Nordic Council of Ministers

Nordic plastic statistics

Pilot application of the UNITAR model and review of plastic waste factors

Contents

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Executive summary

Robust and comparable data on plastic flows is essential for circular economy strategies and for reporting under the upcoming UN plastics treaty. Yet, current national statistics in the Nordics remain fragmented and relying on differing assumptions, scopes, and methods that undermine inter-regional comparability.

To support the need for comparable national statistical inventories, the United Nations Institute for Training and Research (UNITAR) is developing a plastic inventory model. It leverages existing trade and production statistics to estimate how much plastic is put on the market and how much becomes waste. This approach offers a scalable, transparent method which enable harmonised and repeatable assessments.

This report applies the pilot version of the UNITAR model (as of spring 2025) to Nordic data to explore the model's performance in practice. In addition, the report provides a focused review of how plastic shares are currently estimated in Nordic waste statistics—an area that remains highly variable across countries and largely dependent on default assumptions or one-off studies.

The results show that the UNITAR model can provide a harmonised baseline for internationally comparable plastic statistics. Although the current version covers only 35–40% of the trade (HS) and production (CPC) identified in UNITAR's guideline, it reveals broadly consistent trends in plastic put-on-market (POM) across countries—most notably the dominance of packaging.

By applying product-specific lifetimes to products entering the market (POM), the model also simulates when plastic products become waste. This enables time-distributed insights that support sector-specific policy and infrastructure planning. However, limited code[1] coverage, reliance on generic plastic-content factors, and the presence of country-specific data outliers currently constrain the model's accuracy and comparability across the Nordic countries.

The UNITAR model shows conceptual potential, but four actions are crucial for reliable future application in the Nordics:

1. **Validate input data systematically**
   Establish robust quality control routines for trade and production data to ensure consistency and credibility across national datasets.
2. **Review and adapt plastic-content factors to local conditions**
   Review and recalibrate product-specific plastic shares where needed to reflect local production and consumption patterns.

1. And thereby limited product coverage

3. **Strengthen coordination capacity within key organisations**
   Ensure that statistical and environmental authorities–together with other key actors–have the capacity to jointly refine assumptions and manage model updates.
4. **Develop joint Nordic model governance**
   Create a shared structure for ownership, maintenance and practical use of the model.

With these steps, the Nordic region can assist in the development of internationally comparable and policy-relevant plastic statistics to help shape international standards for plastic monitoring.

1 Introduction

Robust, consistent data on how plastics are produced, used, and disposed of is a prerequisite for credible climate and circular-economy strategies. A legally binding UN plastics treaty will rely on countries' ability to report data that are both credible and comparable across borders. As of today, however, the Nordic countries take different approaches to measuring plastic flows—limiting the potential for joint assessments and coordinated policy.

The Nordic countries have each developed their own plastic statistics strategies. These national inventories vary in both scope and assumptions: some cover broad flows, while others focus on specific product categories or waste streams (Fråne et al., 2022; Berge et al., 2023; Karppinen et al., 2025; Gravgård et al., 2021). The result is a set of fit-for-purpose national baselines—often rich in detail, but built on different scopes, definitions, and plastic fraction assumptions.[2]

In response to these challenges, the Nordic Council of Ministers launched a regional initiative to systematically improve and harmonise plastic data across the Nordic countries. This report is a part of the second project under the initiative and builds on some of the challenges identified and high-level recommendations set out in the first project under the Nordic initiative, as outlined in the Nordic Council of Ministers' 2024 summary report.

The summary report–A 2024 Nordic report, *Better and Harmonised Statistics on Plastic Material Flows*–concluded that this fragmentation prevents comparability and weakens the credibility of regional statistics. It highlighted two major challenges: varying assumptions about plastic content in goods or plastic streams, and the absence of a common methodology. The report recommended that countries build on international guidance, especially the UNITAR method and Plastic-KEYs initiative (Nordic Council of Ministers, 2024).

United Nations Institute for Training and Research (UNITAR) is developing a model to support countries in building harmonised plastic-flow accounts using existing trade and production data. It responds to the growing need for comparable, policy-relevant statistics on plastic use and waste across national borders. The model aims to provide a structured approach for estimating plastic put-on-market and waste generation in a transparent, repeatable, and scalable manner across countries, thereby supporting a common international foundation for plastic inventories.

2. Sweden maintains a policy-oriented national baseline, recently updated with 2023 data to guide plastics policy (Fråne et al., 2022; Ljungkvist et al., 2025). Norway has published a preliminary statistical plastic account (Berge et al., 2023). Denmark integrates plastics into economy-wide physical supply and use tables (PSUTs), with a 2016 baseline and a detailed 2018 packaging account (Gravgård et al., 2021, 2023). Finland tracks roadmap indicators such as packaging recycling rates and litter data, but lacks a full plastic inventory (Karppinen et al., 2025). Iceland adopted a national plastics action plan in 2020 but still lacks a quantitative plastics inventory (Umhverfis- og auðlindaráðuneytið, 2020).

Our project consists of two phases:

- **Phase 1** focused on identifying the most relevant plastic data flows, assessing the availability and comparability of current data, and evaluating the cost–benefit of harmonising and increasing the availability of each data point.
- **Phase 2** included a Nordic expert workshop, a pilot test of the new UNITAR model for plastics Put-on-Market and plastic waste generated. It also looked at how plastic amounts can be estimated in relevant waste streams.
    - Identify process challenges
    - Test the draft version of the UNITAR model in practice to assess its potential and limitations as a tool for harmonising plastic inventories in the Nordics (analysed in Chapter 2 of this report)
    - Examine how plastic shares are estimated in different waste categories (analysed in Chapter 3 of this report)
    - Provide recommendations for further improvement of plastic statistics in a Nordic collaboration

Results from phase 1 and the Nordic expert workshop in phase 2 is available here.

1.1 Objective & scope

The objective of this pilot application is to provide a status overview of the pilot version of the UNITAR plastic model for estimating plastic put-on-market (POM) and plastic waste generation using data from the Nordic countries. The aim is to test the model's applicability in practice—highlighting both its potential and its limitations—and to explore its possible use as a harmonised alternative or complement to national plastic inventories.

The pilot is characterised by the following design choices and limitations:

- **Model versions:** The report used the pilot version of the UNITAR plastic model as of May 2025.[3]
- **Geographic scope:** Includes Sweden, Norway, Denmark, and Finland (Iceland excluded due to data constraints).
- **Data:** The trade and production data used are publicly available from Eurostat for European Union member states and from Statistics Norway (SSB) for Norwegian data.

In addition to testing the UNITAR model, the report examines how **plastic shares** can be estimated across relevant waste streams (Chapter 3).

3. Available at: https://academy-ce.info/toolkits/

1.2 Glossary

Table 1 An overview of key terms used in the report.

Term	Definition
Apparent Consumption	An indicator used to estimate how much of a material is used within a country. It is calculated as: *Domestic production + Imports – Exports*.
HS – Harmonised Commodity Description and Coding System	A globally standardised system for classifying traded goods, maintained by the World Customs Organization. It uses a 6-digit coding structure and is the foundation for many national and regional customs and trade classification systems.
CN – Combined Nomenclature	The Combined Nomenclature is the EU's system for classifying traded goods. It builds on the international Harmonised System by adding two extra digits (for a total of 8), allowing for more detailed product categories within EU customs and trade statistics.
CPC – Central Product Classification	An international classification maintained by the United Nations Statistics Division. It groups products—both goods and services—based on their physical characteristics and intended use. CPC supports cross-country comparability in national accounts and statistics.
CPA – Statistical Classification of Products by Activity	A European product classification system that links products to the economic activities in which they are produced. It is used in production and structural business statistics, and forms the basis for classifications such as PRODCOM.
PRODCOM – Production Communautaire	A classification and data collection system managed by Eurostat that provides statistics on industrial production in the EU. It records the quantity and value of goods manufactured, linked to the CPA classification.
Material Flow Analysis (**MFA**)	A systematic, mass-balance-based method for quantifying material stocks and flows within a defined time and space boundary (Eurostat, 2018).
Primary plastic	Plastic polymerised for the first time from virgin fossil or bio-based feedstock.
Secondary plastic	Reprocessed from post-consumer or post-industrial plastic waste for use as a raw material.

Plastic-containing products	Products made from a combination of plastic and other materials. These may include items such as vehicles, electronics, textiles, or furniture. Because they are not wholly plastic, their plastic content must often be estimated separately.
Plastic shares / plastic content factors	Estimated proportions that indicate how much of a product's weight is made up of plastic. These factors are used when the plastic content is not explicitly recorded and help convert gross product flows into plastic-specific estimates.
Put-on-market (**POM**)	The mass (or number of units) of plastic products supplied for the first time for distribution, consumption or use in a given market during a defined period ('placing on the market').
UNITAR – United Nations Institute for Training and Research	A United Nations body that provides training and technical assistance to countries on topics including sustainable development, environmental management, and statistical capacity-building.

2 The UNITAR Plastic Model

Summary

The UNITAR model provides a harmonised structure for estimating plastic put-on-market and waste generation across countries using trade and production data. However, the quality of the results is limited by partial product code coverage, and uncertainty stemming from broad plastic-content assumptions, and quality data issues. Despite these gaps, the model delivers actionable insights—revealing both insights on plastic volume trends and key anomalies in specific sectors such as transportation which need to be addressed for accurate results.

2.1 A harmonised approach based on trade and production statistics

The plastic model in development by UNITAR aims to support the creation of harmonised national inventories by building on existing trade and production data. Such trade and production databases already capture a large share of plastic flows —both from domestic production and imports. For example, in Denmark, two-thirds of plastic in products is imported and one-third is produced domestically (Gravgård et al., 2023).

Leveraging this data allows countries to estimate apparent plastic consumption—the total amount of plastic entering an economy, calculated as domestic production plus imports minus exports. The model is particularly useful for estimating earlier life cycle stages,[4] serving as a first-order approximation of how much plastic is put on the market (POM). It also provides a foundation for further modelling of waste generation, in-use stocks, and circularity indicators. A key advantage of the model is its built-in distinction between short-lived packaging and long-lived goods, which supports more nuanced waste forecasts and policy interventions.

4. National statistics and legislation have historically focused on what is collected and treated, leaving gaps in the understanding of market inflows, in-use stocks, and uncollected plastic—whether due to environmental leakage or collection that fall outside official plastic collection statistics.

However, trade and production databases are not designed to track plastic specifically and often miss plastics embedded in composite goods (Barrowclough et al., 2020).[5] In other words, while the UNITAR model offers the potential of creating harmonised national plastic inventories, it must be applied with careful calibration to generate valid results.

2.2 Key methodological challenges of the UNITAR model

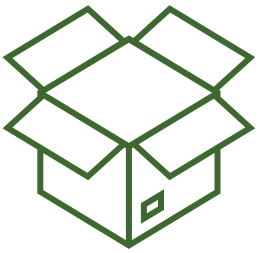
To better understand how the UNITAR model performs in practice, we must first examine the key methodological challenges that affect its accuracy and comparability. These challenges include data limitations, generalised assumptions, and structural gaps in how trade and production statistics represent plastic flows.

Plastic fractions are based on assumptions for broad product categories

Trade and production databases were not built to track plastic specifically. Even though there is a category for plastics in the trade system (Chapter 39 in the HS codes) (World Customs Organization [WCO], 2002), trade or product codes often group plastic and non-plastic items together. To work around this, estimates—e.g., 10% plastic in vehicles—are drawn from literature or one-off studies and carry high uncertainty, especially for complex categories like textiles and construction materials. Both previous national and Nordic analyses have noted that default values are often outdated or poorly documented, limiting the reliability of such calculations (Berge et al., 2023). Moreover, plastic content can change significantly over time due to technological shifts or policy influence—for instance, the transition to electric vehicles affects material composition. This underlines the need for regular revision of plastic coefficients to reflect changing product designs and usage patterns.

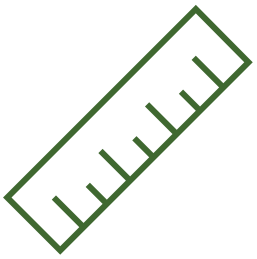
5. These include plastics used in vehicles, electronics, furniture, and textiles – categories where plastic is present but not always reported as a distinct material (UNITAR & UNEP, 2025).

Packaging is often excluded



Trade statistics typically record the net weight of goods excluding packaging (Berge et al., 2023). This means plastic packaging used to ship or contain products is not accounted for in import/export weight data.[6] Since packaging accounts for up to 40% of plastic placed on the market (Abbasi et al., 2023), excluding it can lead to major misrepresentations in both inflow and waste generation figures.

Inconsistent units make comparisons difficult



While many trade records use kilograms, others rely on item counts, litres, or other category-specific units (Berge et al., 2023). This increases the risk of misclassification or missing weights, which in turn adds uncertainty.[7]

Polymer-specific data is limited

If the aim is to break down flows by polymer type (PE, PP, PET, etc.), trade/production data seldom provide that detail except for basic resins. Finished goods and articles are typically not labelled by polymer in official stats. Analysts must either restrict analysis to broad groups (all plastics by sector) or apply assumed polymer splits within product categories (e.g. using market research data to say packaging is X% PE, Y% PP, etc.). This can introduce error if the assumed polymer mix differs from reality. The Danish preliminary MFA reported that "only few data were available on polymer composition of selected plastic flows" (Pivnenko et al., 2019).

6. It should be noted however, empty packaging, which is the product in itself is accounted for through their HS/CN codes.
7. A UN trade analysis found that issues with trade data, such as missing physical weight values, are relatively common and require targeted imputation. Each of these conversions adds to uncertainty in the final material flow figures (Zhang et al., 2022).

Systematic national validation is needed for robust results

Adopting the UNITAR trade-and-production-based model provides a structured path to harmonised plastic flow accounts using existing Nordic data. Yet its reliability depends on refining key assumptions, improving data inputs, and transparently managing uncertainty. Nordic countries can assist in this process by aligning plastic content coefficients, addressing packaging gaps, and contributing to a shared regional approach.

With such efforts, the model can provide a robust foundation for cross-country comparisons—while also highlighting where complementary methods, like micro-level waste composition studies, are needed.

The following section outlines the methodology used to test the pilot version of the UNITAR model in a Nordic context.

2.3 Pilot application methodology

To test the UNITAR framework across the Nordic countries, we added the relevant trade and production data to the pilot version of the UNITAR plastic model (as of May 2025). For a detailed description of the method for adding the trade and production data see Appendix A.

Only a subset of codes is currently included

Of the approximately 620 HS codes and 240 unique CPC codes–defined in the UNITAR report (UNITAR & UNEP, 2025) to be most relevant for estimating plastic flows[8]–only 225 HS codes (≈36%)[9] and 93 CPC codes (≈39%)[10] are currently included in the draft model as of May 2025. These selections were made by UNITAR as part of the ongoing model development and apply equally across all countries.

As a result, this analysis does not include a large part of the relevant plastic flows. The total volumes shown in this report are therefore likely lower than the actual amounts—but it is not currently possible to say by how much. This limitation also prevents direct comparison with national studies such as the Swedish material flow analysis.

8. The full list of CPC and HS codes are available in *Statistical guideline for measuring flows of plastic throughout the life cycle* (UNITAR & UNEP, 2025).
9. Based on a comparison with the appendix of Statistical Guideline for Measuring Flows of Plastic Throughout the Life Cycle (UNITAR & UNEP, 2025), the model's trade data currently includes approximately: 40% of packaging codes (P1), 94% of transportation codes (P2), 100% of building and construction codes (P3), 0% of electrical and electronic equipment codes (P4), 58% of consumer and institutional product codes (P5), 7% of apparel and textile furnishing codes (P7), and 50% of "Other" codes (P8). Industrial machinery (P6) is not covered in either the pilot model or the report, which notes that "Further detailing [is] need[ed] to be developed" (p. 141).
10. Based on a comparison with the appendix of Statistical Guideline for Measuring Flows of Plastic Throughout the Life Cycle (UNITAR & UNEP, 2025), the model's production data currently includes approximately: 55% of packaging codes (P1), 100% of transportation codes (P2), 88% of building and construction codes (P3), 0% of electrical and electronic equipment codes (P4), 81% of consumer and institutional product codes (P5), 15% of apparel and textile furnishing codes (P7), and 50% of "Other" codes (P8). Industrial machinery (P6) is not covered in either the pilot model or the report. The model also has 6 codes that are not found in the draft report appendix.

These limitations are important to keep in mind when interpreting the results and visualisations in this report. The findings reflect a technical pilot test of the UNITAR model, which is still under development—not a complete or fully representative estimate of national plastic flows.

Icelandic data excluded

Due to the nature of the Icelandic trade data structure for their API and time constraints of the informants Icelandic data has not been included in the analysis.

No extensive data validation

The dataset used in this pilot implementation has not undergone full-scale data validation or cleaning. Unlike the rigorous estimation procedures applied in WEEE modelling by Van Straalen et al. (2016), this dataset has only been subject to limited manual review. Apparent outliers were assessed manually by the authors on a case-by-case basis: single-year extreme anomalies were either adjusted to better reflect surrounding trends when deemed implausible or reported separately to maintain visibility in the graphs.[11]

Where multi-year anomalies occur, these values have been visualised separately (see Figures 6 and 8) rather than being smoothed or removed. This to preserve the approach of reflecting the current challenges of the draft model and the aim to preserve transparency in raw data behaviour over time. Nevertheless, deviations in trade units or weight fields may affect result quality. More detailed information on data quality issues is provided in Appendix D.

Interpreting the results

This modelling process provides a harmonised—though partial—view of plastic flows in the Nordic economies. The results illustrate how the draft UNITAR plastic model can be applied using available trade and production data.

The findings should be interpreted as indicative outputs from an exploratory application of the model—not as validated or complete estimates of national plastic flows. The methodological limitations outlined in the section *Key methodological challenges of the UNITAR model* should also be kept in mind when reviewing the results.

11. A comparison with national data (e.g. from SSB in Norway) indicates that some of the extreme spikes found in Eurostat data likely stem from reporting inconsistencies or unit conversion errors rather than actual shifts in plastic flows. A detailed description of this can be found in Appendix D.

2.4 Plastic Put-on-Market Results

Summary

The draft UNITAR model offers a harmonised method for estimating plastic put-on-market (POM) volumes across the Nordic countries. The pilot reveals a consistent trend of steady growth in POM volumes, with packaging as the dominant category. However, the results also highlight data anomalies—particularly related to specific product codes and unit mismatches.

It is important to note that the model currently covers only a limited subset of plastic flows. As such, the results should be viewed as indicative outputs from an exploratory model application, not as conclusive estimates.

Sweden and Finland show stable increases in POM volumes, while Denmark follows a similar trend once outliers are excluded. Norway reports lower overall volumes but is notably affected by extreme spikes linked to offshore infrastructure.

This section presents the results of the pilot application of the UNITAR draft model for estimating plastic put-on-market (POM) amounts in the Nordic countries. It highlights both the strengths of the harmonised approach and the limitations that arise due to data availability, anomalies in trade/production statistics, and assumptions regarding plastic content.

