Paper

Plastic product and waste flows in the Dutch economy

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1. Introduction

1.1 Background

The European Green Deal (EGD) is a strategic initiative aimed at transforming the European Union (EU) economy into a sustainable, climate-neutral economy by 2050. Achieving the goals of the EGD requires more comprehensive and accurate data, particularly in the areas of plastics and plastic packaging waste. While data on various plastic flows—such as bio-based plastic production, packaging waste, and plastic recycling—already exist, it is not yet integrated into a unified statistical framework. The System of Environmental-Economic Accounting (SEEA) could serve as such a framework, consolidating these disparate data streams into a single framework. This report explores the potential of the SEEA to provide an integrated approach to tracking plastic flows, building on the statistical guidelines currently being developed by UNEP and UNITAR (2026) for measuring plastic flows throughout their life cycle.

1.2 Policy needs

Implementing UNEP and UNITAR guidelines can offer valuable insights into plastic flows, especially plastic waste, by linking data on production, waste generation, and treatment. This integrated approach provides a comprehensive view of the plastic lifecycle, from production to disposal.

Such a view is vital for advancing the EU's Circular Economy Action Plan and the Plastics Strategy, both of which rely on a thorough understanding of plastic flows. A more robust monitoring system enhances the accuracy of data on plastic packaging waste and supports key Dutch policy objectives outlined in the Circular Materials Plan (CMP): reducing the use of virgin plastics, maximizing recycling and reuse, and minimizing plastic leakage. These efforts are essential for guiding the Netherlands toward achieving a fully circular economy by 2050.

1.3 Objectives

The objective of this report is to assess whether the application of standard international statistical guidelines can provide policy-relevant measurements of plastic flows across the entire lifecycle. To do so, existing statistics are examined, and data gaps are identified and addressed. An inventory of plastic content across different products will be compiled, and statistical data will be cross-validated with other data sources and input from experts. The policy relevance of the findings will be evaluated based on the currently available data on plastic flows.

1.4 Structure of the report

Following the introduction, chapter 2 presents the state of affairs, including key existing studies on plastics, relevant policies and the UNEP and UNITAR (2026) guidelines for measuring plastic flows. Chapter 3 defines concepts and terms related to plastic products and plastic waste and the framework of supply and use tables. In chapter 4, the methodology for estimating plastic flows is detailed, with a focus on how the framework and supply and use tables in the guidelines were filled. Additionally the methodology for the estimation of plastic coefficients is discussed here. Chapter 5 presents the results, breaking down the flows of plastic products and waste across different categories, supported by supply and use tables and a Sankey flow diagram. In Chapter 6, we validate our findings by comparing them with other relevant studies, particularly those discussed in Chapter 2, and identify areas of agreement and discrepancies. Chapter 7 offers a detailed discussion and conclusion, highlighting the implications of the findings and addressing the challenges faced during the study. Finally, Chapter 8 provides recommendations for future work, identifying areas where further research could strengthen the understanding of plastic flows and improve the methodology.

2. State of affairs

2.1 Inventory of research reports on plastic flows

2.1.1 Data Inventory

In recent years, several research projects have been conducted to evaluate available data and deepen the understanding of the plastic economy in the Netherlands. These projects have been reviewed to assess how they compare to the work presented in this report. Specifically, we explore whether our work can contribute additional insights to existing data or complement the data already available. An overview of the reviewed projects is provided in Attachment 1 "Overview of data sources". In this paragraph, the research projects most relevant to our study are highlighted.

One such study, conducted by a consortium from Utrecht University, developed two models to estimate the volume of plastic waste processed in the Netherlands (Lobelle et al., 2024). These models were based on 2017 data from Rijkswaterstaat (RWS) and Statistics Netherlands (CBS). The study's main finding was that while the Netherlands imports and exports substantial amounts of plastic waste, there is a lack of clarity regarding the treatment of exported waste abroad.

A more recent study by Berenschot - TNO analyzed all available reports and data on (circular) plastics in the Netherlands (Verbeek et al., 2025). The study aimed to gain insights into resource use, production, exports and imports, product lifespan, waste collection, and the sorting and recycling of plastic waste. To measure these factors accurately, the researchers identified key datapoints and complete sets of indicators, Of these indicators, only a few were considered reliable and most could not be validated due to a lack of information on the used methodology or data sources.

The Berenschot - TNO report identifies several data sources that are usable to some degree, including the Material Flow Monitor (MFM) from Statistics Netherlands and data from Rijkswaterstaat (RWS). However, Statistics Netherlands' data are not suitable for adequately monitoring plastic volumes due to the assumptions required to estimate plastic flows. RWS data, while useful, are also limited, as they lack some information on imports and exports, and omit certain categories that companies are not legally obligated to report. An alternative source is Plastics Europe, but the transparency of their data sources, assumptions, and methodology remains unclear.

Another recent report called *Circular Plastics NL: Navigating Volumes and Value Chains Towards Circularity* by Circular Plastics NL provides a quantitative mapping of the Dutch plastics system, focusing on material volumes, value chains, and losses along the pathway to circularity. The volumes presented in the publication were analyzed and researched by Conversio, a consultancy specialized in material flow analysis, recycling markets, and circular economy strategies, supporting policymakers and industry with data-driven insights. Overall, the study is highly valuable for academic and policy-oriented research, as it relies on a broad set of well-documented data sources, resulting in a relatively high level of source reliability (Circular Plastics NL, 2025).

There are also several alternative data sources worth mentioning. Verpact[1], a Dutch non-profit organization, oversees extended producer responsibility by coordinating the collection, recycling, and deposit systems for packaging. They publish an annual report on packaging and recycling (AfvalfondsVerpakkingen, 2023). Another source is the Renewable Carbon Initiative ((RCI)[2], launched by the Nova Institute. This network of companies is focused on eliminating fossil-based carbon from the chemical and materials industries, but it primarily provides policy-related information rather than actual data. Additionally, the Rebel consultancy publishes an annual report[3] on chemical recycling, which is based on data gathered through a survey of chemical recycling projects. Other relevant studies on plastics that will be considered in this report are the material stock accounts (CBS,

[1] Home | Verpact

[2] Home - Goals and Vision of the Renewable Carbon Initiative

[3] https://open.overheid.nl/documenten/ccaf9e50-e4ff-4fc3-bb96-f31d019cc029/file

2024) in which plastic in the urban mine is considered and the report by CE-Delft on plastic use and treatment of waste (Snijder and Nusselder, 2019). In the future, new EU directives, such as those related to product passports, may provide additional data sources that could improve the accuracy of plastic statistics.

On a European level, there are data from PlasticsEurope, which is the European trade association representing the plastics industry, actively working on sustainability and the circular economy. Every year, PlasticsEurope publishes the *Plastics – the Facts* report, which analyzes and presents plastic flows across Europe. This report provides detailed information on the production, use, recycling, and processing of plastics within the European Union and other European countries. The data in these reports are sourced from a combination of industry statistics, public sources, and collaborations with national and international organizations. The aim of this publication is to offer a comprehensive overview of the plastics economy in Europe, track trends, and provide reliable figures for policymakers, businesses, and the general public (PlasticsEurope, 2018, 2022).

In conclusion, the plastic-related data appear fragmented, with various pieces of the puzzle that, while informative, are not yet fully integrated to provide a complete and detailed picture of plastic flows within the Dutch economy. At the macro level, the Material Flow Monitor offers a comprehensive overview of plastic flows, though the plausibility of its results has not been thoroughly validated. However, the various sources referenced in the previous paragraph can help verify the assumptions and expert estimates that underpin the Material Flow Monitor (supply and use tables) for plastics across different subcategories and economic sectors. Additionally, the conclusions from the Berenschot - TNO report can help identify which indicators can be derived from the Material Flow Monitor data, pinpoint existing gaps, and highlight additional data sources needed to fill them. This includes indicators tracking the flow of plastics in and out of the Dutch economy, in terms of both resources (primary and secondary), waste, imports, and exports. The verification of our results is presented in chapter 6, while potential relevant indicators are discussed in chapter 5.4.

2.2 Inventory of existing and upcoming policy on plastics

Plastic has increasingly become a policy focus, driven by environmental concerns such as microplastic pollution and greenhouse gas emissions from waste incineration. Policymakers are prioritizing high-impact products for which regulation is straightforward to implement. Additionally, the entire production chain and the composition of products are being taken into account. At the same time, some Dutch plastic producers and recyclers are discontinuing their operations in the Netherlands, as their business models are no longer viable. It appears that stronger policies are needed to support circular plastic production activities, enabling them to better compete with the low-cost virgin plastics imported from abroad.

A publication by Verbeek et al. (2025) provides a comprehensive overview of both current and forthcoming national and international policies on plastics. The focus is on the potential for digital data collection that is likely to emerge as a result of upcoming legislative changes. This chapter summarizes the key insights from the Verbeek et al. (2025) study, highlighting the most relevant and active policy programs, while also incorporating the latest policy developments. Only those policies pertaining to plastics that are aligned with the specific macro monitoring approach used in this report are considered.

2.2.1 Packaging Waste Regulation (PPWR)

National policy in the Netherlands is often driven by European regulations. In 2018, the European Union introduced the EU Plastics Strategy as part of the broader EU Circular Economy Action Plan. Key objectives included ensuring all plastic packaging is recyclable and reusable by 2030, as well as reducing single-use plastics. As part of this plan, the Packaging and Packaging Waste Regulation (PPWR) will come into effect in 2026. This regulation aims to reduce packaging waste, ensure that all packaging is reusable and recyclable, increase the recycled content in plastic packaging, and harmonize rules across member states. Starting in 2027, it is expected that data on plastic packaging will be reported and made available, covering aspects such as composition, reuse, and material flows.

2.2.2 Single-Use plastic Directive (SUP)

The Single-Use Plastics (SUP) directive came into force in 2021, leading to a ban on single-use plastics in the Netherlands. It also established collection targets for plastic beverage bottles and set requirements for recycled content in PET bottles. To encourage greater collection of plastic bottles, a deposit system was introduced in the Netherlands starting in 2021, expanding to include both large (>1 liter) and small bottles. This policy aligns with the 2016 ban on free lightweight plastic shopping bags, which aimed to reduce plastic waste.

2.2.3 Nationale Circular Plastics Norm (NPCN)

The NCPN (National Circular Plastics Standard) is a new Dutch regulation set to take effect in 2027. It will gradually require manufacturers to incorporate a minimum percentage of recycled or bio-based plastic into their products. This regulation has a much broader scope than the EU's recycled PET content requirement for beverage bottles. However, concerns about potential negative impacts on international competitiveness and job security have led to a scaling back of the NCPN's original ambitions. In response, the Dutch government is exploring alternative, industry-collaborative approaches aimed at achieving environmental and circular economy goals.

2.2.4 Digital Product Passport (DPP)

The PPWR is expected to integrate with the EU Digital Product Passport (DPP) system. The PPWR mandates harmonized labeling and detailed information on packaging materials, recyclability, and reuse options. The DPP, introduced under the Ecodesign for Sustainable Products Regulation (ESPR), is a digital platform designed to store and share product-related sustainability data across the entire value chain. While the DPP is not exclusive to packaging, it provides the digital infrastructure needed to meet the information requirements of the PPWR. Initially, the DPP will focus on high-impact, priority products such as batteries, with other sectors like textiles, electronics, and construction materials to follow.

2.2.5 Circular lever

The 'Plastic Table' is a Dutch national initiative that brings together diverse stakeholders to promote circularity and sustainability within plastic value chains. As part of its efforts, the initiative proposed a financial mechanism known as the 'circular lever,' designed to make virgin (fossil-based) plastics less economically attractive. Under this system, producers and importers would be required to pay for the amount of virgin plastic used in their products, with the generated revenue then being redirected to incentivize companies that use recycled or bio-based plastics. The Dutch government has adopted a motion to formally commit to a policy process aimed at legally embedding the circular lever into national legislation

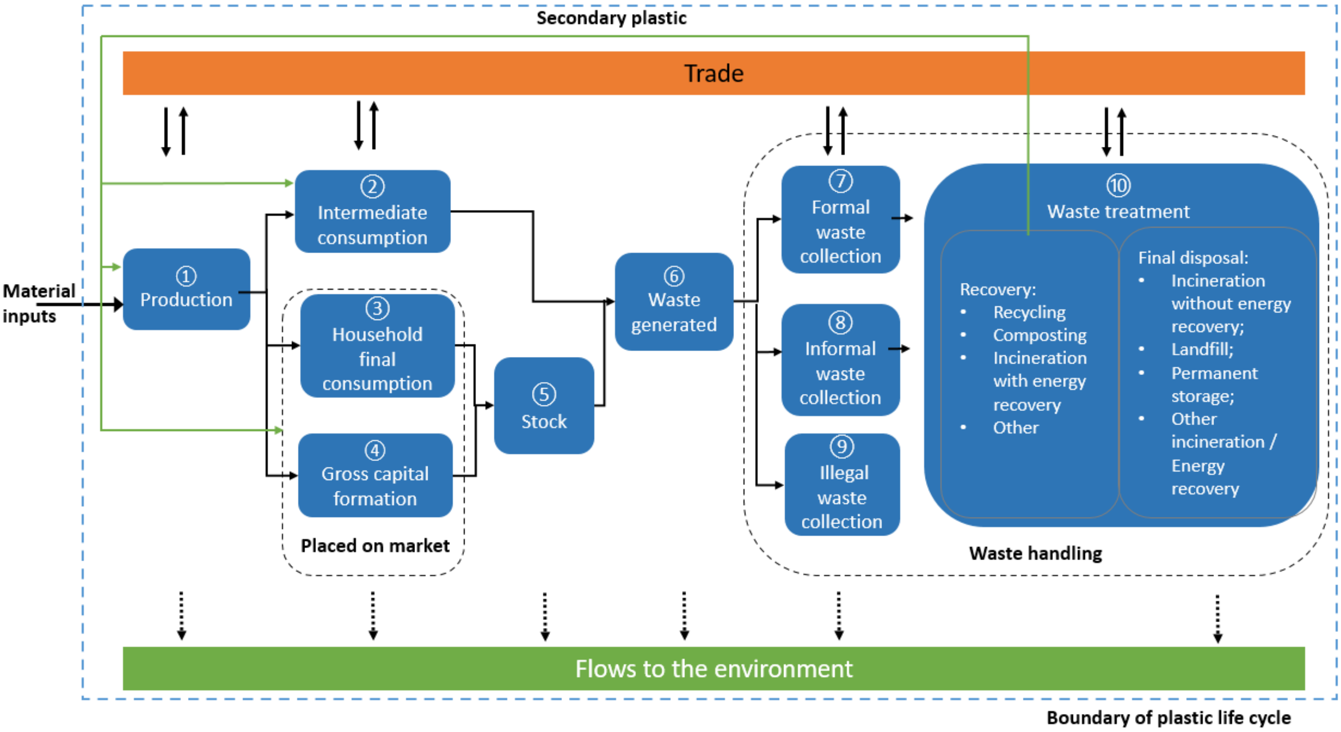
2.3 Guidelines for measuring plastic flows

UNEP and UNITAR (2026) recently developed statistical guidelines for measuring plastic flows throughout the life cycle. Although these guidelines have not yet been officially published, they represent the most current state of affairs to plastic flow monitoring. Their aim is to assist practitioners in generating high-quality, national-level statistics on plastic that are comparable across countries.

