ANALYSIS
OF PLASTIC PACKAGING WASTE MANAGEMENT

Analysis of Plastic Beverage Bottles Management in Slovenia

This document presents the final report summary entitled “Analysis of plastic packaging waste management: Analysis of plastic beverage bottles management”, produced in November 2020 by the Slovenian Beverages Association (SBA) at the Chamber of Commerce and Industry of Slovenia-Chamber of Agricultural and Food Enterprises (CCIS-CAFE) in cooperation with CCIS-Environmental Protection Department (CCIS-EPD) and external experts.

Gospodarska zbornica Slovenije
Zbornica kmetijskih in živilskih podjetij

Združenje industrije pijač

Gospodarska zbornica Slovenije
Služba za varstvo okolja

Analysis of Plastic Packaging Waste Management

Analysis of Plastic Beverage Bottles Management in Slovenia

The Final Report Summary

Ljubljana, 2021

ANALYSIS OF PLASTIC PACKAGING WASTE MANAGEMENT
The Final Report Summary

Authors: Janja Leban (external expert), Andreja Palatinus (CCIS-EPD)
dr. Petra Medved Djurašinović (CCIS-CAFE-SBA) Maja Oblak (CCIS-CAFE)

Responsible person: dr. Tatjana Zagorc

Issued and published by: CCIS-Chamber of Agricultural and Food Enterprises

Ljubljana, 2021

Contents

Introduction and the aim of the analysis

The aim of the analysis was to identify the quantities of plastic beverage bottles placed on the Slovenian market, and the main stakeholders in the plastic beverage bottle management chain – from beverage producers and packers to collectors and recovery operators of waste plastic bottles – and to analyse their operation. The purpose of the analysis was also to determine how close we are to achieving the goals of separate collection of waste beverage bottles introduced by Directive (EU) 2019/904 on the reduction of the impact of certain plastic products on the environment (the SUP Directive), and how the packaging waste management system could be improved.

The SUP Directive requires Member States to take the necessary measures to ensure the separate collection for recycling[1]:

a. by 2025, of an amount of waste beverage bottles equal to 77% of such beverage bottles placed on the market in a given year by weight,

b. by 2029, of an amount of waste beverage bottles equal to 90% of such beverage bottles placed on the market in a given year by weight.

As regards beverage bottles[2], each Member State shall ensure that:

a. from 2025, beverage bottles which are manufactured from polyethylene terephthalate as the major component (PET bottles) contain at least 25% recycled plastic, calculated as an average for all PET bottles placed on the market on the territory of that Member State; and

b. from 2030, beverage bottles contain at least 30% recycled plastic, calculated as an average for all such beverage bottles placed on the market on the territory of that Member State.

Methodological approach to the analysis

In our analysis, we focused on the types of **beverages** covered by the SUP Directive. Although the SUP Directive classifies milk as a beverage, we have determined and separately treated the following product categories for the purposes of the analysis:

1 The requirement applies to beverage bottles of **up to three litres** capacity including their caps and lids except for:
(a) glass or metal beverage bottles that have caps and lids made from plastic;
(b) beverage bottles intended and used for food for special medical purposes as defined in point (g) of Article 2 of Regulation (EU) No 609/2013 that is in liquid form.

2 See note 1.

- **beverages**: bottled water, soft drinks (non-carbonated beverages, carbonated beverages, fruit drinks, energy drinks, ice teas, etc.), juices, and nectars;
- **milk and dairy products** (yoghurts, whey, etc.). In addition to milk, our analysis also includes dairy products in liquid form for which we have estimated that they could fall under the SUP Directive[3].

Beer is not included in the analysis. Namely, it was determined that plastic bottles are not used for beer packaging or they are used in smaller quantities. The same goes for wine, which was also not included in the analysis.