Sweden: Stable profile dominated by packaging, with early volatility and outliers

In Figure 1 Sweden shows a relatively stable distribution of plastic put-on-market (POM) between 1995 and 2023. The modelled trend reveals notable volatility before 2011, with pronounced peaks in 1997 and 2010, and a sudden dip in 2003. Packaging is most consistently the largest category (approximately 20-40 percent of yearly total), especially from 2008 onward, where levels stabilise around 150,000–180,000 tonnes. Building and construction initially account for a large share of the annual total but later converge with transportation and consumer & institutional products. The "Other" category shows erratic behaviour, including a major spike in 2010. This increase comes from a few codes regarding glasses and other optical or protective equipment.[12]

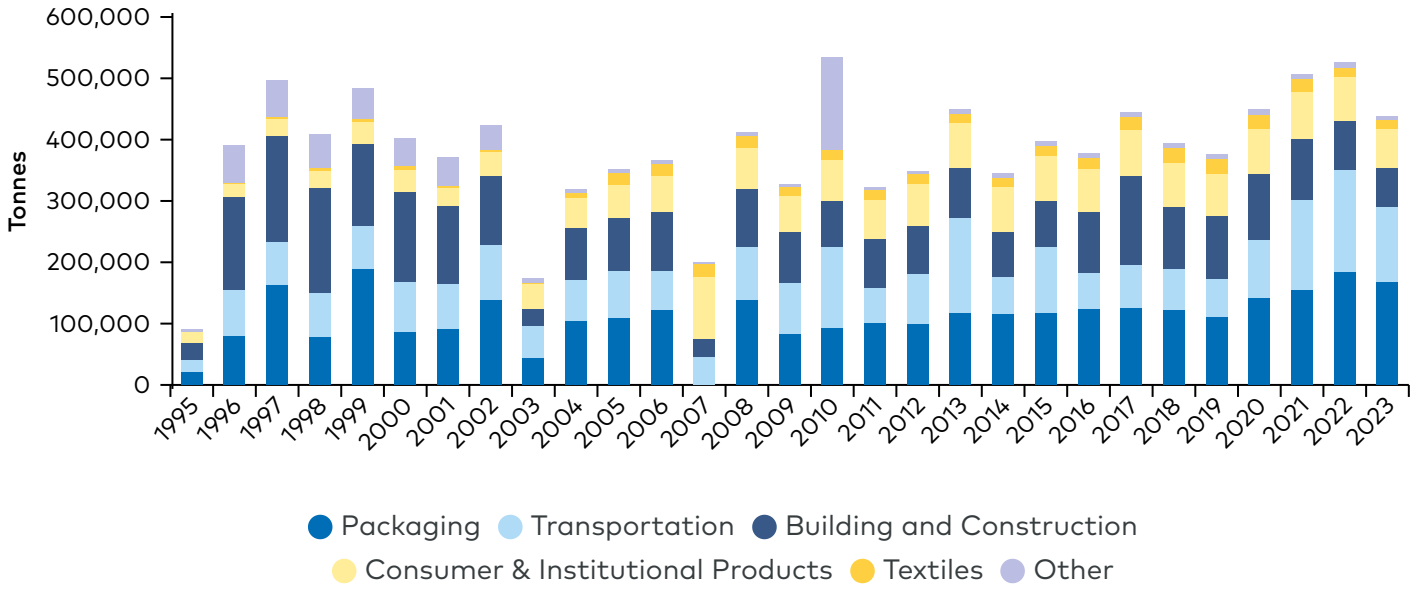


Figure 1 Plastic Put-on-Market Sweden

12. CPC codes:

- **48312** *"Spectacles, goggles and the like, corrective, protective or other"*
- **48313** *"Frames and mountings for spectacles, goggles or the like"*, and
- **48314** *"Binoculars, monoculars and other optical telescopes; other astronomical instruments, except instruments for radio-astronomy; compound optical microscopes"*

Finland: Gradual increase until 2018, followed by sharp rise driven by "Other"

Finland presents a steady increase in plastic put-on-market (POM) volumes from ca 150,000 tonnes in 1995 to just above 350,000 tonnes in 2018. There's a noticeable sharp dip in 2007. From 2019 onwards, volumes surge to over 610,000 tonnes by 2022. The primary driver of this recent jump is a sharp increase in the "other" category, contributing with an additional 150,000 tonnes per year. The spikes in Finland's "Other" category are linked to the same production codes as in Sweden – mainly for glasses and other optical or protective equipment. This highlights the need to review the category's validity, as well as possible unit mismatches or other reporting issues. There's a 7 476 536-tonne spike for the transportation subcategory "Other vessels"[13] 2017 (which is omitted from the graph below).

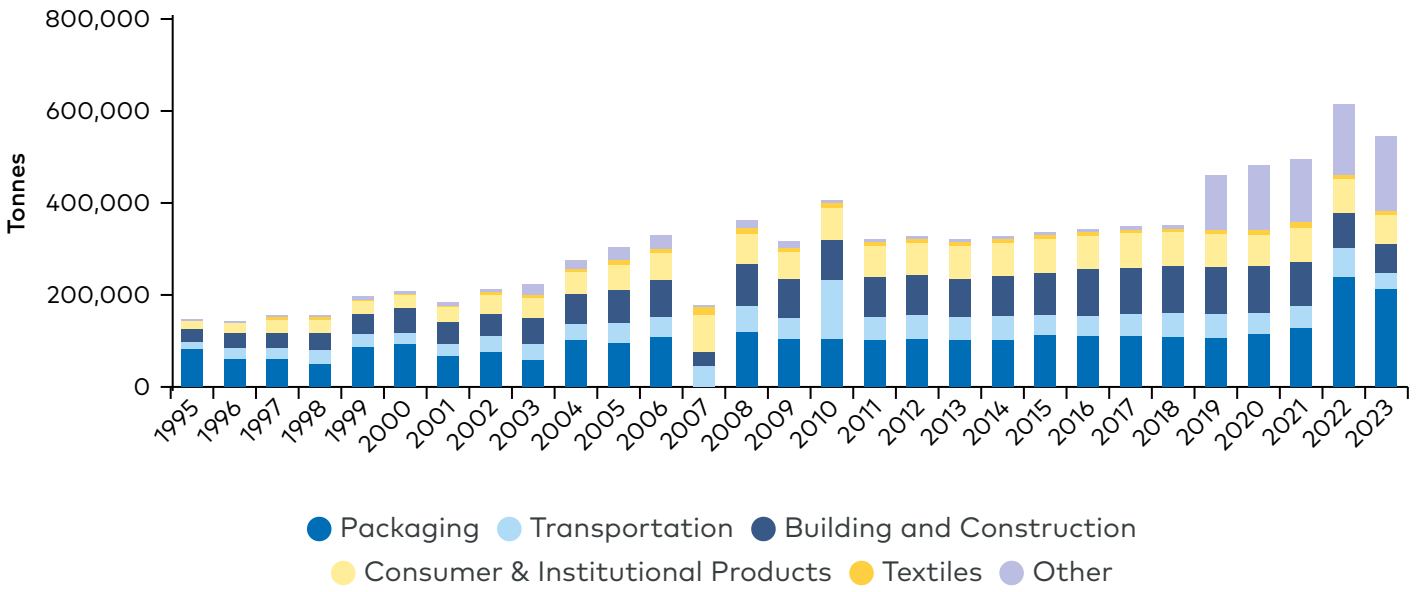


Figure 2 Plastic Put-on-Market Finland

13. CPC codes:

- **49319** – *"Other vessels (including light-vessels, fire-floats, dredgers, floating cranes, floating docks, warships and lifeboats other than rowing boats), except floating or submersible drilling or production platforms"*
- **49320** – *"Floating or submersible drilling or production platforms"*

Denmark: Similar trend to Finland, with extreme outliers removed

For Denmark the increasing trend is similar to that of Finland–starting at above 140,000 tonnes in 1995 and peaking in 2021 at around 490,000 tonnes. Notably, the "Other" category is omitted from the graph due to extreme values in the data. From 2008 onward, annual volumes exceeded 1.3 million tonnes–five to ten times higher than totals in other years–before dropping back after 2012 (Figure 6).[14] The discrepancy comes from the same production codes regarding glasses and other optical or protective equipment as was the case for Sweden and Finland. When omitting the "Other" category from both Finland and Denmark's total put-on-market (POM) values they produce a very similar total trend. We also see the same sharp dip for the Danish data in 2007 as was seen in the Swedish and Finnish data.

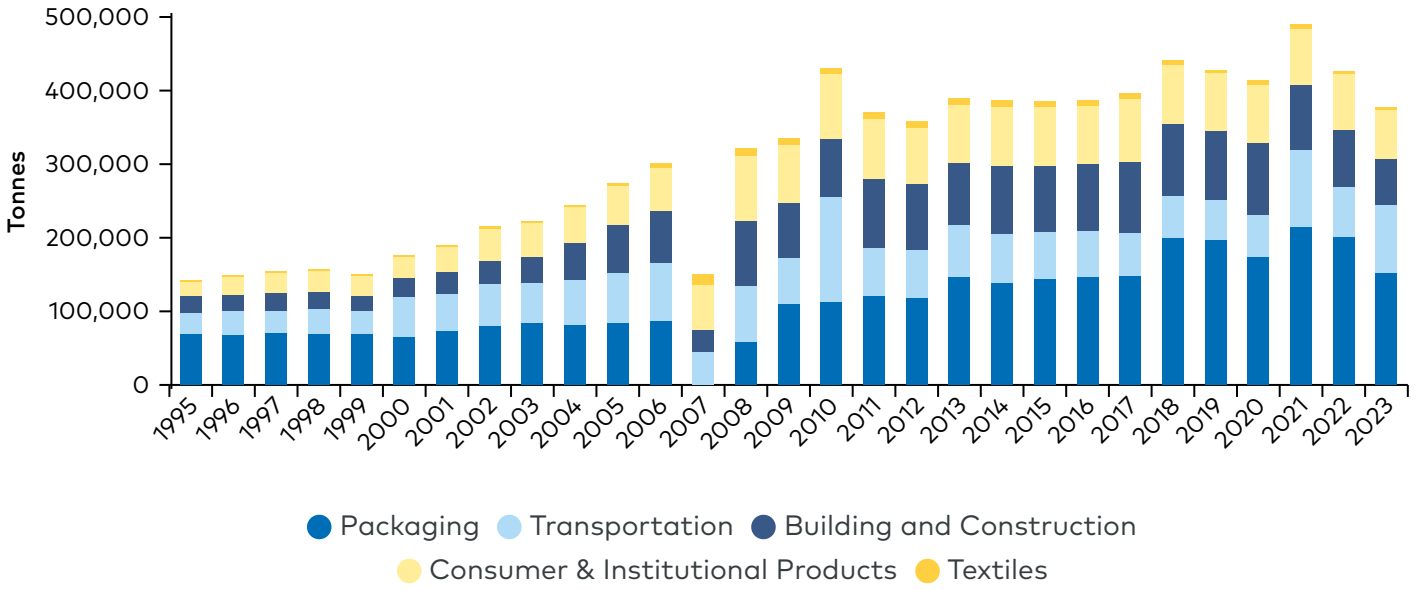


Figure 3 Plastic Put-on-Market Denmark.
Other category is removed due to extreme values.

14. For Denmark there's also a 1 252 017-tonnes jump 1998 in the packaging category 36490 *"Other articles for the conveyance or packing of goods, of plastics; stoppers, lids, caps and other closures, of plastics"* that we have assumed to be a reporting error due to the irregular occurrence and extreme size.

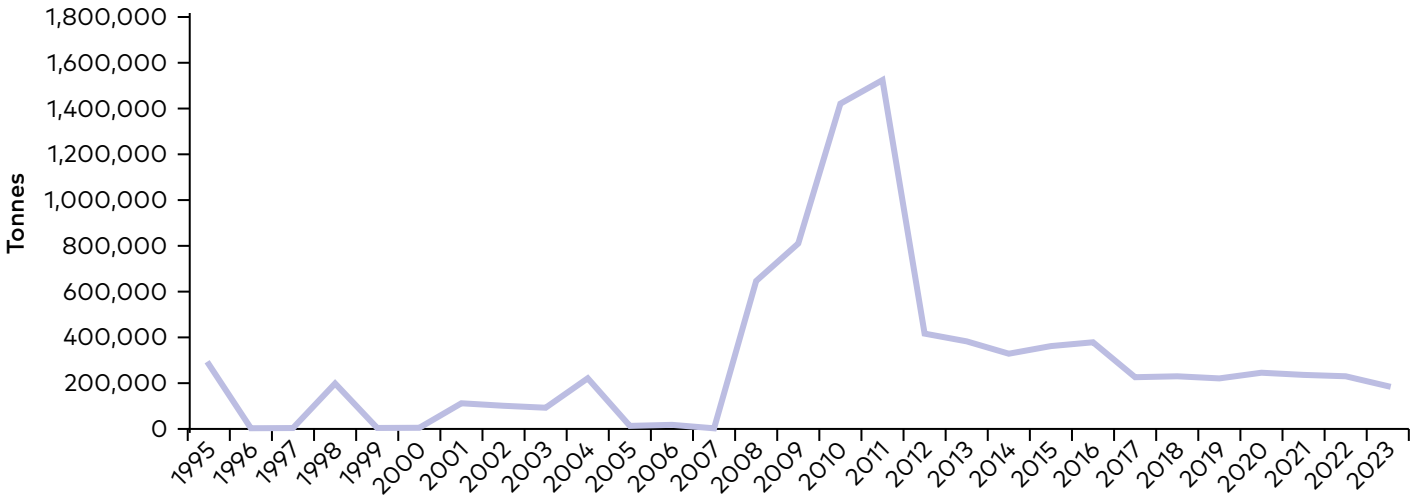


Figure 4 "Other" Plastic Put-on-Market Denmark

The "Other" category showing extreme values from a few codes regarding glasses and other optical or protective equipment between 2008-2012

Norway: Extreme transportation spikes and lower baseline levels

Norway stands out for both its lower baseline volumes and sharp anomalies. Unlike other countries, Norway's issues relate primarily to the Transportation category. As seen in Figure 8 the transportation category shows extreme values for 2011-2016 (spikes of up to 200 million tonnes of plastic). This issue mainly comes from one subcategory "Other vessels".[15] This coincides with large-scale offshore infrastructure such as the Skarv FPSO—one of the world's largest floating or submersible drilling production platforms at the time—was delivered to the Norwegian Continental Shelf (PGNiG, 2011), and in 2016, both the Ivar Aasen and Aasta Hansteen platforms were installed or delivered (Aker BP, n.d.; Boskalis, 2015). These individual structures each weigh tens of thousands of tonnes and, when recorded in production or trade statistics, can dominate annual volumes in the draft model once generic plastic-content shares are applied. It therefore highlights the necessity to provide custom adjustments to the assumption of plastic shares for such categories. Figure 7 show the Norwegian Put-on-Market graph with the "Other vessels" category omitted and Figure 8 show the full transportation category including the "Other vessels" category.

Other notable findings are that the same dip in 2007 found in all other countries, after which follows a 10,055,649-tonne spike for packaging[16] (which is omitted from the graph below for visibility) and a 1 999 608-tonne spike 2012 for two construction codes[17] (also omitted from the graph below for visibility). Both these omitted spikes are shown in more detail in Appendix D. The construction spike of 258 471-tonnes in 2018 comes from the CPC code 36930 *"Baths, washbasins, lavatory pans and covers, flushing cisterns and similar sanitary ware, of plastics".*

15. **CPC codes:**
    - **49319** – *"Other vessels (including light-vessels, fire-floats, dredgers, floating cranes, floating docks, warships and lifeboats other than*

2008[18] (which is omitted from the graph below for visibility) and a 1 999 608-tonne spike 2012 for two construction codes[19] (also omitted from the graph below for visibility). Both these omitted spikes are shown in more detail in Appendix D. The construction spike of 258 471-tonnes in 2018 comes from the CPC code 36930 *"Baths, washbasins, lavatory pans and covers, flushing cisterns and similar sanitary ware, of plastics".*

Apart from the spikes mentioned, Norway stands out with notably lower total put-on-market (POM) volumes – rising from just under 123,000 tonnes in 1995 to around 330,000 tonnes in 2021. These absolute values are lower than those reported for other Nordic countries, and far below the national estimates presented in Berge et al. (2023).[20] The discrepancy reflects limitations in this pilot implementation–such as the use of a restricted set of product codes–but can also reflect issues with the complex estimation of plastic containing products or gaps in trade and production data that hit Norway disproportionally.

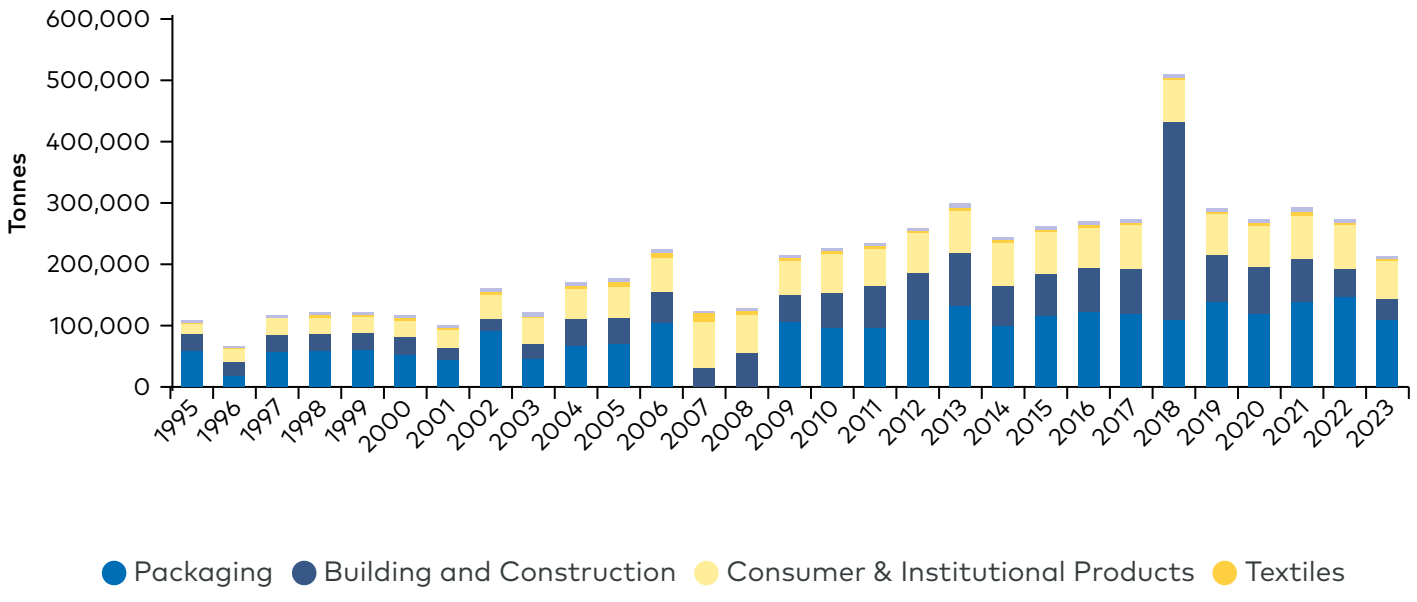


Figure 5 Plastic Put-on-Market Norway

18. **36410** – *"Sacks and bags, of plastics"*
19. **CPC codes:**
    - **27912** – *"Tulles and other net fabrics, except woven, knitted or crocheted fabrics; lace in the piece, in strips or in motifs"*
    - **27913** – *"Embroidery in the piece, in strips or in motifs"*
20. Berge et al. (2023) estimates the net plastic volumes (production + imports – exports) 570 000 tonnes for semi-finished products and 410 000 for primary plastic and finally around 330 000 tonnes of plastic from plastic containing products.

