ACCELERATE GREEN INNOVATION

Deposit return systems (DRS) for beverage packaging in Europe

A study of European DRS for recycling

Thomas v/d Nieuwenhuizen
Cécile Reinkingh
Tjerk Wardenaar
06/10/2023

Preface

The purpose of this document is to extend and update the previous study of EGEN on DRS systems in EU Member States.[1] This paper will focus on a more comprehensive assessment of DRS for Recycling in five EU Member States: Germany, Sweden, Lithuania, Estonia and the Netherlands. Data used in this paper has been collected through desk research and expert interviews.

[1] Reinkingh, v/d Nieuwenhuizen, Wardenaar (2022). MAPPING OF PACKAGING DEPOSIT RETURN SCHEMES IN THE EU (link).

Table of Contents

1. Introduction into the study

Deposit Return Systems (DRS) for recycling have gained attention in recent years as an effective tool to increase return rates and reduce the amount of packaging that end up in our environment. DRS are understood as schemes that manage beverage packaging streams in which consumers leave a deposit when they buy products. These deposits are reimbursed to them when the consumers return empty packaging to producers via retail outlets.

In the European Union (EU), thirteen Member States have currently implemented DRS to encourage consumers to collect beverage packaging and reduce littering of this packaging material. While several Member States have already implemented DRS to incentivize consumers to separately collect beverages packaging, there is a need to understand the legal and operational framework of these schemes. As European countries have implemented DRS in different ways, it is difficult to identify how to design an optimal DRS for a specific national context. This study aims to analyze DRS for recycling in ten EU Member States and zoom in on five specific Member States to gain insight into their legal status, anti-fraud measures, transparency obligations, and system performance.[2]

This study will first discuss European legislation in place concerning DRS for recycling. Hereafter, the main characteristics of European DRS and their governance structure will be assessed. Finally, the study will look into the performance of five case studies and the economics of their DRS – including economic size of the system as well as their main cost and revenue streams.

By comprehensively assessing the DRS in five case study countries, this study will provide a detailed understanding of the legal and operational framework of DRS in the EU. As such, this study aims support policymakers as well as other stakeholders, by creating a better understanding of European DRS for recycling systems.

[2] Deposit return systems for reuse are out of scope of this study, more information about DRS for reuse can be found here.

2. European Legislative Framework

There is both European and national legislation in place in order to ensure the collection of packaging material. This chapter provides an overview of the European directives currently in place.

2.1 Packaging and Packaging Waste Directive[3]

In 1994, the European Packaging and Packaging Waste Directive (Packaging Directive) encouraged Member States to reuse packaging and set recycling goals for all packaging waste and individual packaging materials. In accordance with this directive, and on the basis of "shared responsibility" and the "polluter pays" principles, Member States were required to set up systems for the following objectives: a) return and/or collection of used packaging and packaging waste generated by consumers, other end users or waste streams for separate collection in the most appropriate way; b) reuse or recovery, including recycling, of the packaging and packaging waste collected.

In most Member States packaging producers and users have set up compliance systems or organizations which should make sure that the targets from the Packaging Directive are achieved. The compliance organizations operate on behalf of the companies required to comply with the Packaging Directive. These compliance systems or organizations build on already existing urban waste collection or packaging waste collection infrastructure. Except for the Scandinavian countries and Germany where reuse and recycling systems have been established based on already existing EPR schemes.

The 2004 and 2018 amendments to the Packaging Directive required a total of 28 Member States to achieve much more ambitious packaging recycling goals. These amendments had significant impact not only because of the more stringent recycling goals but also due to an increase of countries that are required to comply with the Packaging Directive following the admission of the EU's new Eastern European Member States.

The amendments of the Packaging Directive accelerated the implementation of measures for collecting, recycling and/or reusing packaging in environmentally friendly ways in line with the Packaging Directive. The implementation of these measures significantly increased recycling of packaging material and other ways to recover packaging waste.[4] However, the increased uptake of reused and recycled materials should not affect food safety or consumer health. Food safety and consumer health should among others be ensured by phasing out hazardous substances.[4 above]

The following measures are among others proposed in order to realize the new Packaging Directive targets:

a) Implementation of deposit return systems in EU Member States;
b) Establishing qualitative or quantitative reuse targets;
c) Implementation of financial incentives, i.e. through extended producer responsibility schemes;
d) Establishing minimum percentages of reusable packaging placed on the market for each type of packaging.

Table 1 provides an overview of recycling targets for individual packaging materials, set by the European Union in the Packaging Directive. The initial targets were set at 15% for all materials, since then the EU has realized significant advancements in recycling rates with more stringent targets coming up in the future. Demanding increased recycling of packaging materials reflects the EU's commitment to stimulate the circular economy and waste reduction.

[3] European Commission (2018). Packaging and Packaging Waste Directive (link).
[4] Ragonnaud (2023). Revision of the Packaging and Packaging Waste Directive (link)

Table 1: Packaging recycling targets

Packaging recycling targets from the Packaging Directive				
Material	2002	2008	2025	2030
Plastic	15%	22.5%	50%	55%
Wood	15%	15%	25%	30%
Ferrous metals	15%	50%	70%	80%
Aluminum	15%	50%	50%	60%
Glass	15%	60%	70%	75%
Paper and cardboard	15%	60%	75%	85%
Total	25-45%	55-80%	65%	70%

2.2. The Waste Framework Directive[5]

In 2008 the new European Waste Framework Directive required Member States to set waste management targets for municipal solid waste (MSW). Furthermore, the Waste Framework Directive established that Member States have to set up a separate collection system for at least the following material streams: paper, plastic, glass, and metals. From 2018 onwards, a separate collection system for organic waste is required as well by an amendment of the Waste Framework Directive.

The amendment in 2018 also increased recycling targets for MSW (Table 2) and it required Member States to design and implement Extended Producer Responsibility (EPR) schemes for packaging materials. The amendment of the European Waste Framework Directive describes minimum requirements which EPR schemes need to comply with. Broadly speaking, EPR schemes typically contain a series of measures, which are designed to ensure that product manufacturers or their subcontractors are financially and/or organizationally responsible for managing the entire product life cycle of their material streams, including end of life treatment (when the product is legally seen as waste).

Table 2: Recycling targets for municipal waste

Recycling targets of the Waste Framework Directive (% of material streams by weight)				
	2020	2025	2030	2035
Recycling of municipal solid waste	50%	55%	60%	65%

The recycling targets in the table above are slightly different from the recycling targets set by the Packaging Directive. The Packaging Directive has established dedicated recycling targets for the entire packaging waste stream, including post-consumer and post-industrial packaging, and for individual packaging material streams, while the Waste Framework Directive sets recycling targets for MSW. MSW is a more heterogenous material stream, which is not limited to packaging waste. MSW contains among others organic, paper, metal, plastic and bulky waste items. Due to its heterogenous character slightly lower targets are established for MSW than for the individual packaging material streams by the Packaging Directive.

[5] European Commission (2018). Waste Framework Directive (link).

2.3 The Single-Use Plastic Directive[6]

In 2019 the Single-Use Plastic Directive (SUPD) fixed specific separate collection goals for the recycling of plastic beverage bottles up to three liters including their caps and lids. By increasing the target for separate collection of plastic bottles, the Single-Use Plastic directive aims to reduce the environmental impact of this material stream. The directive emphasized the importance of increasing the uptake of recycled material in plastic beverage bottles as a pivotal step towards reducing plastic waste and stimulating the circular economy.[7] By setting these targets, the EU encourages Member States, industries and consumers to separately collect plastic packaging material, increase the uptake of recycled content in plastic bottles as well as work towards more sustainable practices. These targeted goals contribute towards a more sustainable future by preventing, as much as possible, plastic bottles ending up in landfills or being incinerated.

The separate collection targets for plastic beverage bottles up to three liters are provided in the table underneath. These targets don't apply to glass or metal bottles with a plastic cap or lid, or beverage bottles that are required for special medical purposes.

Table 3: Separate collection targets for plastic beverage bottles (<3L)

Separate collection targets of the Single-Use Plastic Directive		
	2025	2029
Plastic beverage bottles <3L	77%	90%

According to the SUPD, European Member States have the following policy options to achieve the recycling targets:

1. The implementation of DRS;
2. The establishment of separate recycling targets within related EPR schemes for plastic bottles.

The SUPD thus stipulated that the introduction of DRS can be an alternative for the extension of currently existing EPR schemes. The SUPD has also set targets for the uptake of recycled content in plastic beverage bottles (<3L). Again glass or metal bottles with a plastic cap or lid, or beverage bottles that are required for special medical purposes, are excluded from the legislation. Those targets aim to increase the demand for recycled materials (Table 4).

Table 4: Targets for recycled plastic in beverage bottles

Uptake of recycled content in beverage bottles		
	2025	2030
PET beverage bottles <3L	25%	
All plastic beverage bottles <3L		30%

2.4 Upcoming EU legislation

On the 30th of November 2022, the European Commission has proposed a revision[4] of the Packaging and Packaging Waste Directive (PPWD). The aim is to ensure that all packaging materials are reusable or recyclable in an economically feasible way by 2030. This revision should help to reduce packaging waste and promote a circular economy. The revision builds upon the efforts made earlier through the PPWD and is also proposed as part of the European Green Deal and new circular economy action plan.[4]

[6] European Commission (2019). Single-Use Plastic Directive (link).
[7] European Commission (2019). Single-Use Plastic Directive, p.5 (link).

The proposal is now being reviewed by the European Parliament and the Council of the EU. If approved, the proposal would establish requirements for the entire packaging life cycle, from raw material to final disposal. These requirements include among others environmental sustainability and labeling of materials. The proposed regulation would apply to all packaging and packaging waste and will establish:

- Mandatory targets for waste reduction,
- Re-use targets for certain sectors,
- Relative minimum amount of recycled content in plastic packaging,
- Requirements to ensure full recyclability by 2030 and,
- Standardized product rules.

Regarding the mandatory targets for waste reduction, it is proposed that Member States must include a specific chapter on packaging and packaging waste management in their waste management plans. Each Member State has to reduce the packaging waste generated per capita, with 5% in 2030, 10% in 2035 and 15% in 2040, as compared to 2018. Furthermore, a wide range of re-use and refill targets are established for different sectors and packaging formats, to be met by 2030 and 2040.[4]

The PPWD revision will also introduce minimum recycled content targets for the plastic part in packaging (share per unit of packaging) from 1st of January 2030 onwards. The targets for various packaging materials can be found in Table 5.

Table 5: Proposed targets for recycled content recovered from post-consumer plastic

Type of packaging	From 1 January 2030	From 1 January 2040
Contact sensitive packaging made from polyethylene terephthalate (PET)	30%	50%
Contact sensitive packaging made from plastic materials other than PET (except single use plastic beverage bottles)	10%	50%
Single use plastic beverage bottles	30%	65%
Other packaging	35%	65%

In order to realize full recyclability by 2030, the European Commission is empowered to adopt delegated acts to set up design for recycling criteria, recycling performance grades, as well as rules concerning the modulation of financial contributions to be paid by producers to comply with their extended producer responsibility obligations. For plastic packaging the EC is allowed to establish the percentage of recycled content, and the methodology to assess if packaging is recyclable at scale. What the standardized product rules will exactly entail is still unclear. However, it is known that the Commission will adopt implementing acts to set up a harmonized label, specifications for the labelling requirements, formats for packaging labels and the labelling of waste receptacles by 1.5 years after entry into force of the proposed regulation.

The proposed regulation would also oblige Member States to set up, by 1 January 2029, deposit return systems for single use plastic beverage bottles with a capacity of up to three liters and single use metal beverage containers with a capacity of up to three liters. Member States are exempted if they can show separate collection rates of at least 90% for the in-scope materials, in the two years prior to the entry into force of the regulation. Furthermore, the new regulations established requirements for packaging minimization, substance requirements, and other labelling, marking, as well as information requirements. The proposed regulation would apply to all manufacturers and would require a conformity assessment procedure before placing packaging on the market. If approved, the new

regulation will ensure a more sustainable approach to packaging and help to increase the separate collection rates of the in-scope materials.

3. DRS for Recycling in EU Member States

Currently, DRS for recycling have been implemented in thirteen European Member States. This chapter provides a historic overview of these European DRS countries. In Chapter 6, the performance of DRS for recycling in ten Member States is assessed.[8] While the remaining chapters provide an in-depth assessment of five case study countries to comprehensively analyze DRS for recycling as well as their (economic) performance and governance structure.