The analysis is based on a review of existing data sources (Statistical Office of the Republic of Slovenia (SURS), Eurostat, Financial Administration of the Republic of Slovenia, Slovenian Environment Agency (ARSO), UNESDA[4], PlasticsEurope[5], etc.) and the analysis of the key replies to a questionnaire from the following stakeholders:

- the members of the Slovenian Beverages Association (SBA) at CCIS-CAFE,
- the members of the Dairy Section at CCIS-CAFE,
- the members of the Association of Slovenian Brewers at CCIS-CAFE,
- the packaging waste management companies,
- entities handling the packaging waste: public service providers of municipal waste collection and other providers of packaging waste collection, providers of treatment of mixed municipal waste and providers of treatment (sorting) of packaging waste.

Use of plastic bottles for beverages, milk and dairy products, and estimation of the quantity of the bottles placed on the market

Used materials

The questionnaire replies analysis of the SBA and the Dairy Section members shows that plastic packaging is the key primary packaging for beverages, while for milk and dairy products, mostly used packaging is composite packaging, which is predominantly made of paper or cardboard. About 77% of the sold beverage quantities are packaged in plastic materials – bottles, while this percentage in milk and dairy products is less than 10%.

3 Guidelines with examples of products that are considered single-use plastic products for the purposes of the SUP Directive are still in the process of preparation.

4 European Soft Drinks Association: www.unesda.eu.

5 European Association of Plastics Manufacturers: www.plasticseurope.org.

Beverages

Milk and dairy products

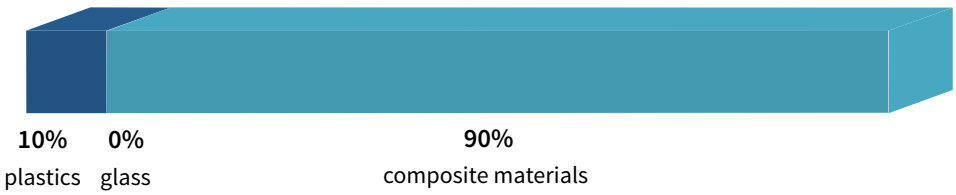


Figure 1: Percentage of materials used for packaging beverages, milk and dairy products, 2019 (%)

The most frequently used plastic packaging materials	
LDPE	Low density polyethylene
HDPE	High density polyethylene
PP	Polypropylene
PET	Polyethylene terephthalate
PS	Polystyrene
PVC	Polyvinyl chloride

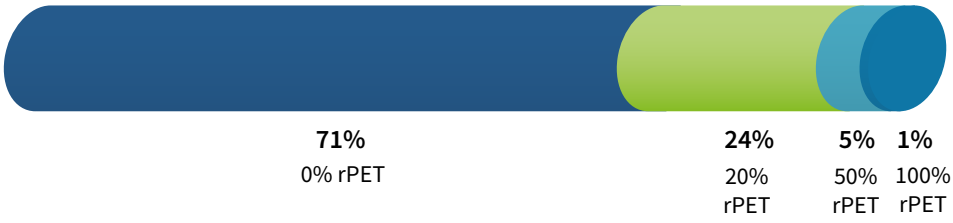
PET is mostly used as a material for plastic bottles (more than 99%), while HDPE is used in smaller quantities (less than 1%).

rPET content in plastic bottles

Certain products are already bottled in recycled PET (rPET) bottles, mainly beverages. The percentage of rPET in beverage bottles is 20%, 50% and even 100%, while this percentage in bottles for milk and dairy products is 25%.

The lids are made of HDPE, PET, and PP, while the labels are made of plastics (PP, PET, etc.) or paper.