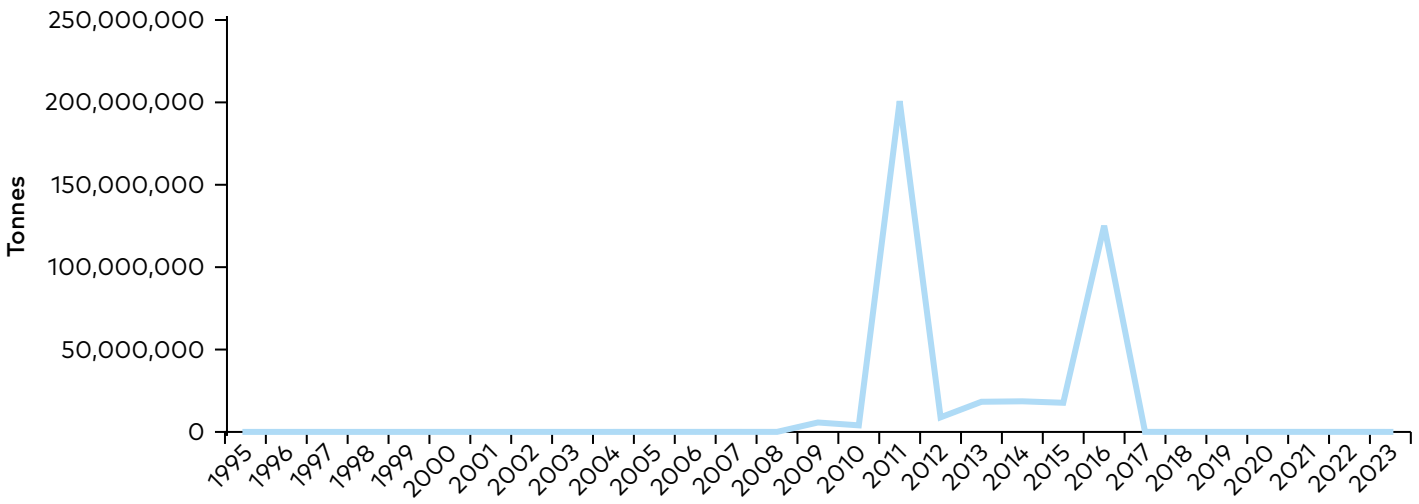


Figure 6 Plastic Put-on-Market Norway – category "Transportation" showing extreme values between 2010-2017

Conclusion

The draft UNITAR model reveals broadly consistent trends in plastic put-on-market volumes across the Nordic countries, with packaging as the dominant category and gradual growth from the mid-1990s onward. However, the results also expose key limitations regarding the data quality uncertainty, reliance on assumed plastic shares for broad categories, and significant outliers tied to specific product codes (e.g. optical goods, offshore platforms). These issues underscore the challenges of a harmonised estimation model based on global trade and production codes (less detailed than their EU equivalents). Careful data validation, category-level adjustments, and expansion of code inclusion will be essential to fully realise the model's comparative value.

2.5 Plastic waste generated

Summary

The waste generation modelling highlights the UNITAR framework's potential to track not only input volumes, but also the long-term accumulation and point of treatment of plastic over time. By applying sector-specific lifetime assumptions, the model provides a dynamic view of how different plastic applications contribute to waste over time—enabling more targeted understanding of when and where waste arises. Despite limitations, the approach opens new avenues for forward-looking planning and shows how harmonised modelling can improve both policy timing and material management strategies.

The UNITAR model estimates plastic waste generation by applying product-specific lifetime assumptions to the previously modelled put-on-market (POM) volumes. This enables a time-distributed simulation of how plastic placed on the market becomes waste over subsequent years. It is important to note that these figures represent modelled, indicative outputs based on the POM results in the previous section—not actual collected waste volumes. They are therefore subject to the same limitations and challenges as the POM results, which should be considered when interpreting the findings.[21]

After 2023, total waste volumes begin to decline for all countries. This is not a forecasted real-world trend, but a result of the model's scope: 2023 is the final year for which POM input data is available. Since no new inflows are added beyond that point, plastic waste generation gradually decreases as products from earlier years reach their end-of-life. A similar limitation affects the start of the graph: because the POM data series begins in 1995, the model does not capture end-of-life waste from long-lived plastic products placed on the market before that year, such as those used in transportation and construction.

This highlights both the utility and the limitations of the model: while it provides valuable insight into waste generation dynamics, it relies on estimations for years preceding available data and requires ongoing updates with new inputs to remain relevant beyond the current cut-off year.

21. **Note on interpretation:** The waste generation estimates presented in this section are based on previously modelled plastic put-on-market (POM) volumes, with the models product-specific lifetime assumptions applied. To improve realism and interpretability, certain one-year spikes identified as data artefacts in the POM stage—particularly those linked to "Other vessels" and optical equipment—have been excluded from the input data prior to waste modelling.

Sweden

Sweden's modelled plastic waste shows a rising trend from the mid-1990s, peaking around 2022. This pattern mirrors the historical growth in plastic placed on the market, with a time lag reflecting product lifespans. Packaging remains the dominant waste category throughout the period, followed by Consumer & Institutional Products and Transportation.

Note that as the put-on-market (POM) data starts in 1995, longer lifecycle plastics are not present at the beginning of the time series. After 2023, the modelled waste volumes decline due to the absence of further POM inputs.

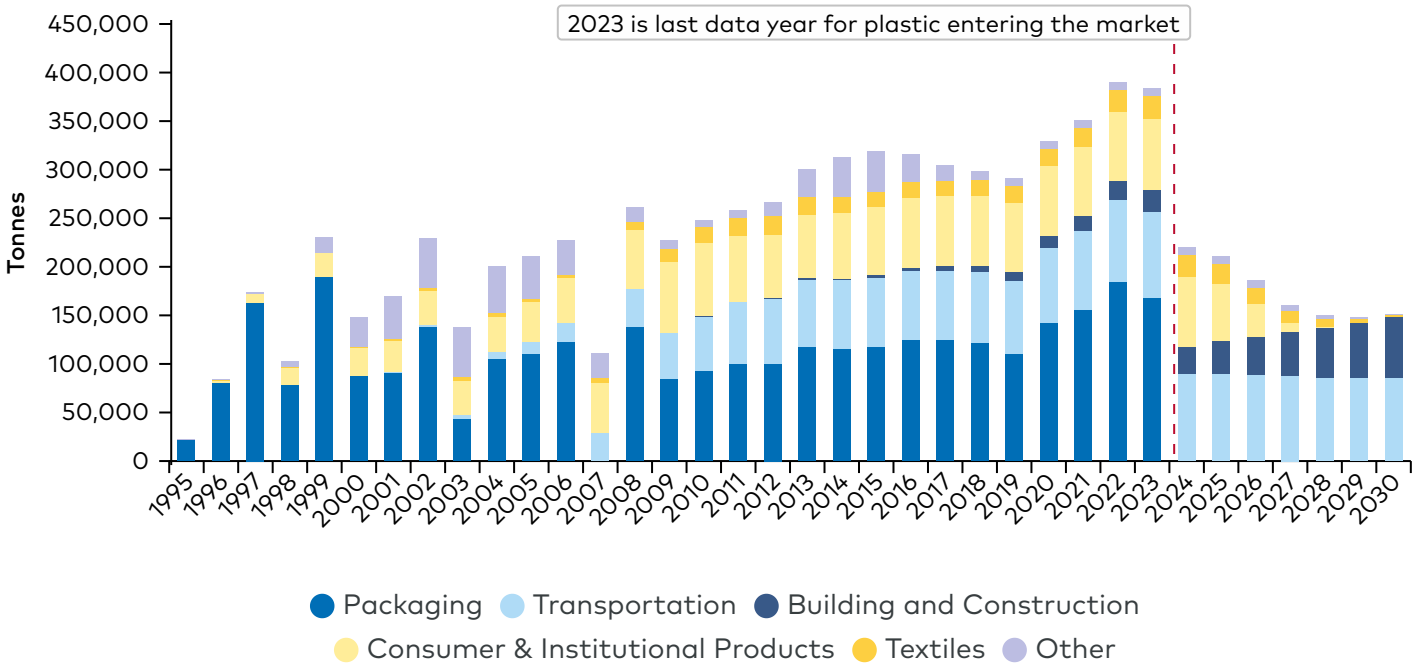


Figure 7 Plastic waste generated Sweden

Finland

Plastic waste generation in Finland shows a consistent upward trend from 1995 to the late 2010s, reflecting the gradual increase in plastic put on the market. Waste volumes peak between 2020 and 2023, following the surge in put-on-market (POM) observed from 2019 onward.

The waste composition is dominated by Packaging and Consumer & Institutional Products, with a growing share of Transportation after 2010. The "Other" category also contributes more to recent years, corresponding to the increase in POM volumes attributed to optical equipment codes.

As in Sweden, long-lifecycle plastics are missing at the start of the time series, and modelled waste volumes decline after 2023 due to no further POM inputs.

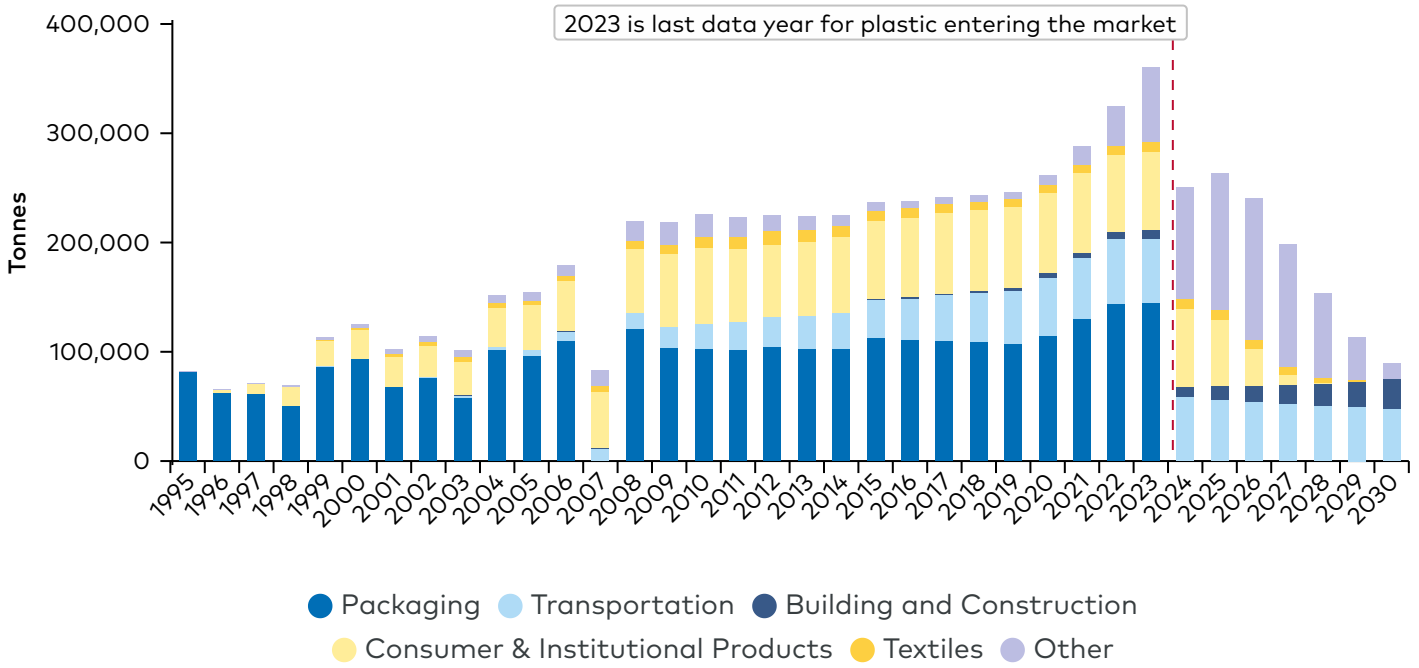


Figure 8 Plastic waste generated Finland

Denmark

Denmark's modelled plastic waste closely tracks its put-on-market (POM) profile, showing a steady rise from 1995 and peaking around 2021–2023. Packaging and Consumer & Institutional Products make up the largest shares, while other categories like Transportation gain from 2010 onwards.

Crucially, waste estimates are smoother than the underlying POM data because the "Other" category – which showed outlier spikes in Denmark's POM results – has been excluded for affected years. This correction prevents exaggerated waste volumes from distorting the total.

As with Sweden and Finland, long-lifecycle plastics are missing at the start of the time series, and the modelled waste volumes decline after 2023 due to the absence of further POM inputs.

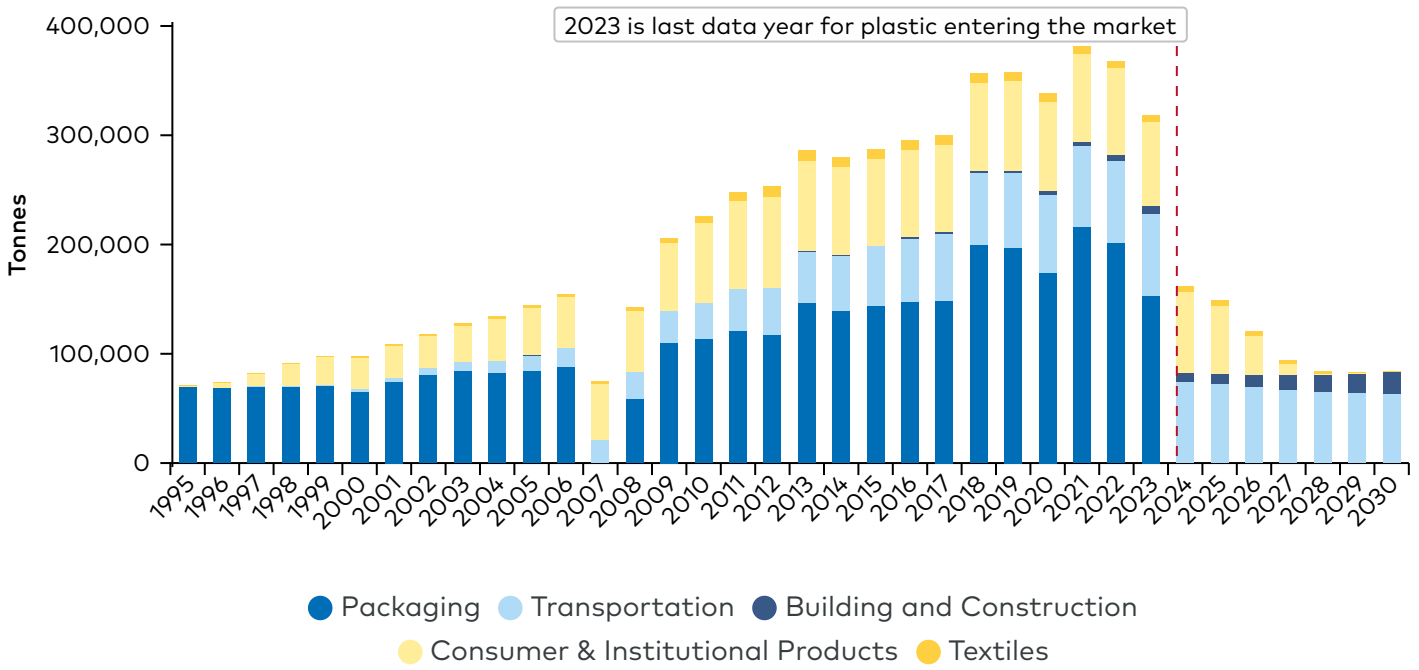


Figure 9 Plastic waste generated Denmark

Norway

Norway's modelled plastic waste is the lowest among the four countries, aligning with its smaller put-on-market (POM) volumes. Waste levels increase gradually to around 230,000 tonnes by the early 2020s, driven primarily by Packaging and Consumer & Institutional Products.

However, the waste profile is also affected by Norway's data anomalies—particularly from transportation. The "Other vessels" category, while partially removed from POM data, still leaves traces in the waste outputs for the years following 2011–2016. As a result, some fluctuations remain visible in the waste time series.

As with the other Nordic countries, long-lifecycle plastics are missing at the start of the time series, and the modelled waste volumes decline after 2023 due to the absence of further POM inputs.

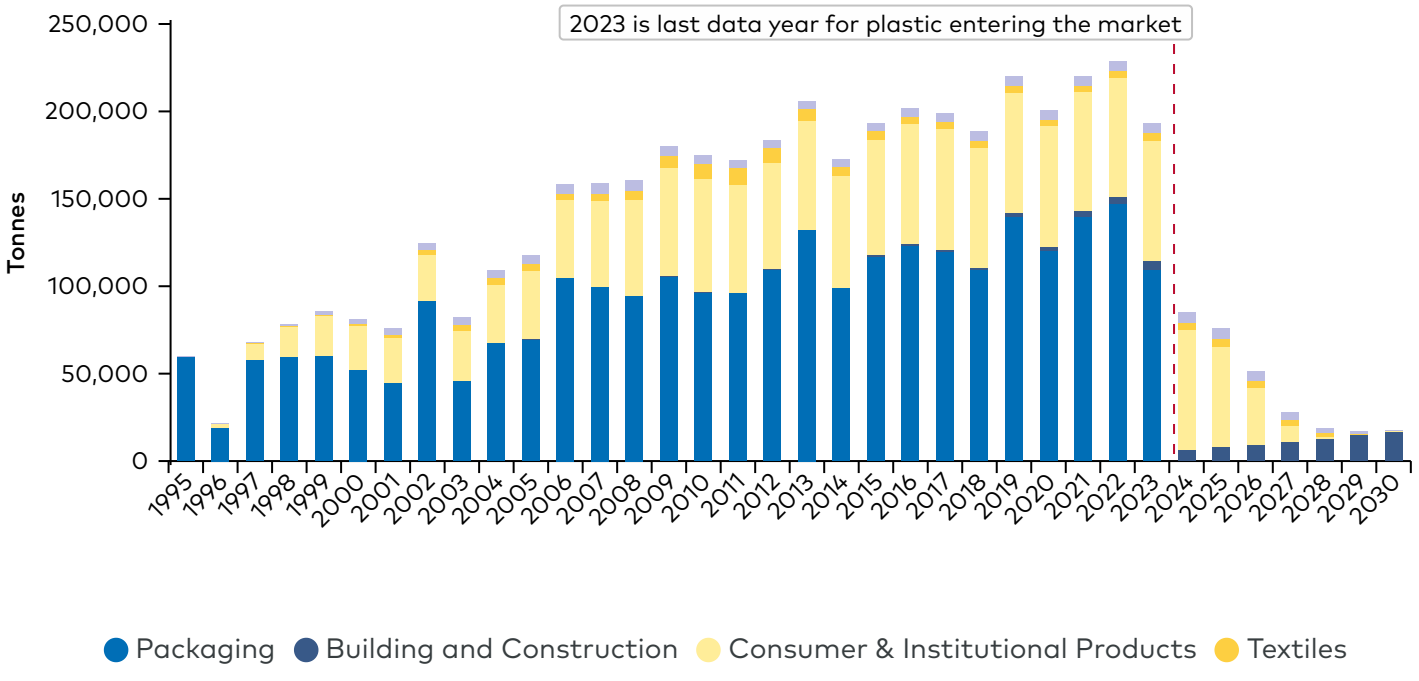


Figure 10 Plastic waste generated Norway

2.6 Insights into polymer composition

Polymer-level outputs offer value by highlighting dominant material types and potential risk areas but should be treated as indicative trends. Beyond estimating total plastic flows, the UNITAR model also provides a first indicative breakdown of polymer types over time. This is done by assigning typical polymer compositions to each product group, based on literature and expert judgement (as described in the guideline's annex) (UNITAR & UNEP, 2025). While approximate, this feature enables a harmonised view of material composition at both the put-on-market and waste stages.

