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Estimating packaging placed on the market at national level

Packaging model updates version 2.0

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Contents

Abstract

This report presents an updated methodology for estimating the mass of packaging materials placed on the market in EU Member States for food and beverages, home care, beauty and personal care, and pet food together covering roughly 75% of the European consumer packaging market. To this end, volume sales of consumer products by packaging type (differentiated by typology, size, and material) are combined with unitary mass coefficients associated to each packaging item. The report builds on an earlier version published in 2024, focused on the food and beverage sector.

Estimates are provided for 19 MSs (covering more than 97 % of the EU population) for the period 2011-2025, at product and packaging type level. In total, 42.8 Mt of packaging placed on the market were estimated for year 2024, consisting of 32.3 Mt glass-based packaging, 5.9 Mt plastic-based packaging, 2.1 Mt paper-based packaging (including liquid cartons), 2.3 Mt metal-based packaging, and the remaining 0.1 Mt of mixed-material packaging. Plastic packaging corresponds to an average of almost 14 kg per capita per year, ranging from 8 kg in Sweden to almost 16 kg in Germany. Over the study period, total packaging quantities remained broadly stable; glass volumes fell in 2020 before recovering, while plastic volumes increased by roughly 11 % in absolute terms.

The developed methodology will be used to support MSs in the mandatory reporting of packaging waste quantities, and will be used to benchmark the quantities reported, in the context of the monitoring of the attainment of the recycling targets set out in the Packaging and Packaging Waste Regulation (EU 2025/40).

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1. Introduction

Reducing packaging waste and boosting recycling rates has become a pressing priority driven by mounting environmental concerns and the EU's policy goal of moving toward a circular economy.

The Packaging and Packaging Waste Regulation 2025/40[1] contains measures designed to prevent the production of packaging waste and to promote its reuse, recycling and recovery. In this context, EU countries need to report wasted quantities and recycled quantities, following the methodology set out in decision EU/2019/665[2]. Moreover, Regulation 2021/770[3] lays down rules on calculating the own resource based on plastic packaging waste that is not recycled, as referred to in point (c) of Article 2(1) of Decision (EU, Euratom) 2020/2053[4] (the 'own resource based on non-recycled plastic packaging waste'). The Regulation also establishes annual reporting obligations in its Article 5(5).

To help Member States to verify their measurement and calculation methods of packaging placed on the market (POM) referring to a set of packaging categories, the JRC introduced in 2024 a modelling framework that estimates the generation of packaging placed on the market for food and beverage products (De Laurentiis et al., 2024).

This report presents version 2.0 of that model. Its main novelties are:

- the incorporation of additional household-consumption categories, i.e. home-care, beauty and personal-care and pet-food products, and the addition of hot-drinks to the beverages category;
- a series of methodological refinements; and
- expanded analyses of the resulting estimates.

Section 2 details the updated methodology used to estimate the amount of packaging material placed on the market associated to the product groups covered in this study, i.e. food and beverage items plus the newly added household-consumption categories (home-care, personal-care and pet-food). The approach is applied at Member State level and yields annual estimates of the quantities of the main packaging materials (e.g., PET, HDPE, glass) used for these products. It relies on the use of Euromonitor International, a business intelligence provider researching consumers, services, and B2B industries including packaging. On the packaging industry Euromonitor International publishes annually updated data on the sales of units of packaging (differentiated by typology, size and material) associated to different products. These data include both retail and food service volume sales.

[1] Regulation (EU) 2025/40 of the European Parliament and of the Council of 19 December 2024 on packaging and packaging waste, amending Regulation (EU) 2019/1020 and Directive (EU) 2019/904, and repealing Directive 94/62/EC

[2] COMMISSION IMPLEMENTING DECISION (EU) 2019/665 of 17 April 2019 amending Decision 2005/270/EC establishing the formats relating to the database system pursuant to European Parliament and Council Directive 94/62/EC on packaging and packaging waste

[3] COUNCIL REGULATION (EU, Euratom) 2021/770 of 30 April 2021 on the calculation of the own resource based on plastic packaging waste that is not recycled, on the methods and procedure for making available that own resource, on the measures to meet cash requirements, and on certain aspects of the own resource based on gross national income

[4] COUNCIL DECISION (EU, Euratom) 2020/2053 of 14 December 2020 on the system of own resources of the European Union and repealing Decision 2014/335/EU, Euratom

Section 3 presents the results of applying this methodology to the expanded product scope, considering in total 73 items across the 19 European countries for which data were available in the Euromonitor database (i.e. Austria, Belgium, Bulgaria, Czechia, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Netherlands, Poland, Portugal, Romania, Slovakia, Spain, and Sweden). The analysis covers the full period from 2011 through 2025, estimating the total amount of packaging material associated with the sales of each product. In addition, the estimated packaging quantities are combined with product-level sales data of Euromonitor International (e.g. linking the total quantity of PET plastic used for drinking-milk containers in Italy in 2020 with the total volume of milk sold in Italy in 2020), to calculate country-specific coefficients that can be used in combination with food consumption or sales data (depending on the availability) to estimate the use of packaging materials in the absence of a database providing detailed information on packaging sales.

To check the validity of the results yielded by the model, a comparison is performed between the amounts of plastic packaging placed on the market in the 19 countries considered and the total quantities of plastic packaging consumed in the EU27 obtained through a Material Flow Analysis (MFA) of plastics in the EU (Amadei et al., 2025). Furthermore, two additional analyses are performed: the first aiming at identifying some potential substitution trends between packaging materials, and the second investigating possible correlations between packaging generation and household economic indicators.

2. Methodology

The following sections (2.1, 2.2, 2.3) illustrate the methodology developed to estimate the quantities of packaging materials linked to the consumption of the following product categories: food and beverages, home care, beauty and personal care, and pet food. These categories were selected based on the product coverage of Euromonitor International packaging industry database (Euromonitor, 2026). It should be highlighted that the coverage of the food sector is not complete, as the Fresh Food packaging industry is not covered by Euromonitor International. For this, packaging data for the following food categories are not available: fresh eggs, fresh fish and seafood, fresh fruit and vegetables, nuts and dry pulses, fresh/unprocessed meat, and sugar.

According to an analysis performed by Mordor Intelligence (2026), the above-mentioned product categories are considered to cover roughly 75% of the European consumer packaging market. Nevertheless, the coverage of this current model is expected to be lower due to the exclusion of fresh food. Based on the coverage of the Euromonitor database, both primary[5] and secondary packaging[6] are included, while tertiary packaging[7] (commonly used to group large quantities of products for transport, warehouse storage, and distribution) is not.

Packaging quantities are estimated by combining information on packaging sales data with estimates of the unitary masses of the different packaging typologies considered. In addition, section 2.4 provides an approach to estimate packaging materials from volume sales data of the considered product categories, that can therefore be used in the absence of a specific packaging sales database. Lastly, section 2.5 illustrates two additional analyses performed on the model outputs, one investigating substitution trends between packaging materials, and the other seeking possible correlations between the use of packaging for food and beverage products and household economic indicators.

2.1. Extraction of packaging sales data

The estimation of packaging materials relies on data provided by Euromonitor International's Packaging industry research, a database providing annual information on consumer goods sold by packaging material.

The data provides a deep understanding of packaging demand offering several data sets including the volumes of units sold for each "Product Variant". A Product Variant (PV) is identified based on attributes like size, closure or material. An example of PV in full is: "milk, HDPE bottle, 1000 ml". In this report we identify three components of a PV:

1. the food or beverage product contained (e.g. milk),

[5] Packaging conceived so as to constitute a sales unit consisting of products and packaging to the end user at the point of sale (Regulation (EU) 2025/40)

[6] Packaging conceived so as to constitute a grouping of a certain number of sales units at the point of sale, irrespective of whether that grouping of sales units is sold as such to the end user or whether it serves as a means to facilitate the restocking of shelves at the point of sale or to create a stock-keeping or distribution unit, and which can be removed from the product without affecting its characteristics (Regulation (EU) 2025/40)

[7] Packaging conceived so as to facilitate the handling and transport of one or more sales units or a grouping of sales units, in order to prevent damage to the product from handling and transport, but which excludes road, rail, ship and air containers (Regulation (EU) 2025/40)

2. the packaging type defined according to the material and the shape (e.g. HDPE bottle),
3. the packaging size expressed in g or L (e.g. 1000 ml)[8].

A list of definitions (complemented with photographs of examples of packaging types) is provided by Euromonitor to inform the user on the different shapes and typologies of packaging recorded under each type (an example is shown in **Figure 1**). Yearly data are available for years 2011-2025 for 19 EU Member States which combined cover 97% of EU27 population[9].

Figure 1. Examples of containers classified as “HDPE bottles”.

Source: Euromonitor documentation (2013), Pack type definition

Sales data are available at “retail/off-trade” level (i.e., household consumption) for all products. In addition, for alcoholic beverages and soft drinks data are also available at “foodservice/on-trade” level (i.e., foodservice consumption). Both levels are considered when available.

In the database, packaging sales data are provided for 73 different products grouped into 16 categories. For instance, the category “Alcoholic drinks” includes five products: “Alcoholic ready to drink (RTD)”, “Beer”, “Cider/Perry”, “Spirits” and “Wine”. In version 1.0 of the model a selection of products was performed to exclude products that had a low contribution to their category in terms of volume sales. This is no longer the case in version 2.0 where all products available are included. **Table 1** shows the number of products that are included in each category in the current version of the model (2.0) and in the previous version (1.0).

[8] In few isolated cases the packaging size is not expressed in mass or volume, but in number of units (e.g. Laundry Care – Flexible plastic with a volume of 15 units). These PVs (contributing to less than 1% of the total number of PVs) were excluded from the analysis due to the uncertainty associated to estimating their unitary packaging mass.

[9] Certain combinations of PV and countries are not available (either due to data gaps or reflecting PVs not being sold in certain countries), corresponding to 5% of all possible combinations (of PV, country and year).[10] The following product codes were included. For food: Cereals and cereal products, Live animals, meat and other parts of slaughtered land animals, Milk other dairy products and eggs, Oils and fats, Sugar, confectionery and desserts, Ready-made food and other food products n.e.c. For beverages: Alcoholic beverages and Non-alcoholic beverages.

Table 1 Number of products included in the different categories in versions 1.0 and 2.0 of the model.

	Number of products included	
Product Category	**Version 1.0**	**Version 2.0**
Baby food	1	1
Baked goods and breakfast cereals	2	2
Condiments	2	4
Confectionery	2	3
Dairy	2	9
Edible oils	1	1
Other processed food products	4	7
Pasta	2	3
Ready meals and soups	3	5
Snacks	3	3
Alcoholic drinks	2	5
Hot drinks	-	3
Soft drinks (inc. bottled water)	3	7
Home care	-	7
Personal care	-	11
Pet food	-	2
TOTAL	27	73

Source: Authors' own elaboration based on data from Euromonitor (2026)

As the Packaging industry research database contains an extensive list of PV (e.g. 1697 distinct PV are recorded for Austria in 2024) a cut-off was put in place to exclude from the analysis PV with low associated sales volumes, as illustrated below.

The total volume of each product sold in 2024 was derived by multiplying the number of units sold for each associated PV (across all included countries) by the unitary volume of each PV. Then, the contribution of each packaging type (e.g. HDPE bottle, milk) to the total volume sold of a given product (e.g. milk) was derived, and packaging types associated to a contribution lower than 1% were excluded, together with all their associated PV (corresponding to the different packaging sizes). An exception was made for plastic-based packaging types, always included in the analysis because of its high policy relevance, mostly due to its large carbon intensity and contribution to marine pollution (Regulation (EU) 2025/40).

When a packaging type was included, all the PV belonging to it (i.e., all the packaging sizes) were also included. This led to the inclusion of 11187 PV, belonging to the list of 73 products available, and 37 different types of packaging with varying sizes.

2.2. Estimation of packaging unitary mass values

Euromonitor International's Packaging research does not capture information on the average mass of each PV (e.g. the mass in grams of 1 PET bottle containing 1000 ml of drinking milk, once empty). An online search was performed to collect unitary mass (UM) coefficients for the PV included in the database. One of the main sources of data were websites of packaging suppliers. However, due to time constraints, it was not possible to perform this search for each of the 11187 PV included in the analysis. Therefore, the search was performed with the aim of collecting data for at least one PV for each packaging type and product combination (e.g. milk, HDPE bottle). To capture the variability of container types, more UM values were collected for the same PV when available, and three values were recorded: the median, minimum, and maximum UM value, respectively UM_{med}, UM_{min}, and UM_{max} (when only one value was found, the three elements coincide).