Beverages



Milk and dairy products

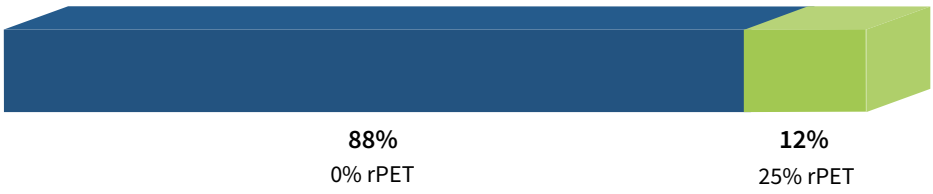
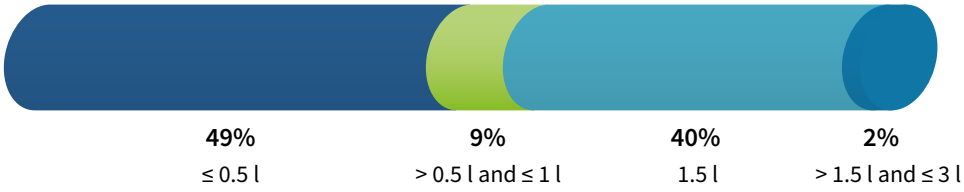


Figure 2: The percentage of plastic bottles for beverages, milk and dairy products by rPET content, 2019 (%)

Plastic bottles by size

The bottle sizes that predominate in beverages are 0.5 and 1.5 litres, while the bottle sizes that predominate in milk and dairy products are 1 and 0.5 litres.

Beverages



Milk and dairy products

Figure 3: The percentage of plastic bottles by the quantity of packaged beverages, milk and dairy products, 2019 (%)

Plastic bottles by colour

By colour, most beverage bottles are colourless (66%), the remaining 34% are coloured (15% of each blue and green and 4% of other colours, such as brown, orange, etc.). More than 80% of the bottles for milk and dairy products packaging are white, while to a lesser extent (less than 20%) they are colourless.

Beverages

Milk and dairy products

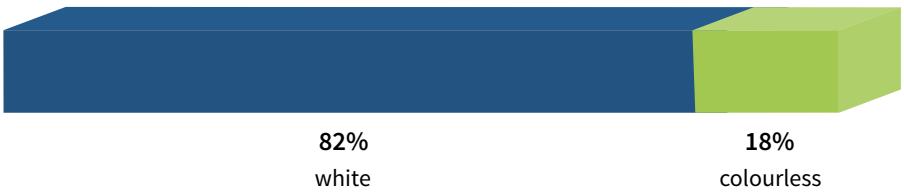


Figure 4: The percentage of plastic bottles for beverages, milk and dairy products by colour, 2019 (%)

We estimated the number of plastic bottles placed on the Slovenian market based on the following data:

- **beverages**:
  a. in 2019, the consumption of beverages in Slovenia was **370.5 million litres**[6],
  b. **77%** of these quantities are packaged in plastic bottles (analysis of SBA members' replies),
  c. 175 million litres of beverages represent **180 million plastic bottles** (the data are based on the SBA members' replies analysis),
- **milk and dairy products:**
  a. in 2019, **18.4 million plastic bottles** were placed on the Slovenian market (the data are based on the Dairy Section members' replies analysis)[7],
  b. in 2019, the percentage of imported products in terms of consumption is **28%** (the estimate is based within the analysis on data from Eurostat).

Based on the number and the average weight of the bottles used for packaging beverages, milk and dairy products – the data come from the SBA and the Dairy Section members' replies analysis –, we also estimated the weight of the bottles placed on the Slovenian market, including lids and labels.

The estimation of **the number** and the **total weight** of the plastic bottles placed on the Slovenian market, 2019:

	Number of bottles (mill)	Average bottle weight* (g)	Total bottle weight* (t)
Bottles for beverages	293	31.4	9,200
Bottles for milk and dairy products	26	31.3	814
In total	**319**		**10,014**

*including lids and labels

We estimate that around 319 million plastic bottles of beverages, milk and dairy products were placed on the Slovenian market in 2019, resulting in around 10,014 tonnes of waste plastic bottles.

6 Source: UNESDA, 2020. Data Extract taken from GlobalData's Soft Drinks Market Insights Database. (https://www.unesda.eu/consumption/).

7 The data on plastic bottles of imported milk and dairy products placed on the market is not included.

Over 99% of bottles are made of PET material.