More than a first-order indication of the plastic composition profile over time—valuable for understanding material dynamics—it also supports future analyses of recycling potential and chemical risk management, particularly for polymers associated with hazardous additives (e.g., PVC, PUR).

Figure 13 and 14 illustrates the polymer distribution in Sweden's put-on-market, and waste generated, volumes respectively. Sweden is shown as a standalone example because of the extreme outliers in other countries and to highlight the indicative and exploratory nature of these results.

The model suggests that polyethylene (PE) and polypropylene (PP) dominate the flows, followed by smaller shares of PET, PVC, and other polymers—broadly consistent with global estimates. A similar pattern is followed by Plastics Europe's data (Plastics Europe, 2024) which is quoted in Sweden's first MFA, published in 2019, while the most recent MFAs do not offer plastic type breakdown.

However, these outputs rely on additional assumptions, such as fixed product-to-polymer mappings and constant shares over time and should be interpreted with caution. These limitations are explicitly acknowledged in the UNITAR guideline as a source of uncertainty (UNITAR & UNEP, 2025).

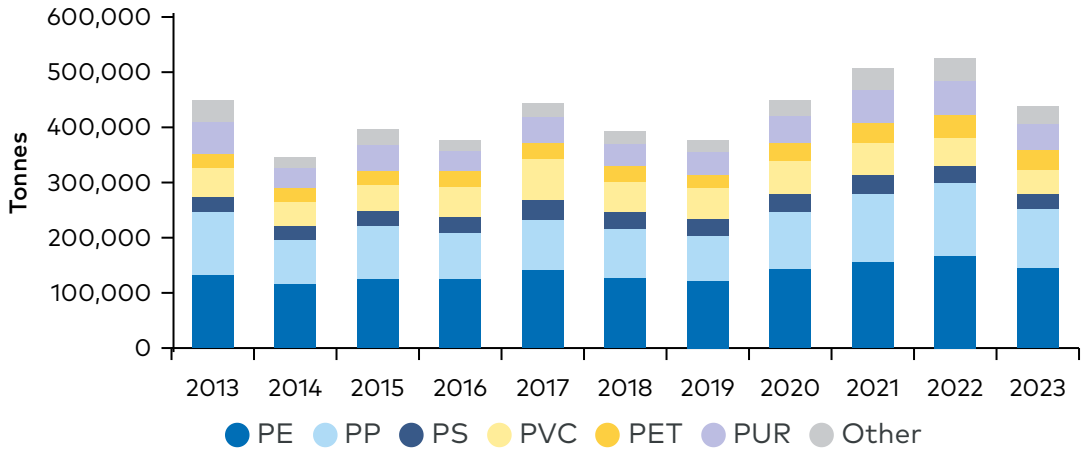


Figure 11 Polymer composition of plastic Put-on-Market (tonnes) – Sweden

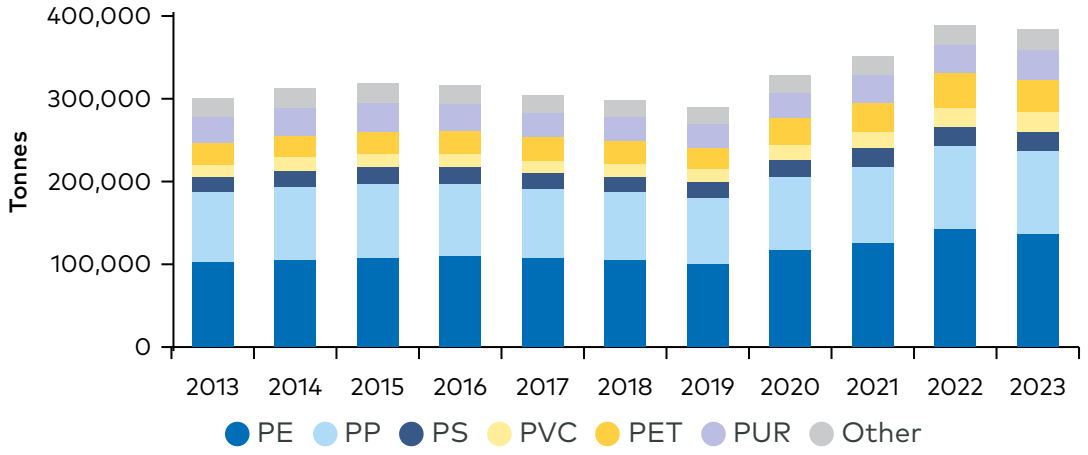


Figure 12 Polymer composition of plastic waste generated (tonnes) – Sweden

2.7 Lessons Learned

Summary

The Nordic pilot confirmed the conceptual value of the UNITAR model but also revealed key barriers to its reliable application. While several challenges—such as confidentiality restrictions and unit inconsistencies—were already known from previous studies, the pilot provided practical insight into how these issues affect model performance in real-world settings. Addressing them is essential to ensure credible, comparable results across countries.

The pilot application of the UNITAR model in the Nordic context offered concrete insights into the practical challenges of harmonising plastic statistics, as previously noted by, for example, Berge et al. (2023). Although national data availability is relatively strong, the process exposed technical, methodological, and institutional barriers that must be addressed to enable robust and comparable plastic-flow modelling across countries.

Input data quality limits model reliability

Although the Nordic countries maintain detailed trade and production statistics, several recurring quality issues affect the accuracy of model results. These include:

- **Confidentiality restrictions** that suppress item-level production data.[22]
- **Inconsistent units or conversions**, which could result in errors if data unit flags are not correct. Many of these issues are well-documented in statistical metadata and previous studies. However, the pilot confirmed how they distort plastic-flow modelling in practice
- **Discrepancies** between data obtained from national sources and from Eurostat.

Many of these issues are well-documented in statistical metadata and previous studies. However, the pilot confirmed how they distort plastic-flow modelling in practice. Each of these issues is explored in more depth in Appendix D, including case examples (e.g. Norway's Eurostat vs. SSB mismatch).

22. While confidentiality restrictions limit external access to detailed production data, national statistical agencies typically hold full access to these records. The model's outputs are aggregated and do not necessarily compromise confidentiality (even though this must be evaluated case by case when unsuppressed data is used). This makes it both feasible and necessary for statistical offices to take an active role in the modelling process—enabling full data use while safeguarding disclosure.

Complexity in converting different units to tonnes

Transportation is a large contributor to plastic consumption and waste. It also represents a complex product category that illustrates the challenges of producing harmonised plastic consumption estimates in tonnes across all categories. One example is ship production, as reported in PRODCOM, where output is measured in either units or CGT (Compensated Gross Tonnage). CGT is not a physical weight but a work index that combines a vessel's size and construction complexity into a single figure, allowing comparisons of labour effort between vessel types rather than their material content (see Compensated gross tonnage, Wikipedia). As a result, converting these CGT figures into tonnes of plastic requires additional assumptions about ship mass and typical plastic shares—data not available in PRODCOM itself.

Plastic content assumptions drive model sensitivity

Many plastic flow estimates depend not just on volume data, but on assumed plastic content per product. The pilot revealed that while some plastic-content coefficients can be considered reasonably accurate for common product groups (e.g. vehicles, clothing), others are less suitable for Nordic conditions — particularly in sectors where plastic content differ. The suitability of default coefficients varies by product group and national context. In general, assumptions for categories such as vehicles and clothing are likely to align reasonably well with Nordic conditions given their globalised markets.[23] In contrast, categories like packaging and construction may diverge more significantly, due to regional material choices (e.g. higher paper use in Nordic packaging). Additionally, country-specific industrial activities—such as shipbuilding or offshore platforms—can cause outliers that require targeted coefficient adjustments. The UNITAR model coefficients are set from a global perspective which means that adjustments are sometimes needed to better reflect local realities.[24]

A shared Nordic coefficient repository could help streamline future modelling efforts by coordinating updates across countries—especially for categories known to vary regionally, such as packaging, construction, WEEE and composites.

23. For more detailed information see chapter 3 *Status of monitoring plastic share in waste streams in the Nordics*
24. In Norway, for example, default coefficients created large spikes in estimated plastic volumes for certain industrial products (e.g. drilling platforms). These artefacts reflect how a small number of outlier codes can distort results unless coefficients are tailored to national conditions.

Harmonisation benefits depend on Nordic organisations working in a consistent way

The modelling work highlighted that statistical harmonisation is not only technical, but institutional. Differences exist between countries in:

- How they define the stages of plastic flows[25]
- What can be shared publicly by organisations due to legal constraints
- How much staff time and resources agencies can dedicate to maintaining and updating data

These differences limit the comparability and repeatability of national models unless coordinated structures are in place. The pilot underlines the value of a Nordic working group for plastics statistics to maintain assumptions, align classifications, and ensure a consistent interface with UNITAR reporting frameworks.

Conclusion

The UNITAR model is conceptually sound and broadly implementable. However, the Nordic pilot shows that reliable results depend on four enablers:

1. Improved input data validation
2. Updated and aligned plastic-content assumptions
3. Institutional capacity and mandate for harmonisation
4. Ongoing Nordic collaboration and shared model maintenance

Together, these are prerequisites for delivering robust, policy-relevant plastic-flow statistics—nationally and internationally.

25. For example, Norway defines the plastic waste generated amount to be equal to the plastic waste collected volume – which implies a 100% recovery rate (Workshop participant, March 2024). In contrast, Sweden does not apply a fixed formula; according to the Swedish Environmental Protection Agency, national statistics are based on reported plastic waste from companies and municipalities, categorised by SNI codes (Swedish EPA representative, personal communication, 2024).

3 Status of monitoring plastic share in waste streams in the Nordics

Summary

Nordic countries adopt different methods to monitor plastic waste as a share of specific waste streams but primarily in larger scale studies related to material flow analyses. These methods involve the use of plastic percentage factors in products or waste streams which, on its own, can pose as a simplified, resource-efficient approach to enhance regular monitoring and follow up. However, the appropriate selection of percentage factors, considering context-specific variations, is crucial for improving the reliability of estimates.

Most countries track the amount of plastic waste as an individual waste stream, or the share of plastic waste in mixed or residual waste. This section discusses the monitoring of plastic waste as a share of other specific waste streams, such as electronics, end-of-life (EoL) vehicles and textiles.

The method used to estimate plastic shares in waste streams varies amongst Nordic countries, which typically involve larger-scale and more resource intensive approaches such as material flow analyses using economic supply-use tables or conducting waste audits. Additionally, such efforts tend to be larger one-off studies rather than regular monitoring.

A method that is relatively informal, resource efficient and regularly replicable would allow for closer follow up and monitoring of the plastic shares in waste. However, one reason that this may not be standardized across countries is because it is not a requirement to report such figures in Eurostat (Tønder, 2025).

Below is a summary of the methods used by Nordic countries in more recent years, mainly based on information given by contacts at the respective statistics and environment authorities.

Table 2 Methods and efforts by Nordic countries to track plastic shares in waste streams in recent years

Country	Methods and efforts of tracking plastic
Denmark	Conducted an accounting of plastic flows in 2016 using physical supply-use tables which contains figures on product and waste flows. Standard percentage factors (derived from literature and various sources) for plastic content by product and waste types were applied to total volumes to obtain plastic content shares (Pedersen, 2025; Gravgård, et al., 2021; UNITAR & UNEP, 2025).
Finland	Currently developing a model to assess plastic content in waste streams, which involves applying estimated plastic shares from literature to generated waste volumes obtained from EPR statistics. In the example of WEEE, EEE was divided into seven product groups, and each had a different estimate for plastic shares (Johansson, 2025).
Iceland	Methods mainly focus on tracking plastic shares in total waste or specifically on plastic packaging or plastic waste, rather than shares of plastic waste in specific waste streams.
Norway	In 2023, Statistics Norway published a national plastics account which involves applying plastic fraction figures (in percentage) to total waste amount in a particular waste stream, to estimate the amount of plastic waste fraction in that waste stream (Berge et al., 2023). An update of this report will be published in 2025.
Sweden	In 2022, the Swedish Environmental Protection Agency published a report on the mapping of plastic flows in 2020 (Fråne et al., 2022). For some waste streams such as electronics, standard percentage factors were used to estimate plastic content. An updated version of the plastic flows mapping for 2023 is expected in late June 2025.

As seen in the table above, one commonality amongst the methods used by Nordic countries is the application of standard percentage factors to estimate plastic content in products and waste as a proxy to estimate plastic share in specific waste streams. The application of standard percentage factors on its own may be a useful tool for informal regular monitoring.

3.1 Use of standard percentage factors as a standalone method

Using standard percentage factors to estimate plastic content share involves selecting a percentage that represents the proportion of plastics in a given product or waste stream. This percentage, derived from literature, studies or other sources, is then applied to the total quantity of the waste stream to calculate the estimated amount of plastics.

This method can be useful to provide a general estimation of trends to inform the development of strategies, policies and other actions. However, since figures from literature and studies can be highly context-specific, the chosen percentage should align with the socioeconomic context of its application. The assumptions behind the figure and its selection should also be clearly documented.

It is important to note that the plastic composition figures of a product can differ significantly from that of its respective waste stream, and as such, there are trade-offs between selecting product-based and waste stream-based figures. Product composition data is more accessible but does not always reflect waste stream composition due to delays between market introduction and disposal. Additionally, product design changes over time, so the plastic shares and types in waste streams may vary over time. On the other hand, waste stream composition data can reflect the waste stream more directly, but because they are often derived from waste audits or LCA studies set in specific socioeconomic contexts, they may not represent the context in which they are applied.

Therefore, there is a difference between selecting figures based on plastic composition in product and figures based on composition in the waste stream. Again, in this case it is important to consider the full assumptions and context behind the figure during the selection process.

3.2 Figures on plastic shares in products and waste streams

For illustrative purposes, this section presents a selection of percentage factors of plastic share in products and waste streams (and underlying assumptions) from literature and other studies, with the potential for application in a Nordic context. To the extent possible, studies in the northwestern European context were[26] for selecting waste streams are based on the severity of the issue in society, which is reflected in their priority on the political agenda and their potential impact if addressed, and wherever possible, connected to existing EWC codes. Waste streams that are composed predominantly of plastic (e.g. plastic packaging) are excluded because in such cases the standard factor can be assumed to be 100%.

26. Based on the respective criteria in the cost-benefit analysis of the report: "Harmonisation of plastic statistics in the Nordics"

prioritized over global or other general figures. The criteria[27] for selecting waste streams are based on the severity of the issue in society, which is reflected in their priority on the political agenda and their potential impact if addressed, and wherever possible, connected to existing EWC codes. Waste streams that are composed predominantly of plastic (e.g. plastic packaging) are excluded because in such cases the standard factor can be assumed to be 100%.

Table 3 Standard percentage factors of plastic content in products and waste streams

Product or waste stream	Plastic share (%)	Source and assumptions
Textiles		
Product	68% plastic share - of the total global fibres placed on the market Of the total fibres placed on market globally (by polymer type): • 57% polyester • 5% polyamide (nylon) • 3% polypropylene • 2% acrylic • 1% elastane (spandex)	(Textile Exchange, 2023) % Share of total global fibre market in 2023. Note: This source updates annually, so users should search for the latest available data.
Waste stream	In all shares • 9% plastic share in "clothing" • 7% plastic share in "home textiles" In "reuse" category • 9% plastic share in "clothing" • 8% plastic share in "home textiles" In "recycling" category • 10% plastic share in "clothing" • 6% plastic share in "home textiles"	(Brieger et al., 2021) Based on a waste audits of used textiles in Hamburg, Germany in 2021. A total of 15m3 or 1,968kg of used textiles were collected on a recycling yard and sorted. 70% was assigned to sorting group Reuse (i.e. has reuse potential) and 26% to Recycling (i.e. has recycling potential without differentiation from energy recovery as recycling). Bags and other residual material accounted for the remaining 4%.
WEEE		

27. Based on the respective criteria in the cost-benefit analysis of the report: "Harmonisation of plastic statistics in the Nordics"

Waste stream	• 3%: Large equipment excluding solar panels • 18%: Small equipment, screens and small IT • 22%: Temperature exchange equipment • 4%: Lamps	(Fråne et al., 2022) Based on data from 2020 by the Swedish Producer Responsibility Organization El-Kretsen. Note: the data combines several of the six categories (i.e. 1. Temperature exchange equipment, 2. Screens and small IT, 3. lamps, 4. Large equipment, 5. Small equipment and 6. Small IT) under the WEEE Directive into four categories.
EoL vehicles		
Product	In a "modern automobile" 10% plastic by weight	(Mashek, 2016) Not geographically specific. Assuming internal combustion vehicle.
	In one "typical car", plastic content broken down by polymer type: • 37% PP, • 27% PUR and PA • 27% PE, PVC, ABS and PET • 9% PC, PMMA, PBT and POM	(Matos, Santos, Simoes, Martins, & Simoes, 2023) citing multiple sources. Polymer composition in the total plastic share of a car. Type of car not specified. Assuming internal combustion vehicle.
	In a "mid-size" internal combustion vehicle, by weight: • 9,4% plastic and composites • 5% synthetic rubber/elastomers In a "mid-size" electric vehicle, by weight: • 10% plastic and polymer composites • 5,6% synthetic rubber/elastomers	(American Chemistry Council, 2024) It's interpreted that synthetic rubber/elastomers are additional to plastic and polymer composites. Geographic context set in the USA.
Batteries		
Product	In an electric vehicle lithium-ion battery pack, by weight: 2-6% plastic	(Duan, 2022) May assume figures are based on battery packs manufactured in China.
Car tires		

Product	In passenger/light truck tire: • 24% synthetic polymers • 19% natural rubber • 4% textiles (combination of polyester, rayon (semi-synthetic), nylon and aramid cord fabric) In a truck tire: • 34% natural rubber • 11% synthetic polymers	(U.S. Tire Manufacturers Association, 2025) Remainder of materials consist of various chemicals, steel and fillers. One may assume that the context is more relevant to the USA.

