d. a)
[16] Products suitable for reuse are sorted for reuse
[17] (Personal communication El-Kretsen, 2025)
[18] (El-Kretsen, n.d. b)
[19] (Personal communication El-Kretsen, 2025)
[20] There are two producer responsibility organizations for packaging that are not covered by a deposit refund system (DRS). In Sweden, the DRS for beverage packaging is operated by the producer responsibility organization Returpack.
[21] (Naturvårdsverket, 2025)

NPA conducts regular waste composition analyses of collected packaging waste with the aim to improve the understanding of the composition and development of the packaging waste streams. The analyses are carried out by waste composition analysis conductors. The result from the analyses is also used as a basis for NPA's reporting to the Swedish EPA.

For some plastic packaging waste, additional, in-house, waste composition analyses are carried out by the recycling company Swedish Plastics Recycling[22], which receives all plastic packaging material collected by NPA.

Private waste management companies

Some private waste management companies conduct their own waste composition studies, typically for quality control or compliance purposes.

Waste composition analysis conductors

There are three private companies in Sweden that specialise in conducting waste composition analyses, Envir, EcoRetur, and AMP Sverige. Their main customers are municipalities, but they also carry out analyses for incineration plants and private companies although to a lesser extent.

[22] Original name: Svensk Plaståtervinning

2. Methods

2.1. Waste flows and regulatory scope

Based on the EU requirements described in Chapter 1.2, the waste flows included in this study were defined to reflect the scope of mandatory or recommended waste composition surveys for different material streams. As the relevant EU legislation applies to different waste flows depending on material category, a mapping exercise was carried out to identify which of the mixed and separately collected waste streams needed to be covered for batteries, textiles, packaging, and municipal waste. Table 1 summarizes the waste flows covered by EU-requirements on waste composition analyses and provides the basis for the selection of data sources and analytical approaches applied in the subsequent sections.

Table 1. Waste flows covered by EU- requirements on waste compositional surveys.

Flows in focus / Materials in focus	**Mixed municipal waste**			**Commercial and industrial waste**	**Separately collected waste**
	Non-bulky household waste	**Bulky residual waste**	**Commercial waste**		
Portable batteries	X	X	X	-	X (WEEE)
LMT batteries	X	X	X	-	X (WEEE)
Textiles	X	X	X	-	-
Packaging	X	X	X	X	-
Material breakdown in municipal waste	X	X	X	-	-

This scoping of waste flows underpins the selection of data sources and analytical approaches applied in the subsequent sections.

2.2. Desktop study and interviews

A desktop study was conducted to identify actors with access to data on the waste flows subject to the EU's requirements on waste composition analyses.

In parallel, existing data available to SMED from previous projects were reviewed.

The identified actors were contacted to collect information on the type, scope and frequency of conducted waste composition analyses, as well as other relevant data held. In total, twelve actors were contacted, of which six were interviewed. The interviewed actors included three private companies conducting waste composition analyses, the Swedish producer responsibility organization for WEEE, one LMT company, and the organization Swedish Waste Management[23]. The interviews were conducted over Teams, or through written responses over email, (see Appendix 6.2) and took place between May and September 2025. Moreover, Sweden's largest producer responsibility for packaging, NPA, provided written input over email.

Interviews were also used to assess sorting practices, scope interpretation, and data limitations relevant for the alignment of national waste composition data with EU reporting requirements.

2.3. Data sources, compilation, weighting, and adjustments

Non-bulky municipal waste

Data from municipal waste composition analyses for residual non-bulky household waste were compiled from Avfall Web for the years 2023 to 2024.

The average values are weighted according to the share of households by housing type in 2024, with 44 percent single-family houses and 56 percent in multi-apartments[24]. Waste quantities generated in each household type have also been weighted separately for single-family houses and apartment buildings, based on data reported in Avfall Web (2023-2024) and documented in the composition analyses.

Complementary waste composition analyses

The desktop and interview study identified several minor data gaps, some arising from differences between EU category definitions and definitions in national manuals used for sampling and sorting procedures (further described in Chapter 3).

[23] Avfall Sverige in Swedish

[24] Data originates from Statistics Sweden (SCB); Number of households per household form and year (SCB, u.d.). It is assumed that waste generated in" special housing" is more similar to the waste from apartments compared to single-family houses. Therefore," special housing" is treated in the same way as waste from apartments. For remaining cases, and in the cases where data is missing, a 50/50 distribution is assumed.

To address these gaps, complementary waste composition analyses on non-bulky residual household waste were conducted by Envir on behalf of SMED and the Swedish EPA. Secondary fractions from the national manuals such as “Other textiles”, “Small electronical equipment” and “Other” were further sorted into tertiary fractions defined by SMED, enabling adjustments that make data on residual household waste better aligned with EU requirements.

Bulky municipal waste

In addition to residual household waste, some municipalities also conduct waste composition analyses of mixed bulky combustible waste collected at recycling centres. Although these analyses are reported to Avfall Web, the results are often available only in aggregated form, for example with packaging waste combined or batteries, WEEE, and other hazardous waste reported together, which is not aligned with EU reporting requirements. To access more detailed data, the municipalities that had reported analyses in Avfall Web for the years 2023 – 2025 (in total 43) were contacted by email, and protocols from 36 municipalities were obtained, containing more detailed and disaggregated data. These protocols showed that some municipalities reused earlier results, with some data dating back to 2020.

For each municipality, waste fraction shares were calculated based on the individual composition analysis protocols and subsequently weighted according to the quantity of combustible bulky waste generated, as reported in Avfall Web for 2024. This approach ensures that municipalities with larger bulky waste flows have a proportionate influence on the aggregated results.

Industrial and commercial mixed waste

Results for industrial and commercial mixed waste are based on an existing national waste composition study conducted by SMED and the Swedish Environmental Protection Agency and are used as reported in that study.

Separately collected waste streams

Results for separately collected waste streams are based on data provided by producer responsibility organisations and are used as reported by the respective organisations.