DRS have a long history in Europe, starting mainly with the introduction of DRS for reuse and gradually DRS for recycling have been implemented to complement already existing DRS for reuse.[9] As such, the first DRS for recycling was introduced in Sweden in 1984. Latvia, Malta and Slovakia are the Member States where a DRS has been introduced most recently (2022).

Broadly speaking, the introduction of DRS in Europe has occurred in three waves. Early adopters (Sweden, Norway, Finland) have a long history of DRS. The introduction of the current DRS in these countries can be seen as a response to the introduction of new types of packaging on the market (especially plastic packaging). These early adopters are followed by countries like the Netherlands and Germany. In these Member States, the introduction of DRS can be seen as a response to the increase of packaging waste and the associated costs of waste management.

Countries like Lithuania, Malta and Latvia make the third wave. In these countries, the introduction of DRS can be seen as a response to increasing packaging waste combined with the introduction of, and compliance with, EU-policies (and targets).

Figure 1: Member States with an active DRS for recycling

[8] Since the required data regarding return of materials, costs and revenues of DRS for recycling is not yet available for Latvia, Malta and Slovakia (the countries that only recently implemented DRS), they are only preliminary assessed in this study and excluded from the in-depth analysis of recycling performance and the economic size of the system.

[9] Eunomia (2023). Study to support the finalisation of the legal proposal and the impact assessment for the review of the Packaging and Packaging Waste Directive (link)

The table below shows an overview of Member States that have implemented a DRS for recycling, and their respective population in 2021. The table provides the countries which have already implemented a DRS in chronological order.

Table 6: Overview of European DRS

	Country (Name DRS):	Population 2021 (million)
1984	Sweden (Returpack)	10.4
1989	Iceland (Endurvinnslan)	0.4
1996	Finland (PALPA)	5.5
1999	Norway (Infinitum)	5.4
2002	Denmark (Dansk Retursystem)	5.8
2003	Germany (Deutsche Pfandsystem)	83.2
2005	Netherlands (Statiegeld Nederland)	17.5
2005	Estonia (Eesti Pandipakend)	1.3
2006	Croatia (FZOEU)	4.1
2016	Lithuania (USAD)	2.8
2022	Malta (BCRS)	0.5
2022	Slovakia (Správca Záloh)	5.5
2022	Latvia (SIA Depozīta Iepakojuma Operators)	1.9

4. Main Characteristics of EU DRS for recycling

This chapter focuses on the main characteristics of DRS implemented in the thirteen EU member states. It examines the materials covered by these DRS as well as the product groups included and excluded. It also assesses the deposit fees in five case study countries (the Netherlands, Germany, Lithuania, Estonia and Sweden), categorizing the fees per type of bottle and material.

4.1 Materials & product groups

Materials handled by DRS differ per country. In general, European DRS for recycling cover plastic (mainly PET bottles), glass and metal (predominantly aluminum): this applies to nine out of thirteen European countries where a DRS has been implemented. Sweden and Norway only cover plastic and metal, which is the same for the Netherlands with the recent integration of metal packaging (from April 2023 onwards) into their DRS.

Product groups included

Soft-drinks and water are included in all systems, as well as beer cans. Overall, a trend can be observed to expand DRS to product groups like alcoholic beverages, mixer drinks, juices, and sport drinks.

Product groups excluded

Milk and milk-based beverages have been excluded from all DRS. However, in Germany these types of beverages are included in the DRS for recycling from January 2022 onwards. Juices (or fruit based drinks) are excluded from some DRS for recycling (like Norway, the Netherlands[10] and Sweden) as well as strong alcoholic beverages (Denmark and Estonia).

The table below provides an overview of types of materials that are included in the DRS for individual Member States.

Table 7: Materials covered by DRS for Recycling

Material:	Country (Material type):
Plastic:	Croatia (predominantly PET), Denmark (predominantly PET), Estonia (predominantly PET), Finland (predominantly PET), Germany (predominantly PET), Iceland (predominantly PET), Latvia (only PET), Lithuania (only PET), Malta (only PET), Netherlands (only PET), Norway (predominantly PET), Slovakia (only PET), Sweden (predominantly PET).
Metal:	Croatia (aluminum, tinplate), Denmark (aluminum), Estonia (predominantly aluminum), Finland (aluminum), Germany (aluminum), Iceland (aluminum), Latvia (aluminum), Lithuania (aluminum, steel), Malta (aluminum, steel) Norway (aluminum), Slovakia (aluminum), Sweden (aluminum, tinplate), Netherlands (aluminum).
Glass:	Croatia, Denmark, Estonia, Finland, Germany, Iceland, Latvia, Lithuania, Malta.

4.2 Deposit amount

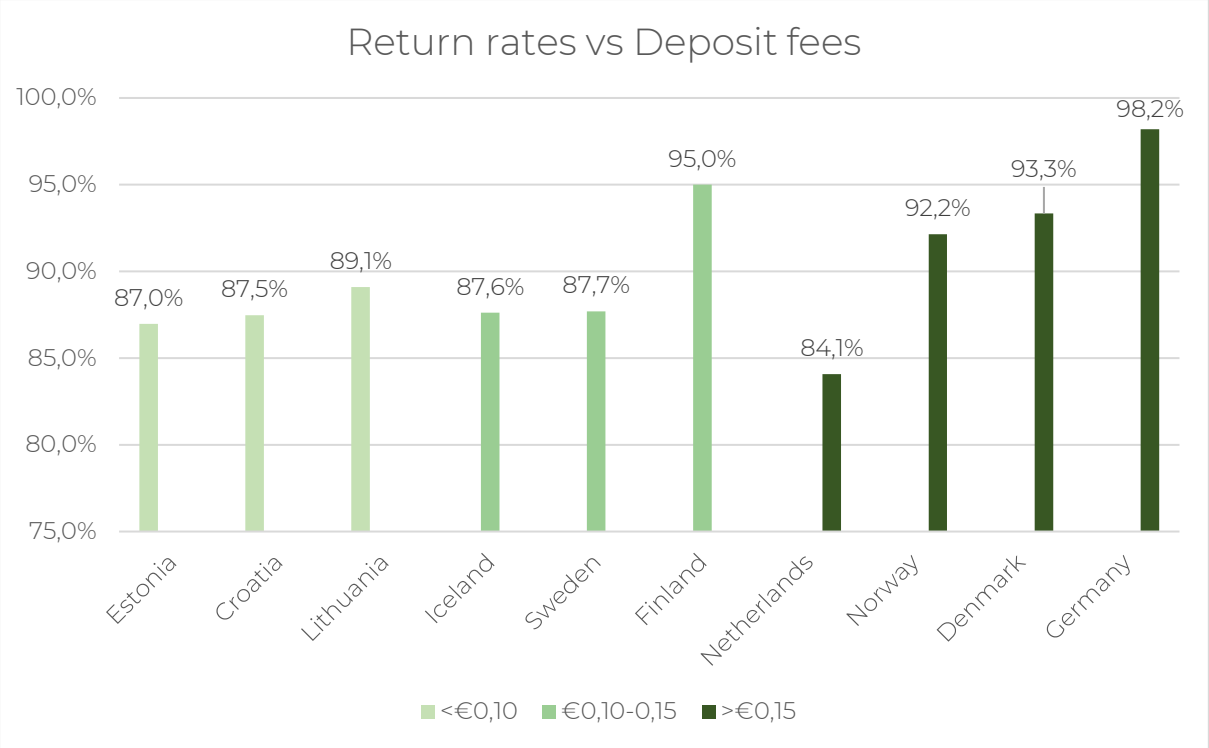
The amount of deposit paid by the consumer for individual packaging items, differs per country and per type of material. In Figure 2, DRS countries have been categorized by deposit fee value in comparison with the return rate of the addressed packaging (2021), and three groups of countries can be distinguished:

a) Countries that apply an average deposit fee lower or equal to 10 €/cents;
b) Countries that apply an average deposit fee between 10 and 15 €/cents;

[10] Since january 2022, the Dutch DRS is open on a voluntary basis for PET-bottles of 100% juices, like orange juice.

c) Countries that apply an average deposit fee higher than 15 €/cents.

Figure 2: Return rates VS Deposit fees (2021)



Overall, the figure illustrates the higher the deposit fee, the more packaging items are returned to the take-back point for recycling. The average return rates of the countries where a deposit fee of more than 15 eurocents is implemented, is significantly higher than the return rates of other countries; from the data observed, we see a range between 84,1% in the Netherlands and 98,2% in Germany.

Table 8 highlights the deposit fees which are implemented in five case study countries that have been extensively assessed. In some countries their DRS organization is responsible for the determination of the deposit amount, while in other countries it is set by legislation. According to interviews with Returpack, the Swedish DRS for recycling, in Sweden the deposit amount is determined by their DRS organization.[11] While in the Netherlands the deposit amount is determined by law, as appeared from an interview with Statiegeld Nederland.[12]

Table 8: Deposit fees in case study countries

	Plastic		Glass	Metal
	Small bottles (PET <1L)	*Large bottles (PET >1L)*		
The Netherlands	€0.15	€0.25	-	€0.15 (from 04/2023)
Germany	€0.25		€0.25	€0.25

[11] Personal communication with Returpack (20th of April 2023).
[12] Personal communication with Statiegeld Nederland (15th of December 2021).

Lithuania	€0.1		€0.1	€0.1
Estonia	€0.1		€0.1	€0.1
Sweden	€0.1	€0.19	-	€0.1

Some key conclusions regarding the deposit fees in the case study countries can be derived from Table 8. In the five case study countries, two different fee structures are seen:

1. Variation in deposit fees: The Netherlands and Sweden maintain different deposit fees per type of packaging. Moreover, both countries have a different fee for large (>1L) and small (<1L) PET bottles.
2. Consistent deposit fees: Germany, Lithuania and Estonia have set one single deposit fee for all packaging material (size and type). This is also known as a flat rate deposit system.

Broadly speaking, a deposit fee should be high enough to encourage consumers to return packaging materials. However, the deposit fee should also be compared to the product price. As a high deposit fee in relation to a low product price, can discourage consumers to buy the product.[13]

[13] Patorskaa & Paca (2019). Deposit-Refund System (DRS) FACTS & MYTHS (link)

5. Governance of DRS for recycling

This chapter explores the governance structure of DRS for recycling for the five case study countries. It provides insight into the legal foundation for DRS implementation and the shareholders involved in operation and management of DRS. Finally, it examines the operation and management of national DRS for recycling as well as the anti-fraud measures that are in place.

5.1 Legal status of the DRS for recycling

DRS for recycling usually operate on a not-for-profit base as is the case for the five countries included in this study (table 9). Revenue streams are thus primarily used to cover the operating expenses of DRS.[14] Revenue surpluses are used to cover additional promotional campaigns or innovation projects to improve the performance of the collection system.

Table 9: Legal Status of DRS for Recycling

Country	Not-for-profit	Legal foundation DRS
Statiegeld NL *The Netherlands*	*Yes*	Packaging Act, i.e. Verpakkingsverordening Productschap Dranken 2003[15], updated Amendment Besluit Beheer verpakkingen 2014
USAD *Lithuania*	*Yes*	Law on packaging and packaging waste 2001[16], Amendment Law on Packaging Waste, 2018
Eesti Pandipakend *Estonia*	*Yes*	Packaging Act 2004[17], updated 2021
Returpack *Sweden*	*Yes*	Packaging Act, i.e. Förordning om producentansvar för förpackningar 1994[18], latest update Enhetlig och effektiv marknadskontroll 2020
Deutsche Pfandsystem DPG *Germany*	*Yes*	Packaging Ordinance, 1991[19]; VerpackG, 2019

Legal waste status of deposit items

The legal waste status of deposit items refers to the categorization and requirements for waste management. The legal waste status of packaging material determines the obligations of producers, importers and distributors regarding collection, recycling targets and recovery of packaging waste to promote the circular economy. The waste status of packaging material, while under EU law, is defined per EU Member State and is bound to the national regulation on waste management of packaging material.

Generally, the legal waste status of DRS for recycling considers waste to be any substance a holder discards, tends to discard, or must discard. The table below provides an overview of how the waste status is legally defined in the five case study countries. While the Netherlands, Lithuania, Estonia, and Sweden provide comprehensive definitions, Germany is less transparent and doesn't provide a clear definition on waste status.