The guidelines were publicly consulted with expert groups from international organizations, national statistical offices, academia, knowledge institutes, and other stakeholders. They draw on international standards, including statistical frameworks and classifications, and address key elements such as plastic supply, use, and waste within the context of the System of Environmental-Economic Accounting (further details are provided in Chapter 3).

The plastic life cycle encompasses all stages and processes, from the production of plastic in primary forms to its final disposal. This cycle covers a broad range of activities, including raw material extraction, production, distribution, use, and eventual disposal as waste. The plastic life cycle framework proposed by UNEP is illustrated in Figure 2.3.1, with a focus on the flows of plastic within the economy and their movement to the environment, while excluding material inputs into the economy.

2.3.1: Measurement framework for the plastic life cycle (UNEP and UNITAR, 2026)



The guidelines provide instructions for developing two key datasets: 1) a dataset on plastic production and consumption, and 2) a dataset on plastic waste. The recovery of plastic waste, which is categorized as secondary plastic, is also considered. Additionally, the guidelines outline how to construct supply and use tables and incorporate polymer types into the datasets. The core indicators derived from these datasets (e.g. plastic product and waste generation, consumption and trade) offer a comprehensive view of plastic flows throughout the life cycle, making them valuable tools for policy development.

Plastic exists in various flows and forms, and to capture its complexity, the guidelines use terms and definitions that align closely with existing standards. The following chapters demonstrate the practical application of these guidelines.

3. Concepts, terms and definitions

Paragraph 3.1 provides an overview of key terms and definitions related to plastics, primarily sourced from the UNEP and UNITAR statistical guidelines (UNEP and UNITAR, 2025). Plastic products are classified according to specific codes: the Central Product Classification (CPC[4]) and the Combined Nomenclature (CN[5]). These products are categorized into three groups based on their stage of production, or manufacturing stage.

Paragraph 3.2 introduces the physical flow framework for plastics, as outlined in the statistical guidelines. This framework, grounded in statistical standards and classifications, defines the scope and boundaries for the supply and use of plastic products and waste within the System of Environmental-Economic Accounting (UN et al., 2014).

3.1 Terms and definitions of plastics

3.1.1 Plastics in general

Plastics are synthetic materials primarily composed of polymers, which can be molded into shape when softened and retain their form once cooled or set. There are two main types of plastics: thermoplastics, which can be melted and re-hardened upon cooling, and thermosets, which cannot be re-melted or reformed after being heated. Rubber materials are also made from polymers but have elastic properties. However, rubber is not within the scope of this project.

3.1.2 Plastic products in primary forms

Raw plastic products consist of unprocessed polymers (such as liquids, pastes, and granules), which, along with additives, can be converted and processed into a wide variety of plastic products. In the Central Product Classification, plastic in primary forms is listed under Group 347. In the Combined Nomenclature of International Trade Statistics, raw plastic products are categorized within the four-digit groups 3901-3914.

3.1.3 Plastic products in semi-finished forms

Semi-finished plastic products are typically used as inputs for further manufacturing and are considered part of the "intermediate consumption" stage. In the Central Product Classification, these products are listed under several groups, including Group 363 (for a complete CPC list, see Annex 1 of the UNEP and UNITAR guidelines). In the Combined Nomenclature (, see Annex 2 of the UNEP and UNITAR guidelines) for International Trade Statistics, semi-finished plastic products are primarily found within the four-digit groups 3916–3921.

3.1.4 Finished plastic products

Finished plastic products are completed items made entirely from plastic. These can include packaging (CPC 364) or textiles (CPC 28243). In International Trade Statistics, finished plastic products are primarily categorized under CN codes 3922–3926.

3.1.5 Plastic in composite products / plastic in ambiguous products

Composite products are final goods made from a combination of different materials, including plastics. Ambiguous products, on the other hand, can be made from various materials, including plastics. For example, a toy truck could be constructed from either plastic or wood. These products lack a specific statistical classification. In the Material Flow Monitor, all commodities that could contain plastics or are made from either plastics or other materials have been identified. For each product group, the share of plastic was estimated. Most of these estimates are based on prior research into plastic flows. Chapter 4.1 provides a detailed explanation of the estimation process for plastic content.

[4] UNSD — CPC
[5] Combined Nomenclature | Access2Markets

3.1.6 Plastic waste

Waste is defined as any material which the holder discards, intends to discard, or is required to discard (UNECE, 2022). It can consist entirely of plastic or include plastic embedded within other types of waste. A distinction is also made between post-consumer recycled (PCR) and post-industrial recycled (PIR) plastics. The Dutch Material Flow Monitor tracks discarded plastic waste from both industry and households. Pure plastic waste is classified under the European Waste Classification for Statistics (EWC-Stat) code 7.4. Further details on types of plastic waste can be found in Chapter 4.2.3.

Additionally, international trade of plastic waste is recorded. However, a clear distinction between trade in primary plastic waste and plastic as a secondary waste product is not possible. To address this, we assume that all international waste flows consist of primary plastic waste. CN codes, used to identify imports and exports of waste intended for recycling, are provided by Eurostat[6]. Hazardous waste is collected in compliance with the European Waste Shipment Regulation (EWSR[7]).

3.1.7 Plastic embedded in waste

In addition to the "pure" plastic waste fractions, plastics is also included in mixed fractions of waste. For instance, mixed ordinary waste (EWC-stat code 10) or discarded equipment EWC stat code 8).

3.1.8 Plastic packaging

Plastic packaging is a key focus of this research due to its policy relevance. We estimate the amount of packaging for both plastic products and plastic waste. When produced, plastic packaging is either a semi-finished or final product made entirely from plastic. It is considered a semi-finished product when used as part of another product, such as a shampoo bottle.

3.2 Plastics flows in supply and use tables: conceptual framework

3.2.1 Conceptual framework physical supply and use tables

An international working group of statisticians, major international organizations, and researchers from universities developed the System of Environmental-Economic Accounting (SEEA) (UN, 2014) to assess sustainable development by analyzing the interactions between the economy and the environment. Currently, the SEEA serves as an internationally recognized framework for integrating environmental and economic statistics. It provides definitions, classifications, and statistical principles to produce comparable environmental accounts. The SEEA framework follows accounting rules similar to those of the System of National Accounts (SNA), making it highly suitable for environmental-economic analyses and policy applications. SEEA covers three main areas: physical flows, stocks and environmental assets, and economic activities related to the environment. Within the domain of physical flows, the Physical Supply and Use Tables (PSUT) play a central role

Figure 3.2.1.1 presents a basic version of the PSUT, as described in detail in the SEEA. The rows in the figure represent three types of physical flows: natural inputs, products, and residuals. Natural inputs are defined as physical flows from the environment (origin) to the economy (destination). Products are tangible goods, such as food, durable consumer items, and machinery, that move within or between economies. Residuals generally refer to physical flows from the economy back to the environment, although some residuals, such as waste, may also flow within the economy.

The top half of the figure, the supply table, outlines the flows associated with the extraction of natural resources, production of products, and residuals by various economic units or the environment. The bottom half, the use table, details the flows related to the consumption and use of these same items by different economic units or the environment.

[6] https://ec.europa.eu/eurostat/cache/metadata/Annexes/cei_srm030_esmsip2_an_1.pdf
[7] Waste shipments - Environment - European Commission

The columns of the PSUT are structured to reflect the activities driving the flows (e.g., production, consumption, accumulation, international trade, and interactions with the environment). The production column covers the economic units involved in production, classified by industry type. The household column records the consumption of products by households and the generation of residuals from that consumption. The accumulation column tracks changes in the stock of materials within the economy. The rest of the world column captures exchanges between national economies, imports and exports. The environment column records flows to and from the environment.

Figure 3.2.1.1 Basic form of physical supply and use table (SEEA-CF)

	Industries	Households	Accumulation	Rest of the world	Environment	Total
Supply table						
Natural inputs					Flows from the environment	Total supply of natural inputs
Products	Output			Imports		Total supply of products
Residuals	Residuals generated by industry	Residuals generated by final household consumption	Residuals from scrapping and demolition of produced assets			Total supply of residuals
Use table						
Natural inputs	Extraction of natural inputs					Total use of natural inputs
Products	Intermediate consumption	Household final consumption	Gross capital formation	Exports		Total use of products
Residuals	Collection and treatment of waste and other residuals		Accumulation of waste in controlled landfill sites		Residual flows direct to environment	Total use of residuals

The conceptual framework of PSUTs, as outlined above, has been implemented in the Netherlands, resulting in the Dutch Material Flow Monitor (MFM). The MFM tracks the supply and use of approximately 10 types of natural inputs, 350 product types, 17 waste categories, and data across 130 industries. More detailed information on how the MFM is compiled can be found in Delahaye et al. (2022). The MFM forms the foundation for the development of the plastic supply and use table proposed by the UN (UNEP and UNITAR, 2025).

3.2.2 Supply and use table on plastics

The PSUT for plastics are taken from the UNEP and UNITAR (2026) guidelines and provide a systematic overview of plastic flows, highlighting key supply and use patterns (see Figures 3.2.2.1 and 3.2.2.2). The tables are organized around three main components: (a) Natural inputs—the extraction of raw materials for plastic production, (b) Products—the production and consumption of plastics in various forms, and (c) Residual flows—plastic waste. The tables distinguish between primary, semi-finished, and finished products, as well as waste. Additionally, plastic embedded in finished products and waste is accounted for. Recording these different stages of production helps to avoid double counting when calculating total plastic amounts. The classification of finished plastic products includes categories such as packaging.

The columns of the plastic PSUTs mirror the structure of the standard PSUTs used in the MFM, though they are more aggregated. However, the PSUTs for plastics do not include other inputs to plastic production, such as additives and colorants, which may cause imbalances in the PSUT columns. To address this issue, balancing items could be introduced into the tables.

Figure 3.2.2.1: Physical supply table for plastic according to UNEP and UNITAR (2026) guidelines

	Industries	Households	Accumulation	Imports	Flows from the environment	**Total supply**
Natural inputs						
Products: Plastic in primary forms						
Products: Semi-finished plastic products						
Products: Total plastic in finished products						
Finished plastic products						
Packaging						
Transport						
Building and construction						
Electrical and electronic equipment						
Consumer and institutional products						
Industrial machinery						
Apparel and textile furnishing articles						
Other						
Plastic embedded in plastic-containing products						
Packaging						
Transport						
Building and construction						
Electrical and electronic equipment						
Consumer and institutional products						
Industrial machinery						
Apparel and textile furnishing articles						
Other						
Plastic waste						
of which leakages from different stages of life cycle						
Total supply						

Figure 3.2.2.2: Physical supply use for plastic according to and UNITAR (2026)

	Industries	Households	Accumulation	Exports	Flows to the environment	**Total use**
Natural inputs						
Products: Plastic in primary forms						
Products: Semi-finished plastic products						
Products: Total plastic in finished products						
Finished plastic products						
Packaging						
Transport						
Building and construction						
Electrical and electronic equipment						
Consumer and institutional products						
Industrial machinery						
Apparel and textile furnishing articles						
Other						
Plastic embedded in plastic-containing products						
Packaging						
Transport						
Building and construction						
Electrical and electronic equipment						
Consumer and institutional products						
Industrial machinery						
Apparel and textile furnishing articles						
Other						
Plastic waste						
of which leakages from different stages of life cycle						
Total use						

4. Methodology

4.1 Estimating plastic contents

4.1.1 Introduction

This chapter outlines the methodology used to determine the plastic content coefficients for product and waste categories. These coefficients are essential for converting product and waste flows into plastic flows, a crucial step in estimating plastic flows within the Dutch economy.

Products that are only partly made of plastic are referred to as composite products or ambiguous products, with plastic content ranging from >0 percent to <100 percent. In addition, there are products that are either, entirely made of plastic (e.g., plastic packaging) or fully made of materials other than plastic (e.g., wood or metal). For these products the plastic coefficient is respectively 100 percent or 0 percent plastic content.

Our initial goal was to link plastic content to international trade code classifications using the various data sources at hand. However, this approach proved challenging due to gaps and inconsistencies in the data. Paragraph 4.1.2 and 4.1.3 discuss the methodology and data sources used to allocate plastic contents to international trade codes. Ultimately, the plastic content coefficients of the products and waste used to compile supply and use tables, visualization and indicators, are determined in a slightly different way. The methodologies behind these estimations are discussed in paragraph 4.1.4 and 4.1.5.

4.1.2 Data sources for plastic content coefficients for international trade codes (CN codes)

The CN (Combined Nomenclature) and HS (Harmonized System) codes are standardized systems used to classify traded products. The HS system, developed by the World Customs Organization (WCO), is a globally recognized classification system for goods. The CN system, which is an extension of the HS system, is specifically used by the European Union and includes additional digits for more detailed product identification. The Combined Nomenclature contains around 9700, 8-digit, codes[8].

For determining the plastic content coefficients for the CN codes, national statistical organizations (such as Denmark (Gravgard et al., 2021), Norway (Berge et al,, 2023)and Canada (Statistics Canada, 2025)) and the United Nations (UNEP & UNITAR, 2026), were used. However, each data source applied its own methodology and level of detail, which affects the applicability and reliability of the coefficients when combining these sources. The following sections outline the origin, content, and specific characteristics of each data source.

Statistics Denmark

A set of plastic coefficients is available at the CN-6-digit level, with the last two digits being specific to Denmark. To align the data with the CN codes used in this study, these extra two digits were removed. While this adjustment allows for broader coverage, it also introduces a challenge: multiple plastic coefficients can exist for a single 4-digit CN code. Simply applying these aggregated values is not always appropriate, as the plastic content may vary significantly across the subcategories represented by each code.

Statistics Norway

Plastic coefficients are provided at the CN-6-digit level, offering a more detailed classification compared to the 4-digit level. This data aligns well with the standard CN codes and can be used directly. However, coverage at this level is not always extensive and some CN codes that likely contain plastic do not have a corresponding coefficient. This absence requires careful manual review to ensure that all relevant products are accounted for.

[8] https://www.cbs.nl/-/media/cbsvooruwbedrijf/international-trade-in-goods/commoditycodes-2026.xlsx

Statistics Canada

Statistics Canada provided a list of potential sources to help guide our research. While no direct plastic coefficients were available, the data shared by Statistics Canada included references to material composition for several product categories, allowing us to explore indirect sources for plastic content estimation.