3. Waste composition in Sweden

This chapter presents the results of waste composition analyses used in this report, based on the latest available data and information, as well as complementary composition analyses conducted specifically for the purposes of this report. It also describes the key assumptions underlying the data used for subsequent calculations and results. The results are structured by waste stream, including non-bulky household residual waste, bulky municipal waste, and industrial and commercial waste, and conclude with an assessment of overlaps between these streams.

Non-bulky residual household waste

Swedish Waste Management Association has recently strengthened the quality assurance of waste composition analyses by updating its manuals. These measures were partly prompted by observed inconsistencies in analyses performed during 2022–2023, where results varied more than could be explained by normal changes in waste composition. A targeted review confirmed that contractor practices likely contributed to these discrepancies, reinforcing the need for clearer instructions and enhanced quality control[25].

Against this background, a total of 629 waste composition analyses of non-bulky residual household waste were reported in Avfall Web during 2023-2024. Of these, 354 were assessed as being of sufficiently high quality to be used in national reporting. Among these, 189 were used to determine the composition of waste from single-family houses, and 165 from multi-apartment buildings. These analyses cover all eight Swedish NUTS 2 regions for both single-family houses and multi-apartment buildings (see Appendix 6.4).

The resulting composition of non-bulky residual household waste is presented in Table 2. Results are shown both according to sorting practice and in an adjusted form to improve alignment with EU reporting requirements.

Adjustments mainly affect packaging, paper waste, textiles, and batteries. Packaging and paper fractions decrease after correction for moisture and food residues, while textile and battery shares increase slightly following scope related reallocations.

[25] (Avfall Sverige, 2024)

The results show that non-bulky municipal waste is dominated by the biowaste fraction, followed by packaging waste. Standard deviations calculated by housing type and presented in Appendix 6.5 indicate lower variability for major fractions and very high variability for fractions with small mean shares, notably batteries, hazardous waste, and WEEE. This reflects their sporadic occurrence across samples, and the results in Table 2 should therefore be interpreted as indicative national averages, with higher uncertainty associated with small fractions.

Table 2. Results of mixed household waste composition analysis, 2023 to 2024

	Waste fraction	**Main result (%)**	**Adjusted result (%)**	**Adjustment applied**
Bio-waste	Food waste in residual waste	24.0	24.0	-
	Food waste residues, moisture in packaging and paper waste (corrected)	-	5.4	Allocation from packaging and paper waste
	Garden waste in residual waste	2.7	2.7	None
Textiles	Textile waste	3.6	3.6	Scope adjustment to WFD
	Footwear (WFD textile scope)	-	0.6	Scope adjustment to WFD
Paper & packaging	Waste paper *	3.8	3.4	Moisture and food correction
	Paper packaging*	10.8	8.0	Moisture and food correction
	Plastic packaging*	11.2	9.4	Moisture and food correction
	Glass packaging*	2.4	2.3	Moisture and food correction
	Metal packaging*	1.3	1.1	Moisture and food correction
Hazardous and special waste	Hazardous waste	0.2	0.2	None
	Batteries	0.10	0.11	Scope adjustment to battery regulation 2023/1542
	WEEE (electrical and electronic waste)	0.35	0.34	Reallocation to batteries
Other	Other (combustible)	28.3	27.7	Reallocation to textile waste
	Other (non-combustible etc.)	11.3	11.3	None
	Total	100[26]	100	

[26] Due to rounding of individual fractions, totals may not equal exactly 100%.

*All packaging and paper waste are corrected for moisture and contamination, which are allocated to the fraction food waste residues, moisture in packaging and paper waste.

Packaging and paper waste

Packaging waste and other moisture sensitive waste fractions, such as waste paper, found in residual waste often contain food residues and moisture, leading to an overestimation of their material content in waste composition analyses. To improve comparability with separately collected waste fractions and placed-on-the-market statistics, packaging waste and recovered paper are therefore corrected for moisture and remaining food content in the reported results.

In Sweden, standardised correction factors have been available since 2014 and are based on the share of food waste in residual waste (Avfall Sverige 2014:04). As the average share of food waste in the analysed dataset exceeds 20 percent, correction factors corresponding to the 20 to 30 percent food waste interval are applied (Appendix 6.6). This adjustment provides a more accurate representation of the dry material content of packaging and paper waste.

Textile waste

Textile waste may also be affected by moisture and food contamination. However, as no correction factors for textiles currently exist in Sweden or elsewhere, to our knowledge, textile fractions are reported without correction and should be interpreted considering this limitation (SMED, 2023[27]). To our knowledge, no corresponding adjustments are specified in current EU requirements.

National textile sorting practices differ from the textile scope defined in the revised WFD. Adjustments were applied to align national textile categories with the textile scope defined in the revised WFD, based on complementary analyses and information from interviews. Particularly clothing and accessories made of leather or artificial leather, as well as footwear, hats, and headwear not predominantly made of textile materials, are generally excluded from the textile fraction and classified as other residual combustible waste[28]. By contrast, bags and similar articles (CN 4202) are not classified as textiles under the revised WFD, although they have traditionally been included in the textile fraction in Sweden when predominantly made of textile materials. Key

[27] (Miliute-Plepiene, Sundqvist, & Stråhle, 2023)
[28] ”Övrigt brännbart” in Swedish

differences between national practice and the WFD textile scope are summarised in Appendix 6.10.

To better estimate textile quantities required under the Waste Framework Directive, additional composition analyses were conducted by the end of 2025. These analyses covered 52 samples, including 27 from single-family houses and 25 from multi-apartment buildings, and were used to quantify footwear and other textile related items previously included in other combustible waste, Appendix 6.7. The additional composition analyses covered six of the eight NUTS 2 regions in Sweden[29].

Based on the additional analyses, materials falling under the WFD textile scope were reallocated from other combustible waste to the textile fraction in the adjusted results, resulting in an increase in the textile fraction and a corresponding decrease in other combustible waste, as shown in Table 2. Thus, this adjustment reflects a reallocation between waste fractions rather than a change in total waste generation.