3.3 Conclusion

To illustrate the use of standard plastic percentage factors to estimate plastic shares in waste streams, this report section provided an indicative list of figures, their sources and the general assumptions made. However, further research and consideration of the assumptions behind the figures should be made by official statistics agencies before they are adopted in the production of statistics. Statistics producers should also assess whether the figures are appropriate for adoption specifically in their respective geographical context.

This conclusion section provides some commentary on the sources behind the various product or waste streams.

For textiles, data provided by Brieger et al. (2021) offers a granular and recent indication for the Nordic context, considering the waste audit was conducted within the last five years in a central European, relatively high-income city. The data offers granularity to covering the general stream as well as sub streams such as "recycling" and "reuse". If the geographic context is not suitable, then plastic share in fibers placed on the market by the Textile Exchange (2023) could be used as a proxy. However, as the extended producer responsibility scheme on textiles is expected in the future, it is anticipated that data from advanced textile sorting facilities will be able to provide high quality data of textile waste composition. Therefore, it may not be worthwhile to invest significant resources in monitoring plastics solely within textiles at this stage.

On WEEE, data from the Swedish PRO El-Kretsen was identified, which is likely a good representation of other Nordic countries. However, certain WEEE categories have been combined to provide single figures. The shares vary between 4 and 22% across the different categories and the source does not specify whether the four categories indeed cover the entire waste stream of WEEE. To be able to apply these shares, the relative share of each category (of the full WEEE stream) must be

considered.

The estimations of plastic fractions in end-of-life vehicles, batteries, and car tires are reliant on data at the product level since waste-stream level data was not found. The figures that were found allowed for further differentiation within one product type, such as differentiating between internal combustion and electric vehicles (for end-of-life vehicles), and between passenger and truck tires (for waste tires). This differentiation can provide greater nuance in monitoring plastic waste. While the geographic context of these data sources is more ambiguous, it does not necessarily mean they are not representative of the Nordic context, given the globalized nature of markets. Nonetheless, further research should be made if the figures are intended for official statistics production.

4 Conclusions and recommendations

The Nordic pilot illustrates that the UNITAR model is technically feasible to apply across countries, and conceptually sound as a harmonised framework for plastic-flow statistics. However, the pilot also shows that the quality, completeness and comparability of outputs depend critically on foundational work across three fronts:

- Cleaning and validating key trade and production data
- Updating plastic-content assumptions where needed to increase alignment with national/Nordic conditions
- Aligning institutional rules, terminology, and capacity

Taken together, these lessons highlight both the model's promise and the concrete actions needed to realise its full value.

Model limitations reflect scope, not design flaws

The differences between the UNITAR model outputs and national plastic inventories are partly explained by the model's limited coverage at this stage. As of this pilot, only 36% of relevant HS codes and 39% of CPC codes were included, leaving key product groups outside the scope. These differences do not indicate that the model is flawed, but are expected side effects of applying an early-stage version. However, systemic issues—such as default assumptions, input data quality, and unit mismatches—must be addressed to build confidence in the model's results.

Value of harmonisation is clear, provided challenges are addressed

Despite its current limitations, the pilot suggests that harmonised modelling can support international comparability, policy planning, and treaty reporting. The UNITAR model offers a consistent structure for tracking plastic put-on-market and waste generation in a comparable way—provided it is supported by better data inclusion and coordinated refinement efforts, such as updating plastic content assumptions, and improving data cleaning and validation.

Data on plastic shares in waste streams are fragmented and do not match waste data

The plastic shares in certain waste streams are based on the available estimates identified by this study, using either product data or waste data. The weakness of using the product's plastic share is that the corresponding waste stream may not

have the same composition. Additionally, this study has found that obtaining reliable product data is a challenge. Estimates of plastic share that are based on waste data was identified for two of the studied streams: WEEE and textiles. A challenge in this case is to identify estimates that match waste statistics, i.e. the European Waste Codes (EWC) or equivalent to be applied. Hence, the available research largely does not coincide with these conditions.

4.1 Recommendations

The recommendations below are designed to support more robust, comparable, and policy-relevant plastic statistics across the Nordic countries. Each proposal builds on insights from this project.

Recommendation 1: Establish a Nordic coordination mechanism for plastic statistics

Insight: National efforts are fragmented, and institutional prerequisites vary

- Form a Nordic reference group with regular meetings, including key experts from each country's EPA and statistics office.
- Assign the group a clear mandate to validate priorities, oversee harmonisation efforts, and coordinate inputs to international processes.
- Assign the group responsibility for onboarding updates from international standards, documenting choices, and resolving methodological conflicts.
- Secure a dedicated budget to enable continuity, coordination, and follow-up between meetings.
- Consider rotating leadership or secretariat functions to maintain engagement across countries.

Recommendation 2: Launch a joint Nordic–UNITAR project to put the method into practice

Insight: Nordic countries already have strong datasets, but lack a structured forum to jointly apply, test, and improve the UNITAR method.

- Initiate a project directly involving key participants from Nordic statistical and environmental protection agencies together with UNITAR to work on applying the UNITAR model to Nordic plastic statistics.
- Ensure adequate resources are made available for active participation by each country's statistical and environmental authorities, with emphasis on:
- Validating and cleaning trade and production data (as well as estimating time periods before the model and projecting into the future for accurate waste generation time series)

- Ensuring comprehensive inclusion of all relevant trade and production codes in the model
- Developing and harmonising plastic-content coefficients, especially in areas with national deviations or unique sectors (e.g. Norwegian offshore infrastructure)
- Comparing modelled flows against existing national estimates (e.g. packaging POM, recycling rates)
- Use the project to assess the coverage, sensitivity, and comparability of the model before scaling to routine implementation.

Recommendation 3: Collaborate with Producer Responsibility Organisation to explore existing and produce plastic share data

This study has identified recent textile waste data that can be applied on the textile waste stream. The source is relevant to the Nordic countries and is relatively recent (2021). It is recommended to use this data as a temporary proxy. To obtain more recent, continuous and Nordic textile data, it is recommended to form a dialogue with modern textile sorting facilities to explore how plastics in textiles can be monitored moving forward. Additionally, once Producer Responsibility Organisations are formed, they should be included in the dialogue.

The plastic share of the WEEE fraction can be estimated using data from El-kretsen, however it must be clarified how the shares for the four sub streams can be applied to the EWC coded streams.

In regard to WEEE, batteries, End of Life Vehicles and car tyres, all streams are covered by EPR legislation and thereby responsible for the generated waste and it's handling. It is therefore recommended to increase the dialogue with the Producer Responsibility Organisations and initiate a partnership that:

- Explore existing data and identify methods to produce primary data through for example waste audits.
- Fund production of fit for purpose data

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Appendix A: Adding trade and production data to the model

To evaluate the status of the UNITAR draft plastic model in the Nordic context Sweco set out to collect the necessary data from each respective Nordic country. To calculate (1) plastic Put-on-Market (POM) and (2) plastic waste generated using the UNITAR model a two-step process is needed:

1. Insert trade and production data into the Plastic Embedded POM-Calculation Tool
2. This tool estimates the volume of plastic entering the market (POM) based on product-level trade and production statistics combined with assumed plastic content fractions.
3. Transfer the POM outputs to the Plastic Waste Generated Tool
4. This tool applies lifetime assumptions to model annual plastic waste generation across product categories.

Trade data and HS code access

The UNITAR model uses HS codes (Harmonised System) to identify relevant traded goods.

Sweco retrieved trade data from:

- **Eurostat's open access API** for the members of the European Union: Sweden, Denmark, and Finland.
- **Statistics Norway's (SSB) API** for Norwegian trade data.

The project relied on HS6-level codes, which are globally standardised and form the core of both UN and EU trade classification systems. The figure below illustrates how CN codes used in the EU system map back to the required HS codes for the model.

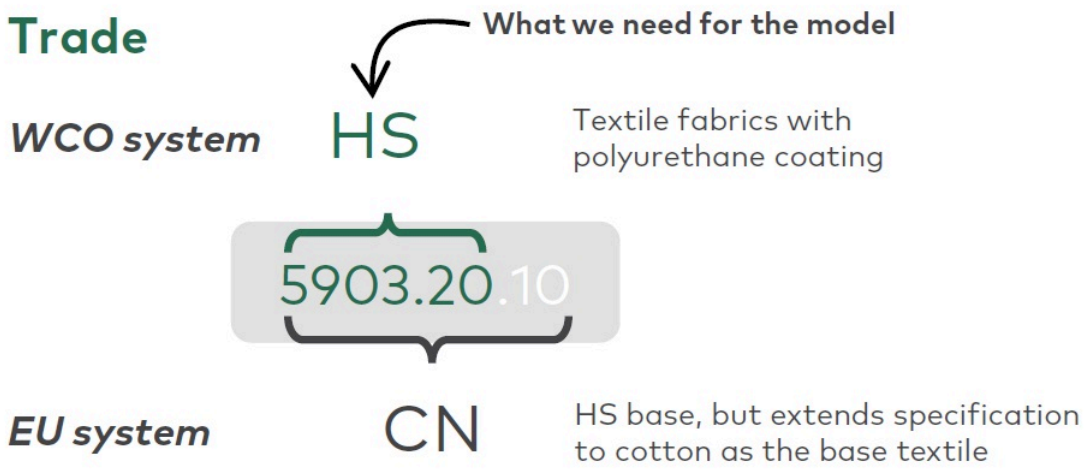

Figure 13 UN Harmonised system (HS) trade codes are collected directly from Eurostat.
For trade codes the UNITAR model uses HS codes which are already available from Eurostat – which allows us to access them directly

Production data and code mapping

The UNITAR model uses **CPC codes (Central Product Classification)** to classify production data.

As EU countries report production using the **PRODCOM** system, a two-stage code conversion was required:

- **Step 1:** PRODCOM → CPA (the first 6 digits of PRODCOM correspond to CPA)
- **Step 2:** CPA → CPC using official correspondence tables

This mapping ensured compatibility with the UNITAR model, which expects inputs in CPC format. See Figure 2 for an illustration of the conversion chain from PRODCOM to CPC.

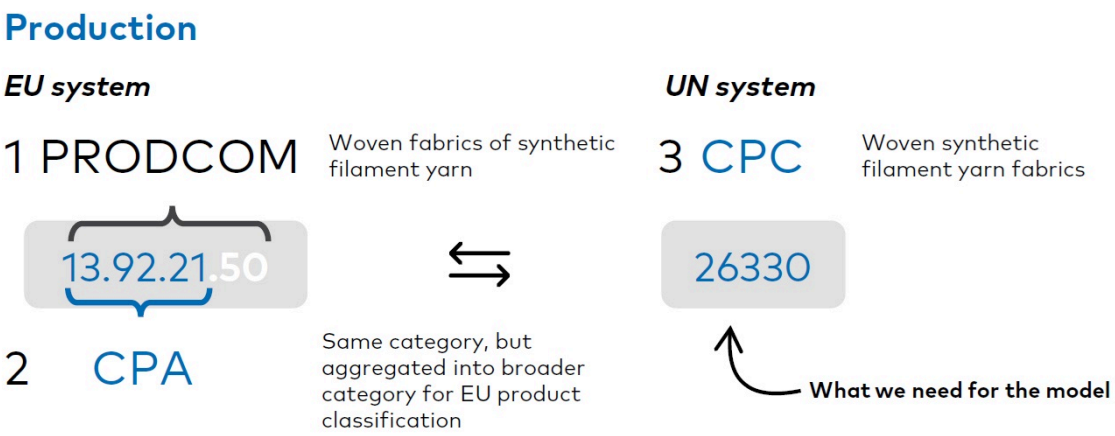

Figure 14 Production PRODCOM codes need to first be aggregated to CPA codes and then secondly converted to the UN CPC production codes to insert the values into the UNITAR models.

For production codes the UNITAR model uses CPC codes.

1. PRODCOM codes are most widely used in EU.
2. They first are aggregated to CPA codes
3. Then converted to CPC codes using official correspondence tables.

Appendix B: Pilot Model (HS) codes

Table 4 UNITAR Pilot Model trade (HS) codes

HS	Description
392310	Boxes, cases, crates and similar articles for the conveyance or packaging of goods, of plastics
392330	Carboys, bottles, flasks and similar articles for the conveyance or packaging of goods, of plastics
392321	Sacks and bags, incl. cones, of polymers of ethylene
392329	Sacks and bags, incl. cones, of plastics (excl. those of polymers of ethylene)
200911	Frozen orange juice, unfermented, whether or not containing added sugar or other sweetening matter (excl. containing spirit)
200912	Orange juice, unfermented, Brix value <= 20 at 20¬∞C, whether or not containing added sugar or other sweetening matter (excl. containing spirit and frozen)
200919	Orange juice, unfermented, whether or not containing added sugar or other sweetening matter (excl. containing spirit, frozen, and of a Brix value <= 20 at 20¬∞C)
200921	Grapefruit juice, unfermented, Brix value <= 20 at 20¬∞C, whether or not containing added sugar or other sweetening matter (excl. containing spirit)
200929	Grapefruit juice, unfermented, Brix value > 20 at 20¬∞C, whether or not containing added sugar or other sweetening matter (excl. containing spirit)
200931	Single citrus fruit juice, unfermented, Brix value <= 20 at 20¬∞C, whether or not containing added sugar or other sweetening matter (excl. containing spirit, mixtures, orange juice and grapefruit juice)
200939	Single citrus fruit juice, unfermented, Brix value > 20 at 20¬∞C, whether or not containing added sugar or other sweetening matter (excl. containing spirit, mixtures, orange juice and grapefruit juice)
200941	Pineapple juice, unfermented, Brix value <= 20 at 20¬∞C, whether or not containing added sugar or other sweetening matter (excl. containing spirit)
200949	Pineapple juice, unfermented, Brix value > 20 at 20¬∞C, whether or not containing added sugar or other sweetening matter (excl. containing spirit)

200950	Tomato juice, unfermented, whether or not containing added sugar or other sweetening matter (excl. containing spirit)
200961	Grape juice, incl. grape must, unfermented, Brix value <= 30 at 20¬∞C, whether or not containing added sugar or other sweetening matter (excl. containing spirit)
200969	Grape juice, incl. grape must, unfermented, Brix value > 30 at 20¬∞C, whether or not containing added sugar or other sweetening matter (excl. containing spirit)
200971	Apple juice, unfermented, Brix value <= 20 at 20¬∞C, whether or not containing added sugar or other sweetening matter (excl. containing spirit)
200979	Apple juice, unfermented, Brix value > 20 at 20¬∞C, whether or not containing added sugar or other sweetening matter (excl. containing spirit)
200981	Cranberry "Vaccinium macrocarpon, Vaccinium oxycoccos, Vaccinium vitis-idaea" juice, unfermented, whether or not containing added sugar or other sweetening matter (excl. containing spirit)
200989	Juice of fruit or vegetables, unfermented, whether or not containing added sugar or other sweetening matter (excl. containing spirit, mixtures, and juice of citrus fruit, pineapples, tomatoes, grapes, incl. grape must, apples and cranberries)
200990	Mixtures of fruit juices, incl. grape must, and vegetable juices, unfermented, whether or not containing added sugar or other sweetening matter (excl. containing spirit)
220110	Mineral waters and aerated waters, not containing added sugar, other sweetening matter or flavoured
220190	Ordinary natural water, not containing added sugar, other sweetening matter or flavoured; ice and snow (excl. mineral waters and aerated waters, sea water, distilled water, conductivity water or water of similar purity)
220210	Waters, incl. mineral and aerated, with added sugar, sweetener or flavour, for direct consumption as a beverage
860110	Rail locomotives powered from an external source of electricity
860120	Rail locomotives powered by electric accumulators
860210	Diesel-electric locomotives
860290	Rail locomotives (excl. those powered from an external source of electricity or by accumulators and diesel-electric locomotives)
860310	Self-propelled railway or tramway coaches, vans and trucks, powered from an external source of electricity (excl. those of heading 8604)

860390	Self-propelled railway or tramway coaches, vans and trucks (excl. those powered from an external source of electricity and those of heading 8604)
860400	Railway or tramway maintenance or service vehicles, whether or not self-propelled, e.g., workshops, cranes, ballast tampers, trackliners, testing coaches and track inspection vehicles
860500	Railway or tramway passenger coaches, luggage vans, post office coaches and other special purpose railway or tramway coaches (excl. self-propelled railway or tramway coaches, vans and trucks, railway or tramway maintenance or service vehicles and goods vans and wagons)
860610	Railway or tramway tank wagons and the like (excl. self-propelled)
860630	Railway or tramway self-discharging goods vans and wagons (excl. tank wagons and the like and insulated or refrigerated goods vans and wagons)
860691	Railway or tramway goods vans and wagons, covered and closed (excl. self-discharging goods vans and wagons and tank wagons and the like)
860692	Railway or tramway goods vans and wagons, open, with non-removable sides of a height > 60 cm (excl. self-discharging wagons)
860699	Railway or tramway goods vans and wagons (excl. those specially designed for the transport of highly radioactive materials, tank wagons and the like, insulated, refrigerated or self-discharging goods vans and wagons and open goods vans and wagons with non-removable sides of a height > 60 cm)
870110	Pedestrian-controlled agricultural tractors and similar tractors for industry (excl. tractor units for articulated lorries)
870120	Road tractors for semi-trailers
870130	Track-laying tractors (excl. pedestrian-controlled)
870191	Tractors, of an engine power <= 18 kW (excl. those of heading 8709, pedestrian-controlled tractors, road tractors for semi-trailers and track-laying tractors)
870192	Tractors, of an engine power > 18 kW but <= 37 kW (excl. those of heading 8709, pedestrian-controlled tractors, road tractors for semi-trailers and track-laying tractors)
870193	Tractors, of an engine power > 37 kW but <= 75 kW (excl. those of heading 8709, pedestrian-controlled tractors, road tractors for semi-trailers and track-laying tractors)
870194	Tractors, of an engine power > 75 kW but <= 130 kW (excl. those of heading 8709, pedestrian-controlled tractors, road tractors for semi-trailers and track-laying tractors)
870195	Tractors, of an engine power > 130 kW (excl. those of heading 8709, pedestrian-controlled tractors, road tractors for semi-trailers and track-laying tractors)