Most bottles are colourless, followed by blue, green and other colours. In the dairy field, white bottles predominate.

Some products are already being packaged in bottles made of recycled material (rPET), which applies to both the beverage and dairy sectors.

The collection of waste plastic bottles and their recovery

Six collective systems are established in Slovenia and they are being managed by the packaging waste management companies[8]. In addition to these, the ARSO records contain 14 individual systems which are not included in our analysis, as from the point of view of waste beverage bottles management (municipal packaging waste), only collective systems are important – the packaging waste management companies.

Waste plastic bottles are mainly collected within the system of the obligatory municipal commercial public services of the municipal waste collection, together with other waste plastic, metal and composite packaging, such as mixed packaging waste (waste number 15 01 06).

On the entire territory of Slovenia, there are 67 providers of the obligatory municipal commercial public services of the municipal waste collection[9], and a network of delivery points has been established according to a "door-to-door" system, collection points and collection centres.

Waste packaging collected within the public service system must be handed over to the packaging waste management companies. They must take it over and ensure further handling operations. As more than one packaging waste management company are operating, the share of taking over packaging waste is determined by a government decision published in the Official Journal of the Republic of Slovenia on a yearly basis since 2016. Packaging waste that needs to be submitted should be collected as a separate fraction and separated from mixed municipal waste in municipal waste management centres.

Due to difficulties in (non)acceptance of packaging waste by packaging waste management companies and the consequent accumulation of packaging waste in

8 Source: ARSO, records on 16. 12. 2020: https://www.gov.si/assets/organi-v-sestavi/ARSO/Odpadki/Podatki/Odpadna-embalaza.pdf.

9 Source: ARSO, records on 11. 1. 2021: https://www.gov.si/assets/organi-v-sestavi/ARSO/Odpadki/Podatki/Evidenca-izvajalcev-javne-sluzbe-zbiranja-odpadkov.pdf.

the collection centres of the public service providers of municipal waste collection, packaging waste that has not been taken over by packaging waste management companies, according to the state intervention measures from 2018 onwards, is also sent directly to waste treatment contractors, whereby a regulation determines the conditions under which packaging waste may be handed over to these contractors.

Collected mixed packaging waste (waste number 15 01 06) is sorted in packaging waste sorting facilities and sent to further processing, either in Slovenia or abroad. Sorting is performed by more than 10 companies; the capacities of sorting devices range from about 5,000 tonnes to 75,000 tonnes per year. The process is carried out (mostly) manually, automatically or with the combination of both; the number of obtained fractions ranges from 5 to 10 and more (20) fractions, including plastic bottles.

For recycling purposes, colourless or natural PET and blue PET are excluded, green and other colours are sent to further processing most often as a PET mix. White or opaque bottles of milk and dairy products are not excluded, since they are not wanted in the recycling process.

Recycling of waste bottles, processing to PET regranulate suitable to come in contact with foods or for other purposes takes place mostly (more than 90% of it) abroad (in Austria, Poland, Germany, Hungary, Serbia, etc.), to a lesser extent (less than 10%), processing to PET flakes takes place also in Slovenia.

The estimation of waste bottles quantities and recycling percentages

Based on the estimates given by the packaging waste management companies in their replies to the questionnaire, it was calculated that in 2019 we recycled[10] about **5,000 tonnes** of waste PET beverage bottles, mostly colourless – about 60%, 10% are blue, and the remaining 30% are of different or mixed colours, which also corresponds to the structure of PET bottles placed on the market.

The quantities of waste beverage PET bottles handed over for recycling were also estimated based on the replies providers of sorting mixed packaging waste provided (waste number 15 01 06) and the estimate of the percentage of excluded waste beverage PET bottles for recycling purposes.

10 Following the latest amendments to Directive 94/62/EC on packaging and packaging waste (Directive (EU) 2018/852), the methodology of calculating the achievement of recycling targets is changing, which will affect the data on the quantity of recycled bottles and the recycling rate. According to the new methodology, these data will be lower.