[14] Reloop (2022). Global Deposit Book: An Overview of Deposit Return Systems for Single-Use Beverage Containers 2022.
[15] Dutch government (2003). Verpakkingsverordening Productschap Dranken 2003 (link).
[16] Lithuanian Government (2001). Law on the Management of Packaging and Packaging Waste (link).
[17] Estonian Government (2004). Packaging Act (link).
[18] Swedish Government (1994). Förordning (1994:1235) om producentansvar för förpackningar (link).
[19] German Government (1991). Verpackungsverordnung – VerpackV (link).

Table 10: Legal definition of waste status per country

Country	Waste Status Definition
The Netherlands	"Waste" as all substances, preparations or other products belonging to the categories (…) which the holder thereof discards, intends to discard or must discard.
Lithuania	"Waste" as any substance or item which the holder discards or intends or is required to discard.
Estonia	"Waste" as any movable property or registered ship which the holder discards, intends or is required to discard.
Sweden	"Waste" as any matter or object that the bearer disposes of, intends to dispose of, or is obligated to dispose of.
Germany	n/a

In most countries deposit items are legally considered as waste from the moment the consumer hands in a deposit item through manual or automatic collection points. However, in some countries deposit items only become waste from the moment that the deposit items are provided to recycling facilities.[20] The latter option, allows the implementation of reverse logistics which enables a more efficient logistic system. In the analysed countries, a reverse logistics system is not implemented because deposit items are legally considered as waste from the moment that beverage containers are returned by consumers.

5.2 Role of DRS operator

This chapter provides an overview of the DRS in the case study countries and highlights the roles and responsibilities of their operators. The shareholders and managers are discussed as well as their responsibility within the organization is presented. Additionally, if the information was available, the distribution of voting rights within the countries' DRS boards are presented. Finally, the roles of the DRS operators is categorized as supervisory, operational or administrative. This is based upon the type of tasks carried out by the DRS operators.

Statiegeld Nederland has a supervisory role. The organization is responsible for the enforcement of national law on recycling and packaging disposal. Additionally, it is responsible for the system's financials as well as operational improvements. In Lithuania, the system operator is responsible for data management, and money and material's flow within the system. Data management, deposit clearing, reporting, the operations of the logistic system, sale of collected materials, and communication activities are also responsibilities held by USAD. Eesti Pandipakend is responsible for the collection of packaging, including the returned packaging from retailers, and recovery of the collected packaging aligned with the requirements of applicable legislation. Additionally, Eesti Pandipakend is responsible for the registration system for information about packages used by packaging companies via an online tool. They have also implemented a barcode system which packaging producers are obliged to use, in order to facilitate the collection of deposit-subjected packaging.

In Sweden, the DRS operator takes care of the registration of packaging producers and packaging items, collection and sorting packaging into material flows, and reselling the collected material streams. In Germany, the DRS operator functions more as a system administrator than operator, in contrast to the other case study countries. The German system operator creates framework conditions and standards for all actors involved in the

[20] Personal communication with Tomra (22nd of June 2023).

German one-way deposit system to create a level playing field for the involved stakeholders. As such, Deutsche Pfandsystem (DPG) is responsible for a central DPG system database for the implementation of deposit clearing, the development of binding labelling standards, the enforcement of legally compliant contracts for the system partners, and the implementation of an IT management system. DPG provides a framework for participating organisations in which they independently come to settlements.

The table below provides an overview of national DRS, their shareholders and the role of DRS operators.

Table 11: Shareholders and managers of DRS for recycling

National DRS	Shareholders & Managers	Voting Rights	Role of DRS operator
Statiegeld NL - *The Netherlands*[21]	Statiegeld NL is an organization with an independent chairman, managed by industry and retail representatives as well as producer associations. The organization is financed by the Dutch EPR system (Afvalfonds Verpakkingen).	Full responsibility and decision-making within Statiegeld Nederland. All decisions are made by an absolute majority vote.	Supervisory – Responsible for law enforcement, system financials and system improvement.
USAD - *Lithuania*[22]	USAD is managed by Industry representatives: The Lithuanian Brewers Association, the Association of Lithuanian Trade Enterprises and the Lithuanian Natural Mineral Water Manufacturers' Association.	There is no clear data available on the distribution of voting rights within the organization of USAD.	Operational - Among others collection and handling of deposit items.
Eesti Pandipakend - *Estonia*[23]	Eesti Pandipakend is also managed by Industry associations: the Association of Producers of Soft Drinks (25%), The Association of Importers of Soft Drinks and Beer (25%), The Estonian Retailers Association (25%), The Estonian Association of Brewers (25%).	There is no clear data available on the distribution of voting rights within the organization of Eesti Pandipakend. Yet, it appears that the distribution of voting rights is done equally amongst the number of members.[24]	Operational - Among others collection and handling of deposit items.
Returpack - *Sweden*[25]	Svenska Returglas (~50%), Retail organisations (~25%), and Returpack (~25%).	Voting is distributed equally to the shareholders' representation.	Operational - Among others collection and handling of deposit items.
Deutsche Pfandsystem	In Germany the DRS is managed by retail and industry representatives: 50%	The eight-member board is distributed in equal shares of industry and	Administrative – Providing a legal framework for DRS stakeholders.

[21] Statiegeld Nederland (2022). Beleid innamepunten statiegeld Nederland (link).
[22] USAD (2021). Annual report (link)
[23] Eesti Pandipakend (2021). Annual report (link).
[24] Credit Report Eesti Pandipakend (link)
[25] Personal communication with Returpack (20th of April 2023).

DPG – *Germany*[26]	German Retail Federation e.V. (HDE), 50% Federation of German Food and Drink Industries e.V.	retail representatives. This is also applicable to the voting rights.	

5.3 Relationship to other collection systems

In the assessed case study countries no formal or voluntary collaboration between local authorities and DRS for recycling exists. Municipalities are not involved in the design or implementation of currently existing DRS for recycling. Only in the interview with the Lithuanian Ministry of Environment and USAD it was mentioned that local authorities are involved in promotional campaigns of DRS for recycling, in order to increase overall system performance.[27] Nevertheless, within the group of countries that are currently preparing for DRS for recycling a trend can be noticed where local authorities would like to be involved in DRS for recycling.[28] For instance by installing collection points at public spaces, so local authorities also obtain part of the revenue that is gained with the collection of in-scope materials.

Besides the relationship of DRS for recycling with local authorities, the relationship between Extended Producer Responsibility (EPR) schemes and DRS for recycling has been assessed. The relationship between DRS and Extended Producer Responsibility (EPR) is complementary and interconnected. EPR is a policy approach placing the responsibility for the entire lifecycle of a product - including its packaging, collection, recycling and disposal - on producers and brand owners. The effective implementation of EPR differs per Member State. Regarding the implementation of DRS and EPR systems, it is known that in Estonia and Lithuania their DRS for recycling has been implemented at the same time as their EPR scheme, while in Sweden and the Netherlands EPR has come into place only after the implementation of DRS for recycling. Only in Germany EPR has been implemented before the implementation of their DRS for recycling.

Looking at the relationship between DRS and EPR systems in the five case study countries, only in the Netherlands a clear collaboration between DRS and EPR systems exists. The Dutch EPR and DRS have been revised in order to establish a formal link between DRS and EPR (Afval Fondsverpakkingen). This means that in the Netherlands, packaging falls under the responsibility of EPR.

As such, the packaging producer informs Statiegeld Nederland on a periodic basis on the amount of packaging put-on-the-market. The DRS operator drafts an invoice that is subsequently sent by the EPR-scheme (Afvalfonds Verpakkingen). The invoice specifies the deposit and producer fees (for the DRS) and the waste management fee (for EPR). Therefore, the Dutch EPR has the final responsibility and keeps track of the legally binding target to separately collect 90% of plastic packaging.

In the other countries no formal collaboration exists between DRS and EPR systems. Although implemented at the same time, in both Estonia and Lithuania a clear division between target material groups for either DRS or EPR systems is made. In Sweden the DRS for recycling is structured by means of different cost centers for individual material streams, but no collaboration exists between DRS and EPR systems.

In Germany the situation is a bit different as the EPR scheme has been implemented prior to DRS for recycling. In 2003 the German government mandated a compulsory DRS for single-use packaging made from glass, plastics and metal. The DRS for recycling has been placed under the responsibility of another Packaging Responsibility Organization (PRO),

[26] Rodríguez Monsalve (2017). IMPLEMENTATION OF DEPOSIT REFUNDING SYSTEM IN SPANISH RETAIL MARKET (link).
[27] Personal communication with USAD and Lithuanian Ministry of Environment (28th of June 2023).
[28] Personal communication with Tomra (22nd of June 2023).

namely Deutsche Pfandsystem. Thus no formal link exists between German DRS and EPR systems, as these systems operate independently from each other and belong to different PROs.

In conclusion, the majority of EPR schemes and DRS for recycling are separately operating from each other. EPR schemes have a wider scope of materials than DRS for recycling. In some countries – such as the Netherlands – a clear collaboration between EPR and DRS for recycling exists. However, in most countries collaboration between both systems is not present.

5.4 Shareholder Composition & Decision making

In all case study countries the DRS operator is managed by retail and industry representatives, except for Lithuania where the board consists of only industry representatives. Table 11 provides insight into the shareholders and managers of each system. The division between retail and industry representatives differs per country and is presented per system underneath.

- The Netherlands: the board of Statiegeld Nederland consists of eight board members, including one independent chairman. Besides the independent chairman the board consist for 38% of retail representatives and for 50% of industry representatives.
- Lithuania: USAD, the Lithuanian DRS operator, is founded and managed by directly involved industries: Lithuanian Association of Brewers, Association of Lithuanian Trade Enterprises and Lithuanian Natural Mineral Water Manufacturers' Association.[29]
- Estonia: In Estonia, Eesti Pandipakend is mainly managed by industry representatives and only for a minor part by retail representatives. Their board consists of the Association of Producers of Soft Drinks, the Association of Importers of Soft Drinks and Beer, the Estonian Retailers Association, and the Estonian Association of Brewers. Each association provides 25% of the board members.
- Sweden: In Sweden, the board of the DRS operator is represented by Svenska Returglas (50%), retail organisations (25%), and Returpack (25%).
- Germany: In the German Deutsche Pfandsystem DPG, the board comprises for 50%, of representatives by retail associations (Retail Federation e.V.) while the other 50% is represented by industry associations (German Food and Drink Industries e.V.). This organizational aspect is reflected in dual leadership of DPG management, which consists of an equal number of trade and industry representatives.

In all case study countries retailers and industry is to some extent presented in the board of DRS operators. During one of the interviews it is mentioned that it is valuable to have both groups presented in the board of DRS operators, as this helps to create a cost efficient DRS for recycling.[30] Since producers will do their best to keep the producer fee as low as possible, while retailers will aim to have an adequate handling fee and collect as many beverage packaging items as possible.

Voting Rights

Governance of DRS for recycling plays a crucial role in ensuring effective implementation and management of these systems. Shareholders and system owners have a vested interest in the success and sustainability of DRS, their involvement thus extends beyond mere ownership. They actively participate in establishing policies, rules, and regulations governing the system. As such they need to ensure alignment with industry standards, consumer demands, and regulatory requirements.

[29] The specific division (and voting rights) in the board team is not known.
[30] Personal communication with Tomra (22nd of June 2023).

In each DRS system, the voting rights and decision-making authority are typically determined by the specific governance structure and agreements among the shareholders and managers. The distribution of voting rights ensures that different stakeholders have a say in shaping the policies, strategies, and operational aspects of the DRS. The involvement of industry associations, retail organizations, and producer associations highlights the collaborative approach towards governing the DRS, ensuring representation from various sectors involved in the production, distribution, and recycling of beverage containers.

Statiegeld Nederland, as a non-profit organization, has a system in place to ensure that its decision-making process remains independent at all times. According to the statutes of Statiegeld Nederland, unless specified otherwise, all board decisions are made by an absolute majority of valid votes in a meeting where at least half of the directors in function, representing the Central Bureau for Food Trade and the Federal Dutch Food Industry, are present or represented. This approach highlights the commitment of Statiegeld Nederland to transparency and fair governance, ensuring that decisions are made with the involvement of key stakeholders from the food trade and food industry sectors.