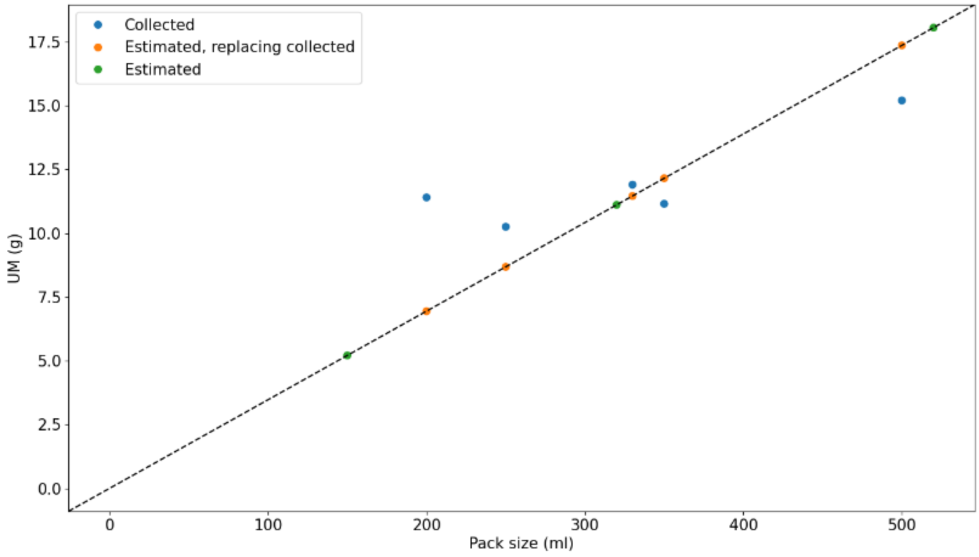
This led to the collection of UM_{med}, UM_{min}, and UM_{max} values for 815 PVs. In the remaining cases, the unitary mass coefficients were estimated by following three alternative approaches (from the most preferable to the least preferable).

<u>Approach 1:</u>

When one or more UM_{med} values were available for a PV associated with the same food product and packaging type but different packaging size, a linear regression of the UM_{med} values available plotted against their size was performed. The linear regression was performed for all packaging materials, with the exception of glass. In the presence of glass packaging, a logarithmic regression was preferred as it was deemed that the linear regression led to overestimate the UM values for large pack sizes. In doing so, the axes origin was included as one of the points for the regression (i.e., UM = 0 when size = 0) for both linear and logarithmic regressions. This was done to avoid situations in which extrapolating the UM value for a small packaging size would result in a negative value. Future developments of the model could explore the use of different regression types also for the other materials to select the most suitable ones in each case. The UM_{med} values of the missing PV were then extrapolated based on their size. Collected UM values were replaced with regression-predicted values, in order to ensure that for the same packaging type and product, a larger size always resulted in a larger UM value. This was not always the case in the original data collected due to the large variety of data sources used. The same operation was repeated with UM_{min}, and UM_{max} values. In total, 3733 PVs were assigned a UM_{med}, UM_{min} and UM_{max} value with this approach.

To provide an example (**Figure 2**), there are 8 PV associated to the product "Juice" and packaging type "Metal beverage cans". Of these, primary data on UM values were found for 5 packaging sizes: 200 ml, 250 ml, 330 ml, 350 ml, and 500 ml (blue dots). A linear regression through the origin of axes of the 5 data points (considering the median value for each PV – UM_{med}) was performed, and the 3 missing UM_{med} values were extrapolated based on their packaging size (i.e., 150 ml, 320 ml, and 520 ml) (green dots). The 5 UM_{med} values collected (in blue in **Figure 2**) were also replaced by the values predicted (in orange in **Figure 2**) by the linear regression to avoid situations such as the ones visible in the figure, where the collected value for size 200 ml the UM value is higher than the collected one for sizes 250 ml, 330 ml, and 350 ml. The same operation was repeated with the collected UM_{min} and UM_{max} values. In this way, each UM_{med} value is associated with an uncertainty range, shown by the shaded area in **Figure 3**.

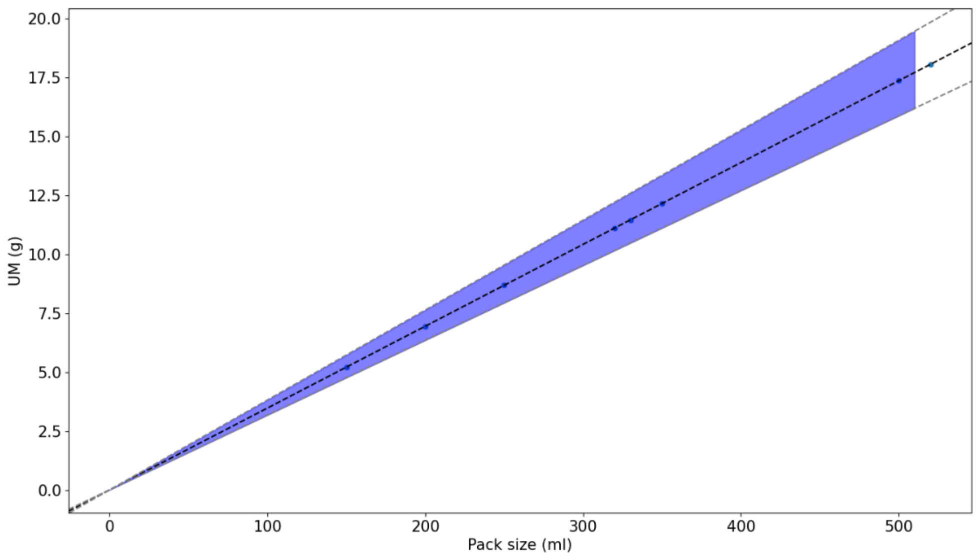
Figure 2. Visual representation of collected (blue dots) and estimated (orange and green dots) UM median values for PV associated with different sizes of juice metal beverage cans.



Source: Authors' own elaboration

Note: the black line represents the linear regression used to perform the estimation.

Figure 3. Estimation of uncertainty ranges in UM values (UM_{min}-UM_{max}) for the PV reported in Figure 2.



Source: Authors' own elaboration

Note: the lines represent the regression models for the median values (black line), and the minimum and maximum values (grey lines), the shaded blue area represents the uncertainty range between estimated minimum and maximum values.

<u>Approach 2:</u>

When no UM_{med} values were available for a PV associated with the same product and packaging type, the UM_{med} values were estimated by using 5 alternative sub-methods, based on data availability, from 1 (most preferable) to 5 (least preferable).

Sub-method 1: median value of the UM_{med} values collected for all PV associated with the same product, packaging material, and packaging size.

Sub-method 2: median value of the UM_{med} values collected for all PV associated with the same product category, packaging type, and packaging size.

Sub-method 3: median value of the UM_{med} values collected for all PV associated with the same product category, packaging material, and packaging size.

Sub-method 4: median value of the UM_{med} values collected for all PV associated with the same packaging type and packaging size.

Sub-method 5: median value of the UM_{med} values collected for all PV associated with the same packaging material and packaging size.

The same operation was repeated with UM_{min}, and UM_{max} values. In this way, 1131 PVs were associated with a UM_{med}, UM_{min}, and UM_{max} value.

Approach 3:

To assign a UM value to the remaining PVs, approach 1 was performed a second time, using as input data not only the 815 UM values directly collected but also the 1131 UM values estimated via approach 2. In total 4819 PVs were assigned UM_{med}, UM_{min}, and UM_{max} values with this approach.

A remaining list of 689 PVs from the initial 11187 selected for the analysis was not assigned UM values, as none of the approaches presented above allowed for estimating their UM values. These PVs were therefore left out of this analysis. In total they contributed to roughly 1% of the total units sold across the countries considered in 2024.

The unitary mass values associated to each PV with this approach are listed in **Annex 1**.

2.3. Estimation of packaging materials

The total mass of materials associated to each combination of packaging type and product is calculated per country and per year as follows:

$$M_{x,y} = \sum_i N_{PVi} \times UM_{PVi} \times 0.001 \qquad [1]$$

Where:

- $M_{x,y}$ is the mass associated with packaging type x product y expressed in kg
- N_{PVi} is the number of units of the i-th PV sold belonging to packaging type x and product y
- UM_{PVi} is the unitary mass of the i-th PV belonging to packaging type x and product y expressed in g
- 0.001 is the conversion factor to transform the mass from g to kg.

The calculation is performed with the UM_{med} values and then repeated with the UM_{min} and UM_{max} values to provide uncertainty intervals.

The resulting quantities are presented in Section 3.1. Detailed results are provided in **Annex 2** (for 19 MSs and years between 2011 and 2025) at different levels of aggregation: total mass of each packaging material associated with each product distinguishing by packaging type, total mass of each packaging material associated with each product (aggregating across packaging types), total mass of each packaging material distinguishing by packaging type (aggregating across products), total mass of each packaging material (aggregating across both packaging types and products).

To perform an external validation of the model results, the total estimated quantities of plastic packaging placed on the market for the 19 countries considered were compared with estimates of the amounts of plastic packaging used in the EU27 at consumption stage, resulting from a Material Flow Analysis (MFA) of plastics developed by Amadei et al., (2025). The results of this comparison are shown in Section 3.1.2.

2.4. Calculating coefficients to estimate packaging consumption from sales volumes

The results of the estimation presented in Section 2.3 were combined with information on total sales of each product in the countries/years considered, so to obtain a set of coefficients (one for each packaging type) that can be used in the absence of a packaging sales database to estimate packaging material use from data on sales volumes.

To this end, coefficients expressing the ratio between the estimated mass of packaging associated with a product and the sales volume associated with the same product in each country are calculated. The coefficients are valid under the hypothesis that the unitary mass coefficients collected for each PV are a good proxy for the average unitary mass of that PV in all countries.

The coefficients estimated with this approach are referred to as Consumption-Weight Conversion Factors (CWCFs). CWCFs are calculated at two levels of aggregation. At the more disaggregated level, they are specific per packaging type, country and product, and are calculated as the ratio between the total mass of packaging associated to a product, calculated for each packaging type (obtained in Section 2.3) – as expressed by the numerator in equation 2 - and the total volume or mass sold of the same product - as expressed by the denominator in equation 2.

$$CWCF_{x,y} = \frac{\sum_i N_{PVi} \times UM_{PVi} \times 0.001}{\sum_i N_{PVi} \times V_{PVi}} \qquad [2]$$

Where:

- $CWCF_{x,y}$ is the coefficient associated to packaging type x and product y (e.g. PET bottles, milk)
- N_{PVi} is the number of units of the i-th PV sold belonging to packaging type x and product y
- UM_{PVi} is the unitary mass of the i-th PV belonging to packaging type x and product y
- V_{PVi} is the volume or mass of product y contained in the i-th PV belonging to packaging type x (i.e., the packaging size)
- 0.001 is the conversion factor to convert from g to kg.

At the more aggregated level CWCFs are specific for packaging material, country and product and are calculated following equation 3.

$$CWCF_{z,y} = \frac{\sum_i N_{PVi} \times UM_{PVi} \times 0.001}{\sum_i N_{PVi} \times V_{PVi}} \qquad [3]$$

Where:

- $CWCF_{z,y}$ is the coefficient associated to packaging material z and product y (e.g. PET, milk)
- N_{PVi} is the number of the i-th PV sold belonging to packaging material z and product y
- UM_{PVi} is the unitary mass of the i-th PV belonging to packaging material z and product y
- V_{PVi} is the volume or mass of product y contained in the i-th PV belonging to packaging material z (i.e., the packaging size)
- 0.001 is the conversion factor to transform the mass from g to kg.

The coefficients are calculated for all years between 2011 and 2025. Users of these coefficients can choose whether to use the ones calculated for the most recent year or whether to calculate an average of the last 2 or more years (to reduce the effect of yearly fluctuations). Depending on the product considered, CWCFs are expressed in kg-packaging/kg-product or kg-packaging/L-product. For example, the CWCFs obtained for glass bottles used for drinking milk sold in Italy in 2025 will express the average mass of glass associated with the sale of 1 L of drinking milk in Italy during that year.

Specifically for food and beverage consumption, in the of lack of sales data, the coefficients can be used in combination with estimates of food consumption data obtained from modelling (e.g. if the total amount of drinking milk sold in country x in year y is not known, an estimation of the total amount of drinking milk consumed – obtained via an alternative modelling approach - can be used instead). It should be stressed that in this case, the uncertainty of the estimation would be higher than if sales data were used.

The resulting CWCF coefficients are provided in **Annex 3** at the two levels of aggregation mentioned.

2.5. Analysis of model results

Two separate additional analyses were performed on the results of the model.

The first aimed at identifying possible substitution trends between packaging materials, specifically between plastic-based packaging and other packaging materials. These material substitutions may be driven by different factors, such as availability and costs of resources, changes in consumer behaviour, or as a consequence of new legislation.