Batteries

National sorting practices for batteries in household waste composition analyses differ slightly from EU requirements. According to the Swedish manual for household waste composition analyses, the battery fraction may in theory include batteries other than portable batteries. However, interviews with waste composition analysis contractors indicate that, in practice, only portable batteries are classified under this fraction, including batteries removed from consumer WEEE when they can be easily separated during sorting. No automotive, industrial, LMT, or other large batteries, including batteries exceeding 3 kg, have been identified in practice, except for a single starting vehicle battery reported by one interviewee, over many years of waste composition analysis experience. This suggests that batteries reported under battery fraction can be considered to consist entirely of portable batteries. Small quantities of batteries that cannot be easily removed from WEEE are, however, instead reported as WEEE, despite guidance in the manual to report them as batteries.

To improve alignment with EU reporting requirements, the same additional composition analyses used for textiles were applied to estimate the quantity of portable batteries remaining in WEEE. The conducting company was requested to identify the share of electronic items for which batteries were not removed during sorting. Based on the specific types of WEEE products identified, and assumptions regarding their battery weights, estimates were

[29] NUTS 2 regions not covered are North Middle Sweden and Upper Norrland

calculated and applied to quantify batteries embedded in WEEE. Assumptions regarding battery types and weights are presented in **Fel! Hittar inte referenskälla.** in Appendix 6.12. The additional composition analyses covered six of the eight NUTS 2 regions[30]. The resulting adjustments are reflected in Appendix 6.8 and Table 2.

Figure 1. Pictures of the fraction "WEEE with embedded batteries" from the complementary waste composition analyses. Photographer: staff at Envir.

The additional samples included a total of 21 electronic product categories with embedded batteries, whereof one category included unidentified products. The products were dominated by e-cigarettes, which accounted for more than 70 percent of all WEEE items with embedded batteries, followed by products such as solar lamps, small lamps, and similar items, see **Fel! Hittar inte referenskälla.** in Appendix 6.11. Figure 1 shows two examples from the fraction "WEEE with embedded batteries" from the complementary waste composition analyses.

Overall, the analysis indicates deviations from EU scoping for textiles and batteries, as these categories are not fully aligned with EU definitions. However, the additional composition analyses show that these deviations generally account for very small shares and do not significantly affect the results in Table 2, compared with existing practice. Footwear constitutes the main exception, though its contribution remains small in relation to total waste.

[30] NUTS 2 regions not covered are North Middle Sweden and Upper Norrland

Municipal mixed bulky waste

The composition of municipal mixed bulky waste[31] is based on waste composition analyses from 34 municipalities, the waste from these municipalities representing approximately 14 percent of the total quantity of combustible bulky waste reported for the reference year 2024. The analyses were conducted between 2020 and 2025. All Swedish NUTS 2 regions are covered by the data. The composition is presented in Table 3.

Table 3. Composition of bulky combustible waste by waste fraction[32]

	Waste fraction	**Share (%)**	**Aligns with EU requirements**	**Comments**
Paper & packaging	Waste paper	3.7	N/A	
	Paper packaging	3.9	Yes	
	Plastic packaging	2.9	Yes	
	Glass packaging	0.6	Yes	
	Metal packaging	0.1	Yes	
Textiles	Textiles (clothing, accessories & footwear, etc.)	9.9	Yes	
	Other textiles	1.8	Unclear	Information about the type of textiles is missing.
	Filled textiles (pillows, duvets)	2.6	No	
WEEE	Batteries	0.03	Yes	Only portable batteries included. Built-in batteries may

[31] ”Grovavfall” in Swedish

[32] The table only includes waste fractions directly or indirectly relevant for EU reporting. Other fractions are excluded; therefore, the total does not sum to 100%.

				also be reported under WEEE (see below).
	Small WEEE (< than 25 cm)	0.4	No	Could include built-in batteries but the share is unknown.
	Other WEEE	0.3	No	Could include built-in batteries but the share is unknown.

Compared to non-bulky residual household waste, mixed bulky combustible waste contains lower shares of packaging and higher shares of textiles, including categories outside the scope of the revised WFD. As the total quantity of bulky waste is substantially lower, these shares cannot be directly compared with non-bulky waste fractions (see section 'Non-bulky residual household waste'). High standard deviations indicate substantial variation between samples (see Appendix 6.9), and the results should therefore be interpreted as indicative overall tendencies rather than precise estimates.

Packaging – no adjustment to moisture

In contrast to non-bulky residual household waste, corrections for moisture and food residues are considered less relevant for bulky waste, as the share of food waste is very low, below 1 percent. Existing correction factors do not cover bulky waste and are not considered appropriate for such low food waste contents. Therefore, no moisture or food residue corrections were applied to bulky combustible waste fractions.

Textiles

Although more detailed textile categories were used in the bulky waste composition protocols, some minor disparities in relation to the revised WFD textile scope may remain. The bulky waste fraction includes filled textiles such as pillows and duvets, which fall outside the scope of the revised directive and are therefore presented separately. In several cases, textiles were also classified under the category "other textiles", which is not clearly defined. According to Avfall Sverige's manual, this category may include rags, defined as worn out textiles that cannot be materially recycled, for example heavily soiled or damaged textiles, but may also include other bulky textile items such as textile carpets. These fractions are also therefore presented separately. Similarly, the fraction "textiles (clothing, accessories and footwear)" may include items that are not covered by the revised WFD textile scope, such as bags and similar articles (CN 4202). As these items could not be reliably

separated within the available data, no scope adjustment was applied to the bulky waste textile fractions.

Batteries

Sorting practices for batteries in mixed bulky waste composition analyses largely follow the same approach as for residual household waste. Interviews with waste composition analysis contractors indicate that batteries identified during sorting at recycling centres are predominantly portable batteries, either collected as loose items or removed from WEEE when this can be done easily. Automotive, industrial, LMT or other large batteries are typically not observed in the analysed bulky waste samples. Batteries that cannot be readily removed from electronic equipment are instead reported as part of the WEEE fraction.

As a result, batteries reported in bulky waste composition analyses can be considered to consist entirely of portable batteries, while a share of portable not easily removable batteries remains embedded in WEEE. However, this embedded battery share could not be quantified for bulky waste due to the limited number of compositions analyses available and structural differences between bulky and non-bulky waste streams, which may affect the types of EEE discarded.