The Swedish DRS for recycling, also known as Returpack or Pantamera, is governed and regulated by the "Regulation on recycling systems for cans and plastic bottles" (SFS 2005:220). The governance and operation of the Swedish DRS involve multiple entities, as separate entities are responsible for managing the recycling of metal and plastic packaging. The strategies implemented by Returpack are determined by the board, which sets the boundaries and focuses on key areas. Some decisions such as the deposit value on packaging material, are made jointly by the board and Returpack management (Returpack management advises the board on this decision), while other operational decisions are made solely by the management. The board's role is to provide guidance within the legal boundaries and set the strategic direction of the system. The legislation mandates the presence of the DRS and sets targets, leaving room for Returpack to make operational decisions within those parameters[31]. With their sustainability report Returpack mainly reports on the operational performance of their DRS for recycling (e.g. return rates for individual packaging streams).

The German Deposit Return System, Deutsche Pfandsystem (DPG), is operated by DPG Deutsche Pfandsystem GmbH, a joint venture between the German Retail Federation (HDE) and the Federation of German Food and Drink Industries (BVE). DPG's main role is to manage and administer the nationwide one-way deposit system in accordance with the Packaging Ordinance and Packaging Act. While DPG establishes the overall framework conditions, it does not directly intervene in the flow of deposits, goods, or returns. These activities are exclusively handled by so-called “First Distributors” and “Collectors”.[32] DPG ensures compliance with regulations and facilitates an efficient implementation of the national DRS for recycling, while operational decisions are made by system participants.

In Lithuania, Užstato Sistemos Administratorius (USAD) is accountable to the Ministry of Environment and therefore must submit organizational, financial and public information plans as well as reports showing how these plans have been executed. The voting rights are equally distributed amongst the shareholders, which each hold 33% of the votes. There is no legal obligation for the DRS to distribute their voting rights this way, this has been decided by the DRS system itself.

In Estonia, Eesti Pandipakend is responsible for the operation of their DRS for recycling. As described before, the ownership and the task to organize the collection of such beverage packages in the most effective way is shared between industries and retailers. Where industries are leading the process as they possess a large majority of the shares (75%).

[31] Personal communication with Returpack (14th of April 2023).
[32] Deutsche pfandsystem DPG (2023). About DPG [webpage] (link).

5.5 Anti-Fraud Measures

DRS for recycling employ various anti-fraud measures to prevent misuse of the system, e.g., to claim deposits improperly or forging. Other examples of fraudulent activities that are possible within DRS are shipping of packaging material abroad, and return those items in other countries for higher deposit fees through removal of logo and barcodes. While anti-fraud measures vary per country, examples of such measures are:

- Licensing: producers joining the DRS have to register their packaging and company and receive a license.
- Unique identifiers: packaging material included in the DRS can have unique markings such as QR codes, EAN codes or barcodes.
- Special ink: special inks may be used in order to provide additional security. Yet, this measure is expensive and a burden upon the producers. This measure is seen in Germany, but not in the other case study countries.
- Camera monitoring: reverse vending machines with camera surveillance can be used in order to detect fraudulent activities. An example is Sweden, where these RVMs are obliged. This increases costs for the retailers, that are compensated through higher handling fees.
- Monitoring and auditing: counting and verifying the amount of returns versus total deposit can be used as a statistical method to detect (upon suspicion) fraudulent activities in a specific region or at a specific take-back point

Generally, fraud within DRS systems is relatively low. This is mostly a result of the systemic features implemented at take-back points:

- Take-back points using RVM's are automatically secured by the functioning of the RVM, which requires barcodes to correspond with the labelling, size and type of material that is handed in. This minimizes the risk of fraudulent actions as the packaging needs to meet four different criteria. Additionally, the data is automatically sent to distribution centers, also covering the risk of returning packaging multiple times.
- Manual take-back points use sample checks of the bags with collected beverage packaging, that are provided to counting centers or recyclers. If one of the bags has a lower volume, all bags are assumed to have a lower volume and an investigation into this specific take-back point will be started.[33]

Due to these services, fraud is very limited and additional, usually expensive measures, only provide an additional minor decrease of fraudulent activities. Typically the costs of additional anti-fraud measures outweigh the benefits. According to interviews, when fraud occurs it is often in isolated events or in a specific region or store. Nevertheless, Germany decided to implement additional fraud measures because they have a relatively high deposit fee and they are surrounded by many neighboring countries. Therefore, Germany was afraid that many materials might 'leak' out of their DRS for recycling. The exact costs of the additional anti-fraud measures on a national scale are unfortunately unknown by the Central Packaging Register organisation, due to the decentral character of the German DRS.

5.6 Transparency for external stakeholders

Transparency levels vary significantly among the DRS countries, particularly in terms of governance and performance data. In the context of this study, it is evident that there are notable differences in system transparency among the five assessed DRS countries. Estonia and Lithuania emerge as the most transparent systems, as they provide comprehensive annual reports on system management and return rates for individual material streams, respectively. As opposed to the Dutch and German DRS for recycling, which share very

[33] Personal communication with Tomra (22nd of June 2023).

limited official communication regarding their DRS for recycling. Their system operator publishes only a few reports, primarily focusing on fundamental system information, such as the legal foundation, handling fees, and system registration. Although in the Netherlands the DRS operator officially reports on an annual basis to the Dutch Parliament regarding the DRS for recycling as well as financial performance. This information is however, not publicly available. As such, detailed information about recycling performance and return rates for specific material streams is not officially available in both Germany as well as the Netherlands. The Swedish DRS for recycling falls somewhere in between. Returpack, the system operator, does report annually on recycling performance in their extensive sustainability report. However, financial data concerning their DRS is limitedly shared in their communication.

6. Performance of EU DRS for recycling

This chapter describes the performance of DRS for recycling in Europe. This includes volumes managed, return rates and a comparison of the average national recycling performance per type of system implemented.

6.1 Packaging volumes managed

The table below provides an overview of the amount of packaging material (tons) managed by each DRS for recycling, compared to the total amount of packaging made of glass, plastic and metals put-on-market in 2020. In terms of size, Germany handles the largest amount of packaging, followed by Sweden (table 12). Nevertheless, it is expected that the total amount of packaging handled by the Dutch DRS has significantly increased, due to the recent inclusion of small plastic bottles as well as beverage cans. The numbers in the table below include all types of packaging handled by individual DRS for recycling, i.e. plastic, glass, and metal.

Table 12: Total packaging waste (weight in tons)

DRS system	Material	DRS vs Total	Tons:	% of total:
Statiegeld NL – *The Netherlands*	Plastic packaging	Total generated	**523,000**	**100%**
		Volumes managed by DRS	22,500	4.3%
	Glass packaging	-	-	-
	Metal packaging	-	-	-
USAD - *Lithuania*	Plastic packaging	*Total generated*	**86,100**	**100%**
		Volumes managed by DRS	12,277	14.3%
	Glass packaging	*Total generated*	**78,593**	**100%**
		Volumes managed by DRS	11,247	14.3%
	Metal packaging	*Total generated*	**25,039**	**100%**
		Volumes managed by DRS	4,439	17.7%
Eesti Pandipakend - *Estonia*	Plastic Packaging	*Total generated*	**53,602**	**100%**
		Volumes managed by DRS	4,400	8.2%
	Glass packaging	*Total generated*	**39,795**	**100%**
		Volumes managed by DRS	7,600	19.1%
	Metal packaging	*Total generated*	**2,359**	**100%**
		Volumes managed by DRS	2,200	93.3%
Returpack - *Sweden*	Plastic Packaging	*Total generated*	**248,841**	**100%**
		Volumes managed by DRS	26,690	11%
	Glass packaging	-	-	-
	Metal packaging	*Total generated*	**31,208**	**100%**
		Volumes managed by DRS	23,561	75.5%
Deutsche Pfandsystem DPG - *Germany*	Plastic packaging	Total generated	**3,302,500**	**100%**
		Volumes managed by DRS	405,080	12.3%
	Glass packaging	-	-	-

	Metal packaging	*Total generated*	160,600	100%
		Volumes managed by DRS	56,784	35.4%

The graph below provides an oversight of the amount of packaging managed by the countries included as case studies and their return rates. The figure illustrates that the German DRS is by far the largest DRS for recycling in Europe. While the German DRS realizes an average return rate of 98%, the average return rate amongst the other case studies lies between 84-89%. As such, the average return rate of the assessed countries is 89,2% and thus it is relatively close to the upcoming legislative target of the European Commission: a 90% separate collection target for plastic and metal beverage packaging by 2029.

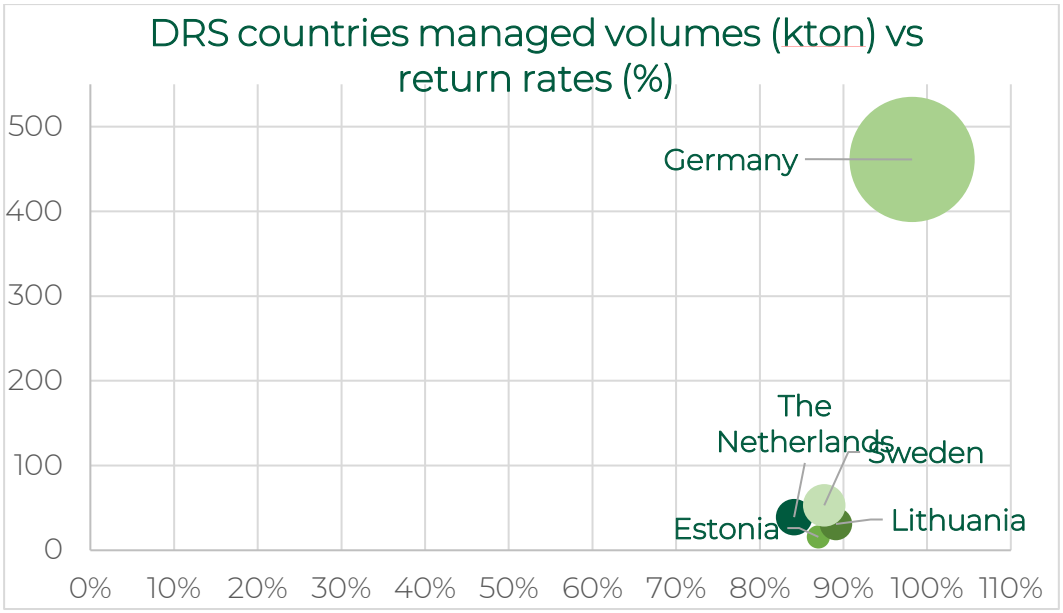


Figure 3: Total packaging volume managed by DRS

Additionally, three graphs are presented in which the total amount of packaging managed by the countries is divided per type of material. In the chart concerning glass recycling, the Netherlands, Germany and Sweden are excluded due to the absence of this material in their DRS system. Furthermore, the Netherlands is excluded from the chart on metal recycling by DRS as this study is based on data prior to the inclusion of metal packaging in the Dutch DRS system which became effective in April 2023 with the implementation of deposit on beverage cans. The figure below concerning plastic recycling resembles more or less the figure on total packaging managed by DRS, as all case study countries include plastic packaging in their DRS for recycling. Furthermore, plastic packaging represents the majority of managed packaging volumes in each DRS country.