To this end, four product categories were selected for investigation: bottled water, fruit juices, milk, and carbonates (i.e. carbonated soft drinks). Together, these categories account for roughly 45% of the mass of plastic packaging placed on the market in 2024. For each country, the share of packaging materials used for each product category was calculated. Potential substitution trends were identified by selecting illustrative cases that met either of the following criteria:

- the share of the dominant material fell by more than 15 percentage points over the examined period
- the share of any alternative material increased by more than 15 percentage points over the same period

These thresholds highlight situations where the primary material appears to have been partially replaced by one or more alternative packaging materials. The results of this analysis are presented in Section 3.2.1.

The second analysis aimed to seek possible correlations between the use of packaging for food and beverage products and household economic indicators. To this end the Eurostat database (Eurostat, 2025) was used, selecting the variable "Real expenditure per capita (in PPS_EU27_2020)" for food and beverages products (for food considering only processed food[10], in line with the scope of the analysis on packaging quantities). This refers to expenditures that have been converted into a common technical currency (Purchasing Power Standard - PPS), resulting in a set of data comparable across countries, and expressing the relative volume underlying each country's expenditure in a given sector. The aim of this exercise was to assess if there was a correlation across countries between the per capita expenditure on food and beverages products and the per capita amounts of associated packaging use. The results are presented in Section 3.2.2.

[10] The following product codes were included. For food: Cereals and cereal products, Live animals, meat and other parts of slaughtered land animals, Milk other dairy products and eggs, Oils and fats, Sugar, confectionery and desserts, Ready-made food and other food products n.e.c. For beverages: Alcoholic beverages and Non-alcoholic beverages.

3. Results

The following sections illustrate the results yielded by the model in terms of estimated total amounts of packing placed on the market, their temporal trends, the investigation of potential substitution trends between packaging materials at country/product level and the study of the potential correlation between packaging quantities POM for food and beverage products and household indicators on food and beverages expenditure.

3.1. Estimated packaging amounts

The model estimates packaging amounts placed on the market belonging to the food and beverages, pet food, home care, beauty and personal care sectors, for 19 MSs (covering 97% of EU population) in the time range 2011-2025.

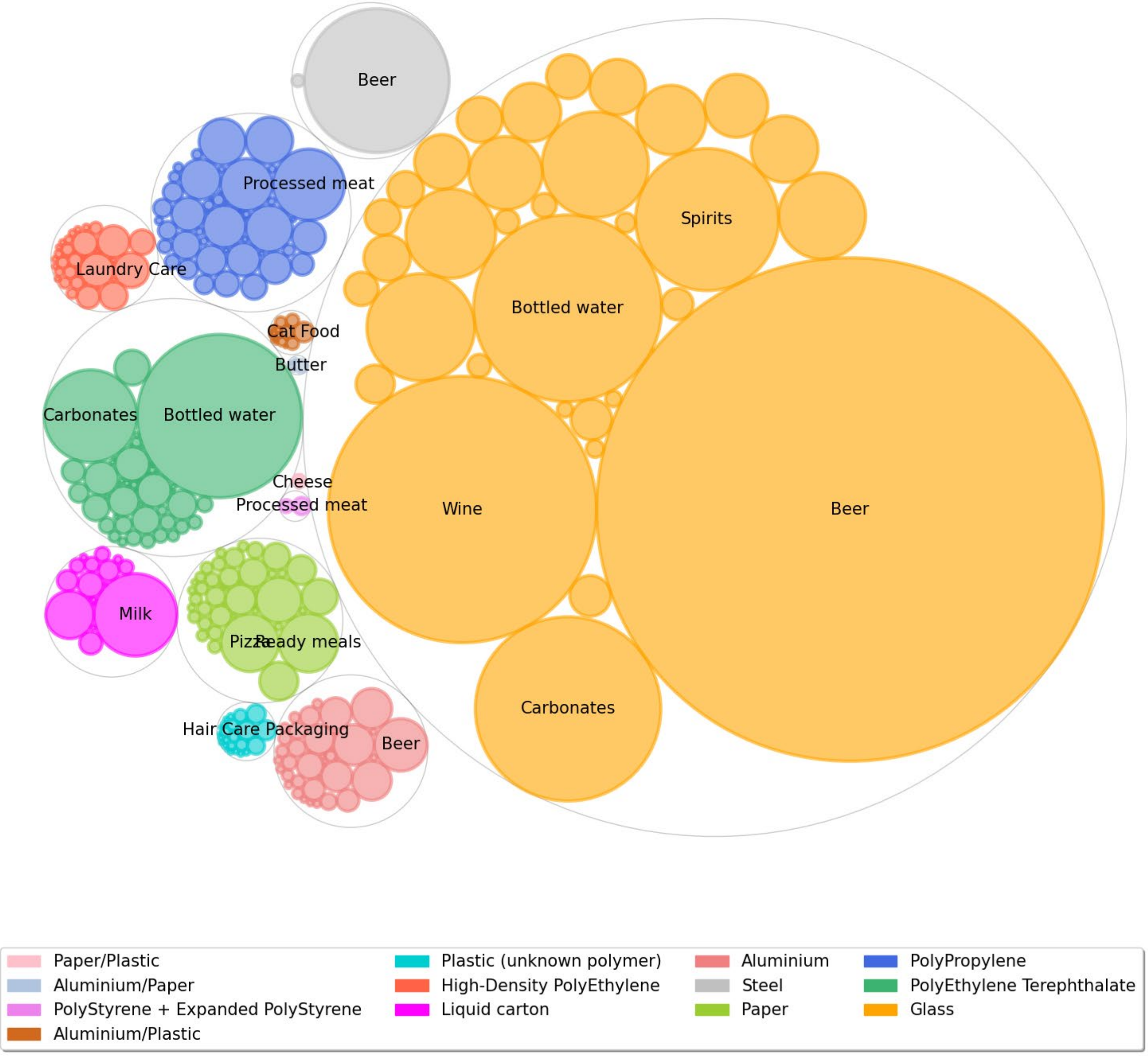
In total, 42.8 Mt of packaging POM were estimated for year 2024, consisting of 32.3 Mt glass-based packaging, 5.9 Mt plastic-based packaging, 2.1 Mt paper-based packaging (including liquid cartons and other paper-based composite containers), 2.3 Mt metal-based packaging, and the remaining 0.1 Mt of mixed-material packaging (such as paper-plastic, aluminium-plastic and aluminium-paper). Over the period considered, total packaging quantities POM remained relatively stable overall, with some fluctuations mainly driven by glass packaging, which declined in 2020 before stabilising again.

When looking at glass, and to a lesser extent plastic packaging, it is important to consider that these estimates include both single-use and reusable packaging types, meaning that only a portion of the total quantities will be disposed of in the year in which they are placed on the market. This is especially true for glass bottles, whose reusable share can be considerable in several European countries, for example, in Germany, as reported by Cayé et al., (2019).

Packaging amounts estimations are available at different levels of granularity: per category (e.g., dairy), product (e.g. yoghurt), packaging type (e.g., glass jar), and packaging material (e.g. glass). Detailed results are provided in Annex 2 (see Table 2.1 for the full data and Table 2.2 displaying them aggregated at the level of packaging material). For each data point, median, minimum and maximum values are provided.

Figure 4 identifies the products that are responsible for the largest amounts of packaging (in mass), per packaging material. The larger the bubble, the greater the amount. The colour legend indicates the packaging material. It shows that glass, partly due to its high density, accounts for the largest amount of packaging mass, followed by PET and PP. Liquid foods account for most of the total packaging mass. Alcoholic beverages (mainly beer and wine) are the largest contributor to glass packaging, bottled water and carbonates to PET packaging, and milk to liquid carton packaging. Laundry care products are the main contributor to HDPE packaging. Beer accounts for the largest share of aluminium packaging, followed by carbonates, and is also the only contributor to steel packaging. Cat food is instead the largest contributor to Aluminium-Plastic packaging. Table 2.3 of Annex 2 reports the amounts of packaging estimated for the total of the considered 19 MSs in 2024 by packaging material and product, while **Table 2** reports the same information aggregated across product categories.

Figure 4. Amounts of estimated packaging placed on the market in 19 MSs in 2024, by packaging material and product (background data are provided in Table 2.3 of Annex 2).



Source: Authors' own elaboration

Table 2 Tonnes of estimated packaging quantities placed on the market in 19 MSs in 2024, per product category and packaging material. The yellow bars in each row indicate the contribution of each product category to the total amount of packaging material.

Material	Alcoholic drinks	Baby food	Baked goods and breakfast cereals	Condiments	Confectionery	Dairy	Edible oils	Home care	Hot drinks	Other processed food products	Pasta	Personal care	Pet food	Ready meals and soups	Snacks	Soft drinks	Total
AL	212105	4209		30303	8770	5542	9723	21630	9359	350756		46584	135426	47961	2988	239132	1124487
AL_PA				690	2610	13632			816					588			18335
AL_PL	615	2388	1400	2862	551	1769		1	12544	7221		45	40343	3223	12513	8804	94279
CA	15823	3017		16145		582153	2315			4868				13768		184369	822458
GL	22839922	125283		1114435		427180	724652	20014	82432	717214		177660		34059	484464	5570391	32317707
HDPE	86	3308	4680	12193	1147	155337	610	197573	414	723	3169	149088	6802	951	2934	7948	546964
PA	57357	13148	88606	10379	156582	42320		21897	30308	50731	148919	15268	32098	501099	143859	754	1313324
PA_PL		113	1817	504	1368	3082			1052	25	1727	77	213		289	12	10278
PET	51628	1863	15364	19099	8735	116764	36141	100406	3701	896	70	135402	36	15914	72480	2635811	3214309
PL			464	25884	28506	2773		13986	6624	32691		49530	803	449	1388	2089	165187
PP		4168	96041	11219	47071	611742		10215	14975	513259	213521	1597	33485	118154	227859	6462	1909768
PS										45197							45197
ST	1178621																1178621

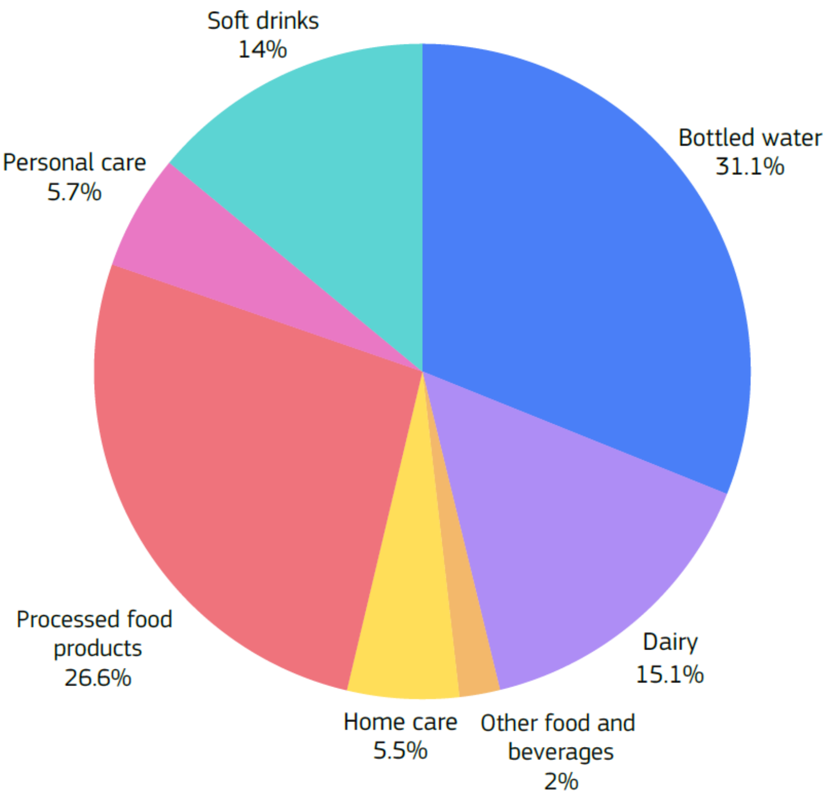
Source: Authors' own elaboration

Note: AL: Aluminium, AL_PA: Aluminium-Paper, AL_PL: Aluminium-Plastic, CA: Carton, GL: Glass, HDPE: High-Density PolyEthylene, PA: Paper, PA_PL: Paper-Plastic, PET: PolyEthylene Terephtalate, PL: Plastic (unknow polymer), PP: PolyPropylene, PS: PolyStyrene and Expanded PolyStyrene, ST: Steel

3.1.1. Plastic packaging estimates

The total amount of plastic packaging POM for 2024 is 5.9 million tonnes, resulting from the sum of amounts of all plastic polymers (excluding mixed packaging materials that contain plastic, such as “aluminium-plastic” and “paper-plastic”), corresponding to an average of almost 14 kg per capita across the countries considered. **Figure 5** illustrates the average contribution of different product categories to the total amount of plastic packaging placed on the market, across the 19 countries.