For categories such as cars, cables, and batteries, detailed information on material composition per product type is available, making these data sources useful for our analysis. Large electronic appliances are also partially covered, with some data on material breakdown; however, some of this information is outdated and may require further validation.

In contrast, other categories like small appliances and e-transport have less comprehensive data, typically offering a single average value for broad product groups, which limits its precision. Additionally, some of the data provided by Statistics Canada is specific to the Canadian context, such as construction techniques and industry practices, which are not always directly applicable to the Netherlands.

UNEP and UNITAR guidelines annex

The UNEP and UNITAR (2026) guidelines include an annex with plastic coefficients at the HS-6-digit level. These coefficients are designed for global use and provide a useful starting point for estimating plastic content across different product categories. However, the list in the guideline report has some limitations. While it covers some products, many HS codes lack associated plastic content data, resulting in notable gaps.

Moreover, as the guidelines are globally oriented, they may not fully reflect the specific conditions and variations in the Netherlands. The plastic content values provided may differ for certain products when considering the local context, such as differences in materials, production methods, or usage patterns that are more common in the Netherlands compared to other regions.

As a result, the coverage of the UNEP and UNITAR list is incomplete, and the data provided for several categories is insufficient to offer a reliable estimation of plastic content for the Netherlands. While the list in the guidelines serves as a valuable reference, it requires further development to achieve more comprehensive and consistent coverage. At this stage, it cannot be used as the sole data source for compiling complete supply and use tables of plastic flows for the Netherlands.

Statistics Netherlands, Material Stocks Monitor

Statistics Netherlands compiles the Material Stock Monitor (CBS, 2024), which records all material stocks in the Dutch economy. A distinction to different types of materials, among which plastics, is also made. The Material Stock Monitor provides some data on the plastic composition of products, which can be linked to product groups in the Dutch Material Flow Monitor. The product groups in the Material Flow Monitor are aggregates of several CN codes. The data is at a higher aggregation level, and quality varies. Some product groups appear to have underestimated plastic content (e.g., medical devices, eyewear, kitchen furniture), necessitating expert judgment for validation. The main advantage is direct compatibility with the Dutch Material Flow Monitor.

Dutch literature and online sources

Various studies and online resources provide information on the composition of Dutch products, particularly in electronics, textiles, and packaging. For textiles, cars, and packaging, there is reasonably detailed and reliable data, often from CE Delft studies (Snijder & Nusselder, 2019). For electrical appliances, multiple sources exist, many derived from WEEE[9] studies.

4.1.3 Applying plastic content coefficients to international trade (CN) codes

[9] Home - Weee Netherlands

The first step in the estimating plastic content per CN-code was to create a comprehensive mapping of available plastic content coefficients to the CN codes at the 8-digit level. This involved systematically linking all available coefficients from different sources described above. For sources that provided data at different classification levels, such as HS codes, we converted the data into the 8-digit CN classification. In cases where sources provided data at the 6-digit or 4-digit CN levels, we linked the coefficients to those levels instead.

This approach resulted in a large table containing all the plastic content coefficients from the various sources, aligned as closely as possible to the 8-digit CN codes. By ensuring that coefficients from different sources were consistently applied at the most specific CN level available, we were able to create a structured overview of the available data.

However, we encountered several challenges, which stemmed from both the level of detail in the data and missing data. The following issues were dealt with:

- **Multiple coefficients for a single CN-code**: When mapping coefficients from 6-digit or 4-digit codes to 8-digit CN codes, we found that a single coefficient often applied to multiple 8-digit codes. This is because the 6-digit or 4-digit codes represent broader categories, meaning that several more specific 8-digit codes would share the same coefficient. This overgeneralization resulted in a mismatch, where certain 8-digit CN codes that did not contain plastic still received the same coefficient as those that did. Another reason for multiple coefficients was that different data sources reported different coefficients for the same CN-codes.
  The issue of multiple coefficients for a single CN-code was solved by giving the data source with highest level of detail priority. If this source was lacking data for a particular CN-code the next best data source was used.
- **Missing Data**: Another challenge was the absence of plastic content coefficients for certain 8-digit CN codes. Keywords, referring to plastic, polymers and synthetic, in the description of the certain products indicated that a certain plastic content should be assigned. Additional information was gathered to make a decision on which coefficient to use. To ensure consistency, the plastic content was carefully aligned between comparable products. The latter was applied especially for multi-material goods such as machine parts, textiles with plastic elements or composite items.
- **Packaging:** It remained unclear to what extent packaging material were part of international trade goods. A certain amount of plastic packaging was only taken into account for food and beverage products. Not taking plastic packaging for other products into consideration might have led to an underestimation of the amounts of plastic packaging flows. The reason for our approach is practical: only for food and beverages plastic coefficients for packaging seemed available in the used data sources. We did not have the expertise to make estimates for packaging of other goods.
- **Rubber:** Rubber products and rubber waste are considered out of scope. This is according to the UNEP and UNITAR guidelines.

The result is presented in attachment 2 “Plastic content CN codes” of this report as a table that shows plastic contents for all CN codes. There are still many uncertainties in the data and changes in plastic contents over time are not considered. However, the data in the table could serve as a starting point for countries to set up their own supply and use tables on plastics. Each country could adjust the coefficients according to their insights and country specific data. The table could also serve as a possibility for UNEP and UNITAR to improve the plastic content coefficients in their guidelines.

4.1.4 Determining plastic content coefficients for commodities

To generate supply and use tables for plastics, plastic coefficients are required according to the more aggregated commodity classification used in the Material Flow Monitor. For determining plastic content coefficients for these commodities, the coefficient per CN code were not the most suitable to use. The complexity of working with CN codes led us to take a more pragmatic approach: instead of applying coefficients to individual 8-digit codes, we focused on directly determining the plastic content coefficients at the MFM level, based on 350 product categories. One advantage of this approach was that many of the product groups in the National Material Stocks project by Statistics Netherlands directly align with the product groups in the MFM framework, making it much easier to apply the coefficients. This allowed us to use more consistent and relevant data, especially since Statistics Netherlands's dataset is more closely aligned with the Dutch context. To address remaining gaps, we supplemented the data with values from relevant literature, and where necessary, with specific figures from the statistical bureaus of Norway and Denmark. The data from these countries primarily served as a check, ensuring our estimates were consistent with other sources and applicable to the Dutch context.

4.1.5 Plastic contents waste

The MFM contains 16 categories for type of waste. These include, for example, chemical waste, textile waste, mixed waste, and plastic waste. Each waste category consists of waste reported under one or more EWC-stat code. Annex 1 presents all 16 MFM waste categories and the corresponding EWC-stat codes. Almost all waste categories are expected to contain some amount of plastic, although to varying degrees. Therefore, a plastic coefficient was determined for each waste category. Where possible, the plastic content was determined at the level of individual EWC-stat codes. The preferred approach was to base the plastic coefficient on available literature. When no suitable (scientific) report was available, an expert from Rijkswaterstaat - part of the Dutch Ministry of Infrastructure and Water Management and responsible for monitoring part of the waste collection in the Netherlands - was consulted to estimate the likely plastic coefficient of a waste category. For example, the plastic coefficient for waste category 102 (iron waste) was estimated to be 0,25 percent, as the weight contribution of plastic is relatively low and plastic is not intended to be present in this waste category. In contrast, for waste category 108 (plastic waste), most of the waste is expected to consist of plastic, although contamination with other materials always occurs. Therefore, the plastic coefficient of waste category 108, which consists of EWC-stat code 7.41 (plastic packaging material) and 7.42 (other plastic waste), was set on 90 percent for EWC-stat code 7.41 and 75 percent for EWC-stat code 7.42. Annex 1 also presents the plastic coefficients and the way it is determined for each waste category. Where possible, the plastic coefficient of waste was aligned with the plastic coefficient of products. For example, the plastic coefficient for textile products was set at 63 percent, and the same coefficient was applied to the textile waste category. Waste in the MFM is assigned to originate from 150 economic sectors. The plastic coefficient is the same for all economic sectors in case of the following:

- a waste category consists of only one EWC-stat code, which means all waste from an economic sector has been reported on one EWC-stat code. The plastic coefficient for an economic sector is equal to the plastic coefficient of the EWC-stat code.
- When it was not possible to accurately estimate plastic coefficients for individual EWC-stat codes. In this case a plastic coefficient was assigned by the expert from Rijkswaterstaat to the full waste category.

When a waste category consists of multiple EWC-stat codes and it was possible to estimate the plastic coefficient per EWC-stat code, the plastic coefficient was determined separately for each economic sector. This approach was applied to waste categories 112 (discarded materials) and 114 (mixed waste). For these waste categories, the plastic coefficient was determined by evaluating the distribution of reported waste across various EWC-stat codes. The relative share of waste assigned to each code contributes to the overall plastic coefficient. For example, if 40 percent of waste in category 112 is reported under EWC-stat code 8.1, 59 percent under code 8.2, and 1 percent under code 8.4, the total plastic coefficient for waste category 112 within that economic sector is calculated as 40 percent of the coefficient for 8.1, 59 percent of the coefficient for 8.2, and 1 percent of the coefficient for 8.4. All other waste categories share the same plastic coefficient across each economic sector.

4.2 Estimating plastic product flows

This section explains the methodology used to assess the flows of plastic products and plastic-containing products within the Dutch economy. The foundation for this methodology is the UNEP and UNITAR guidelines which were explained in chapter 2.3, which provide general guidance and recommendations on data sources and output tables. The approach involves integrating multiple datasets, including the Dutch MFM, international trade statistics, information on the stage of manufacturing, and data on the plastic content of products.

4.2.1 General approach

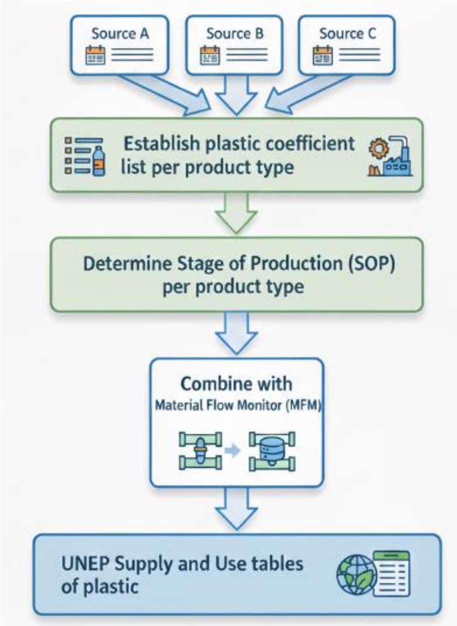
The methodology for estimating plastic flows follows a step-by-step process, beginning with the conversion of material flow accounts into plastic flows. The steps are presented in figure 4.2.1.1 and are as follows:

1. **Determining Plastic Content Coefficients**:
   The first step was to determine the plastic content of various products. This was done by applying plastic content coefficients to the products listed in the supply and use tables. The process of acquiring these coefficients is explained in chapter 4.1.
2. **Categorizing Products by Production Stage**:
   Once the plastic content was determined, we categorized each product based on its stage in the production process: primary forms, semi-finished products, or finished products. This categorization was crucial to prevent double counting of plastic flows. For instance, if a primary plastic (like granules or pellets) is processed into a semi-finished product (such as plastic sheets or molded parts), we assigned the plastic content to the semi-finished product category and ensured that no further counting of plastic occurred within that category. The classification of CN codes into stages of production is updated annually and can be found on the Eurostat methodology page. [10]
3. **Converting Material Flows to Plastic Flows**:
   With the plastic content data and the production stage categorization in place, we then converted the material flow accounts from the MFM into plastic flows. The physical material flows were converted into kilograms of plastic at each stage of production (primary, semi-finished, or finished).

By following these steps, we were able to track plastic flows through the economy at different stages of production. This structured approach helps ensure that plastic content is accurately accounted for without double counting.

Figure 4.2.1.1: Flowchart of the compilation method for plastic supply and use tables

[10] Methodology - Environment - Eurostat



4.2.2 Stage of manufacturing

The classification of plastic products into primary forms, semi-finished products, and finished products follows the definitions outlined in the UNEP and UNITAR guidelines and the categories are explained in chapter 3.1.2 through 3.1.5. These categories were then applied to the product groups in the MFM. For the plastic packaging product group in the MFM, a more detailed distinction was made between semi-finished and finished products. This distinction was necessary because the product group includes several different CN codes, some of which correspond to semi-finished products, while others correspond to finished products.

The distinction between semi-finished and finished products was made based on their intended use and the further processing required before the product reaches the end consumer. For example, a rigid plastic storage crate sold directly to retail for storing goods is classified as a finished product, as it requires no additional processing before reaching the end user. Conversely, a plastic bottle intended to be filled with water by a beverage company is considered a semi-finished product, as it undergoes further processing (filling and labeling) before being sold to the consumer.

To determine the weighted shares of semi-finished and finished products within the plastic packaging MFM group, we analysed the underlying CN codes. Import data (in kilograms) were linked to each CN code and used as weights. Each CN code was subsequently classified as either semi-finished or finished. In the Eurostat categorization in the MFA annex, all items were initially classified as finished products. However, after contacting Eurostat, some CN codes were re-categorized as semi-finished products. Aggregating these weighted classifications resulted in overall shares of semi-finished and finished products for the MFM group. By making this distinction, we aim to more accurately capture the flow of materials and the plastic content at each stage of production. While this approach has proven useful for plastic packaging, it is currently not applied to other product groups within the MFM. In the future, this method could be extended to other product groups, depending on the availability of relevant data.

4.2.3 Types of plastic

Understanding the types of plastics used in different products is crucial for analyzing plastic flows in the economy. Different plastic polymers have distinct properties, such as varying levels of recyclability, durability, and environmental impact. By identifying the polymer types in circulation, we can gain a clearer picture of how plastics could be processed, recycled, and disposed of, which is essential for developing sustainable plastic management strategies.

The UNEP and UNITAR guidelines (2026) provide estimates of polymer composition for key plastic groups (guidelines table 6.1) . The most common polymers in plastic production include polyethylene (PE), polypropylene (PP), polystyrene (PS), polyvinylchloride (PVC), polyethylene terephthalate (PET), and polyurethane (PUR). These polymers have diverse applications, and their composition can vary significantly between products. For example, a plastic bottle is typically made from PET, while a plastic pipe might be made from PVC. The polymer composition data available in the guidelines can be applied to the plastic flows calculated in the MFM, helping to refine our understanding of the different plastic types in use across industries.