870210	Motor vehicles for the transport of >= 10 persons, incl. driver, with only diesel engine
870220	Motor vehicles for the transport of >= 10 persons, incl. driver, with both diesel engine and electric motor as motors for propulsion
870230	Motor vehicles for the transport of >= 10 persons, incl. driver, with both spark-ignition internal combustion reciprocating piston engine and electric motor as motors for propulsion
870240	Motor vehicles for the transport of >= 10 persons, incl. driver, with only electric motor for propulsion
870290	Motor vehicles for the transport of >= 10 persons, incl. driver (excl. with diesel engine or electric motor for propulsion)
870310	Vehicles for the transport of <10 persons on snow; golf cars and similar vehicles
870321	Motor cars and other motor vehicles principally designed for the transport of <10 persons, incl. station wagons and racing cars, with only spark-ignition internal combustion reciprocating piston engine of a cylinder capacity <= 1.000 cm¬≥ (excl. vehicles for travelling on snow and other specially designed vehicles of subheading 8703.10)
870322	Motor cars and other motor vehicles principally designed for the transport of <10 persons, incl. station wagons and racing cars, with only spark-ignition internal combustion reciprocating piston engine of a cylinder capacity > 1.000 cm¬≥ but <= 1.500 cm¬≥ (excl. vehicles for travelling on snow and other specially designed vehicles of subheading 8703.10)
870323	Motor cars and other motor vehicles principally designed for the transport of <10 persons, incl. station wagons and racing cars, with only spark-ignition internal combustion reciprocating piston engine of a cylinder capacity > 1.500 cm¬≥ but <= 3.000 cm¬≥ (excl. vehicles for travelling on snow and other specially designed vehicles of subheading 8703.10)
870324	Motor cars and other motor vehicles principally designed for the transport of <10 persons, incl. station wagons and racing cars, with only spark-ignition internal combustion reciprocating piston engine of a cylinder capacity > 3.000 cm¬≥ (excl. vehicles for travelling on snow and other specially designed vehicles of subheading 8703.10)
870331	Motor cars and other motor vehicles principally designed for the transport of <10 persons, incl. station wagons and racing cars, with only diesel engine of a cylinder capacity <= 1.500 cm¬≥ (excl. vehicles for travelling on snow and other specially designed vehicles of subheading 8703.10)
870332	Motor cars and other motor vehicles principally designed for the transport of <10 persons, incl. station wagons and racing cars, with only diesel engine of a cylinder capacity > 1.500 cm¬≥ but <= 2.500 cm¬≥ (excl. vehicles for travelling on snow and other specially designed vehicles of subheading 8703.10)
870333	Motor cars and other motor vehicles principally designed for the transport of <10 persons, incl. station wagons and racing cars, with only diesel engine of a cylinder capacity > 2.500 cm¬≥ (excl. vehicles for travelling on snow and other specially designed vehicles of subheading 8703.10)

870340	Motor cars and other motor vehicles principally designed for the transport of <10 persons, incl. station wagons and racing cars, with both spark-ignition internal combustion reciprocating piston engine and electric motor as motors for propulsion (excl. vehicles for travelling on snow, other specially designed vehicles of subheading 8703.10 and plug-in hybrids)
870350	Motor cars and other motor vehicles principally designed for the transport of <10 persons, incl. station wagons and racing cars, with both diesel engine and electric motor as motors for propulsion (excl. vehicles for travelling on snow, other specially designed vehicles of subheading 8703.10 and plug-in hybrids)
870360	Motor cars and other motor vehicles principally designed for the transport of <10 persons, incl. station wagons and racing cars, with both spark-ignition internal combustion reciprocating piston engine and electric motor as motors for propulsion, capable of being charged by plugging to external source of electric power (excl. vehicles for travelling on snow and other specially designed vehicles of subheading 8703.10)
870370	Motor cars and other motor vehicles principally designed for the transport of <10 persons, incl. station wagons and racing cars, with both diesel engine and electric motor as motors for propulsion, capable of being charged by plugging to external source of electric power (excl. vehicles for travelling on snow and other specially designed vehicles of subheading 8703.10)
870380	Motor cars and other motor vehicles principally designed for the transport of <10 persons, incl. station wagons and racing cars, with only electric motor for propulsion (excl. vehicles for travelling on snow and other specially designed vehicles of subheading 8703.10)
870390	Motor cars and other vehicles principally designed for the transport of <10 persons, incl. station wagons and racing cars, with engines other than internal combustion piston engine or electric motor (excl. vehicles for the transport of persons on snow and other specially designed vehicles of subheading 8703.10)
870410	Dumpers for off-highway use
870421	Motor vehicles for the transport of goods, with compression-ignition internal combustion piston engine "diesel or semi-diesel engine" of a gross vehicle weight <= 5 t (excl. dumpers for off-highway use of subheading 8704.10 and special purpose motor vehicles of heading 8705)
870422	Motor vehicles for the transport of goods, with compression-ignition internal combustion piston engine "diesel or semi-diesel engine" of a gross vehicle weight > 5 t but <= 20 t (excl. dumpers for off-highway use of subheading 8704.10 and special purpose motor vehicles of heading 8705)
870423	Motor vehicles for the transport of goods, with compression-ignition internal combustion piston engine "diesel or semi-diesel engine" of a gross vehicle weight > 20 t (excl. dumpers for off-highway use of subheading 8704.10 and special purpose motor vehicles of heading 8705)
870431	Motor vehicles for the transport of goods, with spark-ignition internal combustion piston engine, of a gross vehicle weight <= 5 t (excl. dumpers for off-highway use of subheading 8704.10 and special purpose motor vehicles of heading 8705)

870432	Motor vehicles for the transport of goods, with spark-ignition internal combustion piston engine, of a gross vehicle weight > 5 t (excl. dumpers for off-highway use of subheading 8704.10 and special purpose motor vehicles of heading 8705)
870490	Motor vehicles for the transport of goods, with engines other than internal combustion piston engine (excl. dumpers for off-highway use of subheading 8704.10 and special purpose motor vehicles of heading 8705)
870510	Crane lorries (excl. breakdown lorries)
870520	Mobile drilling derricks
870530	Fire fighting vehicles (excl. vehicles for transporting persons)
870540	Concrete-mixer lorries
870911	Electrical vehicles not fitted with lifting or handling equipment, of the type used in factories, warehouses, dock areas or airports for short distance transport of goods; tractors of the type used on railway station platforms
870919	Works trucks, self-propelled, not fitted with lifting or handling equipment, of the type used in factories, warehouses, dock areas or airports for short distance transport of goods; tractors of the type used on railway station platforms (excl. electrical trucks)
871000	Tanks and other armoured fighting vehicles, motorised, whether or not fitted with weapons, and parts of such vehicles, n.e.s.
871110	Motorcycles, incl. mopeds, with reciprocating internal combustion piston engine of a cylinder capacity <= 50 cm¬≥
871120	Motorcycles, incl. mopeds, with reciprocating internal combustion piston engine of a cylinder capacity > 50 cm¬≥ but <= 250 cm¬≥
871130	Motorcycles, incl. mopeds, with reciprocating internal combustion piston engine of a cylinder capacity > 250 cm¬≥ but <= 500 cm¬≥
871140	Motorcycles, incl. mopeds, with reciprocating internal combustion piston engine of a cylinder capacity > 500 cm¬≥ but <= 800 cm¬≥
871150	Motorcycles, incl. mopeds, with reciprocating internal combustion piston engine of a cylinder capacity > 800 cm¬≥
871160	Motorcycles, incl. mopeds, and cycles fitted with an auxiliary motor, with electric motor for propulsion
871200	Bicycles and other cycles, incl. delivery tricycles, not motorised
871310	Carriages for disabled persons, not mechanically propelled

871390	Carriages for disabled persons, motorised or otherwise mechanically propelled (excl. specially designed motor vehicles and bicycles)
871610	Trailers and semi-trailers of the caravan type, for housing or camping
871631	Tanker trailers and tanker semi-trailers, not designed for running on rails
871639	Trailers and semi-trailers for the transport of goods, not designed for running on rails (excl. self-loading or self-unloading trailers and semi-trailers for agricultural purposes and tanker trailers and tanker semi-trailers)
880100	Balloons and dirigibles; gliders, hang gliders and other non-powered aircraft
880211	Helicopters of an unladen weight <= 2.000 kg
880212	Helicopters of an unladen weight > 2.000 kg
880220	Aeroplanes and other powered aircraft of an unladen weight <= 2.000 kg (excl. helicopters and dirigibles)
880230	Aeroplanes and other powered aircraft of an unladen weight > 2.000 kg but <= 15.000 kg (excl. helicopters and dirigibles)
880240	Aeroplanes and other powered aircraft of an of an unladen weight > 15.000 kg (excl. helicopters and dirigibles)
880260	Spacecraft, incl. satellites, and suborbital and spacecraft launch vehicles
890110	Cruise ships, excursion boats and similar vessels principally designed for the transport of persons; ferry-boats of all kinds
890120	Tankers
890130	Refrigerated vessels (excl. tankers)
890190	Vessels for the transport of goods and vessels for the transport of both persons and goods (excl. refrigerated vessels, tankers, ferry-boats and vessels principally designed for the transport of persons)
890200	Fishing vessels; factory ships and other vessels for processing or preserving fishery products (excl. fishing boats for sport)
890310	Inflatable vessels for pleasure or sports
890391	Sailboats and yachts, with or without auxiliary motor, for pleasure or sports
890392	Motor boats and motor yachts, for pleasure or sports (other than outboard motor boats)

890399	Vessels for pleasure or sports; rowing boats (excl. motor boats and motor yachts powered other than by outboard motors, sailboats and yachts with or without auxiliary motor and inflatable boats)
890400	Tugs and pusher craft
890510	Dredgers
890520	Floating or submersible drilling or production platforms
890590	Light-vessels, fire-floats, floating cranes and other vessels, the navigability of which is subsidiary to their main function (excl. dredgers, floating or submersible drilling or production platforms; fishing vessels and warships)
890610	Warships of all kinds
890690	Vessels, incl. lifeboats (excl. warships, rowing boats and other vessels of heading 8901 to 8905 and vessels for breaking up)
890710	Inflatable rafts
890790	Rafts, tanks, coffer-dams, landing stages, buoys, beacons and other floating structures (excl. inflatable rafts, vessels of heading 8901 to 8906 and floating structures for breaking up)
570232	Carpets and other floor coverings, of man-made textile materials, woven, not tufted or flocked, of pile construction, not made up (excl. Kelem, Schumacks, Karamanie and similar hand-woven rugs)
570242	Carpets and other floor coverings, of man-made textile materials, woven, not tufted or flocked, of pile construction, made up (excl. Kelem, Schumacks, Karamanie and similar hand-woven rugs)
570292	Carpets and other floor coverings, of man-made textile materials, woven, not tufted or flocked, not of pile construction, made up (excl. Kelem, Schumacks, Karamanie and similar hand-woven rugs)
570320	Carpets and other floor coverings, of nylon or other polyamides, tufted "needle punched", whether or not made up
570330	Carpets and other floor coverings, of man-made textile materials, tufted "needle punched", whether or not made up (excl. those of nylon or other polyamides)
570500	Carpets and other textile floor coverings, whether or not made up (excl. knotted, woven or tufted "needle punched", and of felt)
580421	Mechanically made lace of man-made fibres in the piece, in strips or in motifs (excl. fabrics of headings 6002 to 6006)
581092	Embroidery of man-made fibres on a textile fabric base, in the piece, in strips or in motifs (excl. embroidery without visible ground)

391721	Rigid tubes, pipes and hoses, of polymers of ethylene
391722	Rigid tubes, pipes and hoses of polymers of propylene
391723	Rigid tubes, pipes and hoses, of polymers of vinyl chloride
391729	Rigid tubes, pipes and hoses, of plastics (excl. those of polymers of ethylene, propylene and vinyl chloride)
391731	Flexible tubes, pipes and hoses, of plastics, burst pressure >= 27,6 MPa
391732	Flexible tubes, pipes and hoses of plastics, not reinforced or otherwise combined with other materials, without fittings
391733	Flexible tubes, pipes and hoses of plastics, not reinforced or otherwise combined with other materials, with fittings, seals or connectors
391739	Flexible tubes, pipes and hoses, of plastics, reinforced or otherwise combined with other materials (excl. those with a burst pressure of >= 27,6 MPa)
391740	Fittings, e.g. joints, elbows, flanges, of plastics, for tubes, pipes and hoses
391810	Floor coverings, whether or not self-adhesive, in rolls or in the form of tiles, and wall or ceiling coverings "in rolls with a width of >= 45 cm, consisting of a layer of plastics fixed permanently on a backing of any material other than paper, the face side of which is grained, embossed, coloured, design-printed or otherwise decorated", of polymers of vinyl chloride
391890	Floor coverings of plastics, whether or not self-adhesive, in rolls or in the form of tiles, and wall or ceiling coverings in rolls with a width of >= 45 cm, consisting of a layer of plastics fixed permanently on a backing of any material other than paper, the face side of which is grained, embossed, coloured, design-printed or otherwise decorated (excl. coverings of polymers of vinyl chloride)
391910	Self-adhesive plates, sheets, film, foil, tape, strip and other flat shapes, of plastics, in rolls <= 20 cm wide
391990	Self-adhesive plates, sheets, film, foil, tape, strip and other flat shapes, of plastics, whether or not in rolls > 20 cm wide (excl. floor, wall and ceiling coverings of heading 3918)
392010	Plates, sheets, film, foil and strip, of non-cellular polymers of ethylene, not reinforced, laminated, supported or similarly combined with other materials, without backing, unworked or merely surface-worked or merely cut into squares or rectangles (excl. self-adhesive products, and floor, wall and ceiling coverings of heading 3918)
392020	Plates, sheets, film, foil and strip, of non-cellular polymers of ethylene, not reinforced, laminated, supported or similarly combined with other materials, without backing, unworked or merely surface-worked or merely cut into squares or rectangles (excl. self-adhesive products, and floor, wall and ceiling coverings of heading 3918)

392030	Plates, sheets, foil, film and strip, of non-cellular polymers of styrene, not reinforced, laminated, supported or similarly combined with other materials, without backing, unworked or merely surface-worked or merely cut into squares or rectangles (excl. self-adhesive products, and floor, wall and ceiling coverings of heading 3918)
392043	Plates, sheets, film, foil and strip, of non-cellular polymers of vinyl chloride, containing by weight >= 6% of plasticisers, not reinforced, laminated, supported or similarly combined with other materials, without backing, unworked or merely surface-worked or merely cut into squares or rectangles (excl. self-adhesive products, and floor, wall and ceiling coverings of heading 3918)
392049	Plates, sheets, film, foil and strip, of non-cellular polymers of vinyl chloride, containing by weight < 6% of plasticisers, not reinforced, laminated, supported or similarly combined with other materials, without backing, unworked or merely surface-worked or merely cut into squares or rectangles (excl. self-adhesive products, and floor, wall and ceiling coverings of heading 3918)
392051	Plates, sheets, film, foil and strip, of non-cellular poly"methyl methacrylate", not reinforced, laminated, supported or similarly combined with other materials, without backing, unworked or merely surface-worked or merely cut into squares or rectangles (excl. self-adhesive products, and floor, wall and ceiling coverings of heading 3918)
392059	Plates, sheets, film, foil and strip, of non-cellular acrylic polymers, not reinforced, laminated, supported or similarly combined with other materials, without backing, unworked or merely surface-worked or merely cut into squares or rectangles (excl. those of poly"methyl methacrylate", self-adhesive products, and floor, wall and ceiling coverings of heading 3918)
392061	Plates, sheets, film, foil and strip, of non-cellular polycarbonates, not reinforced, laminated, supported or similarly combined with other materials, without backing, unworked or merely surface-worked or merely cut into squares or rectangles (excl. those of poly"methyl methacrylate", self-adhesive products, and floor, wall and ceiling coverings of heading 3918)
392062	Plates, sheets, film, foil and strip, of non-cellular poly"ethylene terephthalate", not reinforced, laminated, supported or similarly combined with other materials, without backing, unworked or merely surface-worked or merely cut into squares or rectangles (excl. those of poly"methyl methacrylate", self-adhesive products, and floor, wall and ceiling coverings of heading 3918)
392063	Plates, sheets, film, foil and strip, of non-cellular unsaturated polyesters, not reinforced, laminated, supported or similarly combined with other materials, without backing, unworked or merely surface-worked or merely cut into squares or rectangles (excl. those of poly"methyl methacrylate", self-adhesive products, and floor, wall and ceiling coverings of heading 3918)
392069	Plates, sheets, film, foil and strip, of non-cellular polyesters, not reinforced, laminated, supported or similarly combined with other materials, not worked or only surface-worked, or only cut to rectangular, incl. square, shapes (excl. polycarbonates, polythylene terephthalate and other unsaturated polyesters, self-adhesive products, and floor, wall and ceiling coverings in heading 3918)

392071	Plates, sheets, film, foil and strip, of non-cellular regenerated cellulose, not reinforced, laminated, supported or similarly combined with other materials, without backing, unworked or merely surface-worked or merely cut into squares or rectangles (excl. self-adhesive products, and floor, wall and ceiling coverings of heading 3918)
392073	Plates, sheets, film, foil and strip, of non-cellular cellulose acetates, not reinforced, laminated, supported or similarly combined with other materials, without backing, unworked or merely surface-worked or merely cut into squares or rectangles (excl. self-adhesive products, and floor, wall and ceiling coverings of heading 3918)
392079	Plates, sheets, film, foil and strip, of non-cellular cellulose derivatives, not reinforced, laminated, supported or similarly combined with other materials, without backing, unworked or merely surface-worked or merely cut into squares or rectangles (excl. products of cellulose acetates, self-adhesive products, floor, wall and ceiling coverings of heading 3918)
392091	Plates, sheets, film, foil and strip, of non-cellular poly"vinyl butyral", not reinforced, laminated, supported or similarly combined with other materials, without backing, unworked or merely surface-worked or merely cut into squares or rectangles (excl. self-adhesive products, floor, wall and ceiling coverings of heading 3918)
392092	Plates, sheets, film, foil and strip, of non-cellular polyamides, not reinforced, laminated, supported or similarly combined with other materials, without backing, unworked or merely surface-worked or merely cut into squares or rectangles (excl. self-adhesive products, floor, wall and ceiling coverings of heading 3918)
392093	Plates, sheets, film, foil and strip, of non-cellular amino-resins, not reinforced, laminated, supported or similarly combined with other materials, without backing, unworked or merely surface-worked or merely cut into squares or rectangles (excl. self-adhesive products, floor, wall and ceiling coverings of heading 3918)
392094	Plates, sheets, film, foil and strip, of non-cellular phenolic resins, not reinforced, laminated, supported or similarly combined with other materials, without backing, unworked or merely surface-worked or merely cut into squares or rectangles (excl. self-adhesive products, floor, wall and ceiling coverings of heading 3918)
392099	Plates, sheets, film, foil and strip, of non-cellular plastics, n.e.s., not reinforced, laminated, supported or similarly combined with other materials, without backing, unworked or merely surface-worked or merely cut into squares or rectangles (excl. self-adhesive products, floor, wall and ceiling coverings of heading 3918 and sterile surgical or dental adhesion barriers of subheading 3006.10.30)
392111	Plates, sheets, film, foil and strip, of cellular polymers of styrene, unworked or merely surface-worked or merely cut into squares or rectangles (excl. self-adhesive products, floor, wall and ceiling coverings of heading 3918 and sterile surgical or dental adhesion barriers of subheading 3006.10.30)
392112	Plates, sheets, film, foil and strip, of cellular polymers of vinyl chloride, unworked or merely surface-worked or merely cut into squares or rectangles (excl. self-adhesive products, floor, wall and ceiling coverings of heading 3918 and sterile surgical or dental adhesion barriers of subheading 3006.10.30)