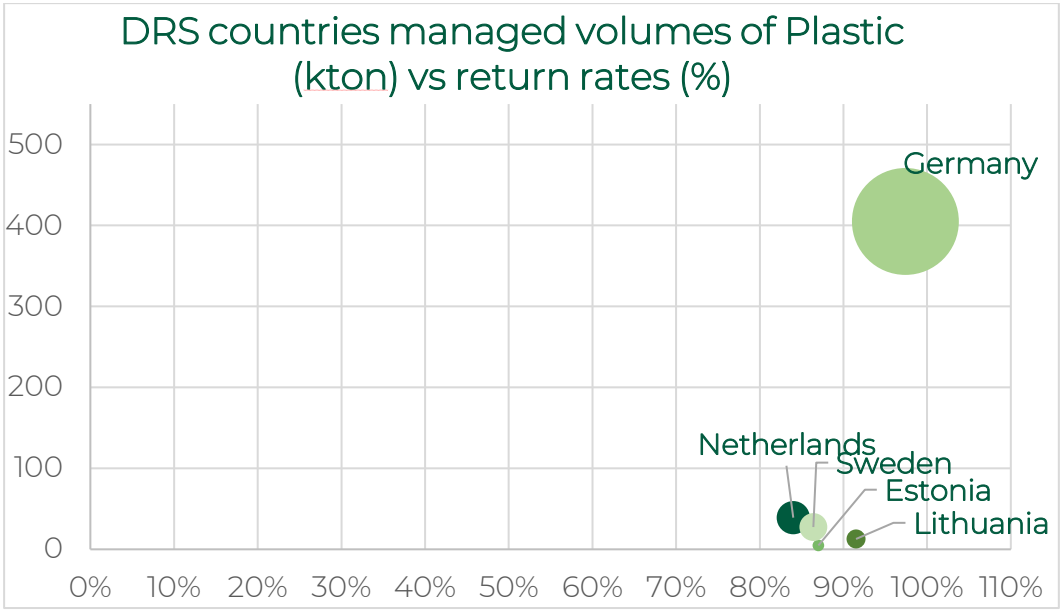


Figure 4: Plastic packaging waste (weight in tons) versus return rate

Regarding glass recycling by DRS it is interesting to see that Estonia performs slightly better in glass recycling than Lithuania. While Lithuania has a higher average return rate for all packaging materials. As both countries apply the same deposit fee to each type of packaging material, it is probably related to the inclusion of different material groups in the DRS for recycling (e.g., (strong) alcoholic beverages, wine bottles).

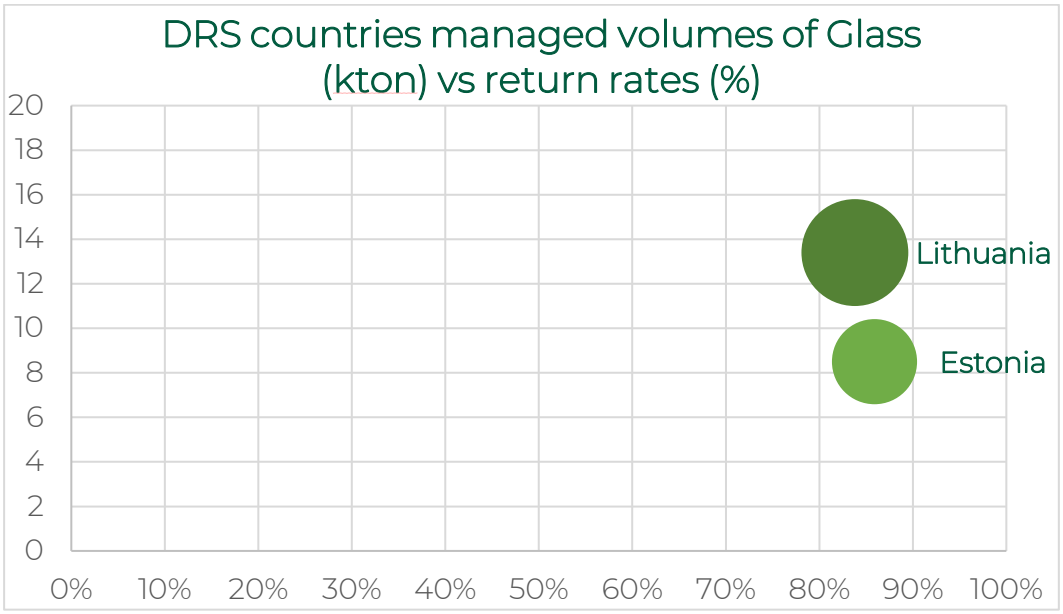


Figure 5: Glass packaging waste (weight in tons) versus return rate

Regarding metal recycling performance of DRS for recycling, it can be seen that Lithuania achieves a relatively high return rate again, outperforming both Estonia and Sweden. However, the German DRS for recycling is again the most effective system with a return rate of 99%.

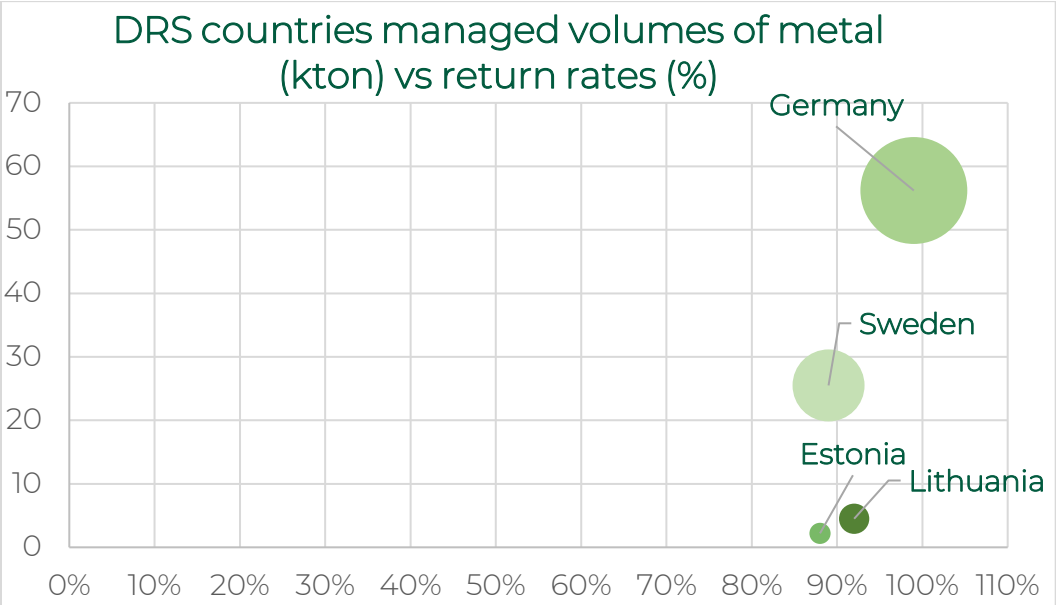


Figure 6: Metal packaging waste (weight in tons) versus return rate

6.2 Share of total collected packaging waste

The packaging collected by DRS for recycling is only a part of the total collected packaging waste, as DRS for recycling are complemented by EPR schemes which cover the packaging materials that are out-of-scope for DRS for recycling. The relative amount of packaging materials that is collected by national DRS for recycling in comparison with the total amount of the respective packaging material that is put-on-market (Eurostat data), is shown in the figure below. On average, collection of packaging material by DRS range from 39% in Croatia to only 4% in the Netherlands. The graphs below provide the total amount of packaging or type of packaging that was put on the market per country and the amount of packaging that was collected by the DRS. Next to the total amount collected by DRS is the percentage of total put on market packaging.

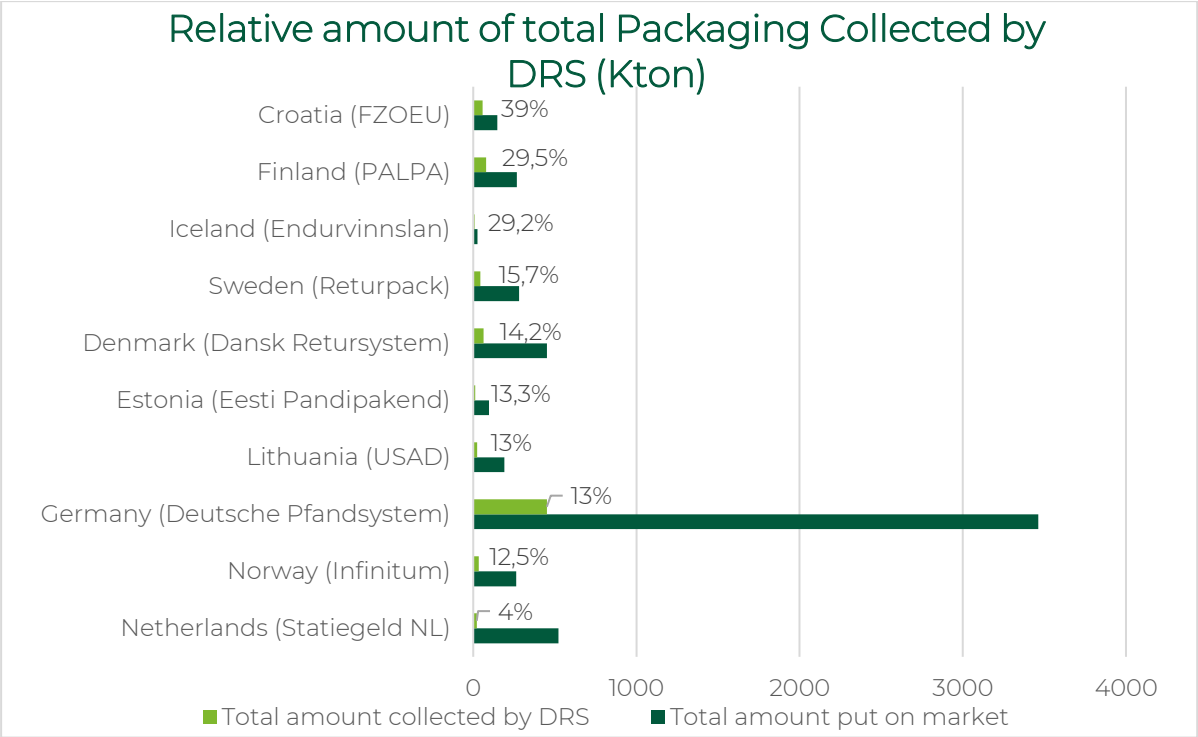


Figure 7: Total packaging collected by DRS vs Total packaging put on market[34] [35]

Plastic packaging

The graphs below focuses on relative collection by DRS per individual material stream. The share of packaging that is collected by DRS is on average the smallest for the plastic fraction (by weight), ranging from 26% for Croatia to only 4% for the Netherlands. For the Netherlands, the collected amount has recently increased with the inclusion of small PET-bottles in the DRS in 2021..

[34] Percentages are calculated by dividing the reported amounts collected by the DRS (from websites, annual reports) by the total packaging waste generated as reported by Eurostat waste statistics for 2020.

[35] Data for the Netherlands is for 2019, because that is the most recent data which is available in Eurostat.

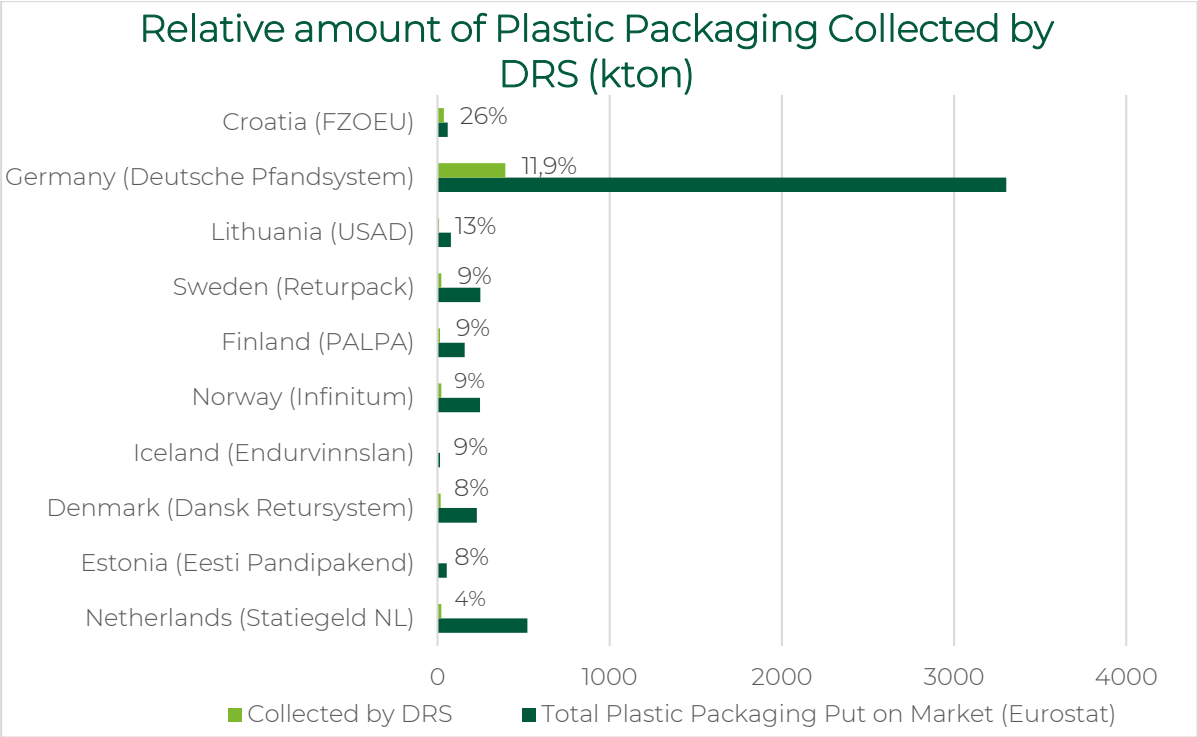


Figure 8: Collected plastic packaging vs Plastic packaging put on market

Glass packaging

For glass, a distinction can be made between DRS for recycling that collect a relatively large share of glass packaging (Croatia, Finland, Iceland) and DRS that collect only a limited share (Estonia, Denmark, Lithuania). In this sense, the share of packaging collected by DRS systems goes from a maximum level of 63% in Croatia to a range of 12% in Lithuania. Reasons for the variations in collection numbers can be a well-established infrastructure and public awareness campaigns in order to promote participation. Contributing factors can also be size and scale of systems, consumer behavior and preferences or specific market dynamics that influence the availability and consumption of glass-packaged products. Furthermore, it should be noted that in many countries only refillable glass packaging is included in their DRS (for reuse). As such, no graphs can be provided for DRS for recycling in these countries.