Industrial and commercial mixed waste (SMED project)

The composition of industrial and commercial mixed waste is not analysed on a regular basis in Sweden. Currently, the only data with a national coverage originates from a project conducted by SMED on behalf of the Swedish EPA during 2024-2025. Within this project, a total of 166 waste composition analyses were carried out on commercial and industrial waste delivered to eleven Swedish waste-to-energy plants. Based on these analyses, the study estimated the composition of commercial and industrial waste sent for incineration in Sweden[33].

The eleven plants included in the recent study[34] accounted for approximately 57 percent of the total commercial and industrial waste incinerated nationally. The findings are presented in a report (in Swedish) published in 2025. The results for the fractions relevant to this report are summarized in Table 4. The location of the eleven incineration plants cover six of eight NUTS 2 regions. However, the area from which waste is collected and sent to the plants can include more NUTS 2 regions.

[33] (Lassesson, o.a., 2025)
[34] (Lassesson, o.a., 2025)

Table 4. Composition of mixed commercial and industrial waste sent for incineration, by waste fraction, based on a project carried out by SMED and the Swedish EPA[35]. Small shares are more uncertain and are marked with an asterisk (*). The reference report present data for confidence intervals.

Waste fraction	**Subcategory**	**Share, %**	**Aligns with EU requirements**	**Comments**
Plastic	Plastic packaging	9.3	Yes, but not corrected for moisture and food content	Includes soft and rigid packaging, including plastic composite packaging and bottles that are part of the national deposit waste system.
Paper and cardboard	Paper and cardboard packaging	13.8	Yes, but not corrected for moisture and food content.	Including paper and cardboard packaging with visible parts of plastic.
Inert waste	Glass packaging	0.48*	Yes	
Metal	Metal packaging	0.31*	Yes, but not corrected for moisture and food content.	Including cans included in the national deposit waste system (0.04%)
Wood	Wood packaging	2.8	Yes	Several packaging materials fall within the extended PPWR scope.
WEEE	Batteries	0.02*	No	Includes both portable batteries and built-in batteries. The share of built-in batteries is based on an assumption, see section below.
Textiles	Accessories	0.16*	Partly	Contains non-relevant materials such as handbags in textile materials.
	Home textiles, incl.	2.0	Partly	Contains non relevant materials

[35] (Lassesson, o.a., 2025)

	textile carpets			such as carpets in textile materials.
	Clothing	1.66	Yes	
	Padded/filled textiles	0.77*	No	Outside the scope of the WFD.
	Upholstered furniture, spring furniture	1.08	No	Outside the scope of the WFD.
	Other textiles	0.74*	Likely not	The fraction mainly included fragmented textiles and rags used for cleaning as well as other textiles that were difficult to define
	Textile packaging	0.03*	Yes	More packaging materials fall within the extended PPWR scope.
Residual combustible waste	Shoes and accessories	0.65*	Partly	Shoes are covered by the WFD scope, but accessories are not necessarily included.

Packaging

In contrast to non-bulky residual household waste, corrections for moisture and food residues are less relevant for industrial and commercial waste, as the share of food waste is low, 3.6 percent[36]. Existing correction factors also do not cover this waste stream. Therefore, no moisture or food residue corrections were applied.

Compared with bulky and household residual waste, additional packaging waste fractions were defined for this stream, such as textile packaging and wood packaging. However, the quantities of these fractions were very small in comparison with the main packaging categories.

Textiles

Textiles from non-municipal waste sources are outside the scope of the revised WFD. However, the waste composition analyses of mixed

[36] (Lassesson, o.a., 2025)

commercial and industrial waste did not distinguish between municipal waste generated by companies and non-municipal commercial waste and the samples also included bulky municipal originating from sorting facilities (see chapter "Overlap"). In a Swedish context, textiles such as clothing, footwear, and other textile products covered by the revised WFD are more likely to arise from service activities and commercial premises than from manufacturing companies and should therefore be regarded as municipal waste

At the same time, a substantial share of the textiles identified in mixed waste from companies falls outside the scope of the revised WFD, notably padded or filled textiles and upholstered or spring furniture. For some categories, scope remains uncertain, as "other textiles" mainly consists of damaged or fragmented materials and "home textiles" likely includes a significant share of textile carpets. No further adjustments to align textile fractions with EU reporting requirements were possible. The textile fractions considered relevant for this study include clothing, footwear, and accessories, as presented in Table 4 above.

Batteries

Batteries from mixed non-municipal waste flows are not covered by the EU battery regulation's requirements of waste composition analyses (see Chapter 1.2.1). However, the report on waste composition of mixed commercial and industrial waste published in 2025, present data for batteries.

According to the result of the 2025 study, batteries constitute 0,01 percent of the mixed commercial and industrial waste sent for incineration in Sweden. This share only includes portable batteries, and no LMT batteries were found in the 166 compositional analyses carried out within the project[37].

As the results from the compositional analyses carried out within the scope of this report show, sealed or built-in portable batteries may also be present in the "WEEE"-fraction from compositional analyses. Photographs of the fraction classified as "Other WEEE" in the 2025 study on mixed commercial and industrial waste showed a total of 117 EEE-products that could contain unremoved sealed or built-in batteries. The products include e-cigarettes, toys, calculators, remote controls, flashlights, sensors and solar lamps, which align with the types of products with built-in batteries identified in the complementary analyses on residual household waste (see Appendix 6.12). By assuming that each product contained, on average, the same amount of batteries as was found in the complementary analyses on household waste (circa 8 g per product, see Appendix 6.12), the estimated share of portable

[37] (Lassesson, o.a., 2025)

batteries in mixed commercial and industrial waste increases slightly but gets rounded to 0.02 percent.

Overlap between different mixed waste streams.

Material shares across different waste streams are not directly comparable as long as the total quantities of the individual mixed waste streams are unknown. Figure 2 presents indicative quantities for each of the mixed waste streams described above. The analysed samples partly overlap, in particular industrial and commercial waste includes parts of bulky waste as well as municipal waste generated by companies.