The estimate of the percentage of recycling of waste beverage bottles, 2019:

			Recycling percentages
1*	The estimate of the bottle quantities placed on the market	10,014 t	
2*	Recycled – estimate 1	5,000 t	**50%**
3*	Recycled – estimate 2	8,099 t	**81%**

*Data sources:

1 – calculations within the analysis; the data refer to bottles of beverages, including milk and dairy products
2 – calculations based on the analysis of the packaging waste management companies data for 2019
3 – calculations based on the analysis of the data from sorting providers for 2019 and the SURS data on the quantity of mixed packaging waste submitted for recovery/disposal, Slovenia, 2019

Taking into account the calculations and data of both groups of stakeholders, we estimate that the percentage of recycled waste PET beverage bottles ranges between 50% and 81% depending on the quantity of bottles placed on the market in 2019; it is an average of 65%.

Regardless of the significant gap between the data, we believe that the percentage of recycled waste is closer to the average or higher, that is between 65% and 81%, except that the quantities are not recorded or not all are included in the packaging waste management companies system.

The data on the percentage of recycled waste PET beverage bottles also represent the first estimates of the separate collection percentage of waste bottles according to the requirements of the SUP Directive.[11]

Performance evaluation of the existing waste bottle collection system

The performance evaluation of the existing waste bottle collection system and possible improvements is based on the questionnaire replies of two groups of stakeholders:

- the packaging waste management companies, and
- the municipal waste or packaging waste collection providers, and processors of mixed packaging waste and mixed municipal waste (hereinafter: collectors and processors).

11 The percentage of the separate collection depends on the methodology for calculating and verifying the objectives of the separate collection, which is still in preparation.

The performance of the waste bottle collection system was assessed on a scale of 1 to 5, with a score of 1 meaning very poor and a score of 5 meaning very good. The performance of the system is assessed with an overall score of **2.4 (poor)**.

As part of the improvement proposals, we asked the interviewees for their opinion on proposals for ten measures that could contribute to the improvement of the collecting waste beverage bottles system. They rated the measures on a scale of 1 to 5, with a score of 1 meaning that the measure would make very little contribution to improving the system, and a score of 5 meaning that it would make a very significant contribution to improving the waste bottle collection system.

How to improve the system of collecting waste beverage bottles?

Figure 5: Measures rated by both stakeholder groups

Based on the joint rating of both stakeholder groups, we conclude that the greatest importance is attached to:

- **setting separate collection objectives for extended producer responsibility schemes,**
- **additional containers for the collection of waste bottles as an independent fraction in the catering industry,**

- **additional containers for collecting waste bottles as an independent door-to-door fraction,**
- **additional awareness and guidelines on the proper separation and collection of packaging waste, with an emphasis on plastic bottles, and**
- **establishing a (mandatory) deposit return scheme for plastic beverage bottles.**

Recommendations and proposals regarding the measures for stakeholders

As part of further activities, we recommend strengthening stakeholder networking, communication between them on the possibilities of improving and upgrading the existing municipal waste collection system with separate collection of waste beverage bottles, coordination of consumer awareness campaigns on packaging waste management focusing on waste beverage bottles collection, and cooperation with the Ministry of the Environment and Spatial Planning in the preparation of legislation and the transfer of the SUP Directive requirements into Slovenian legal system. The following proposed measures are addressed to the Ministry of the Environment and Spatial Planning and individual stakeholders involved in the beverage bottling management system:

Packaging waste management companies

- Involvement of traders in activities related to beverage bottles.
- Upgrading the system of liable persons' reporting on packaging with reporting on beverage bottles. Check the possibility of introducing digital monitoring of bottles (following the example of returnable packaging).
- Complementing the packaging waste management reporting system with reporting on the mass flow of waste beverage bottles (mass flow shown separately).
- Strengthening the cooperation between the packaging waste management companies, the public service providers of municipal waste collection, the collectors of the packaging waste management companies and packaging waste processors.
- Raising consumer awareness on the proper handling of packaging waste with an emphasis on waste beverage bottles.