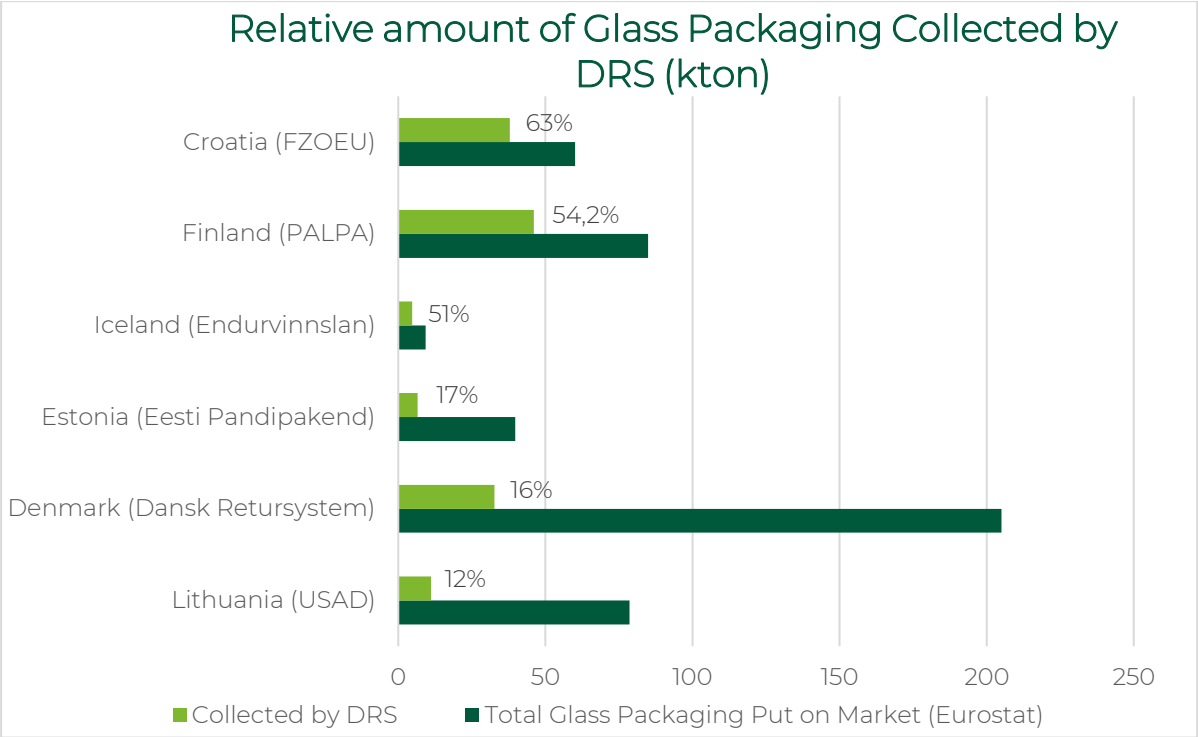


Figure 9: Collected glass packaging by DRS vs glass packaging put on market

Metal packaging

Furthermore, the available data for 2020 show that DRS include relatively larger shares of metal packaging waste in respect to the other streams. This is probably caused by the fact that metal packaging is only limitedly used as packaging material besides beverage cans (which are included in the DRS).

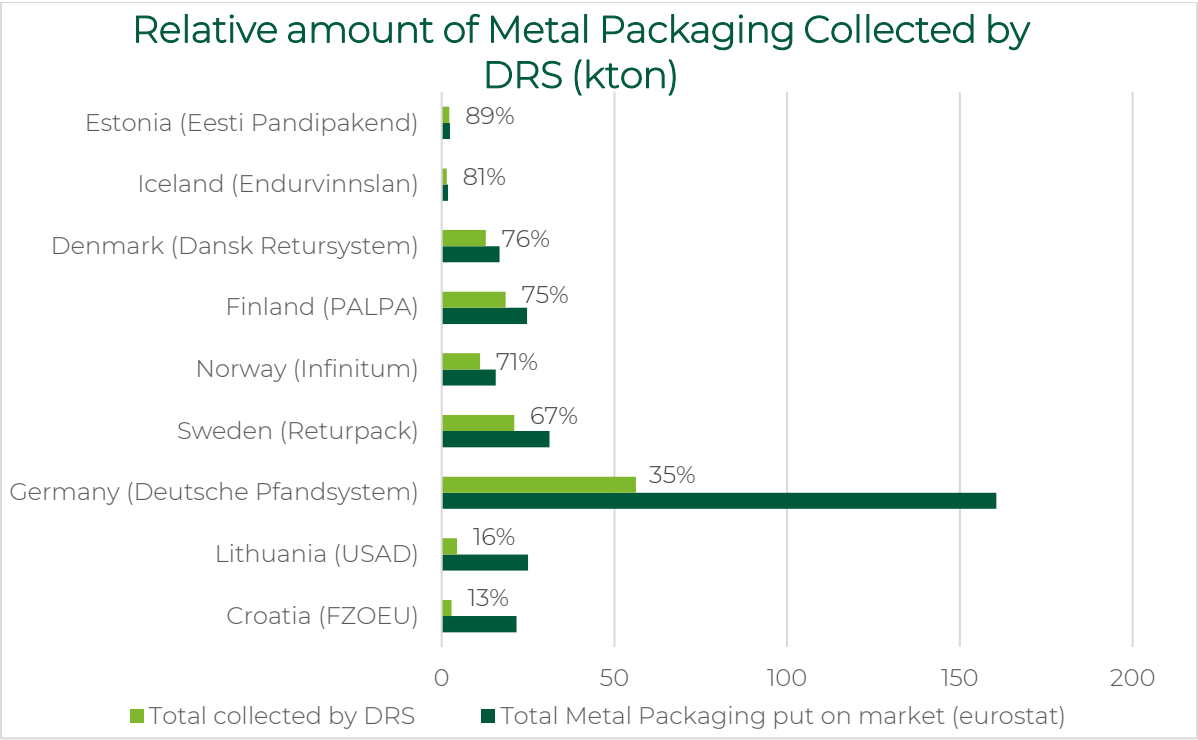


Figure 10: Collected metal packaging by DRS vs Total put on market

6.3 Return rates

Return rates are calculated by dividing the amount of collected packaging by the amount of packaging put-on-market. The average return rates of the European DRS are relatively high. Taken together, the ten DRS have return rates of 90% for plastic, 89% for glass, and 91% for metal (see table 13).

It is interesting to see that significant differences exist between the return rates of different material streams in the same country. In some countries this difference is quite substantial, i.e. in Iceland the return rate of metal is 9 percentage points higher than the return rate for glass; in Croatia this difference is even 12%; while in Lithuania the difference between the glass return rate; and the return rate of plastic as well as metal is 8%.

In the Netherlands, data of the last years show a decline in return rates. The Dutch DRS has been recently extended with the inclusion of a deposit on small plastic bottles. This significantly lowered the overall return rate. The return rate on large plastic bottles is in 2021 still 95% which equals the return rate of 2019. It is expected that the return of smaller plastic bottles will also improve over time, which should bring the overall return rate for plastic on approximately 90%.[36]

Table 13: Overview of return rates in ten EU countries

System:	Data source	Plastic 2021	Glass 2021	Metal 2021	Average 2021
Croatia (FZOEU)*	External study	88%	93%	81%	**88%**
Denmark (Dansk Retursystem)	Annual report	95%	93%	92%	**93%**
Estonia (Eesti Pandipakend)	Annual report	87%	85%	88%	**87%**
Finland (PALPA)	Palpa website	90%	98%	97%	**95%**
Germany (Deutsche Pfandsystem)*	Estimation based on external studies	97%	NA	99%	**98%**
Iceland (Endurvinnslan)	Personal communication with Endurvinnslan	90%	82%	91%	**88%**
Lithuania (USAD)	Annual report	92%	84%	92%	**89%**
Netherlands (Statiegeld NL)*	Estimation based on external studies	84%	-	-	**84%**
Norway (Infinitum)	Annual report	93%	-	92%	**92%**
Sweden (Returpack)	Website of Returpack	86%	-	89%	**88%**
Average:		**90%**	**89%**	**91%**	**90%**

* Data from 2020 is used for Croatia, this data is derived from a Reloop study[37]. Numbers for the German DRS are for 2020 as well and based on estimations because a central administration of return data is missing. Data about the Netherlands is from 2021, before the extension with aluminum cans in 2023, and based on an estimation as well.

Recycling performance

The European Commission has set relatively ambitious targets for recycling for 2025 and for 2030. For 2025 recycling targets are set at 65% and in 2030 at 70% for all packaging materials. Besides these general packaging material targets, the EU has established separate goals for

[36] BNNVARA (2022). Inname van kleine plastic statiegeldflessen laat veel ruimte voor verbetering (link).
[37] Reloop (2022). Global Deposit Book: An Overview of Deposit Return Systems for Single-Use Beverage Containers 2022.

individual material streams. This means that the following rates should be achieved in 2025 and 2030 for the assessed material streams, as highlighted in the figure underneath.

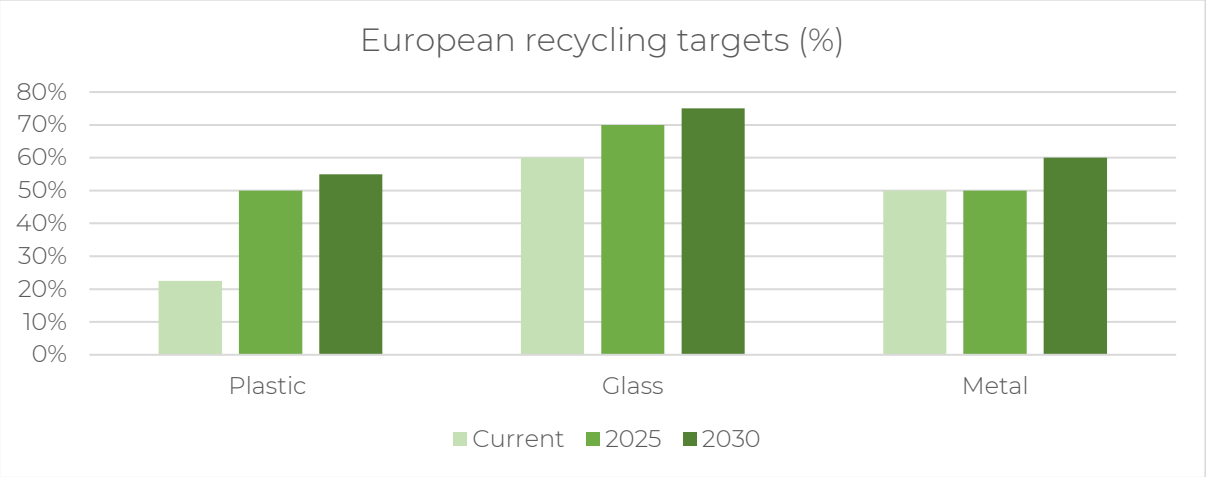


Figure 11: Current and upcoming European legislative recycling targets per material stream

The European targets for individual material streams are included in the graphs below that compare the recycling performance among European Member States. This allows to compare countries' recycling performance against upcoming legislative targets (figure 11), assessing their progress in realizing the recycling goals established by the European Union.