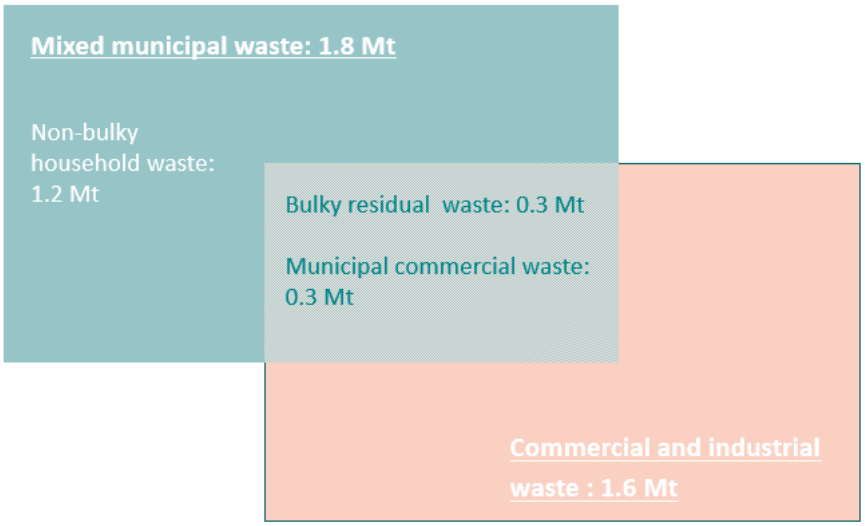

Figure 2 Conceptual overlap between mixed municipal and commercial waste streams in 2023-2024. The precise values and data sources are presented in Appendix 6.11.

Separately collected waste

Separately collected WEEE and packaging are covered by the EU requirements on waste composition analyses. The results for these waste flows are summarized in Table 5 and are described in further detail below.

Table 5. Batteries in separately collected WEEE and packaging flows.

Waste category	Subcategory	Batteries (tonnes or %)	Aligns with EU requirements	Comments
Separately collected WEEE	-	466 tonnes (2024)	Yes	The majority are portable batteries
Packaging	Metal packaging	0.11%	No	Based on an assumption regarding battery weights
Packaging	Plastic packaging	0.03%	No	Based on an assumption regarding battery weights
Packaging	Paper/cardboard packaging	0.01%	No	Based on an assumption regarding battery weights

Batteries in separately collected WEEE

El-Kretsen regularly collect data on batteries in the WEEE stream, as part of their pre-sorting process. In 2024, 466 tonnes of batteries were collected with WEEE[38]. According to El-Kretsen, the majority of these 466 tonnes were portable batteries[39]. At the point of producing this report, El-Kretsen had not carried out any specific analysis related to batteries in their analysis-facility in Arboga.

Separately collected LMT batteries

Based on an interview with one supplier of rental LMT, the decommissioning rate is low and decreasing. A larger part of their batteries is repaired or refurbished outside of Swedish borders but within EU/EES. Repaired batteries are returned to the LMT supplier. Refurbished batteries are used in second life applications (within EU/EES). A small part of LMT is lost due to theft, which includes the batteries[40].

With this information it is assumed that LMT batteries originating from LMT suppliers will either be collected and reported correctly as separately collected

[38] (El-Kretsen, 2025) (Personal communication El-Kretsen, 2025)
[39] (Personal communication El-Kretsen, 2025)
[40] (Personal communication with private LMT company, 2025)

battery waste or shipped to other countries (mostly within EU/EES). The statistics might be a bit skewed if the LMT batteries are imported and reported as LMT batteries but later taken apart for repair. In that case their individual size has decreased from a battery pack of 5-10 kg to individual cells with a size below 100 grams, which means that they will be reported as portable batteries when they are collected.

Batteries in separately collected packaging waste

Separately collected packaging waste is not covered by the EU battery regulation's requirements on compositional waste analysis. However, the Swedish PRO on packaging, NPA, regularly conducts waste composition analyses on separately collected packaging waste flows, which include data on the occurrence of batteries.

Through personal communication with NPA, data for national averages for the number of batteries per 100 kg metal-, plastic- and paper packaging in 2024 were obtained[41]. By assuming that the batteries on average are AA or AAA batteries and weigh 17 grams[42], the share of batteries per packaging waste flow can be estimated, see Table 5. Data and calculations are presented in Appendix 6.13.

[41] (Personal communication NPA, 2025)
[42] Assuming AA batteries have an average weight of 23 grams and AAA batteries an average weight of 11 grams. Assuming a 50/50 composition, the average battery weighs 17 grams..

4. Conclusions

This report presents the current Swedish system for waste composition analyses and assesses the most recent results for selected waste streams, namely municipal waste, packaging, textiles, and batteries, in relation to existing and forthcoming EU reporting requirements. Sweden has a long established and extensive system of standardised waste composition analyses for household residual waste, covering a large share of the total mixed waste stream. Composition analyses of municipal bulky waste are also conducted in some municipalities, but in a more limited and less systematic manner.

Existing national manuals for waste composition analyses differ slightly from forthcoming EU requirements for sorting textiles and batteries. However, additional composition analyses performed within this study indicate that these differences do not substantially affect reported results, with the minor exception of footwear. The observed variation is largely explained by the inherently high variability of waste composition analyses, particularly for small fractions.

Specific waste composition analyses of municipal waste generated by commercial activities are currently not performed on a regular basis in Sweden. Nevertheless, a large-scale national study conducted on behalf of the Swedish EPA during 2024-2025 included this waste flow, providing insights that may improve the understanding of its composition, as well as of mixed commercial and industrial waste more generally.

Further development of national data collection would improve data quality and transparency and support more robust future reporting under EU requirements. For textiles, this could include incorporating footwear classified as textiles into national manuals. For batteries, factors of the share of batteries embedded in WEEE could be provided to waste composition analysis contractors. Increased coverage of municipal bulky waste and the establishment of regular waste composition analyses of mixed commercial and industrial waste would further strengthen the data basis.

5. References

Avfall Sverige. (2014). *Korrektionsfaktorer vid plockanalyser för utsorterat brännbart avfall.* Avfall Sverige.

Avfall Sverige. (2024, April 2). *Vänta med plockanalyser*. Retrieved from Avfall Sverige: https://www.avfallsverige.se/aktuellt/nyheter/vanta-med-plockanalyser/

Avfall Sverige. (2024a). *Manual för plockanalys av hushållens vardagliga avfall.* Avfall Sverige.