392113	Plates, sheets, film, foil and strip, of cellular polyurethanes, unworked or merely surface-worked or merely cut into squares or rectangles (excl. self-adhesive products, floor, wall and ceiling coverings of heading 3918 and sterile surgical or dental adhesion barriers of subheading 3006.10.30)
392114	Plates, sheets, film, foil and strip, of regenerated cellular cellulose, unworked or merely surface-worked or merely cut into squares or rectangles (excl. self-adhesive products, floor, wall and ceiling coverings of heading 3918 and sterile surgical or dental adhesion barriers of subheading 3006.10.30)
392119	Plates, sheets, film, foil and strip, of cellular plastic, unworked or merely surface-worked or merely cut into squares or rectangles (excl.those of polymers of styrene, vinyl chloride, polyurethanes and regenerated cellulose, self-adhesive products, floor, wall and ceiling coverings of heading 3918 and sterile surgical or dental adhesion barriers of subheading 3006.10.30)
392190	Plates, sheets, film, foil and strip, of plastics, reinforced, laminated, supported or similarly combined with other materials, unworked or merely surface-worked or merely cut into squares or rectangles (excl. of cellular plastic; self-adhesive products, floor, wall and ceiling coverings of heading 3918)
392210	Baths, shower-baths, sinks and washbasins, of plastics
392220	Lavatory seats and covers, of plastics
392290	Bidets, lavatory pans, flushing cisterns and similar sanitary ware, of plastics (excl. baths, shower-baths, sinks, washbasins, lavatory seats and covers)
392510	Reservoirs, tanks, vats and similar containers, of plastics, with a capacity of > 300 l
392520	Doors, windows and their frames and thresholds for doors, of plastics
392530	Shutters, blinds, incl. Venetian blinds, and similar articles and parts thereof, of plastics (excl. fittings and similar articles)
392590	Building elements for the manufacture of floors, walls, partition walls, ceilings, roofs, etc., of plastics; gutters and accessories of plastics; railings, fences and similar barriers, of plastics; large shelves, for assembly and permanent installation in shops, workshops, etc., of plastics; architectural ornaments, e.g. friezes, of plastics; fittings and similar products for permanent mounting on buildings, of plastics
392340	Spools, cops, bobbins and similar supports, of plastics
392350	Stoppers, lids, caps and other closures, of plastics
392390	Articles for the conveyance or packaging of goods, of plastics (excl. boxes, cases, crates and similar articles; sacks and bags, incl. cones; carboys, bottles, flasks and similar articles; spools, spindles, bobbins and similar supports; stoppers, lids, caps and other closures)
392410	Tableware and kitchenware, of plastics

392490	Household articles and toilet articles, of plastics (excl. tableware, kitchenware, baths, shower-baths, washbasins, bidets, lavatory pans, seats and covers, flushing cisterns and similar sanitary ware)
392610	Office or school supplies, of plastics, n.e.s.
392630	Fittings for furniture, coachwork and the like, of plastics (excl. building components for permanent mounting on parts of buildings)
392640	Statuettes and other ornamental articles, of plastics
392690	Articles of plastics and articles of other materials of heading 3901 to 3914, n.e.s (excl. goods of 9619)
820210	Handsaws, with working parts of base metal (excl. power-operated saws)
820540	Hand-operated screwdrivers
820551	Household hand tools, non-mechanical, with working parts of base metal, n.e.s.
940130	Swivel seats with variable height adjustments (excl. medical, surgical, dental or veterinary, and barbers' chairs)
940140	Seats, convertible into beds (excl. garden seats and camping equipment, and medical, dental or surgical furniture)
940550	Non-electrical lamps and lighting fittings, n.e.s.
960500	Travel sets for personal toilet, sewing or shoe or clothes cleaning (excl. manicure sets)
960810	Ball-point pens
960820	Felt-tipped and other porous-tipped pens and markers
960830	Fountain pens, stylograph pens and other pens
960840	Propelling or sliding pencils
960860	Refills for ball-point pens, comprising the ball-point and ink-reservoir
960891	Pen nibs and nib points
961310	Pocket lighters, gas fuelled, non-refillable
961320	Pocket lighters, gas fuelled, refillable
961380	Lighters (excl. gas fuelled pocket lighters, and fuses and primers for propellent powders and explosives)

961511	Combs, hair-slides and the like of hard rubber or plastics
960321	Tooth brushes, incl. dental-plate brushes
960390	Mops and leather dusters; prepared knots and tufts for broom or brush making; squeegees of rubber or other flexible materials; brooms and brushes, n.e.s.
960400	Hand sieves and hand riddles (excl. colanders)
961800	Tailors' dummies and other lay figures, automata and other animated displays used for shop window dressing (excl. the articles actually on display, educational models and toy dolls)
590210	Tyre cord fabric of high-tenacity yarn of nylon or other polyamides, whether or not dipped or impregnated with rubber or plastic
590220	Tyre cord fabric of high-tenacity polyester yarn, whether or not dipped or impregnated with rubber or plastic
590290	Tyre cord fabric of high-tenacity viscose rayon yarn, whether or not dipped in rubber or plastic
590310	Textile fabrics impregnated, coated, covered or laminated with poly"vinyl chloride" (excl. wallcoverings of textile materials impregnated or covered with poly"vinyl chloride"; floor coverings consisting of a textile backing and a top layer or covering of poly"vinyl chloride")
590320	Textile fabrics impregnated, coated, covered or laminated with polyurethane (excl. wallcoverings of textile materials impregnated or covered with polyurethane; floor coverings consisting of a textile backing and a top layer or covering of polyurethane)
590390	Textile fabrics impregnated, coated, covered or laminated with plastics other than poly"vinyl chloride" or polyurethane (excl. tyre cord fabric of high-tenacity yarn of nylon or other polyamides, polyesters or viscose rayon; wallcoverings of textile materials impregnated or covered with plastic; floor coverings consisting of a textile backing and a top layer or covering of plastics)
392620	Articles of apparel and clothing accessories produced by the stitching or sticking together of plastic sheeting, incl. gloves, mittens and mitts (excl. goods of 9619)
660110	Garden or similar umbrellas (excl. beach tents)
660191	Umbrellas having a telescopic shaft (excl. toy umbrellas)
660199	Umbrellas and sun umbrellas, incl. walking-stick umbrellas (excl. umbrellas having a telescopic shaft, garden umbrellas and the like, and toy umbrellas)
900311	Frames and mountings for spectacles, goggles or the like, of plastics
900410	Sunglasses

900510	Binoculars
901831	Syringes, with or without needles, used in medical, surgical, dental or veterinary sciences
940180	Seats, n.e.s.
940370	Furniture of plastics (excl. medical, dental, surgical or veterinary, and seats)
950632	Golf balls
950669	Balls (excl. inflatable, tennis balls, golf balls, and table-tennis balls)
950691	Articles and equipment for general physical exercise, gymnastics or athletics
670100	Skins and other parts of birds with their feathers or down, feathers, parts of feathers, down and articles thereof (excl. goods of heading 0505, worked quills and scapes, footwear and headgear, articles of bedding and similar furnishing of heading 9404, toys, games and sports requisites, and collectors' pieces)
670210	Artificial flowers, foliage and fruit and parts thereof, and articles made of artificial flowers, foliage or fruit, by binding, glueing, fitting into one another or similar methods, of plastics
670290	Artificial flowers, foliage and fruit and parts thereof, and articles made of artificial flowers, foliage or fruit, by binding, glueing, fitting into one another or similar methods (excl. of plastics)
670411	Complete wigs of synthetic textile materials
670419	False beards, eyebrows and eyelashes, switches and the like, of synthetic textile materials (excl. complete wigs)
670420	Wigs, false beards, eyebrows and eyelashes, switches and the like, of human hair, and articles of human hair, n.e.s.
670490	Wigs, false beards, eyebrows and eyelashes, switches and the like, of animal hair or textile materials (excl. synthetic textile materials)
950510	Christmas articles (excl. candles and electric lighting sets, natural Christmas trees and Christmas tree stands)
950590	Festival, carnival or other entertainment articles, incl. conjuring tricks and novelty jokes, n.e.s.

Appendix C: Pilot model production (CPC) Codes

Table 5 UNITAR Pilot Model production (CPC) codes

CPC	Description
36490	Other articles for the conveyance or packing of goods, of plastics; stoppers, lids, caps and other closures, of plastics
36410	Sacks and bags, of plastics
21321	Tomato juice
21329	Other vegetable juices
21431	Orange juice
21432	Grapefruit juice
21433	Pineapple juice
21434	Grape juice
21435	Apple juice
21439	Other fruit juices, n.e.c.
17300	Steam and hot water
24410	Bottled waters, not sweetened or flavoured
24490	Other non-alcoholic caloric beverages
49511	Rail locomotives powered from an external source of electricity
49512	Diesel-electric locomotives
49519	Other rail locomotives; locomotive tenders
49520	Self-propelled railway or tramway coaches, vans and trucks (except maintenance or service vehicles)

49531	Railway or tramway maintenance or service vehicles, whether or not self-propelled
49532	Railway or tramway passenger coaches, not self-propelled; luggage vans, post office coaches and other special-purpose railway or tramway coaches, not self-propelled (except maintenance or service vehicles)
49533	Railway or tramway goods vans and wagons, not self-propelled
44141	Pedestrian controlled tractors
44142	Track-laying tractors
44149	Other agricultural tractors
49111	Road tractors for semi-trailers
49112	Public-transport type passenger motor vehicles
49116	Motor vehicles, for the transport of persons, specially designed for travelling on snow; golf cars and similar vehicles
49113	Motor cars and other motor vehicles principally designed for the transport of persons (except public-transport type vehicles, vehicles specially designed for travelling on snow, and golf cars and similar vehicles)
44428	Dumpers designed for off-highway use
49114	Motor vehicles n.e.c. for the transport of goods
49115	Crane lorries
49119	Special-purpose motor vehicles n.e.c.
43530	Fork-lift trucks; other works trucks whether or not fitted with lifting or handling equipment; tractors of the type used on railway station platforms
44710	Tanks and other armoured fighting vehicles, motorized, and parts thereof
49911	Motorcycles and cycles fitted with an auxiliary motor, with reciprocating internal combustion piston engine of a cylinder capacity not exceeding 50 cc
49912	Motorcycles and cycles fitted with an auxiliary motor, with reciprocating internal combustion piston engine of a cylinder capacity exceeding 50 cc
49913	Motorcycles and cycles fitted with an auxiliary motor, other than those with reciprocating internal combustion piston engines; side-cars

49921	Bicycles and other cycles, not motorized
49922	Invalid carriages
49222	Trailers and semi-trailers of the caravan type, for housing or camping
49229	Other trailers and semi-trailers (including trailers and semi-trailers for the transport of goods), except self-loading or self-unloading trailers or semi-trailers for agricultural purposes
49610	Balloons and dirigibles; gliders, hang gliders and other non-powered aircraft
49621	Helicopters
49622	Aeroplanes and other powered aircraft of an unladen weight not exceeding 2000 kg
49623	Aeroplanes and other powered aircraft of an unladen weight exceeding 2000 kg
49630	Spacecraft and spacecraft launch vehicles
49311	Cruise ships, excursion boats and similar vessels, principally designed for the transport of persons; ferry boats of all kinds
49312	Tankers (ships)
49313	Refrigerator vessels (ships), except tankers
49314	Other vessels for the transport of goods and other vessels for the transport of both persons and goods
49315	Fishing vessels; factory ships and other vessels for processing or preserving fishery products
49316	Tugs and pusher craft
49410	Sailboats (except inflatable), with or without auxiliary motor
49490	Other vessels for pleasure or sports; rowing boats and canoes
49319	Other vessels (including light-vessels, fire-floats, dredgers, floating cranes, floating docks, warships and lifeboats other than rowing boats), except floating or submersible drilling or production platforms
49320	Floating or submersible drilling or production platforms
49390	Other floating structures
27220	Carpets and other textile floor coverings, woven, not tufted or flocked
27230	Carpets and other textile floor coverings, tufted

27290	Other carpets and textile floor coverings (including those of felt)
27912	Tulles and other net fabrics, except woven, knitted or crocheted fabrics; lace in the piece, in strips or in motifs
27913	Embroidery in the piece, in strips or in motifs
36320	Tubes, pipes and hoses, and fittings therefor, of plastics
36910	Floor coverings of plastics, in rolls or in the form of tiles; wall or ceiling coverings of plastics
36920	Self-adhesive plates, sheets, film, foil, tape, strip and other flat shapes, of plastics
36330	Plates, sheets, film, foil and strip, of plastics, not self-adhesive, non-cellular and not reinforced, laminated, supported or similarly combined with other materials
36390	Other plates, sheets, film, foil and strip, of plastics
36930	Baths, wash-basins, lavatory pans and covers, flushing cisterns and similar sanitary ware, of plastics
36950	Builders' ware of plastics n.e.c.
36940	Tableware, kitchenware, other household articles and toilet articles, of plastics
36990	Articles of plastics n.e.c.
42921	Hand tools (including hand tools of a kind used in agriculture, horticulture or forestry, hand saws, files, pliers and metal cutting shears, hand-operated spanners, blow-lamps and clamps)
38111	Seats, primarily with metal frames
38112	Seats, primarily with wooden frames
46531	Portable electric lamps designed to function by their own source of energy (except those for cycles or motor vehicles); electric ceiling or wall lighting fittings (except those for lighting public open spaces or thorough-fares); electric table, desk, bedside or floor-standing lamps; non-electrical lamps and lighting fittings; illuminated signs, illuminated name-plates and the like
29220	Luggage, handbags and the like, of leather, composition leather, plastic sheeting, textile materials, vulcanized fibre or paperboard; travel sets for personal toilet, sewing or shoe or clothes cleaning
38911	Pens, duplicating stylos, pencils, pen-holders, pencil-holders and similar holders, and parts thereof; crayons, pencil leads, pastels, drawing charcoals and chalks

38994	Cigarette lighters and other lighters; smoking pipes and cigar or cigarette holders, and parts thereof; combs, hair-slides and the like; hairpins, curling pins, curling grips, hair-curlers and the like (except electro-thermic apparatus), and parts thereof; scent sprays and similar toilet sprays, and mounts and heads therefor; powder-puffs and pads for the application of cosmetics or toilet preparations
38993	Brooms, brushes, hand-operated mechanical floor sweepers (not motorized), mops and feather dusters; prepared knots and tufts for broom or brush making; paint pads and rollers; squeegees (other than roller squeegees)
38999	Articles n.e.c. (including candles, tapers, skins of birds with their feathers, artificial flowers, entertainment articles, hand sieves, hand riddles, vacuum flasks, tailors dummies, animated displays used for shop window dressing, and parts n.e.c.)
27996	Tyre cord fabric of high tenacity yarn of nylon or other polyamides, polyesters or viscose rayon
27997	Textile fabrics, impregnated, coated or covered n.e.c.
28243	Apparel and clothing accessories of plastics (incl. gloves)
38921	Umbrellas, sun-umbrellas, walking-sticks, seat-sticks, whips, riding-crops and the like
48312	Spectacles, goggles and the like, corrective, protective or other
48313	Frames and mountings for spectacles, goggles or the like
48314	Binoculars, monoculars and other optical telescopes; other astronomical instruments, except instruments for radio-astronomy; compound optical microscopes
48150	Other instruments and appliances used in medical, surgical or veterinary sciences (including syringes, needles, catheters, cannulae, ophthalmic instruments and appliances n.e.c. and electro-medical apparatus n.e.c.)
38119	Other seats
38140	Other furniture n.e.c.
38430	Gymnasium or athletics articles and equipment
38440	Other articles and equipment for sports or outdoor games
38972	Human hair, dressed, thinned, bleached or otherwise worked; wool or other animal hair or other textile materials, prepared for use in making wigs or the like; wigs, false beards, eyebrows and eyelashes, switches and the like, of human or animal hair or of textile materials; articles of human hair n.e.c.
38991	Festive, carnival or other entertainment articles, including conjuring tricks and novelty jokes

Appendix D: Technical data issues and discrepancies

This appendix documents the most significant technical issues encountered when using production and trade statistics as inputs to the UNITAR plastic model. While the datasets used are official and high-coverage, several types of uncertainty limit their direct use in plastic-flow modelling without careful pre-processing and validation (Chen et al., 2022; Eurostat, 2024; UNECE, 2022). These issues highlight the importance of further methodological development and dialogue with national statistical agencies before routine use of the model.

Overview of common data quality concerns

After evaluating the underlying data, in combination with previous research on the topic, it's clear that using trade and production data as a foundation for calculating apparent consumption of plastic comes with its innate challenges. The datasets contain inconsistencies in terms of extreme or missing values, units or extreme outliers – however it's a difficult validation process. The most common data issues are:

- **Data is misreported by producers:** Misreporting at the enterprise level is common. Firms frequently enter incorrect quantities or misclassify goods in customs declarations, leading to large errors in aggregate totals (Eurostat, 2020, 2024).
- **Unit mismatches regularly occur:** Typical examples include declaring litres, pieces or square metres but recording them as kilograms, or omitting weight fields altogether (Eurostat, 2020, 2024; UNSD, 2011). These errors can inflate or deflate plastic-flow estimates by orders of magnitude.
- **Missing values and confidentiality gaps**: Quantity or value fields are frequently blank[28] or suppressed, increasing uncertainty (Chen et al., 2022; Eurostat, 2024; UNSD, 2011).

28. In conversation with Eurostat, we confirmed the difference between data being flagged as zero ("0"), *"Data not available"*. That data is not available does not mean that the value is zero, nor does it mean that the data is missing due to confidentiality. It simply means that *"the data were not provided by the relevant member state to Eurostat"* (E. Firth, personal communication, May 20, 2025). This highlights the importance of directly including stakeholders from the relevant statistical agencies in development of these datasets – to be able to provide, validate and distinguish missing data from other causes of data issues.

Previous analyses of global plastic trade confirm that these three issues—misreporting, unit errors and confidentiality gaps—propagate uncertainty through plastic-flow models (Barrowclough et al., 2020). This highlights the need for thorough validation of unit codes and plausibility thresholds. It also showcases the importance of allocating both time and resources to making sure the underlying input data is sound – even before evaluating the assumptions of plastic content.

Large unexplained year-to-year shifts

Several countries show substantial changes in reported trade and production volumes between adjacent years, which may reflect real shifts in trade but could also be caused by changes in reporting practice, classification, or data quality.