It is important to note that polymer composition can vary across countries. While global averages are useful, they may not fully reflect the specific situation in the Netherlands. For more accurate insights into plastic flows and their associated impacts, it is crucial to rely on national-level data where possible. We have applied the available global polymer composition percentages to our calculated plastic flows, but for a more precise understanding of plastic types in the Netherlands, it would be necessary to investigate national distribution data. Additionally, the UN is likely to continue its research in this area and explore the possibility of determining plastic content at the HS-code level, which could further refine global and national assessments.

4.3 Estimating plastic waste flows

4.3.1 Types of plastic waste

When quantifying plastic waste, it is essential to distinguish between different types. These include discarded products made entirely of plastic, products with plastic embedded, and plastic that is not embedded but discarded with other waste, such as plastic packaging in food waste. Another distinction is between *post-consumer recycled* (PCR) and *post-industrial recycled* (PIR) plastics. PCR refers to plastic waste generated after the product has fulfilled its intended purpose and has been discarded by the end user (e.g., packaging waste from households). In contrast, PIR refers to pre-consumer plastic waste which arises during the manufacturing process (e.g., production scrap or off-spec materials) and is typically reprocessed within industrial settings.

This distinction is widely recognized in the recycling industry and by policymakers. PCR materials are typically more contaminated and heterogeneous, making them harder to recycle. However, the environmental benefits of increasing PCR use are higher due to avoided landfilling or incineration and reduced demand for virgin plastic (PlasticsEurope, 2022; UNEP & UNITAR, 2026). PIR materials are more homogeneous and thus easier to reprocess, however they represent material that was never in circulation and therefore contribute less to reducing plastic leakage or post-consumer waste volumes (European Commission, 2023).

To support effective monitoring and policy development — especially under the EU Circular Economy Action Plan, the Packaging and Packaging Waste Regulation (PPWR), and national circularity targets — it is recommended that plastic accounting frameworks distinguish between PCR and PIR.

4.3.2 Data on plastic waste in the Netherlands

The data on the total amount of waste in the Netherlands is collected from several different sources: the municipal waste statistics carried out by Statistics Netherlands, industrial waste statistics carried out by Statistics Netherlands, waste from trade statistics and EWSR, waste from the services and public sectors from the database AMICE, agricultural waste collected by Wageningen University and Research, construction waste collected by Rijkswaterstaat and waste treatment (Werkgroep Afvalregistratie, 2024). Rijkswaterstaat collects data on waste from all these different sources and combines it into a supply and kind-of-treatment dataset, which Statistics Netherlands receives and aggregates into the 16 waste categories and expands to 150 economic sectors of the MFM for both supply and use of waste. The several sources and how much plastic it contains, if known, is described below:

- Municipal Waste Statistics: Annual data collected by Statistics Netherlands on the volume of plastic waste from households. Whether plastic waste from households is collected separately or mixed with residual waste (and later sorted) depends on the municipality. In municipalities where plastic waste is collected separately, it is gathered as PMD (Plastic, Metal, Drink cartons) waste. On average, approximately 65 percent of PMD waste is made up of plastic (Witteveen and Bos, 2018). In municipalities that use post-collection sorting systems, plastic packaging is separated from the rest of the residual waste. Drink cartons are also separated and partially consist of plastic materials. Additionally, a portion of the residual waste that ends up being incinerated contains (contaminated) plastic. Data of municipal waste is published on the website of Statistics Netherlands (CBS, 2025a, CBS, 2025b). Furthermore, every three years the content of the municipal waste is tested by Eureco BV. This study shows that in 2022 13 percent of municipal waste is plastics (Ministerie van Infrastructuur en Waterstaat, 2025).
- Company waste statistics: Biennial statistic at Statistics Netherlands that provides data on the amount of plastic waste that is collected from economic sectors such as mining, industry, energy supply, water utilities, and waste management. There is a separate category for plastic waste (EWC-stat code 7.41 and 7.42). The amount of plastic waste is available per SBI (Standard Business Classification). Data is published on the website of Statistics Netherlands (CBS, 2022).
- Waste from trade statistics: Import and export of “green” waste is derived from our international trade statistics. Trade in hazardous waste is collected by Rijkswaterstaat as part of the European waste shipment (EWSR) regulation.
- Services and public sectors: Biennial statistic by Rijkswaterstaat and Statistics Netherlands. Data is collected from waste collectors in a database named AMICE (Afval Meldingen Informatie en Communicatie Electronisch)[11]. It provides data on the amount of plastic waste that is collected from trade, services, and public sector. There is a separate category for plastic waste (EWC-stat code 7.41 and 7.42).
- The Waste Registration Working Group (Werkgroep Afvalregistratie) of Rijkswaterstaat reports annually on a part of waste treatment in the Netherlands. This information is collected by sending a survey to, among others, landfills, waste incineration facilities and digestion facilities.
- Agricultural waste: Is collected by Wageningen University and Research
- Construction waste: Is collected by Rijkswaterstaat

4.3.3 Allocation and calculation of plastic waste

The aim was to calculate the total amount of plastic waste generated in the Netherlands in 2022, subdivided by the different types of plastic flows discussed in chapter 4.3.1:

- Supply and use per economic sector
- 100 percent plastic waste and plastic waste from plastic containing products
- Packaging and non-packaging plastic
- Post-consumer recycled (PCR) and post-industrial recycled (PIR) waste types

Plastic waste can be calculated using several different methods. One method recommended by the UNEP and UNITAR guidelines is the *placed-on-the-market* (POM) method. This method estimates waste by assessing which products are imported, domestically produced, and exported, as well as the lifespan of those products. The POM method is well suited for estimating waste from products with a lifespan longer than one year, but it is less suitable for products with a lifespan of less than a year. Since a large share of plastic waste consists of packaging materials—which typically have a lifespan of only a few days—we concluded that the POM method is not

[11] AMICE

appropriate for calculating total plastic waste. However, we did use the results derived from the POM method to validate plastic waste estimates for consumer products (see Chapter 6.2).

For the Netherlands, data on the total amount of waste are available (see Chapter 4.3.2), and were considered to be the most suitable basis for calculating plastic waste. Therefore, to enable the subdivision into supply and use per economic sector, the MFM supply and use tables was used to calculate plastic waste in the Netherlands. Waste categories were allocated to distinguish between waste from products consisting entirely of plastic and plastic waste originating from plastic containing products, as well as between packaging and non-packaging plastics (see table 4.3.3.1). Subsequently, the total amount of waste for each waste category and economic sector was multiplied by the plastic coefficients described in chapter 4.1.5.

Table 4.3.3.1: Allocation of the waste categories to different types of plastic waste

Type of plastic waste	Waste category
100% plastic waste – non-packaging	108b (EWC-stat code 7.42)
100% plastic waste – packaging	108a (EWC-stat code 7.41)
Plastic embedded in waste – non-packaging	101 – chemical waste; 102 – iron waste, 103 – non-iron metal waste; 104 - mixed metal waste, 105 – glass waste; 106 – paper waste; 107 – rubber waste; 109 – wood waste; 110 – textile waste; 111 – remaining non-metal waste; 112 – discarded materials; 113 – plant and animal; 113b – manure; 114b – mixed waste (EWC-stat code 10.22, 10.32); 115 – slib; 116 – mineral waste
Plastic embedded in waste - packaging	114a (EWC-stat codes 10.11, 10.12, 10.21)

Several modifications have been made to the use table to better reflect reality. The following adjustments were implemented:

- Plastic packaging waste initially attributed to the waste treatment sector has been moved to the plastic industry. This adjustment was made because plastic packaging material is most likely to be recycled and not burned.
- Due to the heterogeneity of waste categories, some plastic waste in our final table was assigned to sectors that are unlikely to process it. For instance, plant and animal waste is categorized as containing both plastic packaging material and manure. While manure is used by the agricultural sector, plastic packaging waste is not. Since our data compilation does not differentiate manure within the plant and animal waste category, it led to the agricultural sector appearing to process plastic waste, which is highly unlikely. As a result, we excluded all sectors where plastic processing is not plausible. The values initially attributed to these sectors were then redistributed to more appropriate sectors, such as the manufacturing of textiles and waste treatment facilities, where plastic processing is more likely to occur.

It was challenging to distinguish between PCR and PIR plastics. The categories in table 4.3.3.1 ‘*Plastic embedded in waste – non packaging’* and ‘*Plastic embedded in waste – packaging’* consists most likely of PCR plastics. The categories ‘*100 percent plastic waste – non-packaging’* and ‘*100 percent plastic waste – packaging’* probably are produced by economic sectors in which both PCR and PIR plastics might occur. PIR plastics are likely to be largely discarded in the plastic industry, as plastics are produced in this sector. However, other economic sectors might also generate PIR plastic waste. Since these sectors cannot be identified with certainty, only the waste from the plastic industry reported under the categories '100 percent plastic waste – non-packaging' and '100 percent plastic waste – packaging' was allocated to PIR plastics.

5. Results

This chapter presents the results, starting with an analysis of the supply and use tables for plastic in products and plastic in waste in the Dutch economy. Next, the major plastic flows in the Netherlands are examined through a Sankey visualization. Finally, the chapter discusses potential indicators derived from the data, highlighting their relevance for policymakers and their applications in advancing the circular economy.

5.1 Disclaimer

The figures presented in this report are not official Statistics Netherlands data. They are part of an experimental study aimed at exploring potential data sources and methodologies for mapping plastic flows in the Netherlands according to the guidelines laid out by UNEP and UNITAR (2026). The findings and analyses in this report are provisional and intended for research purposes only. They have not been sufficiently validated in order to guarantee plausibility. As such, they should not be interpreted as definitive or official statistics. This report explores various approaches to understanding the dynamics of plastic product and waste flows, aiming to support policy makers in shaping effective policies and researchers in developing accurate statistics on plastic flows.

5.2 Supply and use tables

Supply and use tables of plastic flows are compiled in two formats. The first format is according to MFM, which contains approximately 10 types of natural inputs, 350 types of products, 17 types of waste and for 130 types of industry[12]. In annexes 2a and 2b aggregated MFM tables with plastic flows are presented. In the current report the MFM-plastic tables are only used to give more context to the UNEP and UNITAR tables, which are discussed below.

The supply and use of plastic flows are presented in Tables 5.2.1 and 5.2.2, following the format outlined by UNEP and UNITAR (2026). It distinguishes between key sectors like chemicals, plastics, and waste processing. The plastic flows are broken down into products and waste. In addition, there are columns for other sectors, households, other final demand, and international trade, which capture the broader flow of plastic throughout the economy as well as its international interactions. "Other final demand" includes accumulation and changes in short-term stocks. Accumulation refers to the increase in the stock of goods within the economy, typically arising from investments that are intended for long-term use rather than immediate consumption. With regard to waste, accumulation refers to additions to landfills. Changes in short-term stocks reflect fluctuations in the quantity of goods held in inventory, which are often not consumed in the current period but are stored for use in future periods.

[12] " The table is available upon request for research with a clear societal relevance and no commercial objective. Requests can be submitted by email to milieurekeningen@cbs.nl, stating the intended purpose of the data use.

Table 5.2.1: Physical supply of plastic flows in the Netherlands in million kg, 2022

	Production (including household production on own account); generation of residuals						Flows from rest of the world		
	Manufacture of chemicals and chemical products	Manufacture of rubber and plastic products	Waste collection, treatment, disposal & recovery	Other industries	Households	Other final demand	Imports	Flows from the environment	**Total supply**
Natural inputs									
Products	**8373**	**2630**	**0**	**2284**			**9300**		**22587**
Products: Plastic in primary forms	8261	207	0	190			3664		**12322**
Products: Semi-finished plastic products	98	1352	0	64			1625		**3139**
Products: Total plastic in finished products	14	1071	0	2031			4011		**7126**
Finished plastic products	0	1051	0	57			1269		**2377**
Packaging	0	0	0	0			0		**0**
Transport	0	0	0	0			0		**0**
Building and construction	0	1051	0	57			1269		**2377**
Electrical and electronic equipment	0	0	0	0			0		**0**
Consumer and institutional products	0	0	0	0			0		**0**
Industrial machinery	0	0	0	0			0		**0**
Apparel and textile furnishing articles	0	0	0	0			0		**0**
Other	0	0	0	0			0		**0**
Plastic embedded in plastic-containing products	14	20	0	1973			2742		**4749**
Packaging	2	0	0	885			484		**1371**
Transport	0	0	0	251			343		**594**
Building and construction	0	0	0	15			7		**22**
Electrical and electronic equipment	0	1	0	167			458		**626**
Consumer and institutional products	4	0	0	44			287		**335**
Industrial machinery	0	0	0	65			137		**202**
Apparel and textile furnishing articles	9	20	0	493			940		**1462**
Other	0	0	0	53			86		**139**
Waste	**31**	**59**	**617**	**863**	**767**	**99**	**873**		**3308**
Plastic waste									
Non-packaging	12	33	167	131	23	0	472		**839**
Packaging	2	20	0	38	4	0	91		**155**
Plastic waste from plastic-containing products									
Non-packaging	10	3	444	363	81	99	210		**1210**
Packaging	7	3	6	330	658	0	99		**1104**

Table 5.2.2: Physical use of plastic flows in the Netherlands in million kg, 2022

	Intermediate consumption; use of residuals				Final consumption		Flows to rest of the world		
	Manufacture of chemicals and chemical products	Manufacture of rubber and plastic products	Waste collection, treatment, disposal & recovery	Other industries	Households	Other final demand	Exports	Flows to the environment	**Total use**
Natural inputs									
Products	**1478**	**1644**	**1**	**4803**	**861**	**149**	**13651**		**22587**
Products: Plastic in primary forms	1302	1407	0	1044	0	-316	8885		**12322**
Products: Semi-finished plastic products	118	164	1	1422	66	125	1242		**3139**
Products: Total plastic in finished products	58	73	0	2337	795	340	3524		**7126**
Finished plastic products	42	64	0	1056	141	64	1011		**2377**
Packaging	0	0	0	0	0	0	0		**0**
Transport	0	0	0	0	0	0	0		**0**
Building and construction	42	64	0	1056	141	64	1011		**2377**
Electrical and electronic equipment	0	0	0	0	0	0	0		**0**
Consumer and institutional products	0	0	0	0	0	0	0		**0**
Industrial machinery	0	0	0	0	0	0	0		**0**
Apparel and textile furnishing articles	0	0	0	0	0	0	0		**0**
Other	0	0	0	0	0	0	0		**0**
Plastic embedded in plastic-containing products	16	9	0	1281	654	276	2513		**4749**
Packaging	9	0	0	488	258	14	602		**1371**
Transport	0	0	0	82	32	60	420		**594**
Building and construction	0	0	0	12	0	1	9		**22**
Electrical and electronic equipment	0	0	0	263	38	26	299		**626**
Consumer and institutional products	0	0	0	41	71	53	170		**335**
Industrial machinery	0	0	0	74	0	20	108		**202**
Apparel and textile furnishing articles	7	9	0	297	240	77	833		**1462**
Other	0	0	0	25	16	25	73		**139**
Waste	**10**	**1427**	**622**	**235**		**108**	**907**		**3308**
Plastic waste									
Non-packaging	0	377	0	32		15	416		**839**
Packaging	0	70	0	6		3	77		**155**
Plastic waste from plastic-containing products									
Non-packaging	9	0	622	197		52	329		**1210**
Packaging	0	980	0	0		38	86		**1104**

5.2.1 Product flows

Products are subdivided into three main categories: primary plastic, semi-finished products, and finished products, which were explained in chapter 3.1.2 through 3.1.5. Finished products are further subdivided into two groups: fully plastic products and products that have plastic embedded. The embedded plastic products are categorized according to the UNEP and UNITAR plastic classification, with the plastic content ranging between values greater than 0 percent and less than 100 percent. Greyed-out cells are not applicable, as they represent situations that do not occur.