Avfall Sverige. (2024b). *Manual för plockanalys av grovavfall.* Avfall Sverige.

Avfall Sverige. (2025). *Svensk Avfallshantering Rapport 2024.*

El-Kretsen. (2025). *2024 Hållbarhetsrapport.* El-Kretsen.

El-Kretsen. (n.d. a). *Rikstäckande insamlingssystem ger återvinning i världsklass*. Retrieved from Elkretsen.se.

El-Kretsen. (n.d. b). *Det som samlas in analyseras*. Retrieved from El-kretsen.se: https://www.el-kretsen.se/analys

Eurostat. (n.d.). *Local administrative units (LAU)*. Retrieved from Eurostat: https://ec.europa.eu/eurostat/web/nuts/local-administrative-units

Hultén, J., Johansson, M., Olof , D., & Jensen, C. (2016). *Plockanalyser av textilier i hushållens restavfall: En kartläggning av mängder och typ av kläder, hemtextilier och skor.* Swedish Environmental Protection Agency.

Lassesson, H., Due, L., Miliute-Plepiene, J., Hultén, J., Johansson, J., & Statistikmyndigheten SCB. (2025). *Sammansättning av verksamhetsavfall som går till förbränning.* Naturvårdsverket.

Miliute-Plepiene, J., Sundqvist, J.-O., & Stråhle, J. (2023). *Studies within municipal waste.* SMED.

Naturvårdsverket. (2025, February 28). *Producentansvar för förpackningar.* Retrieved from https://www.naturvardsverket.se/vagledning-och-stod/producentansvar/producentansvar-for-forpackningar/kommuners-insamling-av-forpackningsavfall-fran-hushall-och-vissa-verksamheter/overlamning-av-avfall-till-producentansvarsorganisationer/

Personal communication El-Kretsen. (2025, June).

Personal communication NPA. (2025, June).

Personal communication with Jan-Olov Sundqvist, expert on waste at IVL. (2025).

Personal communication with private LMT company. (2025, September).

Personal communication with three Swedish companies conducting waste composition analyses. (2025, May).

SCB. (n.d.). *SCB statistikdatabasen*. Retrieved from Antal och andel hushåll efter region, boendeform och hushållets storlek. År 2012 - 2024: https://www.statistikdatabasen.scb.se/pxweb/sv/ssd/START__HE__HE0111__HE0111A/HushallT26/

6. Appendix

6.1. CN codes for textile, textile-related and footwear products in provisional WFD

CN code	Description
61 – all listed codes within the chapter	Articles of apparel and clothing accessories, knitted or crocheted
62 – all listed codes within the chapter	chapter Articles of apparel and clothing accessories, not knitted or crocheted
6301	Blankets and travelling rugs (except electric blankets)
6302	Bed linen, table linen, toilet linen and kitchen linen
6303	Curtains (including drapes) and interior blinds; curtain or bed valances
6304	Other furnishing articles, excluding mattress supports; articles of bedding and similar furnishing (for example, mattresses, quilts, eiderdowns, cushions, pouffes and pillows) (CN 9404)
6309	Worn clothing and other worn articles
6401	Waterproof footwear with outer soles and uppers of rubber or of plastics, the uppers of which are neither fixed to the sole nor assembled by stitching, riveting, nailing, screwing, plugging or similar processes
6402	Other footwear with outer soles and uppers of rubber or plastics
6403	Footwear with outer soles of rubber, plastics, leather or composition leather and uppers of leather
6404	Footwear with outer soles of rubber, plastics, leather or composition leather and uppers of textile materials
6405	Other footwear
6504	Hats and other headgear, plaited or made by assembling strips of any material, whether or not lined or trimmed
6505	Hats and other headgear, knitted or crocheted, or made up from lace, felt or other textile fabric, in the piece (but not in strips), whether or not lined or trimmed; hairnets of any material, whether or not lined or trimmed
4203	Articles of apparel and clothing accessories, of leather or composition leather (excl. footwear and headgear and parts

	thereof, and goods of chapter 95, e.g. shin guards, fencing masks)

6.2. Interviewed actors

Actor	Type of interview
Private company conducting waste composition analyses 1	Teams
Private company conducting waste composition analyses 2	Teams
Private company conducting waste composition analyses 3	Email
Private company for LMT	Email
El-Kretsen (PRO WEEE)	Teams and email
Avfall Sverige	Email

6.3. NUTS 2 regions Sweden

NUTS 2 region	Counties included
SE11: Stockholm	Stockholm
SE12: East middle Sweden	Uppsala, Södermanland, Östergötland, Örebro, Västmanland
SE21: Småland and the islands	Jönköping, Kronoberg, Kalmar, Gotland
SE22: South Sweden	Blekinge, Skåne
SE23: West Sweden	Västra Götaland, Halland
SE31: North middle Sweden	Värmland, Dalarna, Gävleborg
SE32: Middle Norrland	Västernorrland, Jämtland
SE33: Upper Norrland	Västerbotten, Norrbotten

6.4. NUTS 2 coverage of waste composition analyses

Presence of municipalities reporting waste composition analyses for single-family houses in AvfallWeb (2023-2024), by NUTS 2 region in Sweden.

NUTS 2 region	Total number of municipalities in region[43]	Presence of composition analyses for single-family houses

[43] Based on (Eurostat, n.d.)

SE11: Stockholm	26	yes
SE12: East middle Sweden	52	yes
SE21: Småland and the islands	34	yes
SE22: South Sweden	38	yes
SE23: West Sweden	55	yes
SE31: North middle Sweden	41	yes
SE32: Middle Norrland	15	yes
SE33: Upper Norrland	29	yes

Presence of municipalities reporting waste composition analyses for multi-apartment houses in Avfall Web (2023-2024), by NUTS 2 region in Sweden.