As shown in figure 15 and figure 16, imports and exports for countries like Sweden and Denmark vary considerably year to year for the included trade codes (before using the model to calculate plastic content). Some of these fluctuations are very sharp as seen for Sweden before 2011, and Norway around 2010.

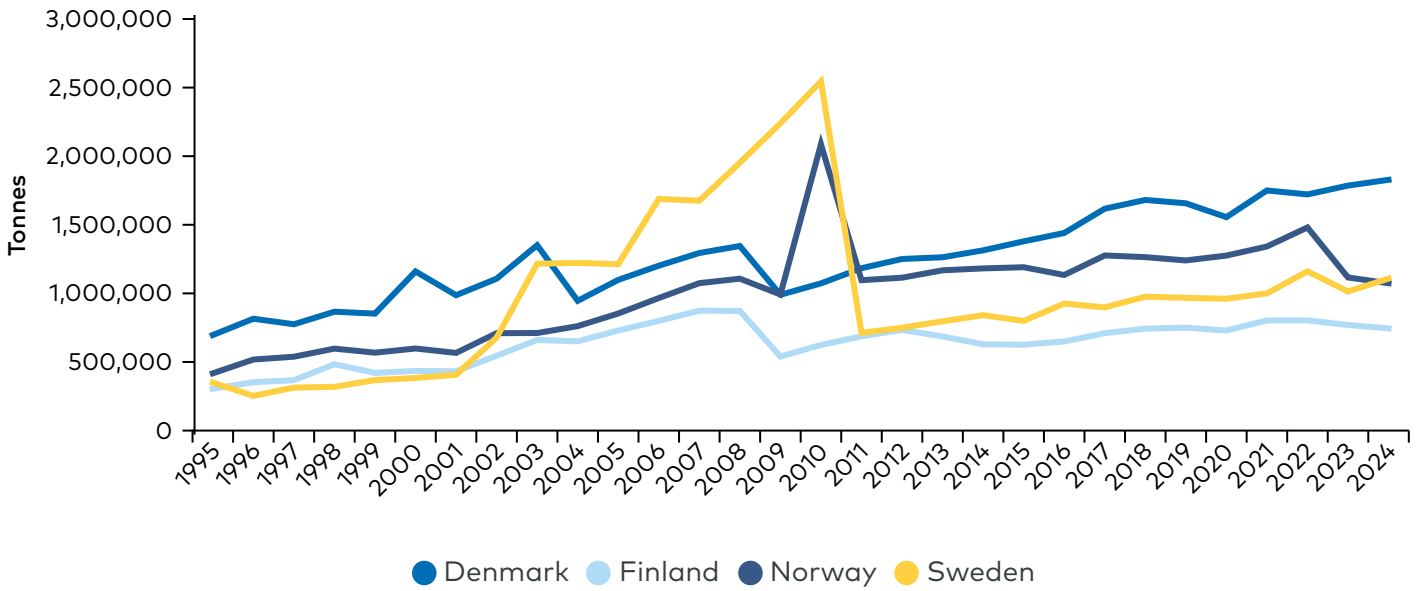

Figure 15 Reported import volumes (tonnes) for included HS codes before using the model to calculate plastic content, 1988–2024. Large fluctuations are visible in Sweden (yellow line) and Norway (dark blue line), particularly around 2007–2010.

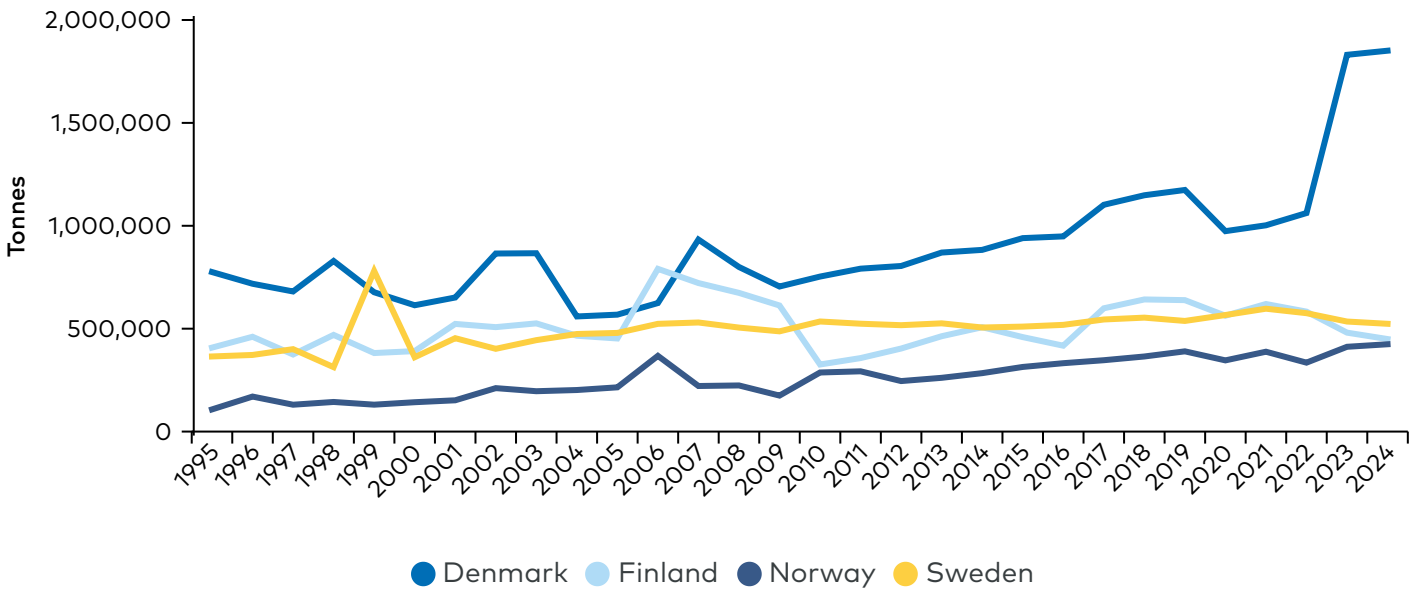

Figure 16 Reported export volumes (tonnes) for included HS codes before using the model to calculate plastic content, 1988–2024. Denmark's reported export volumes show a sharp rise after 2015, possibly linked to changes in classification or re-export practices.

Figure 17 displays *calculated plastic volumes in domestic production* revealing several extreme outliers. In some instances, volumes increase by several thousand percent from one year to the next—levels that far exceed what can reasonably be attributed to changes in actual plastic volumes.

This is illustrated in the Norwegian data for specific product groups. In the Building and Construction category (figure 18), plastic content spikes to over 2 million tonnes around 2010, compared to typical levels below 200,000 tonnes. A similar outlier is visible in the Packaging category (figure 19), where a single-year jump exceeds 10 million tonnes—orders of magnitude above baseline trends for the country totals. These anomalies are not isolated to Norway and appear to stem from either unit conversion errors, inconsistent reporting practices, or the use of inappropriate plastic share proxies in the source data.

Such outliers strongly distort plastic flow modelling and highlight the need for systematic outlier detection and validation protocols before production data can reliably support harmonised statistics.

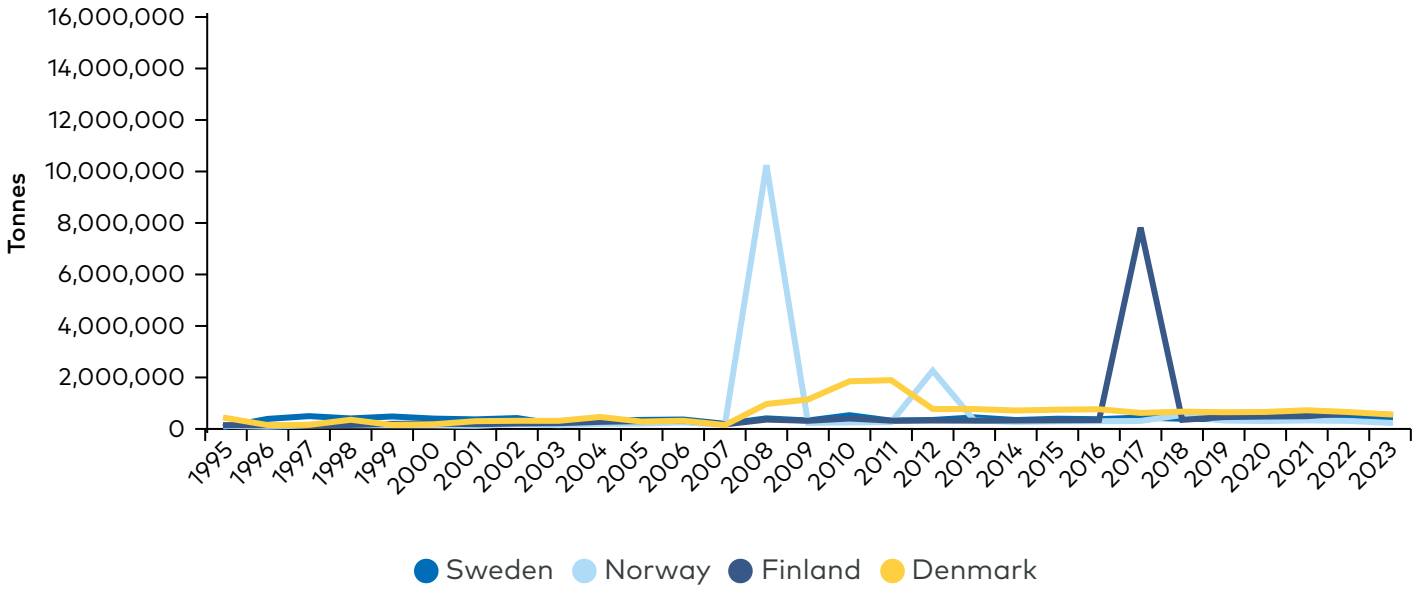

Figure 17 UNITAR model plastic content from production (no removed outliers).

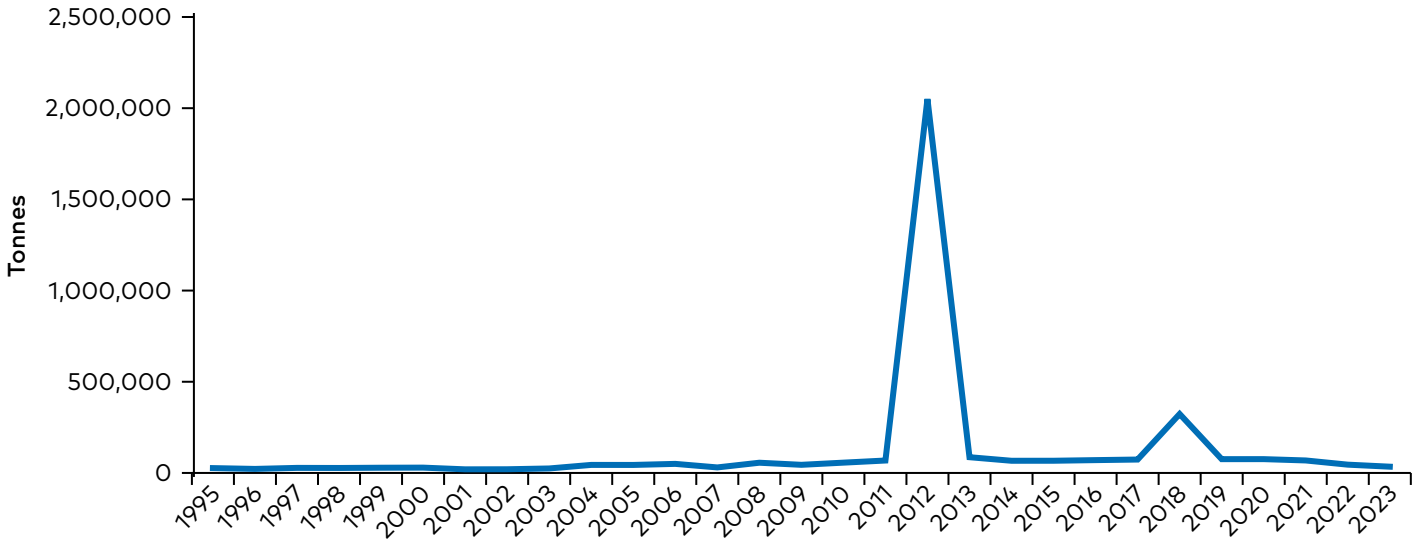

Figure 18 Plastic content in Building and Construction - Norway

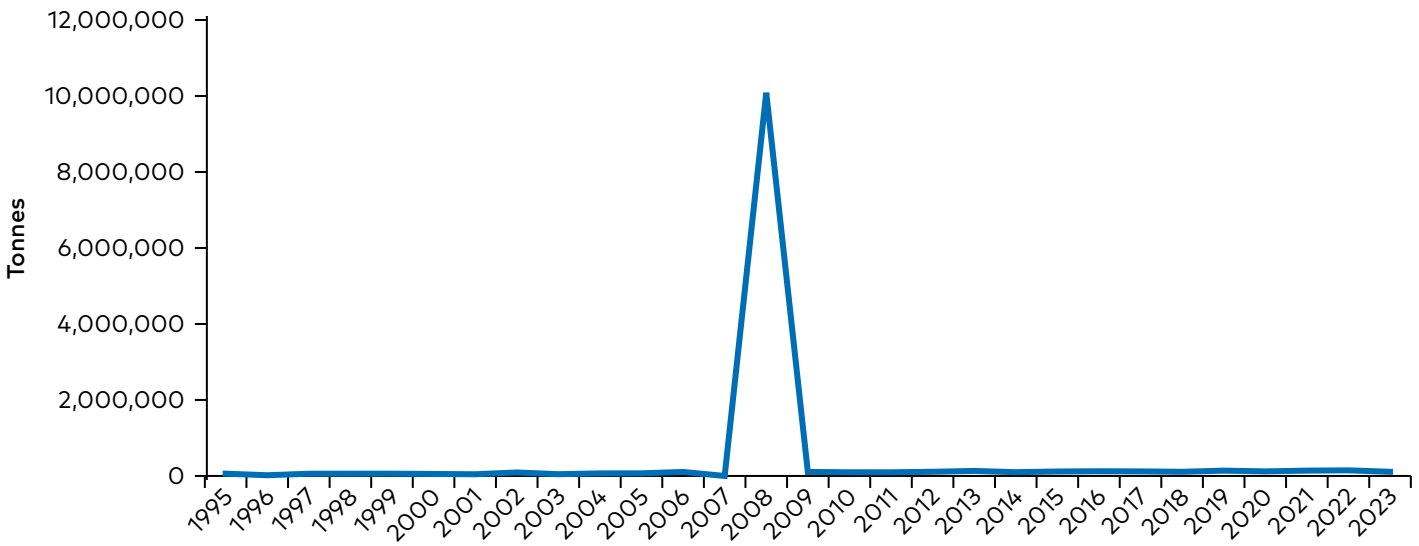

Figure 19 Plastic content in Packaging - Norway

Due to project constraints, this pilot only removed the most extreme outliers and did not undertake a detailed validation of the underlying trade and production data. As a result, it remains unclear whether the observed spikes reflect actual material flows—potentially requiring custom plastic share assumptions—or stem from statistical issues such as unit mismatches, misreporting, or confidentiality-related gaps. Nonetheless, the magnitude and frequency of such anomalies—and their disproportionate impact on modelled plastic flows—underscore the need to integrate robust outlier detection and data validation in future modelling protocols.

Discrepancies between Eurostat and national production statistics

A clear example of inconsistencies in the data came from comparing the PRODCOM production data acquired from Eurostat as well as directly from SSB. As we can see in figure 20 significant differences for some years were observed between production data obtained from Eurostat and from Statistics Norway (SSB) under the same PRODCOM codes. As shown in figure 20 differences exceeded 10 million tonnes in some years.

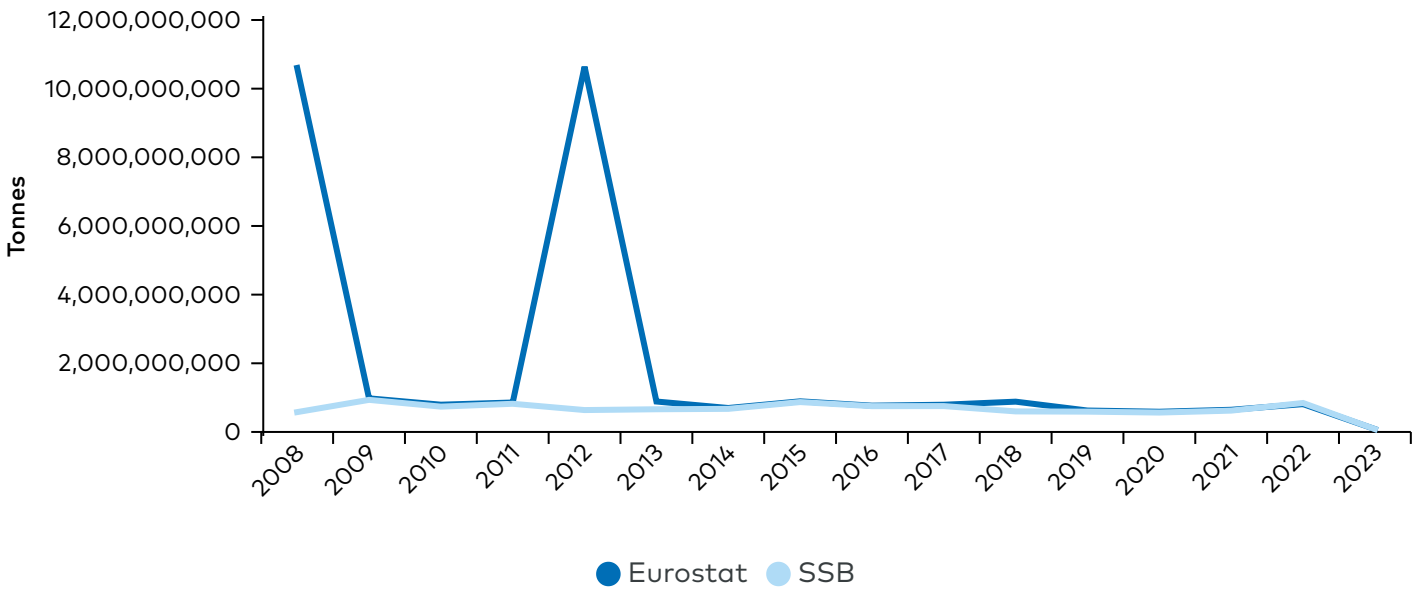

Figure 20 Differences between Norwegian PRODCOM production data (Eurostat vs. SSB). Notably even if most years, apart from two, are quite similar, only 2023 show the exact same numbers.

To combat this in the analysis manual removal of extreme outliers was performed where deemed necessary and most often replaced with linear trends between the surrounding years. This finding reinforces the importance of involving national agencies directly in the data collection, validation and interpretation process.

About this publication

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