The total flow of *plastic products* amounts to approximately 22.6 billion kg, broken down as follows:

- 12.3 billion kg of primary plastic
- 3.1 billion kg of semi-finished products, such as plastic plates and intermediate forms, which need further processing before being used in final products.
- 7.1 billion kg of finished products, with a significant portion being embedded plastic products

Domestic supply

Around 60 percent of plastic products are supplied by domestic industries, with 70 percent of *primary* plastic being produced domestically. Primary plastic production in the Netherlands is concentrated in the western and southern regions, particularly around Rotterdam, Moerdijk, and Limburg, where large chemical and petrochemical complexes are located. The country has a long history of plastic production, dating back to the mid-20th century.

Half of the supply of semi-finished plastics, such as plastic rods/tubes, flat non-cellular plastics, and sheet plastics, is produced domestically, with the other half imported. When focusing on finished plastic products with embedded plastic, packaging is the only category where the majority of products are domestically produced and packaged. This means that, while the plastic itself may not have been produced in the Netherlands, products from Dutch industries, such as the food industry (e.g., meat), are packaged within the country after production. For all other product groups, the majority comes from imports.

For now, only an estimate of plastic packaging has been made for food and beverage products. For other products, it was difficult to determine the share of plastic packaging and whether these were already included in the plastic coefficients applied, which were developed by third parties. This was easier for food and beverages, as products like vegetables and meat, for example, do not inherently contain plastic.

Domestic use

Looking at plastic use in the Netherlands, the "Manufacture of rubber and plastic products" sector is the largest domestic consumer of primary plastic, with an estimated consumption of 1.4 billion kg. This sector primarily uses polyethylene and polypropylene. These plastics are mainly used in the production of semi-finished products, such as plastic rods/tubes and sheets, which are then further processed into finished products like packaging and construction materials.

After the "Manufacture of rubber and plastic products" sector, the "Manufacture of chemicals and chemical products" sector is another significant consumer of primary plastics, using approximately 1.3 billion kg. This sector primarily uses materials such as polyethylene (PE), polyacetates, and polypropylene (PP) to produce various intermediate products and chemicals. For example, polyethylene is processed into resins for packaging and films, while polypropylene is transformed into fibers, compounds, and additives for a wide range of applications. Polyacetates are mainly used to produce coatings, adhesives, and plastic films. While the chemical sector plays a crucial role in processing and utilizing primary plastics, it remains primarily a supplier of primary plastics, with a secondary role as a user of these materials.

More detailed information on the supply and use tables can be found in Annexes 2a and 2b, which provide a breakdown by sector and product. For example, the wood and paper sector shows a notable use of plastic chemical products (primary), including both polyethylene (PE) and polyacetates. PE is primarily used for coating and laminating paper and cardboard to make them water-resistant and protect against grease and oil. Polyacetates, on the other hand, are often used in adhesives and coatings to improve bonding and surface properties. Both materials are critical in enhancing the durability and functionality of paper-based packaging. In contrast, the supply table shows a substantially lower domestic supply of plastics for this sector. Reliable data to accurately quantify the supply of plastics for this sector are currently lacking. This mismatch between supply and use constitutes an important uncertainty in the analysis and could be examined in more detail in future research.

Also, In the supply and use tables of the annex, the agricultural sector also shows a supply of plastic, which is mainly related to plastic packaging associated with agricultural products, such as packaging for cucumbers and bell peppers. In practice, these packaging activities are unlikely to take place at the farm level and are more plausibly performed by wholesalers and/or the retail sector. However, due to limitations in data granularity and the difficulty of tracing these packaging flows across sectors, they are currently attributed to the agricultural sector in the analysis. Future research could further investigate where along the value chain these plastic packaging materials are actually added and reallocate these flows accordingly.

Households are significant end-users of plastic products, mainly in the form of packaging (e.g., food and beverage containers) and textiles. Additionally, some plastic is accumulated by economic sectors, primarily as durable goods like hard plastic storage units used in retail. Durable consumer goods such as furniture, machinery, and electronics are also accumulated by both industry and households. These products are designed for long-term use, contributing to the gradual buildup of plastic within the economy.

International trade

A significant portion of the plastic flows in the Netherlands is driven by international trade. As a key trading and transit hub, the country plays a central role in the global plastic market, with a highly internationalized supply chain. A large share of the primary plastic produced is directed to international markets.

It is important to distinguish between export and re-export: Export refers to goods produced in the Netherlands and shipped abroad, while re-export refers to goods that are imported into the Netherlands and then exported again, often with little or no processing. In this analysis, ‘exports’ refer to both domestic exports and re-exports, while ‘imports’ covers both goods for domestic use and those later re-exported. Additionally, transit trade, where goods pass through the Netherlands without being processed or re-exported, is not included in these figures.

Approximately 18 percent of primary plastic exports from the Netherlands are re-exports. The remaining portion of the primary plastic export, which makes up the majority (82 percent), consists of products that are directly produced in the Netherlands. The majority of these exports are directed towards European countries, particularly Belgium and Germany. This is largely due to their proximity, strong chemical industries, and well-developed manufacturing sectors, which rely on plastic materials for products such as packaging, automotive parts, and consumer goods. The largest non-EU receiving countries are the United Kingdom, Turkey, and China.

As explained in Chapter 5.2.1, most product groups are primarily sourced from abroad, especially apparel and textile furnishing articles. Over the past decades, the production of these textile items has shifted to low-income countries, while the Netherlands has become a more service-oriented economy. Other product groups with a high volume of imports include transport equipment, building and construction products, and electrical and electronic equipment. For example, plastics are embedded in components such as car bumpers, insulation materials for buildings, and casings for electronics like phones and computers.

For exports, a similar pattern emerges. Total exports of finished plastic products are slightly higher than domestic use, mirroring the earlier observation that imports exceed domestic supply. A substantial share of these exports consists of textile products, followed by packaging and transport equipment. It is important to note that approximately 50 percent of total exports are classified as re-exports, meaning that these goods were previously imported into the Netherlands and subsequently exported again, typically with little further processing.

5.2.2 Plastic waste flows

Please note that double counting occurs in the supply and use of waste. This is an inherent feature of the supply and use tables, which account for both primary and secondary waste. A significant portion of the waste produced by the 'Waste collection, treatment, disposal, and recovery' sector consists of secondary waste, derived from primary waste already recorded elsewhere in the table. Keep this in mind when interpreting the results.

Plastic waste is subdivided into four categories: non-packaging and packaging waste from 100 percent plastic products, and non-packaging and packaging waste from plastic containing-products. As shown in table 5.2.1 The total flow of plastic waste is approximately 3.3 billion kg, broken down as follows:

- 839 million kg plastic non-packaging waste from 100 percent plastic products
- 155 million kg plastic packaging waste from 100 percent plastic products
- 1.2 billion kg plastic non-packaging waste from plastic containing products
- 1.1 billion kg plastic packaging waste from plastic containing products

In total, it was calculated that more than 2 billion kg of plastic waste is non-packaging, while 1.2 billion kg of plastic waste is packaging. Furthermore, almost 1 billion kg of plastic waste comes from 100 percent plastic products, and 2.3 billion kg of plastic waste comes from plastic containing products.

As mentioned in chapter 4.3.3, a distinction is also made between PCR and PIR plastics. This resulted in the following amount of PCR and PIR plastics:

- 2.3 billion kg of PCR plastics (plastic waste from plastic containing products)
- The categories in table 4.3.3.1 '*Plastic embedded in waste – non packaging*' and '*Plastic embedded in waste – packaging'* consists most likely of PCR plastics
- 955 million kg is not allocated to PCR or PIR plastics

Plastic waste is for a large part used in the manufacturing of rubber and plastic products (1.427 billion kg) and waste collection, treatment, disposal & recovery (622 million kg). It was calculated that 873 million kg plastic waste was imported, and 903 million kg was exported in 2022.

International trade
In recent years, the Netherlands has played a significant role both in importing and exporting plastic waste within Europe and beyond (ILT, 2023). Most of the plastic waste imported into the Netherlands comes from neighboring EU countries, such as Belgium and Germany. The Netherlands primarily serves as a transit hub for this imported waste. Roughly three-quarters of the exported plastic waste stays within the EU, the remaining quarter is shipped to countries outside the EU.

The exported plastic waste mainly consists of well-recyclable plastic film, which is a high-quality material that could serve as a valuable secondary raw material. However, it is exported because demand for recycled plastics within Europe is too low, and processing costs are high (ILT, 2023). Export markets include countries such as Indonesia, Turkey, Vietnam and Malaysia, where companies purchase this waste and often process it under less stringent environmental regulations than in the EU (ILT, 2023).

Recycling plastic waste
Recycling rates of plastic waste vary widely across EU member states. The Netherlands, with a rate of 46 percent, is among the countries with the highest recycling rates of plastic packaging waste (European Parlement, 2025; Eurostat, 2025). In this study it was calculated that 1.427 billion kg of plastic waste was used again in the

manufacturing of rubber and plastic products in 2022. Plastic waste is collected in different ways depending on the municipality. Part of the municipalities collect plastic waste together with general waste and separate plastics afterwards (Milieucentraal, consulted January 2026). Other municipalities collect plastic waste separately. Furthermore, the Netherlands has a bottle deposit for plastic containers. A small surcharge is added to the price of beverage containers, which is refunded to the consumer when they return the empty bottles or cans for recycling. In 2022 64 percent of the containers within the deposit system were collected again (Afvalfonds Verpakking, 2023).

5.2.3 Types of plastics in finished goods

Plastic flows can also be shown according to the specific type of plastic used to produce them. The largest contributions come from polyethylene (PE, 2 million kg) and polypropylene (PP, 1.4 million kg), followed by polyvinyl chloride (PVC, 1.3 million kg). Among the product groups, 'Building and construction' contains the highest total amount of plastic (2.4 million kg), mainly PVC, PE, and polystyrene (PS). Transport-related products contain relatively high amounts of PUR and PP, while electrical and electronic equipment shows a mixed composition with notable shares. PET is only used in packaging, and 'Apparel and textile furnishing articles' consists of a wide range of plastic types. The total of 7,126 million kg of plastic flows in Figure 5.2.3.1 is equal to the total plastic in finished products found in figures 5.2.2 and 5.2.1.

Table 5.2.3.1: Plastic flows by plastic type for the Netherlands, 2022 (in million kg)

mln kg	PVC	PUR	PS	PP	PET	PE	Other	**Total**
Packaging	27	0	69	247	315	713	0	**1371**
Transport	24	142	0	226	0	77	125	**594**
Building and construction	1032	312	288	144	0	552	72	**2399**
Electrical and electronic equipment	63	63	94	144	0	113	150	**626**
Consumer and institutional products	17	27	50	107	0	127	7	**335**
Industrial machinery	0	75	0	51	0	77	0	**202**
Apparel and textile furnishing articles	161	278	73	468	0	292	190	**1462**
Other	15	26	7	44	0	28	18	**139**
Total	**1338**	**923**	**581**	**1430**	**315**	**1978**	**562**	**7126**

From a policy perspective, understanding the specific types of plastics used in the Netherlands is crucial for developing effective circular economy strategies. While PET and HDPE are successfully recycled, thanks to systems like the deposit-return scheme for bottles, other plastics like LDPE and PP face significant recycling challenges due to sorting difficulties and their complex nature. Mixed plastic products, such as multilayer packaging, further complicate recycling, leading to contamination and reduced material quality. Additionally, plastics like PS, PVC, and PUR are rarely recycled in the Netherlands due to economic and technical barriers, with PUR and PVC often ending up in incineration or landfills. However, emerging technologies in chemical recycling offer potential solutions for these difficult-to-recycle plastics, although they are still in early stages of development.

These figures were calculated using standard fractions from the UNEP and UNITAR guidelines, representing a first approximation of Dutch plastic flows in 2022. Importantly, this analysis only covers finished goods, including products made entirely of plastic as well as products with embedded plastic. Results are based on the flows shown in the supply table, broken down by type of plastic and product group. While these data provide a useful overview of the dominant plastics per sector, they should be considered preliminary estimates and may require further refinement for precise policy or business applications.

5.3 Data visualization: Plastic flow Sankey

Data from the supply and use tables in chapter 5.2 are used to create a Sankey diagram of plastic flows (Figure 5.3.1). Notice that, for the Sankey, some double counting of the waste flows is taken out by excluding waste produced by sector “Waste collection, treatment, disposal & recovery”.