NUTS 2 region	**Total number of municipalities in region[44]**	**Presence of composition analyses for multi-apartment houses**
SE11: Stockholm	26	yes
SE12: East middle Sweden	52	yes
SE21: Småland and the islands	34	yes
SE22: South Sweden	38	yes
SE23: West Sweden	55	yes
SE31: North middle Sweden	41	yes
SE32: Middle Norrland	15	yes
SE33: Upper Norrland	29	yes

NUTS 2 regions covered by municipalities that have conducted waste composition analyses on mixed bulky waste between 2020-2025.

NUTS 2 region	**List of municipalities/ municipal waste management companies**
SE11: Stockholm	Tyresö
SE12: East middle Sweden	Flen, Hallberg, Linköping, Mjölby, Vingåker, Åtvidaberg, Askersund, Laxå
SE21: Småland and the islands	Gotland, Lessebo, Markaryd, Tingsryd, Vaggeryd, Värnamo, Västervik, Växjö, Älmhult

[44] Based on (Eurostat, n.d.)

SE22: South Sweden	Eslöv, Hörby, Höör, Kristianstad, Landskrona- Svalövs Renhållnings AB
SE23: West Sweden	Kungsbacka, Laholm, Lidköping
SE31: North middle Sweden	Borlänge, Falun, Filipstad, Hudiksvall
SE32: Middle Norrland	Härnösand, Kramfors
SE33: Upper Norrland	Vilhelmina

6.5. Compositional analysis of residual household waste by housing type

Mean values and standard deviations calculated in this project based on waste composition analysis data reported by municipalities in AvfallWeb (2023 to 2024).

	Single-family houses		**Multi-apartment houses**	
Waste fraction	**Mean (%)**	**SD (percentage points)**	**Mean (%)**	**SD (percentage points)**
Food waste in residual waste	22.9	6.7	24.77	5.91
Garden waste in residual waste	2.61	1.55	2.82	1.94
Waste paper waste*	3.43	2.59	4.03	2.96
Paper packaging*	10.16	3.02	11.19	2.90
Plastic packaging*	11.59	3.24	10.93	3.19
Glass packaging*	1.94	0.97	2.75	1.16
Metal packaging*	1.23	0.43	1.35	0.42
Textile waste	3.51	1.39	3.65	1.58
Hazardous waste	0.15	0.50	0.21	0.74
Batteries	0.11	0.31	0.10	0.35
WEEE (electrical and electronic waste)	0.30	0.31	0.38	0.40
Other (combustible waste)	29.50	10.91	27.46	9.45

6.6. Correction factors for moisture and food content in packaging and recovered paper waste

Correction factors are derived from Swedish Waste Management[45].

	Below 20% food waste	**20 to 30% food waste**	**30 to 40% food waste**	**Above 40% food waste**
Waste paper waste	0.93	0.89	0.78	0.66
Paper packaging	0.82	0.74	0.69	0.55
Soft plastic packaging	0.88	0.85	0.76	0.58
Rigid plastic packaging	0.85	0.82	0.70	0.56
Metal packaging	0.88	0.84	0.80	0.65
Glass packaging	0.96	0.96	0.96	0.95

6.7. Results from additional composition analyses for categories differing from the WFD textile scope

The shares and standard deviations (SD) are derived from the additional waste compositional analyses conducted as part of this project.

Main category	**Subcategory**	**Share, mean value across all samples**	**SD (percentage points)**	**Description**
Textiles, other textiles	Bags	1.56 % of the textile category or 0.06 % of the total sample	0.28	For example, textile shopping bags, backpacks, knitted or crocheted bags, as well as other types of bags.
Other residual combustible waste	Clothing and clothing accessories made of leather or artificial leather	0.04 % of the total sample	0.06	Excluding footwear, bags, headwear, and sports equipment.
Other residual combustible waste	Hats and other headwear	0.002 % of the total sample	0.01	For example, braided or assembled from strips or bands, made of knitted fabric or other textiles,

[45] (Avfall Sverige, 2014)

				including hairnets. Excluding toy hats, carnival items, and headwear for animals.
Other residual combustible waste	Footwear	0.62 % of the total sample	0.45	For example, made of plastic, rubber, leather, artificial leather, or textile. Excluding toy shoes, ice skates, ski boots, and orthopaedic footwear.

6.8. Categorisation and estimated shares of embedded batteries in WEEE in additional composition analyses

The shares and standard deviations (SD) are derived from the additional waste compositional analyses carried out as part of this project.

Main category	**Subcategory**	**Tertiary category**	**Share, mean value across all samples**	**SD (percentage points)**	**Description**
WEEE	WEEE with embedded batteries	-	11.17 % of "WEEE"	18.09	Electrical waste with embedded batteries that are normally not opened to remove batteries, for example e cigarettes, mobile phones, tablets, as well as other similar products.
WEEE	WEEE with embedded batteries	Batteries in WEEE with embedded batteries	19 % of "WEEE with embedded batteries" or 2.15% of "WEEE"	-	Estimated share of portable batteries contained in WEEE with sealed or embedded batteries, based on product

					specific assumptions.

6.9. Composition of mixed bulky combustible waste

The weighted mean, mean values and standard deviation (SD) were calculated in this project based on composition analyses of mixed bulky combustible waste, received from municipalities.

Waste fraction	**Weighted mean (%)**	**Mean (%)**	**SD (percentage points)**
Waste paper waste	3.7	2.91	2.93
Paper packaging	3.9 %	2.93	2.41
Plastic packaging	2.9	3.10	1.99
Glass packaging	0.6	0.53	1.93
Metal packaging	0.1	0.12	0.17
Textiles (clothing, accessories & footwear, etc.)	9.9	8.34	4.47
Other textiles	1.8	3.19	3.30
Filled textiles (pillows, duvets)	2.6	3.17	2.09
Batteries	0.03	0.03	0.03
Small WEEE (< than 25 cm)	0.36	0.66	1.81
Other WEEE	0.31	0.65	0.90

6.10. Key differences between national textile sorting practices and the revised WFD

The table presents the differences between national textile sorting practices and the revised WFD, compiled within this project based on interviews and analysis of sorting manuals.