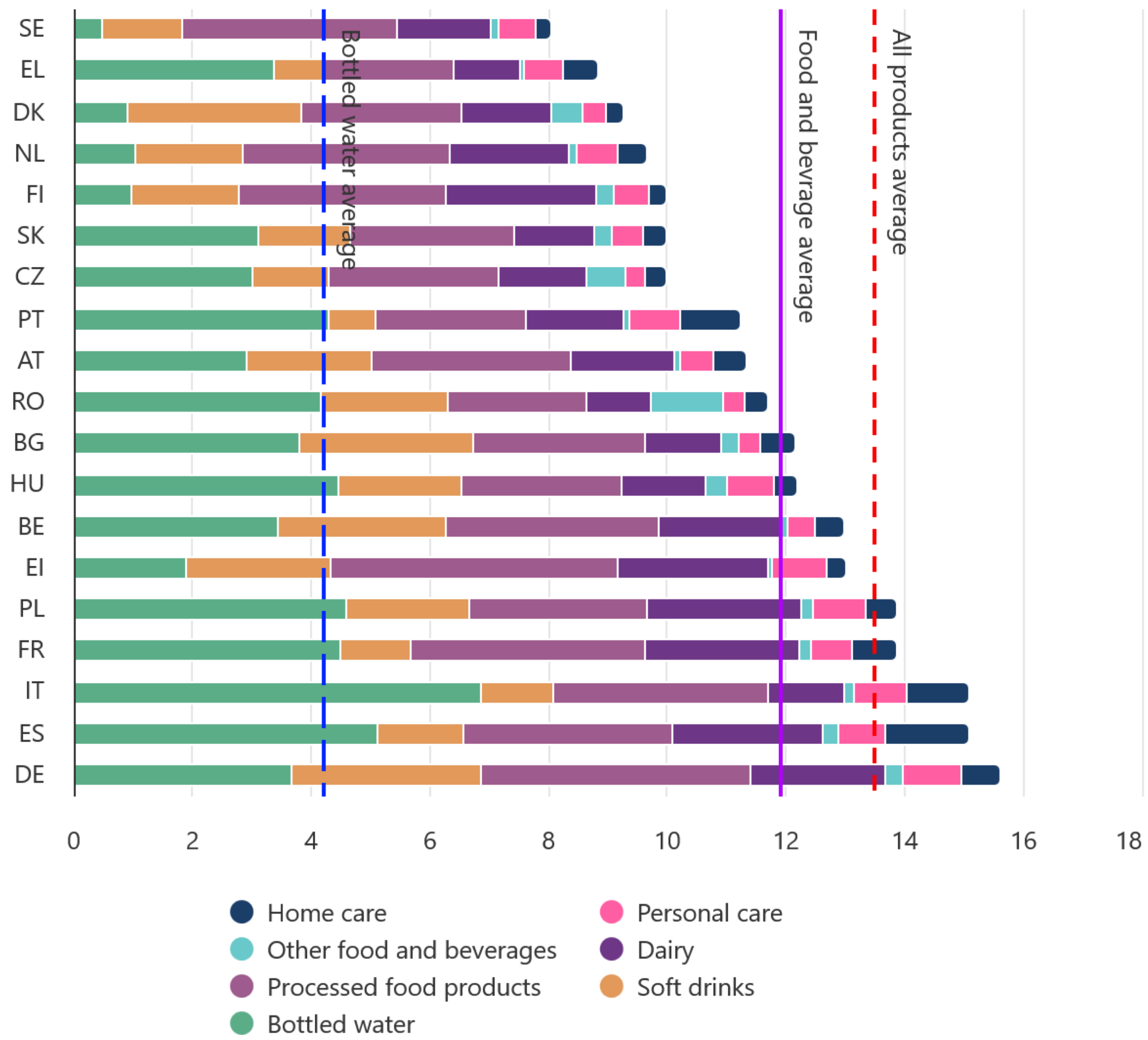
Figure 5. Share of product categories to the total amount of plastic packaging placed on the market in EU19.



Source: Authors’ own elaboration

The amount of plastic packaging POM per citizen varies significantly across countries, ranging from 8.0 kg in Sweden to 15.6 kg in Germany (**Figure 6**). The contribution of product categories to the total amount of plastic packaging changes significantly across countries, for instance in the case of bottled water ranging between 6% in Sweden to 46% in Italy.

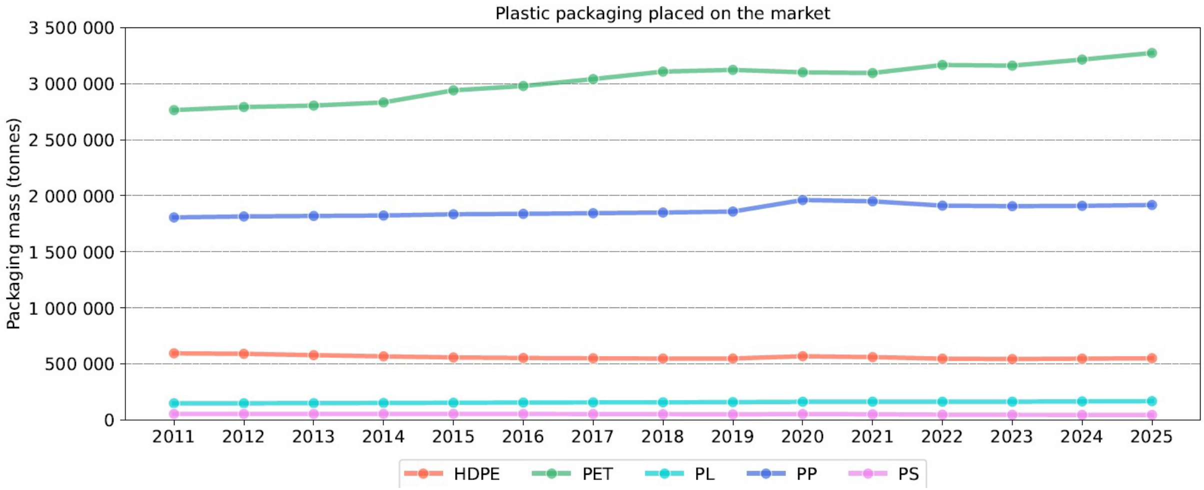
Figure 6. Plastic packaging placed on the market per capita in the 19 countries considered split by product category.



Source: Authors' own elaboration

Between 2011 and 2025 plastic packaging saw a steady increase, rising in absolute terms by 11%, from 5.4 Mt to 5.9 Mt (total values across the 19 countries considered) and by 9% in per capita terms, from 12.6 kg per capita to 13.7 kg per capita on average. **Figure 7** illustrates this trend for each polymer in terms of absolute quantities, while **Figure 8** shows the same trend in terms of per capita quantities, showing how the increase in the total amount is mostly driven by an increase of PET.

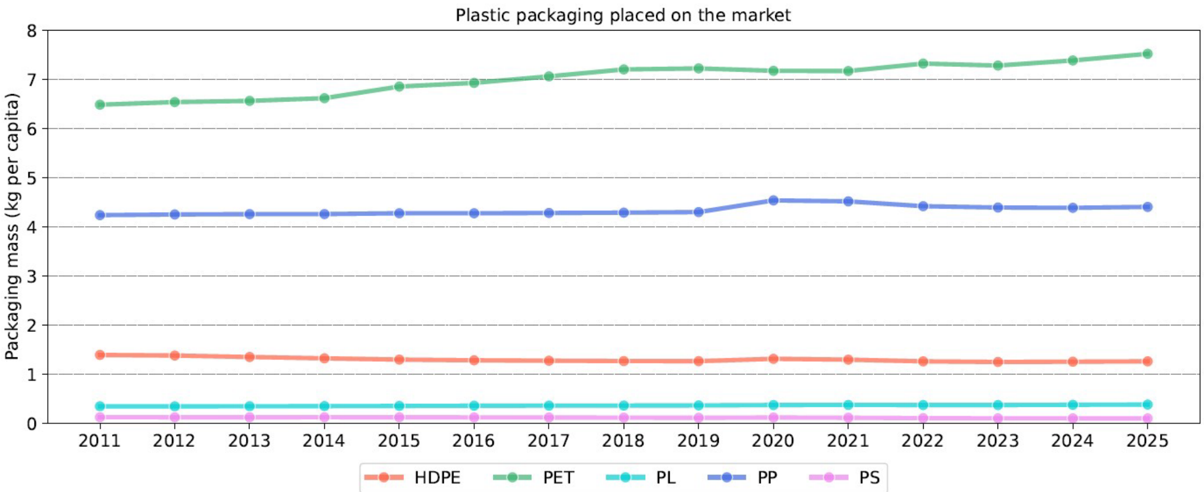
Figure 7. Temporal trend in plastic packaging placed on the market split by polymer for the sum of the 19 countries considered, absolute values.



Source: Authors' own elaboration

Note: HDPE: High-Density PolyEthylene, PET: PolyEthylene Terephtalate, PL: Plastic (unknown polymer), PP: PolyPropylene, PS: PolyStyrene (including also Expanded PolyStyrene)

Figure 8. Temporal trend in plastic packaging placed on the market split by polymer for the sum of the 19 countries considered, per capita values.



Source: Authors' own elaboration

Note: HDPE: High-Density PolyEthylene, PET: PolyEthylene Terephtalate, PL: Plastic (unknown polymer), PP: PolyPropylene, PS: PolyStyrene (including also Expanded PolyStyrene)

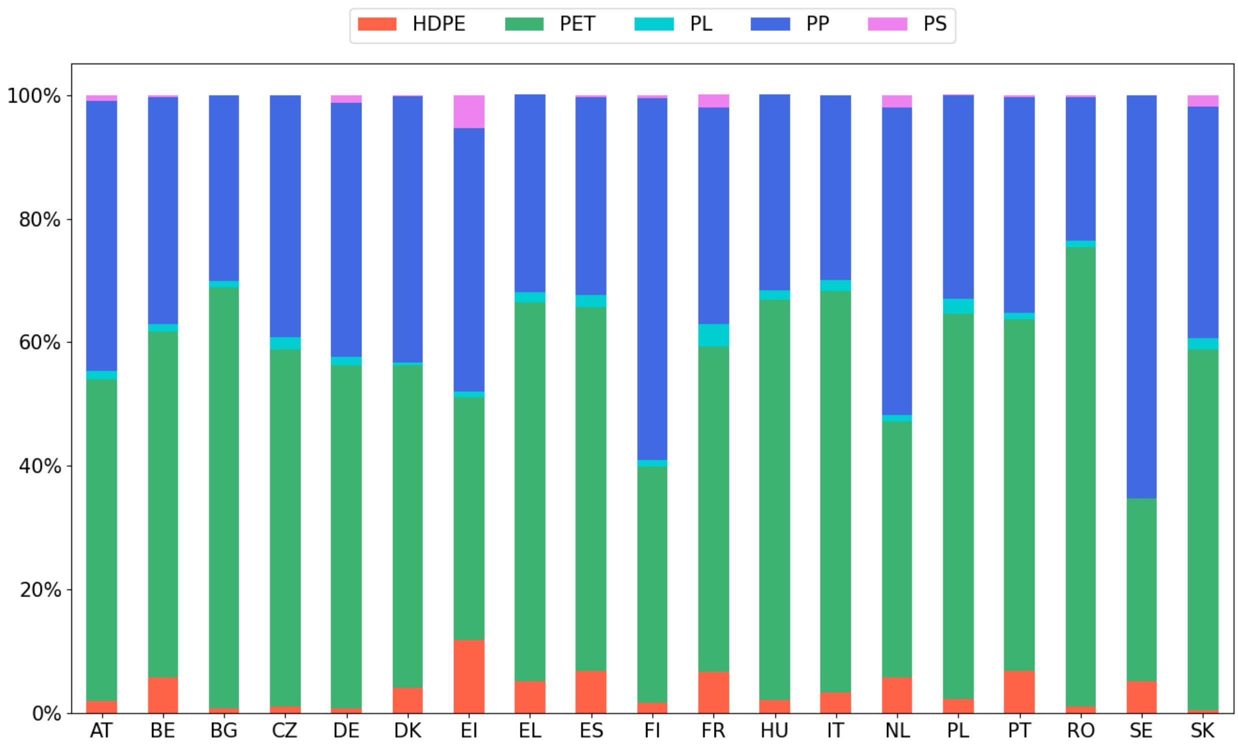
Similar charts for each country are provided in **Annex 4**. From these it is possible to see how quantities remained relatively stable in some countries (e.g. Belgium, the Netherlands and France) and increased in others (e.g. Ireland, Romania, and Poland).