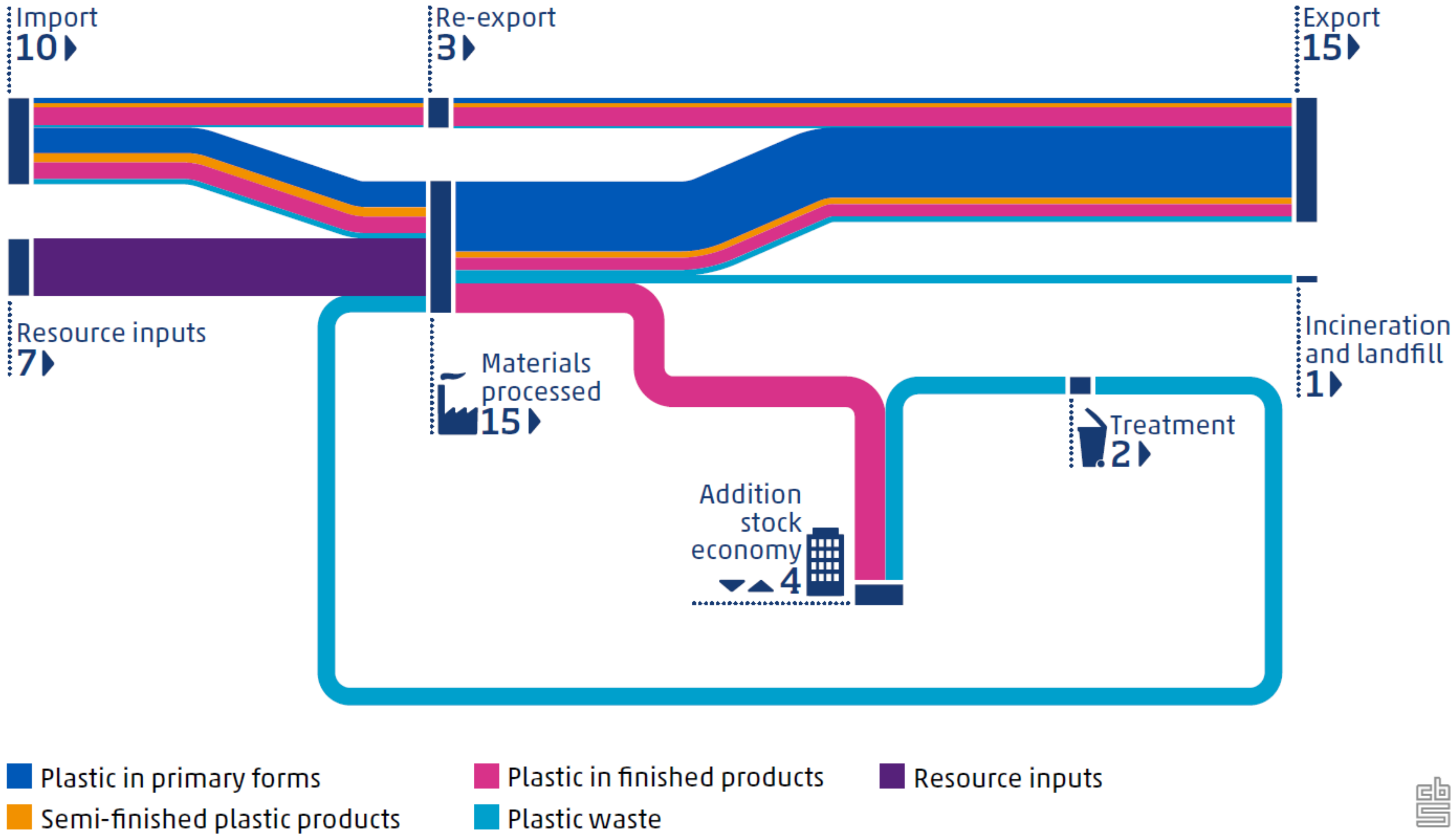
This diagram visualizes the quantities of plastic produced, processed, traded internationally, and treated at the end of life. It tracks both plastic products and plastic waste. Plastic products are categorized into primary (polymers), semi-finished, and finished products, with only the plastic content of finished products being considered. The width of the bands in the diagram is proportional to the flow quantities. Material flows are linked by nodes, which represent processes such as imports and waste treatment, and indicate the direction of the flows.

On the left-hand side, the import of plastics is shown. About one third of the import is re-exported. These are mainly finished products. Two thirds of the import is used for domestic processing. Another input for domestic processing are resources, like crude oil and additives, used to produce plastics. Last, domestically generated plastic waste is input to material processing. Waste can be exported, incinerated, landfilled or recycled.

A substantial amount of plastic is used in the Dutch economy as a final product. In turn, plastic products in the economy lead to plastic waste at the end of life of products. Notice, the input of resources is not directly derived from the plastic supply and use tables but estimated in order to balance all inputs (imports, and waste treatment) with all outputs (export, additions to stock, incineration and landfill). Resources consist mainly of crude oil.

Although Figure 5.3.1 is based on preliminary data, it provides a fairly reliable overview of the main plastic flows. In terms of plastic products, the Netherlands predominantly produces primary plastics, a significant portion of which is exported. Plastic imports are diverse, with primary plastics making up nearly half of the total volume. The Sankey diagram indicates that approximately 17 percent of the inputs for material processing consist of plastic waste (both domestically generated and imported). Of this plastic waste input, about 47 percent is recycled domestically. Plastic waste recycling is determined by subtracting incinerated, landfilled and exported waste from the total supply of waste (domestical supply plus imports).The remaining waste is exported (25 percent) or incinerated and landfilled (28 percent). Verifying the accuracy of these figures is challenging due to the lack of comparable data from other sources (see chapter 6 on the differences between the figures in the Sankey and other data sources). A validity check is recommended before this data can be used for policy decision-making.

Figure 5.3.1: Plastic flows in the Netherlands in billion kg, 2022



5.4 Policy relevant indicators

5.4.1 Introduction

In the Berenschot study on circular plastics (Verbeek et al., 2025), a comprehensive set of indicators was identified to address key aspects such as plastic production, plastic waste, recycling methods, types of plastics, and applied circular strategies. The study also assessed the availability of data for each indicator. In some cases, data was unavailable, and where data did exist, its suitability for deriving reliable indicators for monitoring purposes was not always clear.

The Material Flow Monitor, which forms the basis for the plastic flow analysis in this research, was identified by Berenschot as an administrative data source for which data plausibility—particularly at a granular level—has not been fully quantified. As a result, ensuring the plausibility and reliability of the figures presented in this report has taken priority over compiling an extensive list of potential indicators. Without confidence in the accuracy of these figures, the development of a comprehensive list of indicators, while theoretically valuable, would not be a productive endeavor.

To ensure the indicators presented in this chapter are reasonably plausible, they are aligned with the macro-economic approach of the SEEA framework. This macro-economic perspective involves situating plastic flows within the broader context of supply and use tables, comparing them with other material flows, as well as economic and environmental indicators. A key strength of our research lies in the integration of various types of statistics, made possible by the consistent, internationally agreed-upon SEEA framework. This approach provides added value compared to other existing publications on plastics outside of official statistical offices.

Below four relevant indicators that align with our data and macro-economic approach are discussed. Most of the proposed indicators are not yet very meaningful, as data is only available for a single year. A time series or comparison with similar indicators from other countries would reveal the true usefulness of these indicators. Additionally, having more data points would help assess the robustness and plausibility of the data underlying these indicators.

5.4.2 Indicators

Fossil energy carriers in energy vs. plastic production

Policies governing fossil energy carriers used for plastic production differ significantly from those applied to fossil energy carriers used for energy generation. The latter are heavily taxed, while the former are not. As transport electrification increases and bio-based fuels become more prevalent, there could be a shift toward non-energetic applications of fossil energy carriers. Producers of fossil fuels may find more promising business opportunities in the non-energetic use of their resources. However, this could lead to cheaper primary plastics, potentially undermining policy efforts to promote the use of secondary plastics in production. This underscores the need for an indicator that tracks the share of plastic consumption within the total use of fossil energy carriers.

Final consumption of plastic products vs. plastic waste generation

One strategy for more efficient resource use is "slowing the loop." In the context of the circular economy, "slowing the loop" refers to extending the lifespan of products, components, and materials, which in turn reduces the rate at which plastic products are consumed and waste is generated. A shift in the ratio between the consumption of final plastic products and the generation of plastic waste could signal changes in resource use efficiency. A decrease in product consumption relative to waste generation might suggest longer product lifespans. However, no product lasts forever, and eventually, a new balance between consumption and waste generation will be reached. The Sankey diagram in this report shows that the amount of plastic added to stock exceeds the plastic waste generated by around 75 percent.

Plastic production vs value added and resource inputs

Economic efficiency in the plastic sector can be measured by dividing the value added by the total amount of plastic produced. For the Netherlands, the value added in the plastic sector is €3533 million, while plastic production amounts to 2630 million kg (CBS, 2025c). By calculating the ratio of value added per kilogram of plastic produced, we can gain insight into the economic efficiency of plastic production in terms of its contribution to the economy.

Additionally, to measure resource efficiency, one can look at the ratio of resources used to produce plastic, where lower values indicate better efficiency in utilizing resources. For example, the emissions intensity of plastic production is also an important indicator: the plastic sector in the Netherlands emitted 285 million kg of CO2 in 2022 (CBS, 2025d). A lower emissions intensity means that fewer resources are lost as waste or emissions, contributing to a more sustainable production process.

Both economic and resource efficiency are critical, but they focus on different aspects: economic efficiency relates to the financial value produced per unit of plastic, while resource efficiency measures the minimization of resource consumption and environmental impact during production.

Plastic waste generation vs waste incineration and export

The "closing the loop" strategy focuses on reintroducing products at the end of their lifecycle back into the economy, rather than disposing of them through incineration or landfilling. For all available plastic waste (including both imports and domestic production), our data shows that approximately 28 percent is incinerated or landfilled in the Netherlands, while around 25 percent is exported. Although the policy aims to export only to countries with adequate recycling infrastructure, it remains unclear how plastic waste is treated once it leaves the country. Reducing both incineration and landfilling, as well as managing export flows more transparently, would contribute significantly to closing the loop in the Netherlands.

6. Comparisons with other studies

6.1 Plastic products

This is not the first study to analyze plastic flows in the Netherlands; therefore, we compare our results with findings from earlier publications presented in chapter 2. In this section, we briefly outline several relevant studies, compare their outcomes with our own, and interpret the observed differences.

6.1.1 Total plastic flows

In 2019, CE Delft published a study on plastic use and waste management in the Netherlands, estimating that approximately 1.9 billion kg of finished plastic products were placed on the Dutch market in 2017 (CE Delft, 2019). In addition, Berenschot (2025) estimates that about 2.4 billion kg of plastics were converted into applications or products in the Netherlands in 2022. Despite differences in reference years, our analysis similarly finds that approximately 3.1 billion kg of plastics in finished products were placed on the market 2022.

A clear distinction must be made between plastics placed on the market and the domestic production of primary plastics. According to PlasticsEurope (2022), the Netherlands produced approximately 5.5 billion kg of primary plastics from fossil feedstocks in 2022. The same year, Berenschot (2025) estimates total domestic production at 6.5 billion kg and the study based on Conversio (2025) data estimates a total production of 6.2 billion kg in 2022, while our analysis indicates a higher production volume of roughly 8.7 billion kg. These discrepancies are likely driven by differences in data sources, methodological choices, and the scope of materials and product categories included.

6.1.2 International trade

Significant discrepancies are observed in estimates of international trade flows of plastics. CE Delft (2019) reports imports of 635 million kilograms and exports of 720 million kilograms of finished plastic products, whereas our analysis indicates substantially higher volumes: approximately 4 billion kilograms of imports and 3.5 billion kilograms of exports of finished plastic-containing products. The CE Delft study does not clearly specify the underlying trade data sources, nor does it clarify whether re-exports or plastics embedded in finished and semi-finished products are included. These specifications determine the figures to a large extent, e.g. around 68 percent of the import of plastic in finished products consists of plastic embedded in products. Consequently, it is difficult to assess to what extent these discrepancies stem from definitional choices, differences in data coverage, or methodological assumptions.

Berenschot (2025) reports international trade flows of primary plastics for the Netherlands in 2022, estimating imports at 2.9 billion kilograms and exports at 6.9 billion kilograms. Based on our data, we estimate imports of approximately 3.7 billion kilograms and exports of nearly 9 billion kilograms of primary plastics. Although our estimates are closer to those reported by Berenschot than to the substantially lower figures presented by CE Delft, a considerable difference remains.

6.1.3 Plastic flows per product group

As explained in chapter 6.1.1, the CE Delft study estimated that approximately 1.9 billion kg of plastics were placed on the Dutch market in 2017. This figure represents the amount of plastic contained in finished products, which are either fully made of plastic or contain a certain share of plastic. These products are supplied to final demand. The total is mainly composed of consumer goods (747 million kg), packaging (530 million kg), construction materials (290 million kg), textiles (209 million kg), and vehicles and electrical and electronic equipment (approximately 50 million kg).

6.1.4 Plastic flows per sector

In the report *Kunststoffen in de bouw* published by NIBE in 2022, the authors estimate the quantities of plastics used in the construction sector (civil engineering and residential and non-residential building) based on data from *Plastics – the Facts 2019* by PlasticsEurope. This publication reports a total European plastics demand of 51.2 billion kg in 2018. According to PlasticsEurope, plastic converters in the Netherlands account for 4.3 percent of this demand, corresponding to approximately 2.2 billion kg. PlasticsEurope further provides a breakdown by application segment, allocating 19.8 percent of total plastics demand to the *Building & Construction* sector. Assuming that this sectoral distribution applies uniformly across European countries, NIBE estimates an input of approximately 435 kilotons of plastics used in the construction sector in the Netherlands.

Our own estimates result in a total input of 902 kilotons of plastics for the construction sector; however, this figure covers the entire building sector, including *Demolition / Site Preparation*, *Building Installation*, *Building Finishing*, and *Other Construction Activities*. When we limit the scope to civil engineering and residential and non-residential building, our estimate amounts to 295 kilotons, slightly lower than the 435 kilotons reported by NIBE.

The NIBE report also refers to a separate study by EIB for 2019 (EIB, 2022). According to that study, the total plastics input for the construction sector was 90 kilotons, with an additional 115 kilotons of plastic insulation materials, resulting in a combined total of 205 kilotons of plastics. This is somewhat closer to our estimates for the civil engineering and building segments.

These comparisons illustrate the challenges of comparing different studies, given the differences in reference years and the fact that definitions and system boundaries are not always consistent or clearly documented. NIBE also notes that comparisons are particularly difficult due to variations in the definition of "construction" (for example, whether civil engineering is included or only building), differences in the scope of plastics considered (such as whether synthetic rubbers or insulation materials are counted), and differences in whether the data cover only new construction or also renovation and maintenance activities.

6.2 Plastic waste

Three studies reporting (parts of) plastic waste in the Netherlands for 2022, and one study reporting plastic waste data for 2017, were identified as suitable for data validation:

- A study by Afvalfonds Verpakkingen (Afvalfonds Verpakkingen, 2023) – this study reports on plastic packaging placed on the market in 2022 and the extent to which it is recycled. In this study, a questionnaire was distributed among recyclers in the Netherlands, requesting information on the amount of plastic packaging delivered for recycling and the share that could not be recycled.
- The Material Stock Monitor from Statistics Netherlands (CBS, 2024) calculated the urban mine in the Netherlands in 2020. This analysis was recently repeated for 2022 and 2024, the results were used for the Integrated Circular Economy Report (Hanemaaijer, *et a*l, 2025). Partial results were made available, specifically the amount of plastic waste from consumer products. Plastic waste from consumer products is calculated using the put-on-market (POM) method. With this method, waste generation is estimated based on product consumption (imports + domestic production − exports) and product lifespans. Subsequently, the plastic content of the waste is determined by applying a plastic coefficient per product group, similar to the approach used in the present study. A full description of the methodology is provided in the Statistics Netherlands report (CBS, 2024) and in a detailed methodological paper by Van Straalen (2022).
- A study from a consortium from Utrecht University, described in chapter 2.2.1 (Lobelle et al., 2024) – In this study two models were developed to estimate the volume of plastic waste processed in the Netherlands in 2017.
- A study by Circular Plastic NL (2025). Figures in this study are compiled by Conversio. Figures in publications by Plastic Europe and Verbeek (2025) also use Conversio data.