These graphs are based on Eurostat data for recycling (2020). The graphs show the total national return rate, as well as the return rate of glass, plastic and metal packaging, comparing countries with DRS systems and countries with other systems implemented (mainly EPR).

According to the literature, four types of categories have been identified: EPR systems, DRS systems, EPR together with DRS system and Tax service compliance systems. In regards to the latter option, only Hungary is the exception as it has a specific system implemented based on a tax system. Furthermore, it should be noted that Malta, Latvia and Slovakia are included in the EPR countries, because they have implemented their DRS from 2022 onwards and the Eurostat data relates to 2020. Furthermore, it has been assessed for each individual material stream in which countries the respective material is included in the DRS, these countries are presented as 'DRS' or 'EPR + DRS' countries.

The graph below shows that countries with different systems (DRS versus other systems) perform almost equally, i.e. countries with DRS reached on average a recycling percentage of 64% in comparison to 63% for countries with other systems. From both groups of countries successful cases can be identified that are already in line with upcoming European legislative targets e.g., the Netherlands, Finland, and Estonia (all DRS countries), as well as Belgium, Italy, Liechtenstein and Luxemburg (all non-DRS countries). However, both groups of countries also present countries that are significantly lagging behind such as Croatia and Norway (both DRS countries) as well as Hungary, Malta and Romania (non-DRS countries). The remainder of this chapter focuses on individual material streams in order to get a more comprehensive understanding of the recycling performance regarding packaging material.

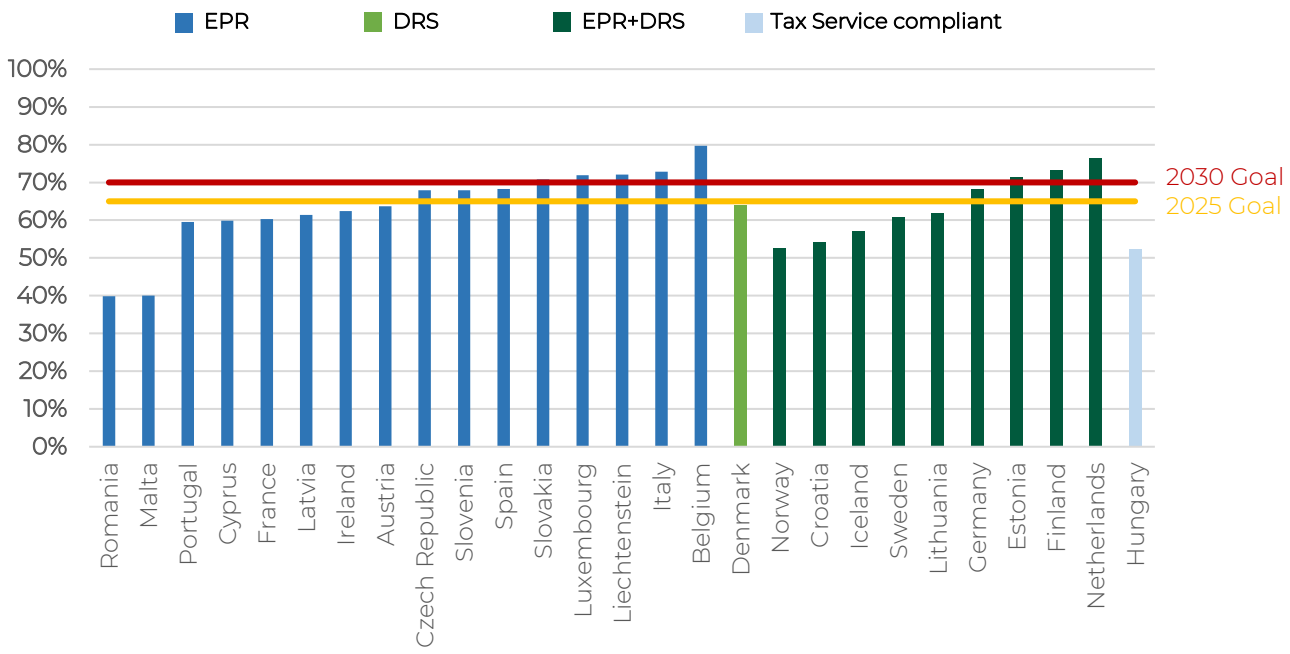


Figure 12: Total packaging recycling among EU countries

Glass packaging

When zooming in on individual material streams, the figure below indicates that the average recycling rate for glass in most European countries is already at the level set for 2030. On average, DRS countries have a slightly higher recycling rate than non-DRS countries; 76% compared to 74%. There are, however, performance differences between various European countries. For instance, Romania, Cyprus and Hungary all have a recycling rate that is significantly lower than 50%.

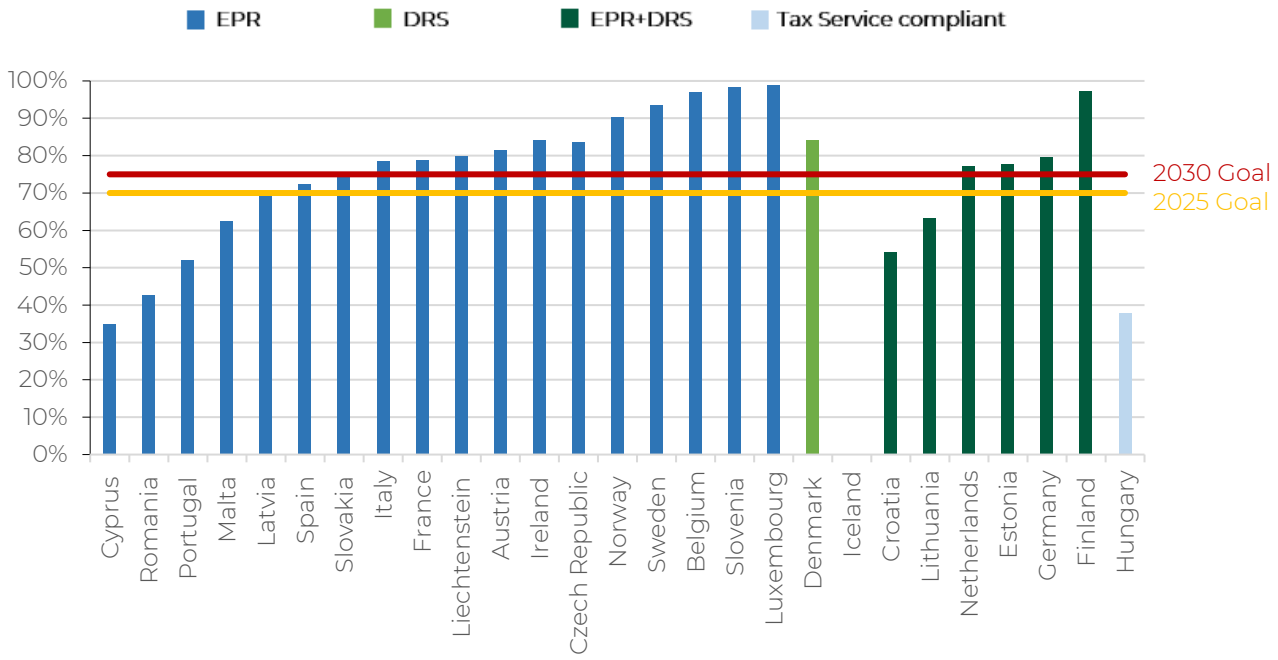


Figure 13: Recycling performance for glass[38]

Metal packaging

Concerning metal recycling, an average recycling rate of 74% is achieved among European countries. Again DRS countries are slightly outperforming non-DRS countries concerning metal packaging recycling: 76% compared to 72%. As for the countries that have implemented a combination of EPR and Deposit Return Schemes (DRS), mainly Finland, Norway, Estonia, Sweden, and Iceland, show strong metal recycling rates ranging from 76% to 100%. These countries both leverage producer responsibility and consumer engagement through deposit systems, which has resulted in relatively higher recycling rates. However, among the DRS countries Croatia is seriously lagging behind.

On the other hand, successfully implemented EPR systems are seen as well. For instance, Liechtenstein, Belgium, and the Netherlands are demonstrating high metal recycling rates ranging from 88% to 100%. As such, it can be concluded that relatively high recycling rates for metal packaging can be realized through EPR systems as well. Among the group countries with only EPR systems in place, countries do exist with lower metal recycling rates which are not yet aligned with upcoming EU targets, such as Romania and Portugal.

[38] Eurostat data concerning glass recycling for Iceland is not available, as such no graph is provided for this country.

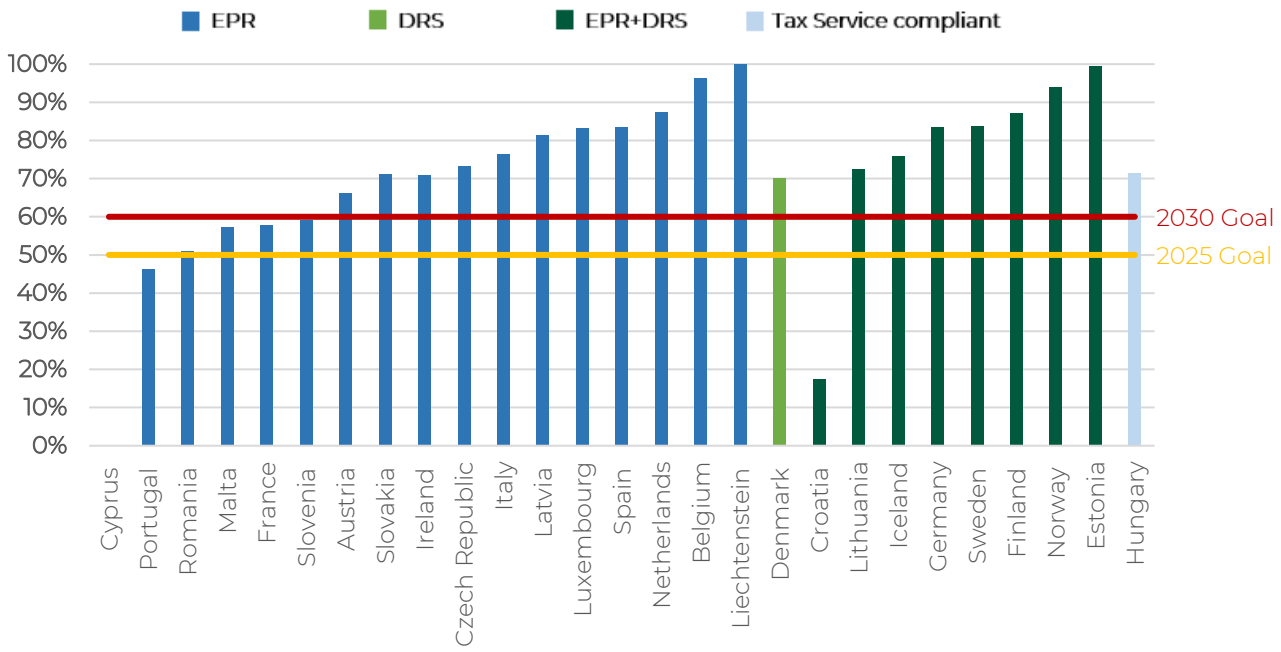


Figure 14: Recycling performance for metal packaging

Plastic packaging

The graph below shows the recycling performance for plastic packaging material, the average recycling rate for plastic packaging is only 37% among all European countries. This is significantly lower than the average return rate for metal and glass packaging. Only minor differences exist in return rates between DRS and non-DRS countries: representing average return rates of 38% and 37%, respectively. Some countries relying only on Extended Producer Responsibility (EPR) systems, such as Italy, Spain and Slovakia, demonstrate relatively high recycling rates ranging from 51% to 56%. Some of the better performing countries with a combination of EPR and Deposit Return Schemes (DRS), are Germany, the Netherlands and Lithuania, showing a plastic recycling rates ranging from 46% to 56%.