Table 3 and **Figure 9** show the share of each plastic polymer to the total amount of plastic packaging POM in each MS in 2024 for food and beverage products. In addition, **Table 3** provides also total quantities. PET is often the largest contributor (ranging from 29.5% in Sweden to 74.4%

in Romania), followed by PP (from 23.2% in Romania to 65.1% in Sweden). Finland, Ireland, the Netherlands and Sweden are the only MSs where the amount of estimated PP is larger than PET. PET is used mainly for “Soft drinks” (including bottled water), whereas PP is used for a wider variety of food and beverage products. The remaining polymer types are less relevant across MSs. It is worth noticing the high contribution of HDPE in Ireland (11.9%), linked to sales of dairy products (“Milk” and “Yoghurt”).

Similarly, **Table 4** and **Figure 10** show the share of each plastic polymer to the total amount of plastic contained in packaging placed on the market for the remaining sectors analysed (i.e. home care, beauty and personal care, pet food) in each MS in 2024. In this case, HDPE and PET are the most used polymer types (contributing jointly to more than 75% of the total in all countries considered). HDPE is the largest contributor among all MSs, and in 11 of 19 cases it accounts for more than half of the estimated plastic packaging used in these sectors. This is due to the specific characteristics of these materials that make them very resistant to moisture and chemicals.

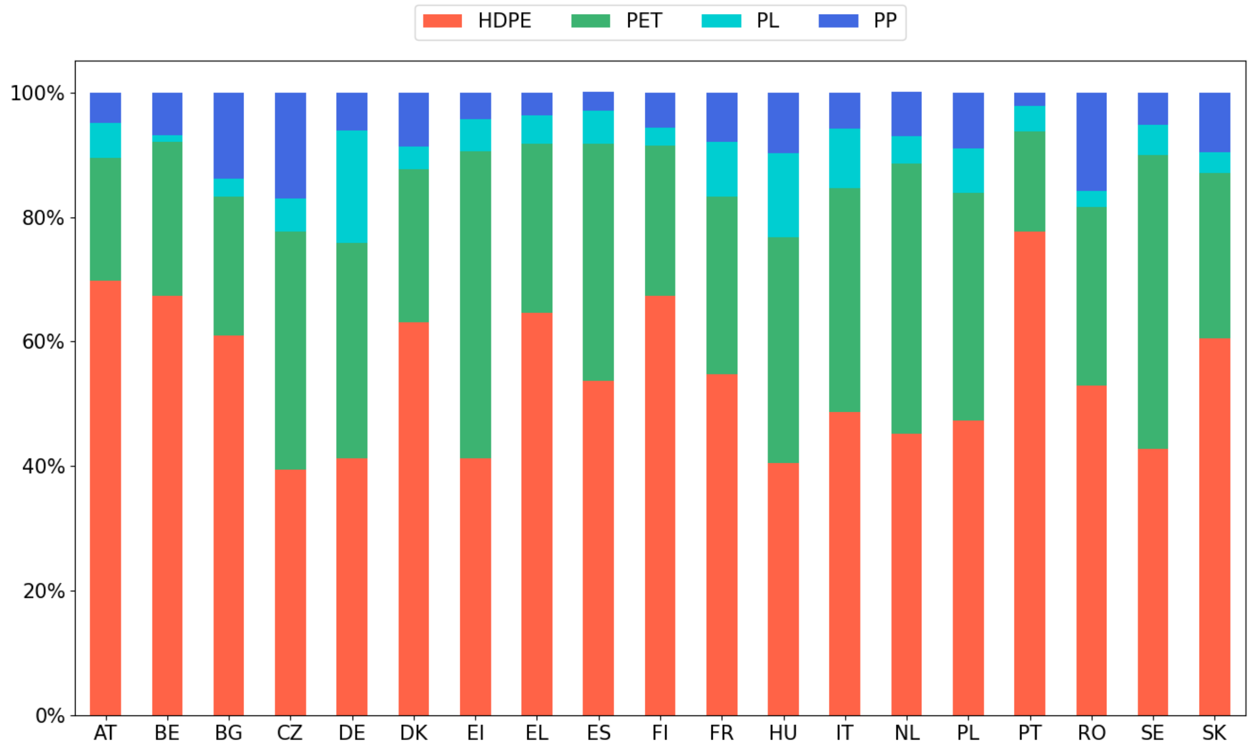
Figure 9. Share of plastic polymers in packaging placed on the market for food and beverage products per MSs in 2024.



Source: Authors’ own elaboration

Note: HDPE: High-Density PolyEthylene, PET: PolyEthylene Terephtalate, PL: Plastic (unknown polymer), PP: PolyPropylene, PS: PolyStyrene (including also Expanded PolyStyrene)

Figure 10. Share of plastic polymers in packaging placed on the market for home care, beauty and personal care and pet food products per MSs in 2024.



Source: Authors' own elaboration

Note: HDPE: High-Density PolyEthylenePET: PolyEthylene Terephtalate, PL: Plastic (unknown polymer), PP: PolyPropylene, PS: PolyStyrene (including also Expanded PolyStyrene)

Table 3 Total estimates (in tonnes) of plastic polymers in packaging placed on the market and relative share of each type of polymer per MS in 2024, related to food and beverage products (minimum, maximum, median, and average shares across the 19 MSs considered are provided at the bottom of the table).

Country code	**HDPE**		**PET**		**PL**		**PP**		**PS**	
AT	1844.5	2.0%	48565.3	52.0%	1246	1.3%	40806.7	43.7%	964.9	1.0%
BE	8063.4	5.7%	79641.2	56.1%	1774.8	1.2%	51935.5	36.6%	572.2	0.4%
BG	564.8	0.8%	48575.6	68.1%	723.1	1.0%	21425.8	30.0%	72.2	0.1%
CZ	1144.8	1.1%	57641.6	57.7%	2004.3	2.0%	39032.1	39.1%		
DE	9171	0.8%	644695.1	55.5%	16629.1	1.4%	475477.6	41.0%	14735	1.3%
DK	2099	4.1%	26470.2	52.1%	242.8	0.5%	21879.6	43.1%	98.6	0.2%
EI	7525	11.9%	24811.2	39.2%	595.6	0.9%	26964	42.6%	3409.4	5.4%
EL	3983.9	5.1%	48141.6	61.4%	1262.6	1.6%	25073.3	32.0%		
ES	42728.4	6.9%	366012.4	58.8%	12627.6	2.0%	198332.1	31.9%	2741.7	0.4%
FI	850.5	1.7%	19455.8	38.2%	534.6	1.0%	29849	58.6%	267.3	0.5%
FR	55609.8	6.6%	445786.3	52.7%	31543.4	3.7%	296073.8	35.0%	17360.6	2.1%
HU	2160.1	2.1%	67613.6	64.8%	1573.7	1.5%	33065.3	31.7%		
IT	25758.4	3.4%	497751	64.8%	13593.2	1.8%	230670	30.0%		
NL	8644.4	5.7%	62591.1	41.4%	1651.9	1.1%	75346.2	49.8%	3009.8	2.0%
PL	10352.8	2.3%	280194.7	62.3%	10620.7	2.4%	148469.7	33.0%	289	0.1%
PT	6832.4	6.8%	56840.1	56.9%	965.7	1.0%	35020.9	35.0%	278.3	0.3%
RO	2065.4	1.0%	152918.8	74.4%	2311.3	1.1%	47721.3	23.2%	470.8	0.2%
SE	3923	5.2%	22246.4	29.5%	96.5	0.1%	48996.7	65.1%	29.9	0.0%
SK	179.6	0.4%	28512.9	58.4%	870.5	1.8%	18331.1	37.6%	897.3	1.8%
MIN	0.4%		29.5%		0.1%		23.2%		0.0%	
MAX	11.9%		74.4%		3.7%		65.1%		5.4%	
MEDIAN	3.4%		56.9%		1.3%		36.6%		0.4%	
AVERAGE	3.9%		55.0%		1.4%		38.9%		1.1%	

Source: Authors' own elaboration

Note: HDPE: High-Density PolyEthylene, PET: PolyEthylene Terephtalate, PL: Plastic (unknown polymer), PP: PolyPropylene, PS: PolyStyrene (including also Expanded PolyStyrene)

Table 4 Total estimates (in tonnes) of plastic polymers in packaging placed on the market and relative share of each type of polymer per MS in 2024 related to home care, beauty and personal care, and pet food products (minimum, maximum, median and average shares across the 19 MSs considered are provided at the bottom of the table).

Country code	HDPE		PET		PL		PP	
AT	7497.3	69.8%	2117.4	19.7%	599.1	5.6%	520.1	4.8%
BE	8078.8	67.3%	2966.3	24.7%	134.5	1.1%	825.6	6.9%
BG	4287	61.0%	1562	22.2%	204.1	2.9%	976.7	13.9%
CZ	3641.7	39.5%	3516.9	38.1%	488.3	5.3%	1574.6	17.1%
DE	59765.9	41.3%	50079.8	34.6%	26133.3	18.0%	8859.2	6.1%
DK	2888.2	63.1%	1127.4	24.6%	166.2	3.6%	396	8.6%
EI	2860.7	41.3%	3407	49.2%	361.1	5.2%	292.4	4.2%
EL	8659.3	64.6%	3638.7	27.2%	603.5	4.5%	499.3	3.7%
ES	61432.2	53.7%	43425.9	38.0%	6036.9	5.3%	3492.7	3.1%
FI	3451.8	67.4%	1235.2	24.1%	146.1	2.9%	288	5.6%
FR	57692.7	54.8%	30056.1	28.5%	9151.2	8.7%	8452.6	8.0%
HU	4968.8	40.5%	4461.3	36.3%	1657	13.5%	1194.2	9.7%
IT	58700.5	48.7%	43330	35.9%	11603.6	9.6%	7013.7	5.8%
NL	10245.9	45.2%	9810	43.3%	995	4.4%	1626.7	7.2%
PL	27076.5	47.3%	20896.3	36.5%	4113.9	7.2%	5161.2	9.0%
PT	15749.4	77.6%	3285.6	16.2%	839.3	4.1%	410.1	2.0%
RO	9058.4	53.0%	4891.8	28.6%	443.9	2.6%	2691	15.8%
SE	4161.5	42.7%	4607.4	47.3%	465.9	4.8%	510.9	5.2%
SK	3246.2	60.5%	1429.4	26.6%	176.6	3.3%	512.2	9.5%
MIN	39.5%		16.2%		1.1%		2.0%	
MAX	77.6%		49.2%		18.0%		17.1%	
MEDIAN	53.7%		28.6%		4.8%		6.9%	
AVERAGE	54.7%		31.7%		5.9%		7.7%	

Source: Authors' own elaboration

Note: HDPE: High-Density PolyEthylene, PET: PolyEthylene Terephtalate, PL: Plastic (unknown polymer), PP: PolyPropylene

3.1.2. Results validation: comparison with plastics MFA

To perform a reality-check of the estimates yielded by the model, its results regarding the amounts of plastic packaging placed on the market at polymer level were compared with the outputs of a Material Flow Analysis (MFA) of plastics in the EU27 developed by the JRC (Amadei et al., 2025). In this model, an MFA was built using a "top-down" approach, where the total plastic production was first allocated to specific economic sectors and then further broken down into specific polymers. Within its scope, the model included 15 polymers, 9 sectors (namely packaging, construction, transport, electronics, agriculture, textiles, healthcare, fishing and other), and the full value chain from production to end-of-life and recycling, at EU level. Due to its "top-down" nature, the plastics MFA model does not assign plastic consumption to individual products. The results of the plastics MFA model obtained for the packaging sector at consumption stage (corresponding to what is here described as placed on the market), were therefore extracted and compared with the estimates of the model presented in this report, bearing in mind that the plastics MFA model included within the packaging sector both household and industrial packaging. This was done at polymer level, considering only polymers considered by both models.

Table 5 Comparison between amounts of plastic packaging placed on the market by polymer type as estimated in this model for the selected 19 EU countries and estimates of plastic packaging consumed in EU27 resulting from the plastics MFA model (Amadei et al., 2025). Values are expressed in Mt and refer to year 2022.

Polymer type (this work)	Corresponding polymer types in plastics MFA (Amadei et al., 2025)	This work (A)	Plastics MFA (B)	A/B
PET	PET	3.17	4.19	76%
PP	PP	1.91	4.37	44%
HDPE	HDPE	0.55	3.19	17%
PS*	PS, EPS	0.05	0.77	6%
Total		5.83	12.52	45%

Source: own elaboration based on Amadei et al., 2025 and packaging model results

Note: HDPE: High-Density PolyEthylene, PET: PolyEthylene Terephtalate, PL: Plastic (unknown polymer), PP: PolyPropylene, PS: PolyStyrene EPS: Expanded Polystyrene. The remaining polymers considered in the plastics MFA were excluded from this comparison as not covered by this work. *Including both PS and EPS.