Table 6.2.1 presents the calculated amounts of plastic waste from the present study, the Afvalfonds Verpakkingen study, the POM-based results from the Material Stock Monitor of Statistics Netherlands, and the Utrecht University study.

In the present study, the calculated amount of plastic packaging used within the plastic industry is 1,050 million kg (see Table 5.2.2: *Physical use of plastic flows in the Netherlands in million kg, 2022*). It is assumed that this plastic packaging is recycled. In contrast, the study by Afvalfonds Verpakkingen reports that 122 million kg of Dutch plastic packaging was recycled in the Netherlands in 2022 (Afvalfonds Verpakkingen, 2023). Although Afvalfonds Verpakkingen considers only waste generated in the Netherlands, the amount of recycled plastic packaging calculated in the present study is substantially higher than the amount reported by Afvalfonds Verpakkingen. The origin of this discrepancy is unclear, but it may be related to the plastic coefficient applied in the present study. It is possible that this coefficient is too high, resulting in an overestimation of the amount of plastic packaging suitable for recycling. Another possibility is that, in the present study, too much plastic waste is classified as "packaging," whereas it might actually be non-packaging material. Circular Plastic NL reports around 428 of recycled plastic. This amount is also substantial lower than our results.

The calculated amount of plastic waste from consumer products in the present study is 1 billion kg, consisting of 1.21 billion kg of non-packaging waste from plastic-containing products minus 210 million kg of imported waste. In the Material Stock Monitor by Statistics Netherlands, the total calculated amount of plastic waste from consumer products is 983 million kg. The difference between the two estimates is 17 million kg, which is relatively small.

In the study by Utrecht University, a total of 1,990 million kg of plastic waste was reported (Lobelle et al., 2024). In the present study, 3,3 billion kg of plastic waste is calculated, which is 1,318 million kg more than reported by Utrecht University. A large part of this difference can be explained by double counting of primary and secondary waste in our study. Most of the most generated by sector "Waste collection, treatment, disposal & recovery" can be considered secondary waste derived from primary waste also recorded.

Furthermore, household plastic packaging and non-packaging waste were reported as 398 million kg and 203 million kg, respectively, in the Utrecht University study, compared to 662 million kg and 85 million kg, respectively, in the present study. Imported and exported plastic waste amounted to 623 million kg and 320 million kg, respectively, in the Utrecht University study, whereas in the present study these figures are 875 million kg and 907 million kg.

With the exception of household plastic non-packaging waste, the amounts of plastic waste calculated in the present study are consistently higher than those reported in the Utrecht University study. Part of this discrepancy may be explained by the difference in reference year, as the Utrecht University data refer to 2017, while the present study uses data from 2022. However, it is unlikely that this temporal difference alone accounts for the magnitude of the observed discrepancies, suggesting that the plastic waste quantities in the present study may be overestimated.

Table 6.2.1: The calculated amount of plastic waste in million kg from the current study, the study of Afvalfonds Verpakking, the Material Stock Monitor from Statistics Netherlands and Utrecht University.

	Current study	**Afvalfonds Verpakkingen**	**Material Stock Monitor**	**Utrecht University**
Plastic packaging recycled	1050	122		
Plastic waste from consumer products	1000		983	
Plastic waste	3308			1990
Household plastic packaging waste	662			398

Household plastic non-packaging waste	104	203
Imported plastic waste	873	623
Exported plastic waste	907	320

Before the plastic waste figures from the current study can be applied, additional research is needed to investigate and clarify the discrepancies between the results of different studies.

7. Conclusions

7.1 General

The main objective of this study was to assess whether the application of standard international statistical guidelines (UNEP and UNITAR, 2026) can provide policy-relevant measurements of plastic flows across the entire lifecycle for the Netherlands. We have demonstrated that it is possible to collect and integrate relevant data on plastic flows to compile supply and use tables on plastic products and waste according to the UNEP and UNITAR guidelines. We primarily combined existing datasets from our environmental accounts, such as the Material Flow Monitor and waste accounts, but also incorporated new information, for example on plastic content coefficients.

It is important to note that the methods and results presented in this study are experimental in nature. As the first comprehensive effort to map plastic flows in the Netherlands, the study applied several assumptions, and some data fell short of the desired quality standards. Validating our findings with existing data proved challenging due to discrepancies in concepts and definitions used. Consequently, the findings should be interpreted with caution and viewed primarily as a basis for further research and refinement.

The preliminary results are illustrated in a Sankey flow diagram, which visualizes the key plastic flows in the Netherlands and their interconnections. The diagram indicates that the Netherlands primarily produces primary plastics for export, with approximately 17 percent of the input for plastic processing consist of plastic waste.

Several upcoming policy measures focus on plastic production and waste management. These initiatives are essential for fostering more favorable conditions for business models centered around circular and sustainable plastic production. Therefore, the need for an effective plastic monitoring system is expected to become increasingly important to support policy measures over time.

7.2 Plastic content coefficients

Plastic content coefficients are used to convert product and waste flows into corresponding plastic flows. A dataset of these coefficients has been compiled at the level of international trade codes (CN codes), drawing on existing international and national data sources. To create this dataset, several assumptions were made to address gaps in coverage, variations in detail, methodological differences across sources, and limited relevance to the Dutch context. Additionally, changes in plastic content over time were not considered. Despite all assumptions, this dataset could serve as a foundation for other countries to develop their own supply and use tables for plastics, with the option to adjust the coefficients based on national data and insights. Furthermore, it provides an opportunity for UNEP and UNITAR to refine the plastic content coefficients in their guidelines.

In order to estimate the plastic supply and use tables in this report, plastic content coefficients were determined at the more aggregated commodity level of the Material Flow Monitor. This approach turned out to improve internal consistency and relevance for the Netherlands. Plastic packaging was not fully captured. An estimate for packaging was made only for food products. For other consumer products it was uncertain whether the available coefficients accounted solely for the plastic within the product itself or also for the associated packaging. The plastic coefficients for waste were determined per EWC waste category and and/or economic sectors.

7.3 Plastic products

Comparing and validating the results was challenging due to differences in data sources, reference years, methodologies, and scopes across studies. While the major plastic flows in the Netherlands were broadly comparable, discrepancies became apparent in more detailed flows, such as international trade or the supply of specific product groups. These differences were often difficult to explain. Many studies relied on European-level data, estimating the Dutch share of these flows, which differed from the data sources used in this report. Moreover, large gaps between reference years further complicated the comparability of results, limiting the ability to robustly validate the estimates presented here.

The results indicate that total plastic product flows amount to approximately 22.6 billion kg, of which 12.3 billion kg consists of primary plastics, 3.1 billion kg of semi-finished products, and 7.1 billion kg of finished products. It is likely that there are some instances of double counting, as plastic flows from primary to semi-finished to finished products. These double counts are probably not reflected in the breakdowns, but may be included in the total across the three categories. Around 60 percent of the plastic products are supplied by domestic industries, with the remainder imported. Packaging is the only finished product group that is predominantly supplied domestically; all other finished products, particularly apparel and textile furnishings, are mainly sourced from abroad. Over the past decades, the production of many consumer goods has shifted to low-income countries, while the Netherlands has become a more service-oriented economy. Plastic use is highly concentrated in a limited number of sectors, most notably the manufacture of rubber and plastic products and the chemical industry, while households represent a significant end-use through packaging, textiles, and durable goods that contribute to long-term accumulation. As a key trading and transit hub, the Netherlands plays an important role in the global plastic market, with a highly internationalized supply chain. Approximately half of all plastic products are exported, with a substantial proportion of the total plastic exports consisting of re-exports rather than domestically produced goods.

7.4 Plastic waste

This study demonstrates that it is possible to estimate plastic waste based on available data on the total waste generated in the Netherlands. However, given the discrepancies with other studies, the results should be validated before their plausibility can be confirmed. The uncertainty in the data arises from the numerous assumptions made in estimating the plastic content of waste and allocating it across various categories (e.g., packaging versus non-packaging, pure plastic versus plastic-containing products, and PIR versus PCR) that are differentiated in our supply and use table.

The plastic waste from consumers, calculated using the Put On Market (POM) method, aligns closely with the results of the present study. However, we used the POM method solely for verification purposes, as our waste account data is more comprehensive. The POM method is less applicable to packaging waste due to the short lifespan of packaging. Nonetheless, in countries where data on total waste generation is lacking, the POM method could serve as a viable alternative for estimating plastic waste from products with a longer lifespan.

7.5 Policy relevance

Systematic monitoring of plastic flows in the Netherlands remains limited. The methodology and indicators discussed in this study could play a crucial role in supporting policies by providing a consistent, macro-economic perspective on plastic flows. The added value of this approach includes: 1) integrating plastic data from multiple sources (e.g., plastic products production and plastic waste treatment); 2) linking policy-regulated plastic products to flows that fall outside of current regulations; 3) connecting plastic flows with potential non-fossil-based alternatives; and 4) relating physical data to economic indicators, such as value-added and employment.

Emerging policies, such as the Packaging Waste Regulation (PWR), the National Circular Plastics Standard (NCPN), and the Digital Product Passport (DPP), have the potential to require data collection that could be valuable for monitoring purposes. Data on plastic content and the types of plastics used could be integrated into the macro-plastic-flow framework employed in this study. However, as these policies still need to take effect, the ultimate usefulness of the data they generate remains uncertain.

Nonetheless, new policy measures on plastic production and waste management are essential for creating favorable conditions for business models focused on circular and sustainable plastic production. Therefore the need for an effective plastic monitoring system is anticipated to become increasingly important over time to support these policy initiatives. To ensure that our data will be useful for monitoring programs, such as the European Green Deal or the Dutch Circular Economy Monitoring Program, it is crucial to engage with stakeholders for feedback and validation of the data and methodology used in this research.

8. Recommendations

In this chapter, we outline key recommendations aimed at enhancing the accuracy, consistency, and accessibility of plastic flow data. These suggestions are designed to address existing data gaps, improve monitoring systems, and support evidence-based policy-making for more effective plastic waste management.

8.1 Standardization of definitions and methodologies

Data on plastic is available from various sources, but the absence of standardized definitions for plastics and economic sectors complicates the integration of data across studies. We recommend adopting the SEEA statistical framework outlined by UNEP and UNITAR (2026) in order to establish clear standards. This could facilitate better data harmonization and comparability across different countries and studies.

8.2 Expansion of international dataset for plastic flows

A dataset containing plastic coefficients for all international (CN) trade codes has been compiled, which serves as a useful starting point for estimating plastic flows. Our dataset can be used to expand the list provided by UNEP. We encourage other countries and institutions to further refine this dataset by integrating specific, time- and country-related data. To maximize its utility, we propose that updates or refinements made by other institutions be shared and centralized through organizations like Eurostat, UNEP, or a dedicated platform. This would not only enhance the dataset but also ensure broader access and facilitate cross-country comparisons.

8.3 Improvement in data coverage and granularity

To improve the quality and accuracy of plastic flow data, we recommend a focus on the following areas:

- **Plastic packaging**: Expand data collection on plastic packaging, which represents a significant share of plastic consumption and waste. A detailed breakdown of plastic packaging types (e.g., rigid, flexible) and their recycling rates could offer more targeted insights.
- **Plastic as a secondary resource:** Gather more detailed data on plastic as a secondary resource (recycled plastic), including the processes of recycling and the types of products produced from recycled materials.
- **Plastic composition and origin:** Collect more granular and time specific data on the types of plastics used (e.g., PE, PP, PET) and their origin (e.g., primary versus recycled), which could provide a clearer picture of supply chain dynamics and material flows.

8.4 Expert verification and validation of results

To enhance the applicability and credibility of the results for decision-making, we emphasize the importance of further validation by experts specializing in plastic flow and waste management. Expert reviews can provide valuable insights into existing data gaps and help refine the methodology. In particular, more granular data at the sector or product level is essential to improve the accuracy of plastic flow estimates.

A formal peer review or stakeholder consultation process would help ensure that the results align with current data collection practices and policy needs. Moreover, governments should be encouraged to adopt regulations that require businesses to report detailed data on plastic production, use, and recycling at a more micro level. Such policies would facilitate the creation of a comprehensive and accurate database, ultimately supporting evidence-based decisions.

References

Afvalfonds Verpakkingen (2023). Toelichting op het verslagleggingsformulier recycling verpakkingen - Resultaten recycling verpakkingen 2022. https://ap.lc/lXaLJ

Berge, G., Landsem, T.L., Skjerpen, C. (2023) Plastic account for Norway, Statistics Norway, 2025/35

Circular Plastics NL (2025) Navigating volumes and value chains towards circularity. Circular-Plastics-NL-Navigating-Volumes-and-Value-Chains-FULL-202504-1-1.pdf

CBS (2022). Bedrijfsafval; afvalsoort, bedrijfstak (SBI 2008 https://opendata.cbs.nl/#/CBS/nl/dataset/84970NED/table?searchKeywords=bedrijfsafval

CBS, (2024) Materiaalvoorradenmonitor, Statistics Netherlands, The Haque/Heerlen. https://www.cbs.nl/nl-nl/longread/aanvullende-statistische-diensten/2024/materiaalvoorradenmonitor.

CBS (2025a). Statline, Huishoudelijk afval per gemeente per inwoner https://opendata.cbs.nl/#/CBS/nl/dataset/83452NED/table?ts=1749723649158

CBS (2025b). Statline, Huishoudelijk restafval; nascheiding per gemeente https://opendata.cbs.nl/#/CBS/nl/dataset/86053NED/table?ts=1749717664167

CBS (2025c). statline, Productie- en inkomenscomponenten bbp; bedrijfstak; nationale rekeningen https://opendata.cbs.nl/#/CBS/nl/dataset/85867NED/table?dl=D046E

CBS (2025d). Statline, Emissions to air by the Dutch economy; national accounts. https://opendata.cbs.nl/#/CBS/en/dataset/83300ENG/table

Circular Plastics NL. (2025). *Circular Plastics NL: Navigating volumes and value chains towards circularity*. Retrieved from https://circularplasticsnl.org/wp-content/uploads/2025/06/Circular-Plastics-NL-Navigating-Volumes-and-Value-Chains-FULL-202504-1-1.pdf

Delahaye, R., Tunn V., Tukker, A. (2022) Developing a material flow monitor for the Netherlands from national statistical data. Journal of Industrial Ecology, vol. 27. is. 2, pag. 408-422. https://onlinelibrary.wiley.com/doi/full/10.1111/jiec.13365

European parlement (2025). Plastic afval en recycling in de EU: feiten en cijfers. https://www.europarl.europa.eu/topics/nl/article/20181212STO21610/plastic-afval-en-recycling-in-de-eu-feiten-en-cijfers

Eurostat. (2025). Packaging waste by waste management operations https://ec.europa.eu/eurostat/databrowser/view/env_waspac__custom_13315375/bookmark/table?lang=en&bookmarkId=5c65359f-e039-4bb9-a3da-f58ef179d43b&c=1729065591112

ILT (2023). Hoogwaardige grondstoffen naar verre landen door geringe vraag in EU. https://www.ilent.nl/documenten/afval/afvalinzameling-en--preventie/factsheets/hoogwaardige-grondstoffen-naar-verre-landen-door-geringe-vraag-in-eu

Gravgard, O., Kristensen, S., Svantesson, S., Urhammer, E. (2021) Accounts and indicators for Danish Plastic Flows, Statistics Denmark, Eurostat gran 881510-2019-DK-ENVECO.