The public service providers of municipal waste collection and the collectors of the packaging waste management companies

- Strengthening the cooperation between the packaging waste management companies, the public service providers of municipal waste collection and the collectors of the packaging waste management companies.
- Sorting analysis of mixed packaging waste and reporting – separately presented data on waste beverage bottles.
- Raising consumer awareness on the proper handling of packaging waste with an emphasis on waste beverage bottles.
- Recording possibilities for improvements of the waste beverage bottle collection system.

Packaging waste processors

- Strengthening the cooperation with the packaging waste management companies.
- Reporting of excluded fractions of waste beverage bottles.
- Recording possibilities for improvements of the waste beverage bottle sorting system.

Ministry of the Environment and Spatial Planning

- Upgrading the existing packaging reporting system with reporting on beverage bottles (in legislation).
- Complementing the packaging waste management reporting system with reporting on the mass flow of waste beverage bottles – mass flow shown separately (in legislation).
- Establishing guidelines for a unified approach in assigning the waste number to plastic packaging waste.
- Strengthening the control over waste beverage bottles flows.
- Implementation of the requirement for the performance of a sorting analysis of mixed municipal packaging waste before submission for processing – determining its composition and reporting with emphasis on waste beverage bottles.
- Complementing the requirement for the separation of packaging waste from mixed municipal waste, and the submission to the packaging waste management companies with a requirement for keeping separate records of excluded waste bottles and reporting about it.
- Clear definition of the roles and responsibilities of all actors involved in the packaging and packaging waste management system.
- Establishment of an independent body/agency with the following activities:

- day-to-day monitoring of packaging waste flows or establishing a control system for the mass flows of packaging waste,
- preventing the submission of waste beverage bottles past the packaging waste management company system,
- ensuring the traceability of packaging waste/waste beverage bottles throughout the whole chain until final processing.

Conclusions

In Slovenia, a good infrastructure has been established for the separate collection of municipal waste. Regardless of this, we need to point out the shortcomings of the existing collection system, especially the poor quality of separately collected mixed municipal packaging waste, within which the majority of plastic beverage bottles is collected. In order to monitor the implementation of the SUP Directive's requirements and achieve the objectives regarding the separate collection of waste beverage bottles and the content of the recycled plastics in bottles, we note that the key is the collection of more detailed data on packaging placed on the market, and on the fractions of waste plastic packaging that are collected, delivered to treatment and recovered, as well as greater data reliability.

In order to achieve the objectives of the SUP Directive, the existing collection system should be upgraded, which means to separately collect more and better-quality waste beverage bottles that will meet the conditions for acceptance into recycling processes, and further use of recyclates which are intended to come into contact with foodstuffs. Compliance with food safety requirements is essential from the point of view of the use of rPET in the production of new bottles, and the achievement of the SUP Directive's objectives regarding the content of rPET in beverage bottles.

Acknowledgements

The analysis of plastic packaging waste management – beverage bottles – would not have been possible without the initiative of the members of the Slovenian Beverages Association at the CCIS-Chamber of Agricultural and Food Enterprises. We would like to thank them in the first place. The data received from the members are the starting point for making the final report possible, so it is unequivocal that the contribution of the Dairy Section and the Association of Slovenian Brewers members is invaluable.

We would also like to thank all the other stakeholders in the plastic packaging management chain, who by providing data, information, and insights into their operation significantly contributed to an even greater added value of the analysis and the final report. These are, of course, representatives of packaging waste management companies, companies that collect and manage municipal waste and packaging waste, as well as other representatives of the plastic beverage packaging value chain.

Finally, we would also like to mention the support of the Ministry of the Environment and Spatial Planning that monitored and directed the analysis in its planning, implementation, and development of conclusions.

Gospodarska zbornica Slovenije

Zbornica kmetijskih in živilskih podjetij