According to this comparison (**Table 5**), the total plastic packaging placed on the market for household consumption of food and beverages, pet food, home care, and personal care products, as estimated by the present model across the 19 EU countries considered, represents approximately 45% of the plastic packaging used at consumption stage in the EU27, as reported by the plastics MFA model considering only the 5 polymers that are common to both models. The lower value obtained here, while remaining within the same order of magnitude, correctly reflects the narrower scope of the present model, thus confirming the validity of the results. A comparison of results by polymer type is presented below. As mentioned, the plastics MFA model does not extend to the product-level. Therefore, all considerations on the types of products that might be associated to the quantities of packaging estimated by this model are based on literature information on the common uses of different polymers by the packaging sector (e.g. Plastics Europe, 2024).

- PET: the two values are relatively close, which seems reasonable as the use of this material is mostly related to bottles that are covered in both studies. In addition, the plastics MFA could include uses for industrial applications such as containers for lubricants, chemicals or reagents.
- PP: the difference can be explained considering that this work focuses on food packaging applications for this polymer, whilst the broader scope of the plastics MFA analysis allows to capture other PP uses in packaging (e.g. industrial logistic crates and bins/boxes, or containers for cement bags, fertilisers or seeds bags, etc.).
- HDPE: the significant difference can be explained considering the industrial uses of this polymer type captured by the plastics MFA model, including for instance bulk containers used for liquids, powder or granulates chemicals for industrial applications; containers for fertilisers, herbicides, oils for cars, paints and solvents; industrial logistic pallets and catch-all crates; or containers for the transportation of hazardous materials.
- PS: the significant difference can be explained considering that in this work PS is only used in packaging for processed meat and seafood, while additional uses potentially covered by the plastics MFA model are protective packaging for electronics and appliances or other fragile or media equipment, industrial trays or fresh fish transport boxes.

3.2. Analysis of model results

The following sections illustrate the results of the analyses of model outputs introduced in Section 2.5.

3.2.1. Substitution between packaging materials

As described in Section 2.5 an analysis was carried out for four selected products (milk, carbonates, fruit juices, and bottled water), to identify possible trends of substitution in terms of packaging materials over the period 2011-2025. A potential substitution was recorded when, for a given country and product, either:

— the share of the dominant material fell by at least 15 percentage points (pp), or

— the share of an alternative material rose by at least 15 percentage points.

Seven cases met these criteria (as shown in **Table 6** and **Figures 11-17**).

Table 6. Country/product combinations where a potential substitution between packaging materials was identified.

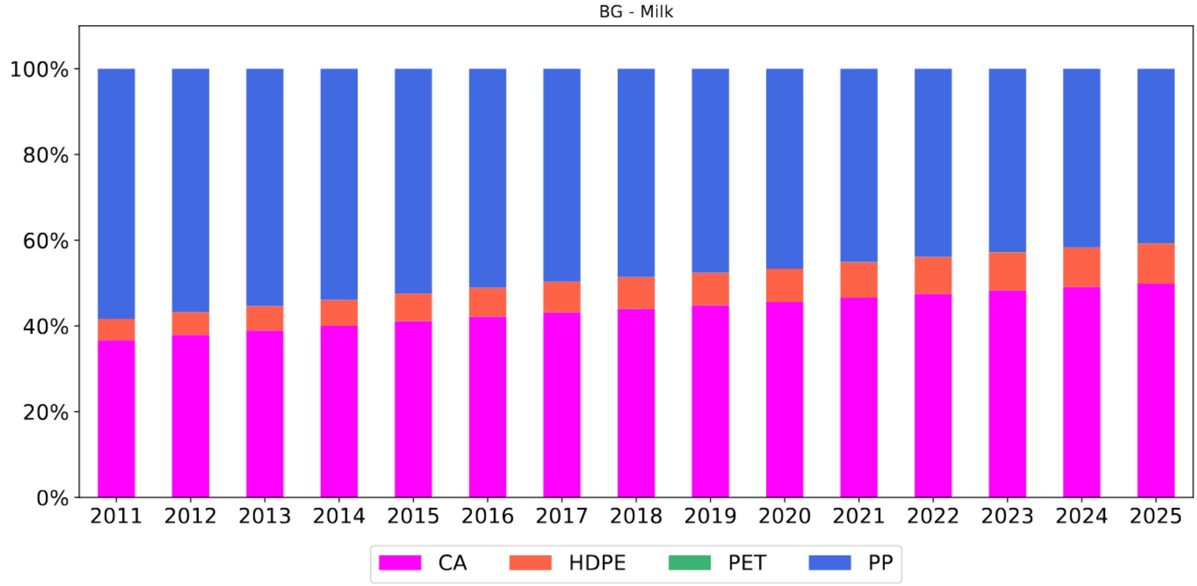
Country	Product	Material(s) losing share (- percentage points)	Material(s) gaining share (+ percentage points)	Interpretation
Bulgaria	Milk	PP (-18 pp)	Liquid carton (+13 pp) HDPE (+4 pp)	PP appears to have been partially replaced by liquid-carton and, to a lesser extent, HDPE
Bulgaria	Bottled water	PET (-17 pp)	Glass (+17 pp)	PET usage declined while glass increased, suggesting a partial shift to glass containers
France	Milk	Liquid carton (-10 pp) HDPE (-13 pp)	PET (+23 pp)	PET is progressively displacing both liquid-carton and HDPE
Italy	Bottled water	Glass (-18 pp)	PET (+18 pp)	PET has largely supplanted glass as the dominant packaging material
Romania	Milk	Liquid carton (-26 pp) PP (-5 pp)	PET (+17 pp) HDPE (+14 pp)	PET and HDPE together replace a substantial portion of liquid-carton
Sweden	Juices	Liquid carton (-29 pp)	Glass (+25 pp) PET (+4 pp)	Glass packaging gains ground at the expense of liquid-carton
Slovakia	Bottled water	Glass (-15 pp)	PET (+15 pp)	PET increases its share, partially replacing glass

Source: Authors' own elaboration

The identified shifts do not necessarily reflect deliberate material substitution by manufacturers. Changes in sales composition within a product group can produce similar patterns. For example, the decline of liquid-carton and the rise of glass in the Swedish juice market may stem from a growing preference for premium juices that are traditionally sold in glass bottles, rather than from a systematic replacement of one material by another.

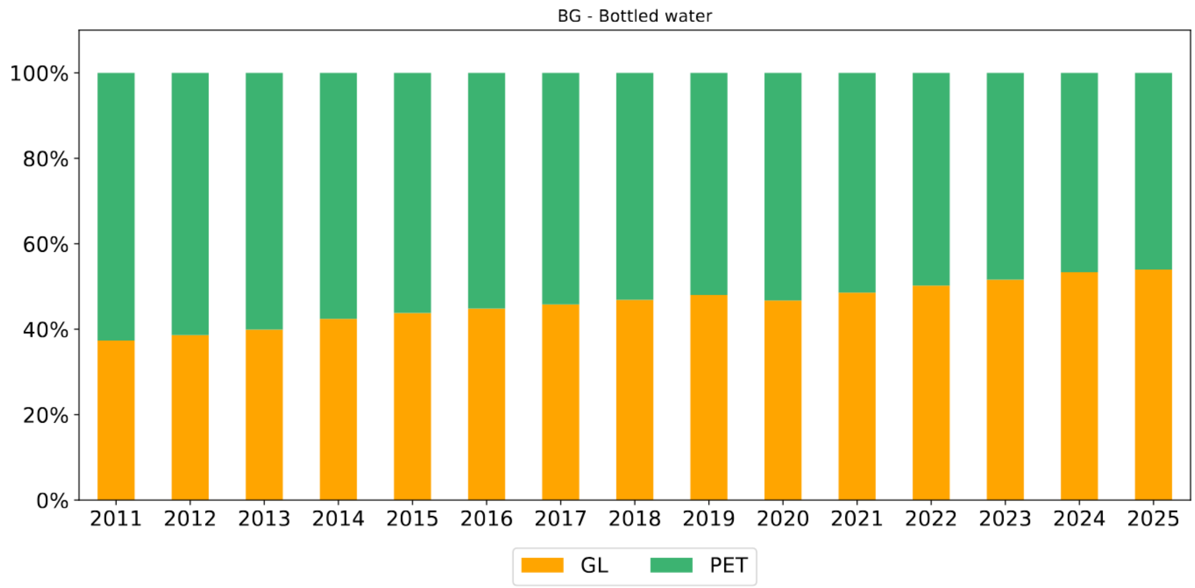
Overall, substitution patterns vary markedly across countries and product categories, as illustrated by the contrasting trajectories for bottled-water packaging in Italy (PET gaining) and Bulgaria (glass gaining).

Figure 11. Temporal trend in the shares of packaging materials relative to total packaging POM for milk in Bulgaria.



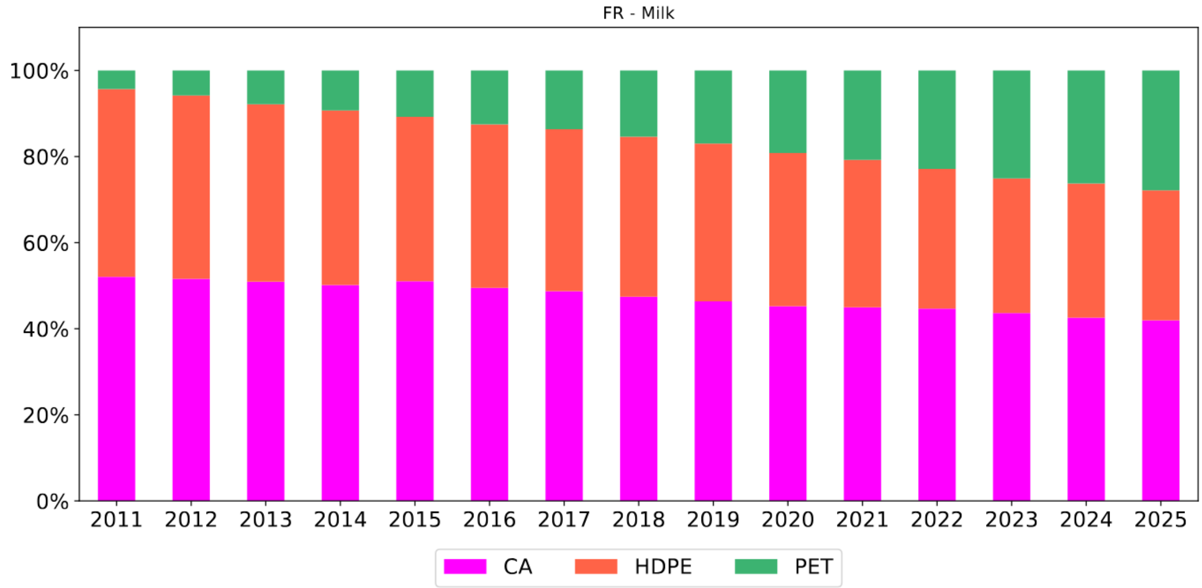
Source: Authors' own elaboration

Figure 12. Temporal trend in the shares of packaging materials relative to total packaging POM for bottled water in Bulgaria.



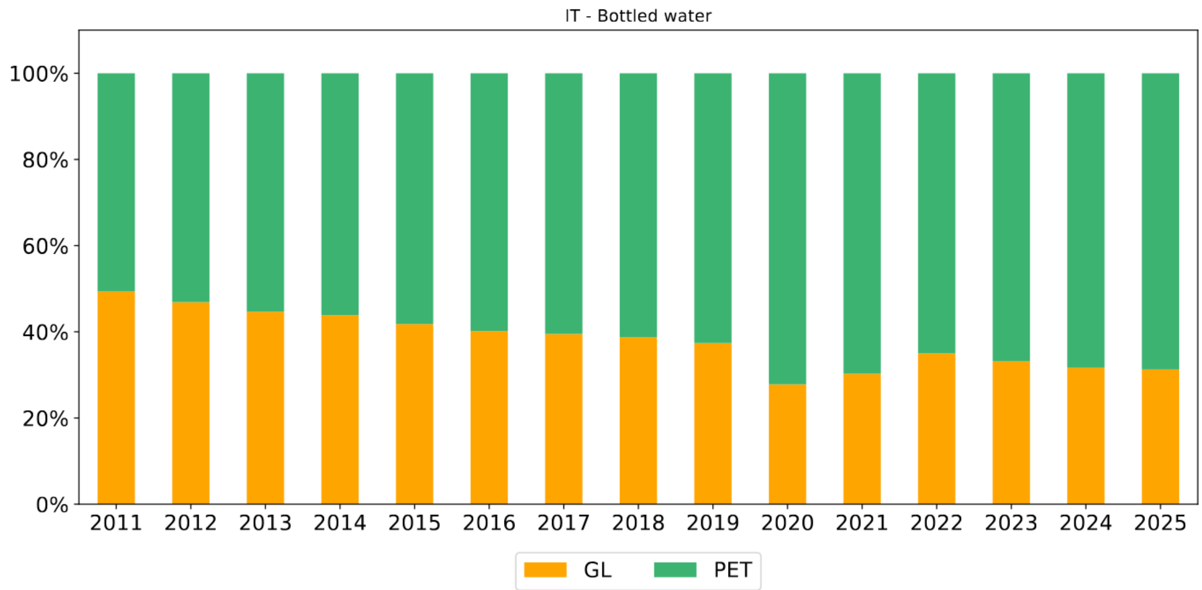
Source: Authors' own elaboration

Figure 13. Temporal trend in the shares of packaging materials relative to total packaging POM for milk in France.