Hanemaaijer, A. et al. (2025). Integrale Circulaire Economie Rapportage 2025. Den Haag: Planbureau voor de Leefomgeving.

Lobelle, D., Shen, L., van Huet, B., van Emmerik, T., Kaandorp, M., Iattoni, G., Baldé, C. P., Lavender Law, K., & van Sebille, E. (2024). Knowns and unknowns of plastic waste flows in the Netherlands. *Waste Management and Research*, *42*(1), 27-40. https://doi.org/10.1177/0734242X231180863

Ministerie van Infrastructuur en Waterstaat (2025). Samenstelling van het huishoudelijk restafval, sorteeranalyses 2023. https://open.overheid.nl/documenten/235acad6-fe0c-4c9e-8cd9-09263a7649ba/file

Milieucentraal (consulted January 2026) Plastic verpakkingen en voorwerpen. https://www.milieucentraal.nl/minder-afval/afval-scheiden/plastic-verpakkingen-en-voorwerpen/

NIBE. (2022). *Kunststoffen in de bouw*. Circulaire Bouweconomie. https://circulairebouweconomie.nl/wp-content/uploads/2022/09/kunststoffen-in-de-bouw.pdf

PlasticsEurope. (2018). *Plastics – the facts 2018*. PlasticsEurope. https://plasticseurope.org/knowledge-hub/plastics-the-facts-2018/

PlasticsEurope. (2022). *Plastics – the facts 2022*. PlasticsEurope. https://plasticseurope.org/knowledge-hub/plastics-the-facts-2022/

Snijder, L. and Nusselder, S. (2019) Plasticgebruik en verwerking van plastic afval in Nederland, CE Delft, 19.T13.026, Delft.

Statistics Canada (2025) Physical flow account for plastic material, 2021. https://www150.statcan.gc.ca/n1/daily-quotidien/250312/dq250312d-eng.htm

UN (United Nations), EU (European Commission), FAO (Food and Agriculture Organization), IMF (International Monetary Fund), OECD (Organisation for Economic Co-operation and Development), & World Bank. (2014) System of Environmental-Economic Accounting 2012: Central Framework. United Nations. https://seea.un.org/content/seea-central-framework

UNEP (United Nations Environment Programme) and UNITAR (United Nations Institute for Training and Research). (2026) Statistical guideline for measuring flows of plastic throughout the life cycle. Nairobi & Bonn. https://doi.org//10.59117/20.500.11822/49173

Van Straalen, V. (2022). *Voorraden project. Conversie naar materialen - methode beschrijving.* The Hague, The Netherlands: Statistics Netherlands (CBS).

Verbeek, W., Wijngaard, M., Cohen, Q., van Harmelen T., Zuijderwijk, N., de Ruiter E. & van Liempt T. (2025) Monitor circulaire plastics - Methodologie en nulmeting. https://open.overheid.nl/documenten/9f66952b-ff58-40fa-8798-c86bddf40b9d/file

Werkgroep Afvalregistratie (2024) Afvalverwerking in Nederland, gegevens 2022, Rijkswaterstaat WVL, Utrecht.
Witteveen and Bos, D. A. (2018). *Samenstelling ingezameld kunststof/PMD verpakkingen.*

Annexes

Annex 1: Plastic coefficients per EWC waste category

Waste category	EWC	Plastic coefficient	Way of determining
101 - Chemical	1.1 – Spent solvents 1.2 – Acidic, alkaline and saline wastes 1.3 – Used oils 1.4 – Spent chemical catalysts 2.1 – Off-specification chemical wastes 2.2 – Unused explosives 2.3 – Mixed chemical wastes 3.1 – Chemical deposits and residues 3.2 – Industrial effluent sludges 3.3 – Slib and liquid waste from waste treatment 5.1 – Infectious health care wastes 5.2 – Non-infectious health care wastes	0,01	Expert judgment, plastic coefficient set on 1%, based on plastic contamination of the chemical waste mostly from healthcare
102 – Iron	6.1 – Ferrous metal waste	0,0025	Expert judgement, plastic coefficient set on 0,25%. Weight of plastic compared to metal is low.
103 – Non-iron	6.2 – Non-ferrous metal waste	0,0025	Expert judgement, plastic coefficient set on 0,25%. Weight of plastic compared to metal is low.
104 - Mixed metal	6.3 – Mixed Ferrous and non- ferrous metal waste	0,0025	Expert judgement, plastic coefficient set on 0,25%. Weight of plastic compared to metal is low.
105 – Glass	7.1 – Glass waste	0,0002	Expert judgement, plastic coefficient set on 0,2%. Weight of plastic compared to glass is low.
106 – Paper	7.2 – Paper and cardboard waste	0,01	Expert judgement, the contamination of paper waste is known to be 2%, of which half is estimated to be plastic.
107 – Rubber	7.3 – Rubber waste	0	Expert judgement, almost not contaminated with plastic.
108 – Plastic	7.4 – Plastic waste	0,83	Expert judgement, EWC 7.41 (plastic packaging waste) is set on a contamination of 10% with other materials than plastic and EWC

			7.42 (other plastic waste) is expected to be contaminated between 10 and 40%. Combined the plastic coefficient of waste category 108 is set on 83%.
109 – Wood	7.5 – Wood waste	0	Expert judgement, almost not contaminated with plastic.
110 - Textile	7.6 – Textile waste	0,63	Plastic Soup Foundation
111 – Remaining non metal	7.7 – Waste containing PCBs	0	Expert judgement, almost not contaminated with plastic.
112 – discarded materials	8.1 – End-of-life vehicles 8.2 - Discarded electrical and electronic equipment 8.4 – Discarded parts of machinery and equipment	8.1 = 0,145 8.2 = 0,14 8.4 = 0,135	• CBI – Plastics for vehicles in the European Union • Plasticgebruik en verwerking van plastic afval in Nederland - CE Delft
113 – plant and animal	9.1 – Animal waste and mixed food waste 9.2 – Plants waste	0,005	Expert judgement, plastic coefficient set on 0,5%. Weight of plastic compared to plant and animal waste is low.
113b - AfvalMest	9.3 - Animal faeces, urine and manure	0	Expert judgement, almost not contaminated with plastic.
114 – mixed waste	10.1 – Household and similar waste 10.2 – Mixed and undifferentiated materials 10.3 – Sortin residues	10.1 = 0,13 10.2 = 0,65 10.3 = 0,15	• Samenstelling van het huishoudelijk restafval, sorteeranalyses 2023 en gemiddelde driejaarlijkse samenstelling 2022 | Rapport | Rijksoverheid.nl • Samenstelling ingezameld kunststof/PMD verpakkingen - het effect van inzamelsystemen - VANG Huishoudelijk afval • Expert judgement
115 – Slib	11.1 – Sludge from wastewater treatment 11.2 – Sludge from drinking water and process water treatment 11.4 - Septic tank contents	0	Expert judgement, almost not contaminated with plastic.
116 – Mineral	12.1 – Construction and demolition waste 12.2 – Asbestos waste 12.3 – Waste from natural mineral	0,0025	Expert judgement, Weight of plastic compared to mineral waste is low.

	extraction 12.4 – Incineration waste 12.5 – Miscellaneous mineral waste 12.6 - Soil 13.1 – Solidified and stabilized waste 13.2 – Vitrified waste

Annex 2a: Physical supply of plastic flows in the Netherlands, MFM format, in mln kg, 2022

	Agriculture, forestry and fishing	Mining industry	Manufacture of food products, beverages and tobacco products	Manufacture of textiles, wearing apparel and leather products	Manufacture of wood and paper products	Manufacture of coke and refined petroleum products	Manufacture of chemicals and pharmaceutical products	Manufacture of rubber and plastics products	Manufacture of other non-metallic minera products	Manufacture of basic metals	Manufacture of metal products, except machinery and equipment	Manufacture of computer, electronic and optical products	Manufacture of electrical equipment	Manufacture of machinery and equipment n.e.c.	Manufacture of transport equipment	Manufacture of furniture and other manufacturing a	Electricity, gas and steam supply	Water treatment and supply; sewerage; waste treatment	Construction	Services	**Total collum 1–20**	Consumption households	Accumulation	Import	Flows from the environment	**Total**
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
1 Products of agriculture, forestry and fishing	95																				**95**			81		**176**
2 Products of cattle breeding	6																				**6**			3		**9**
3 Energy carriers																					**0**			0		**0**
4 Other mining products																					**0**			0		**0**
5 Fish and meat products	1		98																	0	**99**			47		**147**
6 Potato, vegetable and fruit products			56																	3	**59**			54		**112**
7 Diary products	1		115																	1	**117**			56		**174**
8 Grain mill and starch products			12																	0	**12**			25		**37**
9 Other food products			372		0		2													1	**375**			134		**510**
10 Beverages and tobacco products			123																	0	**123**			83		**206**
11 Textiles, wearing apparel and leather products				425	13		9	20			4			9		7				35	**521**			940		**1 462**
12 Wood products, except furniture																					**0**			0		**0**
13 Printing and paper products																					**0**			0		**0**
14 Coke and refined petroleum products																					**0**			0		**0**
15 Chemical and pharmaceutical products			17				8 330	208	19				22							127	**8 723**			3 856		**12 580**
16 Rubber and plastic products					15		42	2 402		2	30		6	27	3	31				7	**2 565**			2 717		**5 282**
17 Other non-metallic mineral products																					**0**			0		**0**
18 Basic metals																					**0**			0		**0**
19 Metal products, except machinery									2	0	25			1						0	**27**			49		**77**
20 Machinery and equipment					1			1	1	7	10	24	144	40	0	5				6	**238**			640		**879**
21 Transport equipment										1	1			4	241	1			0	3	**251**			343		**594**
22 Furniture and other manufactured goods				1	4		4				0		0			37				29	**75**			270		**344**
23 Total row 1-22	**102**	**0**	**793**	**426**	**33**	**0**	**8 387**	**2 630**	**22**	**11**	**70**	**24**	**172**	**80**	**244**	**80**	**0**	**0**	**0**	**214**	**13 287**			**9 300**		**22 587**
24 Waste	62	1	121	37	48	7	34	59	11	17	13	3	3	9	5	13	3	618	89	418	**1 570**	767	99	873		**3 308**
25 Extraction																										**0**
26 Balancing item																										**0**
27 Total	**165**	**1**	**914**	**462**	**80**	**7**	**8 420**	**2 689**	**32**	**28**	**83**	**28**	**176**	**89**	**249**	**94**	**3**	**618**	**89**	**631**	**14 857**	**767**	**99**	**10 172**	**0**	**25 896**

Annex 2b: Physical use of plastic flows in the Netherlands, MFM format, in mln kg, 2022

	Agriculture, forestry and fishing	Mining industry	Manufacture of food products, beverages and tobacco products	Manufacture of textiles, wearing apparel and leather products	Manufacture of wood and paper products	Manufacture of coke and refined petroleum products	Manufacture of chemicals and pharmaceutical products	Manufacture of rubber and plastics products	Manufacture of other non-metallic minera products	Manufacture of basic metals	Manufacture of metal products, except machinery and equipment	Manufacture of computer, electronic and optical products	Manufacture of electrical equipment	Manufacture of machinery and equipment n.e.c.	Manufacture of transport equipment	Manufacture of furniture and other manufacturing a	Electricity, gas and steam supply	Water treatment and supply; sewerage; waste treatment	Construction	Services	**Total collum 1–20**	Consumption households	Accumulation & other final demand	Export	Flows to the environment	**Total**
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	23	24	22	26	27
1 Products of agriculture, forestry and fishing	1		33																	8	**42**	34	- 2	103		**176**
2 Products of cattle breeding	1		1																	0	**3**	1	0	5		**9**
3 Energy carriers																										**0**
4 Other mining products																										**0**
5 Fish and meat products			31																	9	**40**	23	2	82		**147**
6 Potato, vegetable and fruit products	0		6				0													9	**15**	23	0	73		**112**
7 Diary products	0		48				3													17	**68**	45	3	57		**174**
8 Grain mill and starch products			16																	2	**18**	9	0	9		**37**
9 Other food products	121		101		0	9	9	0												18	**259**	73	1	177		**510**
10 Beverages and tobacco products							0				0	0			0				1	50	**51**	50	9	95		**206**
11 Textiles, wearing apparel and leather products			1	97	37		7	9	3		5		8	8	8	9			6	116	**312**	240	77	833		**1 462**
12 Wood products, except furniture																										**0**
13 Printing and paper products																										**0**
14 Coke and refined petroleum products																										**0**
15 Chemical and pharmaceutical products				181	376		1 302	1 407	37		15	18	79		14	163			153	131	**3 876**		- 299	9 002		**12 580**
16 Rubber and plastic products	52		278	5	299	15	183	228	147	19	105	8	141	87	53	87		1	667	375	**2 750**	207	172	2 153		**5 282**
17 Other non-metallic mineral products																										**0**
18 Basic metals																										**0**
19 Metal products, except machinery											4			2	2				17	3	**27**	3	5	42		**77**
20 Machinery and equipment		1	5								20	13	50	97	32	10			55	64	**348**	47	49	435		**879**
21 Transport equipment											0			0	54				1	27	**82**	32	60	420		**594**
22 Furniture and other manufactured goods															4	9			2	18	**34**	75	71	165		**344**
23 Total row 1-22	**176**	**1**	**519**	**283**	**712**	**24**	**1 505**	**1 644**	**187**	**19**	**150**	**39**	**278**	**195**	**166**	**278**		**1**	**902**	**848**	**7 926**	**861**	**149**	**13 651**		**22 587**
24 Waste				103			10	1 427									132	622			**2 294**		108	907	0	**3 308**
25 Extraction																										**0**
26 Balancing item																										**0**
27 Total	**176**	**1**	**519**	**386**	**712**	**24**	**1 515**	**3 071**	**187**	**19**	**150**	**39**	**278**	**195**	**166**	**278**	**132**	**623**	**902**	**848**	**10 220**	**861**	**257**	**14 558**	**0**	**25 896**