Product group	**CN code**	**National sorting practice in Sweden**	**Classification under revised WFD**
Clothing and home textiles	61-62	Typically sorted as textiles	Included in textile scope

	6301; 6302, 6303, 6304; 6309;		
Clothing and accessories of leather	4203	Sorted as other residual combustible waste	Included in textile scope
Footwear	6401–6404	Sorted as other residual combustible waste, except when predominantly made of textile materials	Included in textile scope
Hats and headwear	6504–6505	If made of non-textile materials, sorted as other residual combustible waste	Included in textile scope
Bags and similar articles	4202	Included only if predominantly made of textile materials	Not included in textile scope

6.11. Waste streams, reference years, data sources, and assumptions used to construct Figure 2

The table presents waste streams included in Figure 2, together with reference years, data sources and applied assumptions.

Scope	**Fraction**	**Reference year**	**Tonnes**	**Data source**	**Notes and assumptions**
Mixed municipal waste	Non-bulky municipal waste	2024	1,517,030	(Avfall Sverige, 2025)	Originally based on Avfall Web, 2025
	Non-bulky household waste	2024	1,190,869	Avfall Web 2025	A factor of 78.5 percent for 2024 was applied to estimate the household share

					of total non-bulky municipal waste.
	Non-bulky municipal commercial waste	2024	326,162	Avfall Web 2025	Calculated as non-bulky municipal waste minus non-bulky household waste.
	Bulky municipal waste	2024	304,210	Avfall Web 2025, underlying data for (Avfall Sverige, 2025).	
Mixed commercial and industrial waste	Commercial and industrial waste	2023	1,550,188	(Lassesson, o.a., 2025)	Includes both municipal and non-municipal waste.

6.12. Complementary analyses- batteries in residual household waste

Background data and assumptions for estimating the share of built-in batteries in non-bulky residual household waste. The "Number of products in 52 samples" was compiled by analysing pictures of the fraction "WEEE with embedded batteries" from the complementary waste composition analyses on non-bulky residual household waste. The assumed battery types and battery weights are based on the references presented in the last column. In the cases the battery weights are not specified in the reference, the weigh is assumed based on available information about battery type and/or capacity. The average weight of the "un-identified" category is assumed to be equal to the average weight of the 20 remaining categories, which is 8 grams.

Product	**Number of products in 52 samples**	**Assumed battery type (average)**	**Assumed Battery weight (g)**	**Reference and assumptions**
E-cigarette	255	Li-Po (200-500 mAh)	7	Panther Bar Engångs Vape - 2ML & Premium Mesh Coils

Thermometer/pregnancy test	9	LR41	1	Köp Vide Vilda Febertermometer Flextip på apotea.se
Headlamp	1	CR 2032 (x2)	6	Assumed to be the same as "Small lamp/bike light".
Small lamp/bike light	17	CR 2032 (x2)	6	Mini-LED vit/röd med gummiband, 2-pack | Clas Ohlson
Solar lamp	17	Li-Po (50 Ah)	1	Solcellslykta | Clas Ohlson
Remote control	2	CR 2032	3	Nexa Fjärrkontroll för fjärrströmbrytare - Nexa Fjärrkontroll för fjärrströmbrytare | Kjell & Company
Unidentified	14	Li-Po (200-500 mAh)	8	Assumption: Average weight of the batteries in the remaining 20 categories.
Headphone case	6	Li-Po (400-500 mAh)	12	What Kind of Battery Does the AirPods Battery Use?
Headphone without case (pcs)	3	Li-ion (30 mAh)	0,5	Look inside the AirPods Pro: Teardown shows how hard repairing them would be - CNET
Bank box	4	CR 2032	3	Byta batteri Swedbank säkerhetsdosa » Byggoteknik
Teeth whitening	3	Li-Po (1200-1500 mAh)	75	US20130045457A1 - Lighting Device for Teeth Whitening - Google Patents
Electric toothbrush	6	Li-ion (1000 mAh)	20	Do Electric Toothbrushes Have Lithium Batteries and Why It Matters
Power bank/hard drive	2	Li-ion (7000 mAh)	150	Which Type of Battery is Best for a

				Power Bank? A 2025 Guide - KONELEX
Shoes with lights	1	Li-Po (150 mAh)	3	Custom Rechargeable Lithium-ion Battery for Smart Shoes | Grepow
Lighter	1	LiPo (150 mAh)	5	Rubicson Elektrisk tändare - Rubicson Elektrisk tändare | Kjell & Company
Calculator	1	CR 2032	3	Casio MS-88ECO (16 butiker) se priserna här • Jämför nu »
Razor	6	Li-ion (500-1200 mAh)	25	Philips Norelco Series 7600 Wet & Dry Men's Rechargeable Electric Shaver - S7886/84 : Target
Nail file	1	Li-Po (500 mAh)	7	Amazon.com: Akozon Intelligent Electric Nail Drill Machine, USB Charging Automatic Nail File Polisher, Cordless Rechargeable Manicure Pedicure Tool for Adults : Beauty & Personal Care
Vacuum cleaner nozzle	1	Li-ion (500-2000 mAh)	30	What types of batteries are typically used in cordless vacuum cleaners?- Ningbo Jiequ Electric Appliance Co., Ltd
Microphone	1	Li-Po (200 mAh)	5	cellePhone Battery Li-Polymer for DJI Mic Wireless Microphone Transmitter (replaced BJX211) | cellePhone mobile generation

Mobile phone	1	Li-ion (3000-5000 mAh)	60	All About Phone Battery (Li-ion and Li-Polymer) - Myphontech
Total	**352**		**2883**	

A total of 352 products were identified in the fraction "small WEEE with built in batteries". The batteries in these products had an estimated combined weight of 2,88 kg, representing 2,15 percent of the weight of the "WEEE" category (which had a total weight of 134 kg).

6.13. Batteries in separately collected packaging waste

The number of batteries per 100 kg packaging waste stream were obtained through personal communication with NPA[46]. The shares of batteries in waste streams were calculated assuming an average battery weight of 17 g.

Waste stream	**Number of batteries per 100 kg packaging waste 2024**	**Share of batteries in waste (%)**
Metal packaging	7.6	0.13
Plastic packaging	1.9	0.03
Paper/cardboard packaging	0.8	0.01

[46] (Personal communication NPA, 2025)