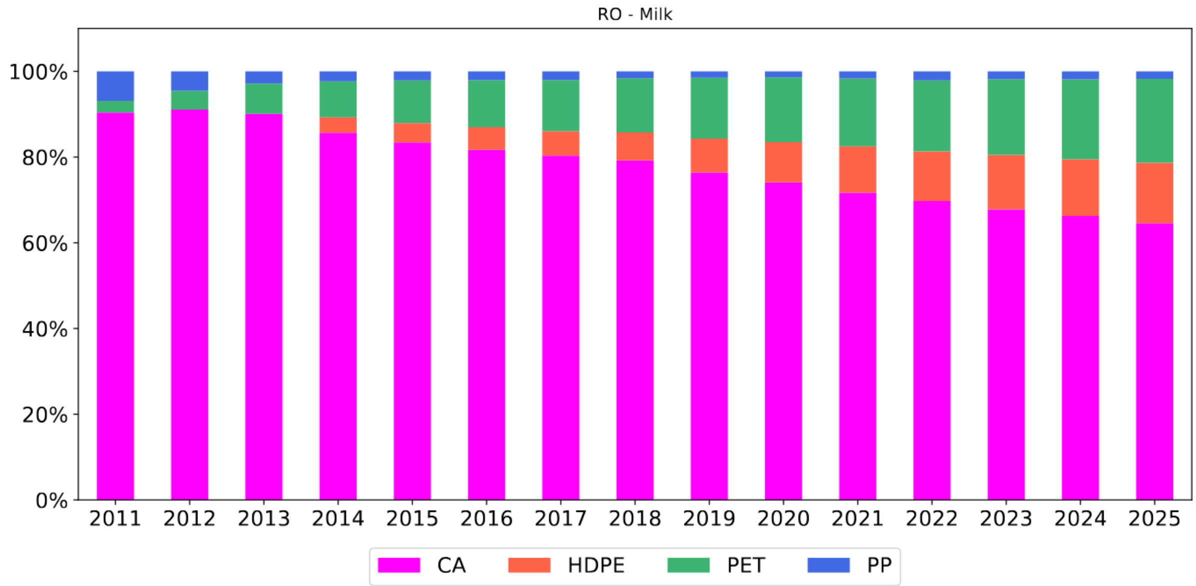
Source: Authors' own elaboration

Figure 14. Temporal trend in the shares of packaging materials relative to total packaging POM for bottled water in Italy.



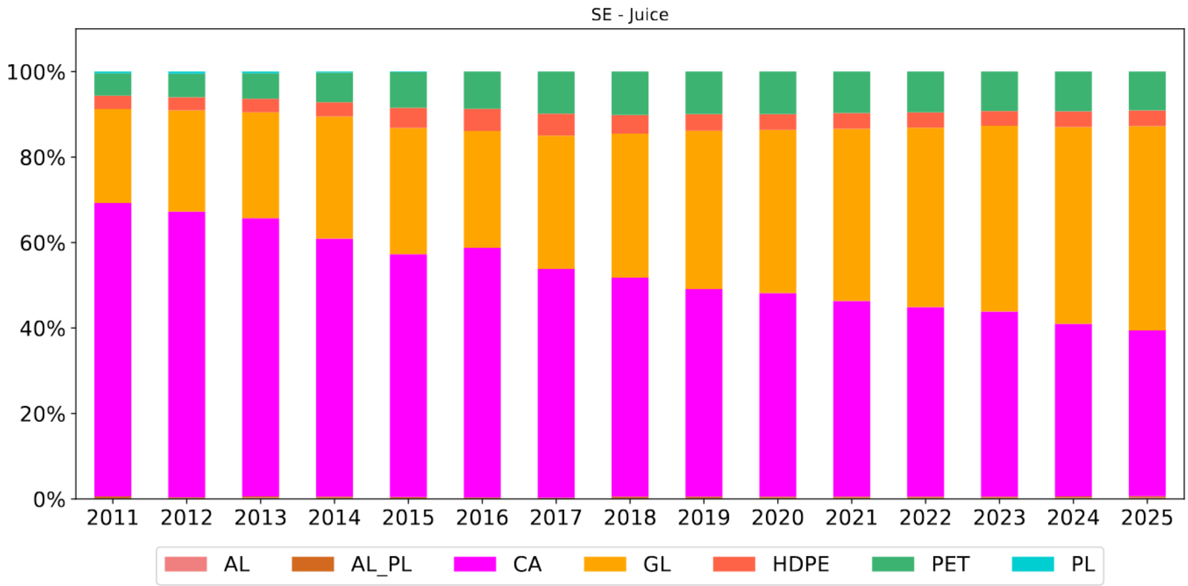
Source: Authors' own elaboration

Figure 15. Temporal trend in the shares of packaging materials relative to total packaging POM for milk in Romania.



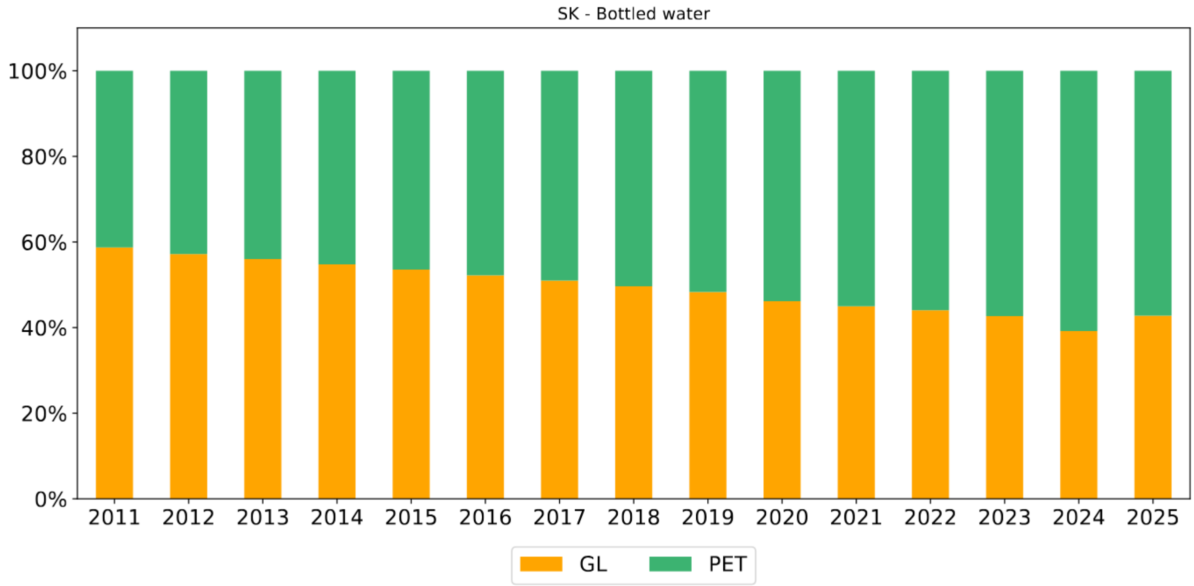
Source: Authors' own elaboration

Figure 16. Temporal trend in the shares of packaging materials relative to total packaging POM for juices in Sweden.



Source: Authors' own elaboration

Figure 17. Temporal trend in the shares of packaging materials relative to total packaging POM for bottled water in Slovakia.



Source: Authors' own elaboration

3.2.2. Correlation with household economic indicators

The results of this analysis showed no correlation across countries between:

- real expenditure per capita for processed food (taken from Eurostat (2025) and expressed in PPS) and total packaging mass POM for processed food products
- real expenditure per capita for beverages (taken from Eurostat (2025) and expressed in PPS) and total packaging mass POM for beverage products

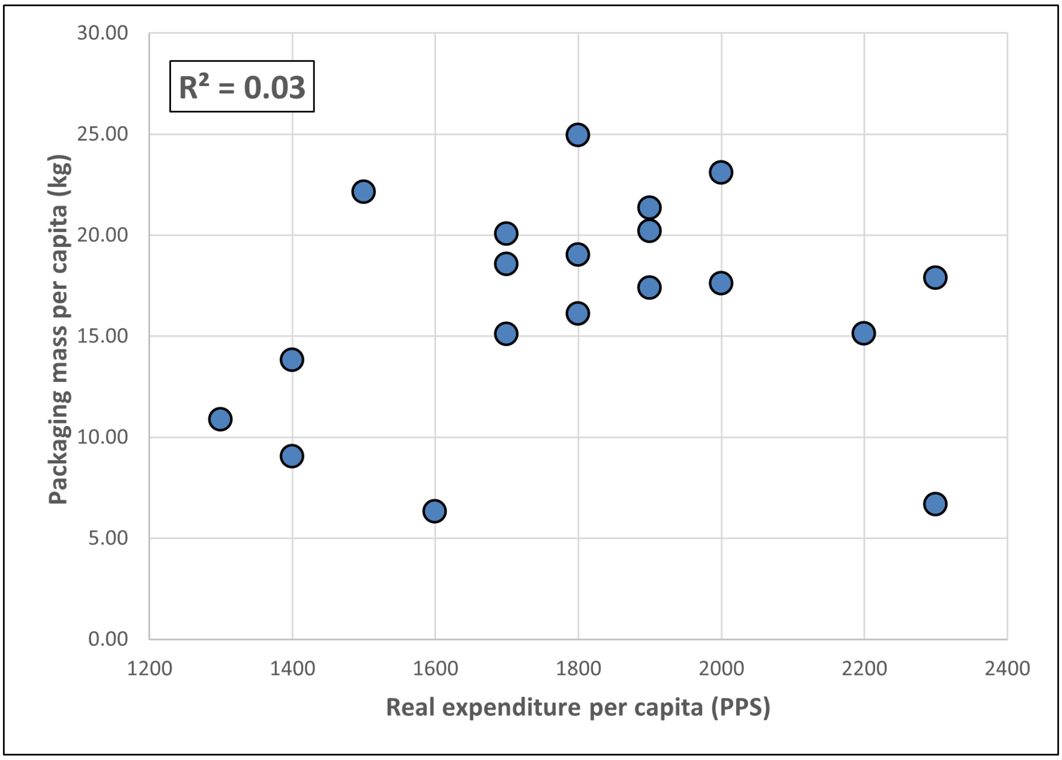
Figure 18 and **Figure 19** illustrate the resulting scatterplots and the R^2 value.

The absence of correlation between expenditure and packaging mass (**Figures 18** and **19**) suggests that expenditure is not strongly related to sales volumes at this level of aggregation. This can be explained by the high variability in product prices. For instance, a country with high consumption of bottled water and low consumption of alcoholic beverages may have high consumption volumes but relatively low expenditure. Conversely, a country where tap water is more commonly consumed and alcoholic beverages are consumed on average in larger quantities may show the opposite pattern.

A weak correlation was instead observed between total sales volumes of food and beverages (taken from the Euromonitor database) and the estimated associated mass of packaging POM, as shown in **Figure 20** and **Figure 21**. For both food and beverages, this limited correlation can be explained by differences across countries in consumption patterns and packaging choices. In particular, the composition of consumed products and the types of packaging materials used vary significantly, and these materials have very different densities. For example, a country where beer is mainly sold in glass bottles will have a higher packaging mass per unit of volume than a country where beer is primarily sold in aluminium cans.

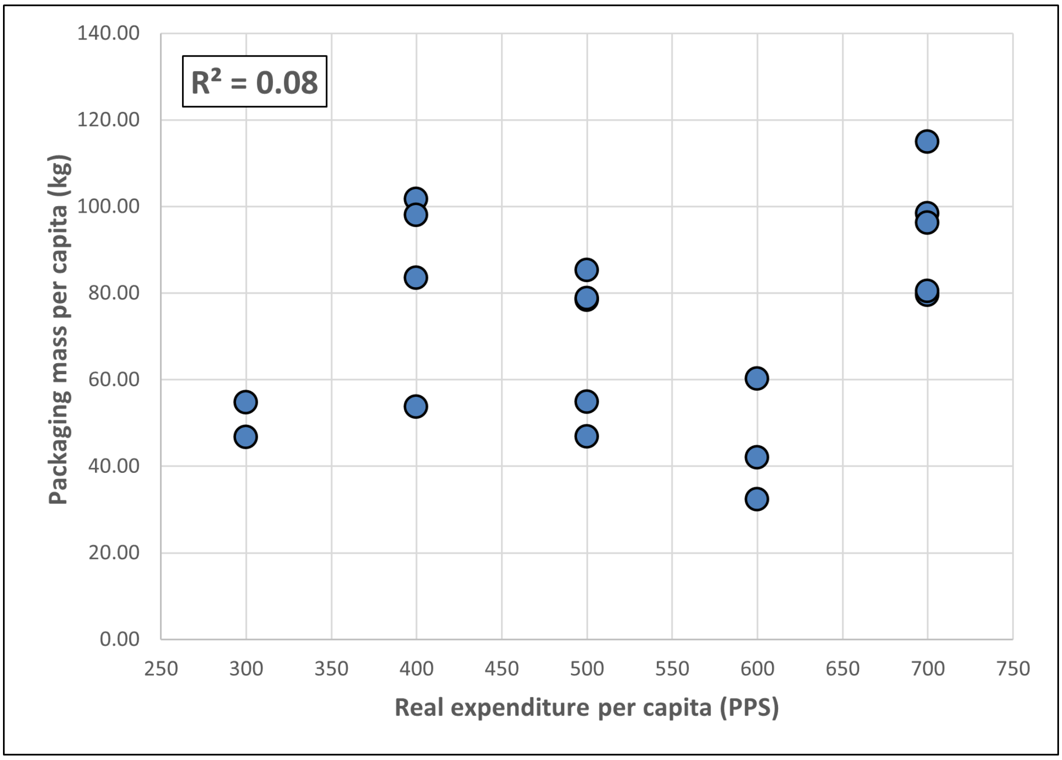
These findings are not unexpected, given the highly aggregated nature of the data used to estimate packaging amounts, which reflects average packaging use per capita at the country level. More granular data—such as segmentation by socio-economic characteristics or consumption habits—could reveal stronger relationships, particularly where purchasing patterns are linked to packaging-intensive products (e.g. processed versus fresh foods). At the current level of aggregation, however, packaging use cannot be reliably predicted based solely on food or beverage expenditure.

Figure 18 Processed food: correlation between real expenditure per capita (in PPS_EU27_2020) and estimated packaging mass per capita POM.



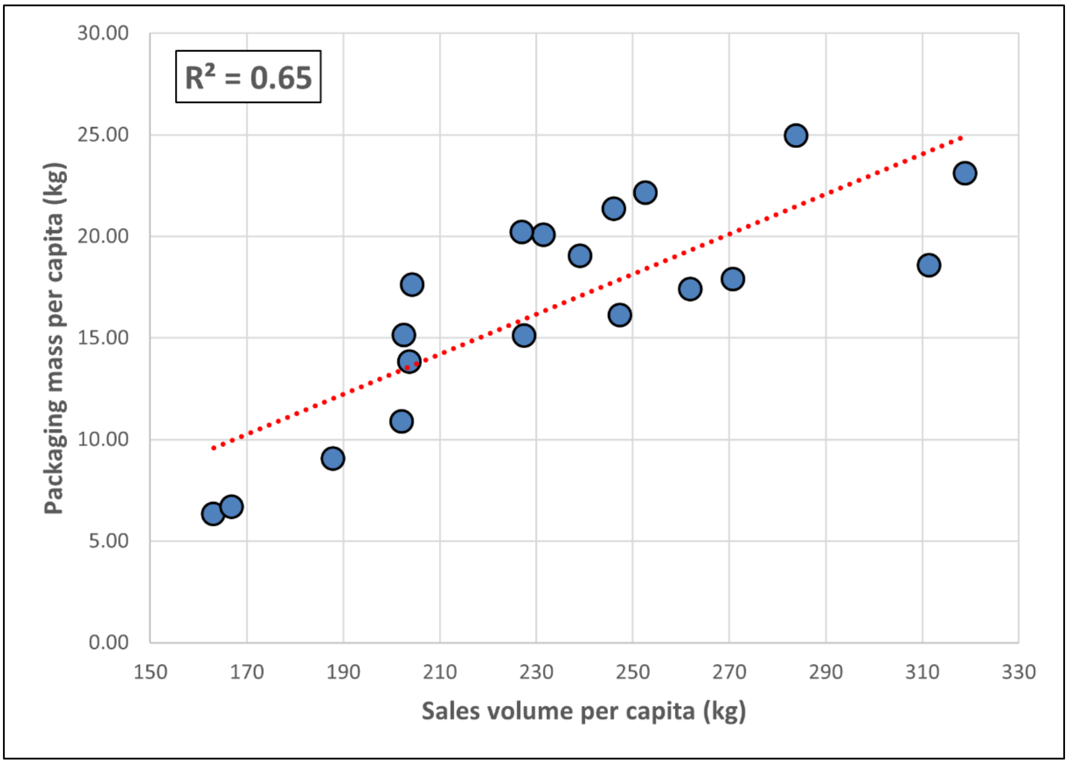
Source: own elaboration based on Eurostat (2025) and packaging model results

Figure 19 Beverages: correlation between real expenditure per capita (in PPS_EU27_2020) and estimated packaging mass per capita POM.



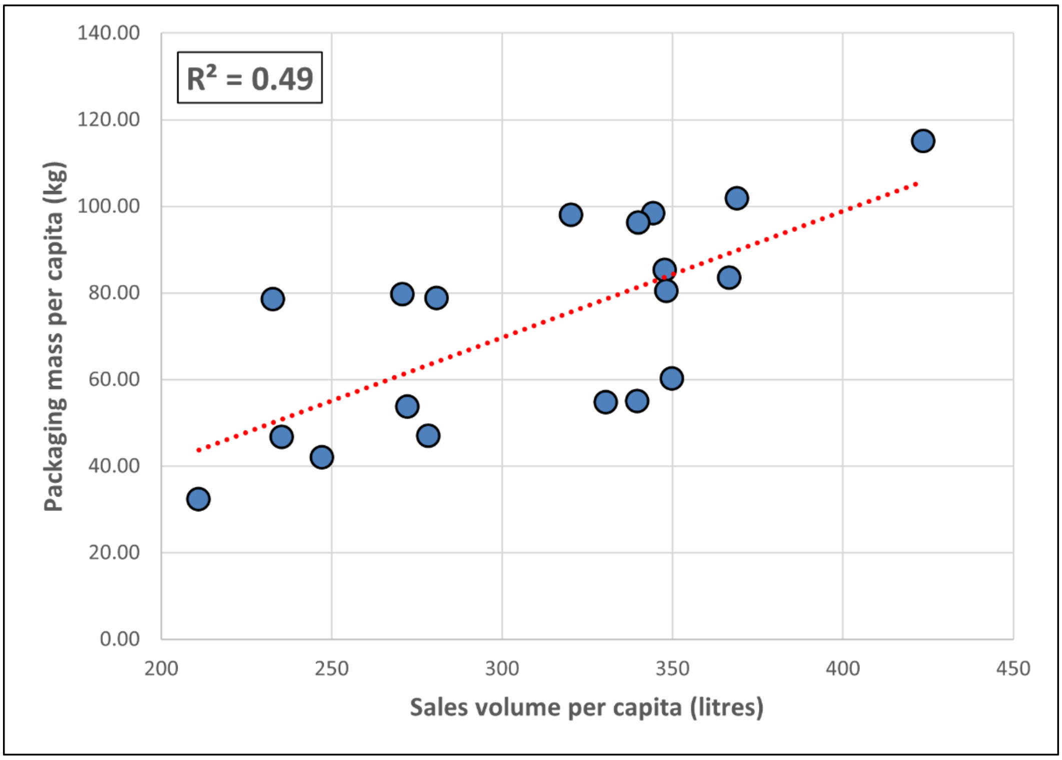
Source: own elaboration based on Eurostat (2025) and packaging model results

Figure 20 Processed food: correlation between sales volumes per capita and estimated packaging mass per capita POM.



Source: own elaboration based on Euromonitor (2026) and packaging model results

Figure 21 Beverages: correlation between sales volumes per capita and estimated packaging mass per capita POM.



Source: own elaboration based on Euromonitor (2026) and packaging model results

4. Conclusions

This report presents an updated methodology (version 2.0) for estimating the mass of packaging materials placed on the market in EU Member States. Building on an earlier version published in 2024, focused on the food and beverage sector, the model now incorporates three additional household consumption categories (home-care, personal-care and pet food).

Estimates are provided for 19 MSs (covering more than 97 % of the EU population) for the period 2011-2025, at the levels of product category, product, packaging type and material. For 2024, a total of 42.8 Mt of packaging POM was estimated, of which 32.3 Mt is glass-based, 5.9 Mt plastic-based, 2.1 Mt paper-based (including liquid cartons), 2.3 Mt metal-based and 0.1 Mt other mixed-materials. Plastic packaging POM corresponds to an average of almost 14 kg per capita per year, ranging from 8 kg in Sweden to almost 16 kg in Germany. Over the study period, total packaging quantities remained broadly stable; glass volumes fell in 2020 before recovering, while plastic volumes increased by roughly 11 % in absolute terms.

In addition, coefficients linking packaging mass to sales volumes have been derived, enabling estimation of packaging from sales data, in cases where a dedicated packaging database is unavailable.

Furthermore, potential substitution trends between packaging materials were investigated at product level for four selected products - bottled water, juices, carbonated soft drinks and milk - revealing shifts from one material to another that varied markedly across countries and product types.

These results can support Member States in reporting packaging waste quantities and can be used by Eurostat to benchmark the quantities of packaging waste reported.

References

Amadei, A., Venturelli, S. and Manfredi, S., Plastics materials flows in the EU-27 and their environmental impacts - Unveiling the European plastic value chain, Publications Office of the European Union, Luxembourg, 2025, https://data.europa.eu/doi/10.2760/6579757, JRC142860.

Cayé, N. and Leighty, A., Bundesweite Erhebung von Daten zum Verbrauch von Getränken in Mehrweggetränkeverpackungen, 2019. https://www.umweltbundesamt.de/system/files/medien/11850/publikationen/19_2024_texte_mehrweggetraenkeverpackungen.pdf (Accessed April 2026)

De Laurentiis, Biganzoli, F., Valenzano, A., and Sala, S., Estimating food waste generated and packaging placed on the market at national level, Publications Office of the European Union, Luxembourg, 2024, doi:10.2760/21595, JRC138277.

Euromonitor, Euromonitor International, Fresh Food, Packaged Food, Alcoholic Drinks, Soft Drinks, and Packaging Industry editions, 2026. http://www.euromonitor.com/ (Accessed February 2026).

Eurostat, Purchasing power parities, price level indices, nominal and real expenditures by analytical categories - based on COICOP 1999 (prc_ppp_ind), 2025, https://ec.europa.eu/eurostat/databrowser/view/prc_ppp_ind_1/default/table?lang=en&category=prc.prc_ppp

Plastics Europe, The Circular Economy for Plastics - A European Analysis, Plastics Europe, 2024 https://plasticseurope.org/wp-content/uploads/2024/03/CEreport_fullreport_2024_light-1.pdf

Mordor Intelligence, Europe Consumer Packaging Market Size & Share Analysis - Growth Trends and Forecast (2026 - 2031), 2026. Available at: https://www.mordorintelligence.com/industry-reports/europe-consumer-packaging-market? (Accessed March 2026).

List of abbreviations and definitions

Abbreviations	Definitions
CWCF	Consumption Weight Conversion Factor
EC	European Commission
EU	European Union
EPS	Expanded PolyStyrene
HDPE	High-Density Polyethylene
JRC	Joint Research Centre
MFA	Material Flow Analysis
MS	Member State
PET	Polyethylene terephthalate
POM	Placed on the market
PP	PolyPropylene
PPS	Purchasing power standard
PS	PolyStyrene
UM	Unitary mass

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Annexes

Annex 1. Collected and estimated unitary mass values, in grams

The document is publicly available on the JRC Data Catalogue at the following URL:

https://data.jrc.ec.europa.eu/dataset/21643d39-2c12-4a4a-bab7-1286a886dbfe

Annex 2. Packaging amounts estimates by country, year, type of food product and packaging material type, in kilograms

The document is publicly available on the JRC Data Catalogue at the following URL:

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Annex 3. Consumption-weight conversion factors

The document is publicly available on the JRC Data Catalogue at the following URL:

https://data.jrc.ec.europa.eu/dataset/21643d39-2c12-4a4a-bab7-1286a886dbfe

Annex 4. Temporal trends in plastic packaging placed on the market at national and EU level

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