On the other hand, a large group of countries, independent of their waste collection system, need to make significant improvements to realize upcoming European legislative targets. For instance, Malta, France, Denmark, Hungary, Norway, Ireland, Romania and Liechtenstein have a recycling rate of 30% or lower. Indicating the need for improved waste management systems. The relative low recycling rates for plastic packaging among all European countries can be explained by the fact that plastic packaging is probably the most difficult material to recycle as it is so widely used as packaging material within various economic sectors.

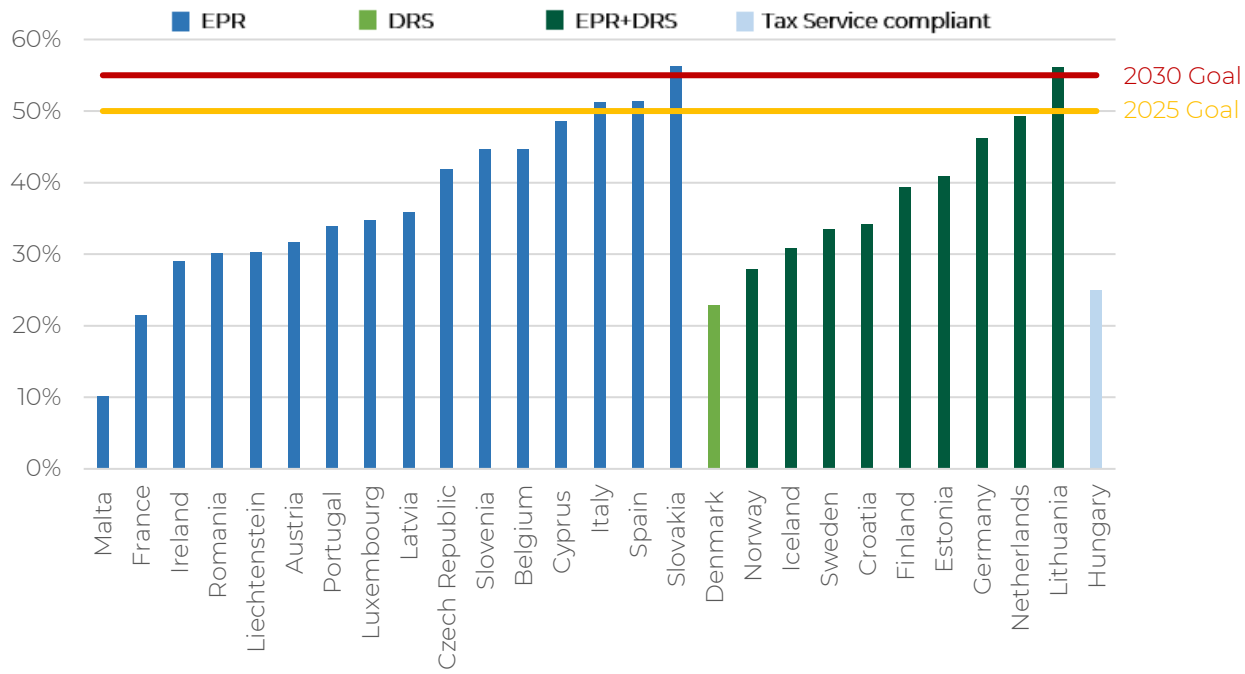


Figure 15: Recycling performance for plastic

In conclusion, the analysis shows that the average European recycling rates for metal (average of 74%) and glass (average 75%) are already at or above the targets set for 2030. In particular, recycling of plastic packaging is lagging behind with a relatively low average recycling rate of 37%. This can be partially explained by the fact that different types of plastic are widely used as packaging material. This makes plastic packaging a hard to recycle material. Besides plastic packaging items are significantly cheaper than glass and metal packaging items. As plastic is a relatively light-weight material and the price per ton is also significantly lower than the price per ton for glass or metal. Nevertheless, a large group of countries needs to make significant steps in order to comply with upcoming European legislative targets concerning plastic packaging recycling.

Furthermore, when DRS countries are compared to countries with only EPR systems, it can be seen that a relative large number of DRS countries is in line with upcoming EU targets for glass and metal recycling. While the recycling performance of DRS countries, in comparison with non-DRS countries, is approximately the same for total packaging and plastic packaging. This can be explained by the fact that plastic is widely used as packaging material and thus a DRS manages only a relatively small part of the total amount of packaging material. The same applies to total packaging material as this includes different types of material that are not managed by DRS. Therefore, the implementation of a DRS only has a minor impact on the total recycling rates regarding plastic packaging and total packaging waste, while it has a significantly bigger impact on recycling rates for metal and glass packaging.

Table 14: Relative amount of countries that complies with EU 2030 target

Packaging material	DRS countries	Non-DRS countries
Total packaging	30%	29%
Plastic	10%	6%
Glass	71%	58%
Metal	89%	67%

Significant differences can be seen when individual countries are compared with each other. These differences are partially caused by the type of collection system that is implemented,

including aspects like implemented deposit fees, included packaging materials, and governance of EPR or DRS schemes. However, recycling performance of Member States is also influenced by well-established collection infrastructure, cultural values and public awareness campaigns. From the analysis it can be concluded that there is no one-size-fits-all solution for the successful implementation of waste collection systems. As such, national waste collection systems should account for characteristics of their own country.

7. Economics of EU DRS for recycling

This chapter provides an overview of the financial structure that is implemented in European DRS for recycling. By means of the five case studies the most important cost and revenue streams are analysed, which allows to estimate the economic size of national DRS for recycling.

7.1 Financial structure of DRS

When economic data of DRS for recycling is more comprehensively assessed, different types of costs and revenues can be identified. Based on an in-depth analysis of European DRS, the most important cost items for DRS for recycling have been identified:

1) Handling fees (compensation for retailers to cover their expenses);
2) Management costs (installation and maintenance of Reverse Vending Machines, separate waste collection centers, etc.);
3) Logistics (packaging collection and transport);
4) Administrative costs (IT platform management, etc.);
5) Other costs, such as marketing, anti-fraud labelling, etc.

In order to cover the costs of a DRS, different revenue streams are identified for a DRS operator. Revenues come among others from unredeemed deposits, sale of materials and other operational aspects. The most important revenue streams are:

1) Unredeemed deposits;
2) Sale of collected materials;
3) Producer and product registration fees;
4) Other operational revenues.

The exact cash and/or material flows can be quite different in national DRS, as DRS for recycling can be designed in different ways. Broadly speaking, it can be said that a DRS operator (facilitating organisation) is managing material and cash flows within a DRS. Furthermore, in all case studies that are analysed it is seen that the DRS operator is managed by retail and industry representatives. However, by means of scientific literature four DRS archetypes are identified and each archetype has a different money-material flow as well as different costs and revenue streams for each actor.[39] Therefore, paragraph 7.2 focuses on cost and revenue streams in five case studies, in order to obtain a better understanding of cashflows in European DRS for recycling.

7.2 Costs and revenues for individual DRS

Now that the most relevant types of costs and revenues are identified, a more comprehensive overview of financial data of DRS for recycling can be provided. The table below illustrates economic data for the five case studies which are included in this study. The remainder of this paragraph describes the most important differences between the case studies' financial flows.

Table 15: Cost and revenues DRS for recycling[40]

[39] Calabrese et al. (2021). Operating modes and cost burdens for the European deposit-refund systems: A systematic approach for their analysis and design (link).
[40] The producer and handling fees for the Netherlands and Sweden are estimated based on the volume of deposit items. For Estonia and Lithuania handling fees are based on their annual reports (2021).

Economic data – DRS for Recycling*																				
	The Netherlands		Lithuania					Estonia					Sweden					Germany		
	€/Ton	€/capita	€/Ton				€/capita	€/Ton				€/capita	€/Ton				€/capita	€/Ton		€/capita
Deposits																				
Paid	6,053	13.7	517				5.2	2,082				22.3	5,847				28.4	10,479		56.7
Unredeemed	1,144	2.6	185				1.8	382				4.1	745				2.6	192		1.1
Managed	7,197	16.3	702				7	2,463				26.4	6,591				32	10,671		57.8
Costs																				
			Plast	*Glass*	*Metal*	*Total*		*Plast*	*Glass*	*Metal*	*Total*		*Plast*	*Glass*	*Metal*	*Total*				
Handling fee	934.3	2.1	540.5	67	1,106.1	439.9	4.4	1,015.8	126	2,078.8	704.2	7.5	843.6	-	2,147	1,454.7	7.0	N/A		N/A
Other costs	N/A	N/A	661.6				6.6	246.5				2.7	710.4				3.4	N/A		N/A
Total costs	N/A	N/A	1,101.4				11.0	950.7				10.2	2,165.1				10.4	25,551.3		13.8
Revenues and transparency																				
			Plast	*Glass*	*Metal*	*Total*		*Plast*	*Glass*	*Metal*	*Total*		*Plast*	*Glass*	*Metal*	*Total*				
Producer fee	656.6	1.5	861.3	106.8	1,762.6	700.9	7	284.4	35.3	582.1	197.2	2.1	685.5	-	1,744.6	1,182.1	5.7	N/A		N/A
Other Revenues	N/A	N/A	379.1				3.8	478.9				5.1	N/A				N/A	432.6		2.4
Transparency	Limited		Good					Good					Limited					Limited		

*Deposits, costs and revenues that are provided for the Netherlands, Sweden and Germany are estimations based on available data, such as the amount of materials that fall under the responsibility of their DRS for recycling.
**The handling and producer fee in €/T are calculated by multiplying the average handling or producer fee per individual item with the number of items per ton of specific material streams. As such, a relative low amount of costs is allocated to heavy weight material streams (i.e., glass) which has a low number of items per ton in comparison with plastic and metal packaging.

Revenues of DRS for recycling

From the analysis it appears that the German DRS for Recycling (Deutsche Pfandsystem) receives the highest amount of deposits, a total of €4.8 billion per year, which translates to €10,671 per ton and €57.8 per person. The country which records the lowest amount of received deposits is Lithuania (USAD) with €19.6 million per year, which equals €702/ton and €7.0 per capita. In absolute numbers the revenue coming from unredeemed deposits is the highest in Germany (approx. €90 million). However, when the unredeemed deposits/capita are assessed, Estonia has the highest relative amount (€4.1/capita). As such, the relative performance of DRS per capita can mostly be improved in Estonia.

Besides unredeemed deposits, producer fees and the sale of collected materials are also important revenue streams in each national DRS. The German DRS has the highest estimated total amount of revenues, which is also required in order to cover their relatively high costs. The German DRS receives approximately €90 million of unredeemed deposit fees on an annual basis, while from the sale of collected materials an estimated €140-250 million is gained. This brings the total amount of yearly revenues on €230-340 million, per ton of DRS material this equals €432.6. Interesting about the German DRS is the fact that they don't apply producer fees in contrast to the other European DRS countries. Instead every member of DPG is required to pay a small annual fee which is depending on the size of their operations. A more detailed overview of producer fees from other DRS countries can be found in the table below.

Table 16: Producer fees for DRS for recycling

	Plastic		Glass	Metal	
	Small bottles	Large bottles		Aluminum	Steel
The Netherlands[41]	€0.014	€0.016	-	€0.002	
	€0.01/kg (system contribution)	€0.01/kg (system contribution)		€0.01/kg (system contribution)	
	€0.0023 SUP contribution (€0.0046 SUP contribution when lid is not fixed to bottle)	€0.0023 SUP contribution (€0.0046 SUP contribution when lid is not fixed to bottle)			

[41] Afvalfondsverpakkingen (2023). Statiegeld [webpage] (link).

Lithuania[42]	€0.0270		€0.05	€0.006	€0.05
Estonia[43]	€0.009 (national barcode)	€0.0162 (national)	€0.0162 (national barcode)	€0.00	€0.024
	€0.014 (international)	€0.0212 (international)	€0.0212 (international barcode)		
Sweden[44]	€0.018	€0.043	-	€0.00	€0.024
Germany	-		-	-	-

The table above illustrates that producer fees are not only a source of income for DRS operators, but it can also be a financial incentive to discourage the usage of certain packaging. For instance, in Sweden an additional sorting fee of €0.0049 is charged to producers when coloured plastics are used as packaging material. Since these plastics are more difficult to recycle than transparent plastics. Furthermore, the usage of steel packaging material is discouraged in multiple countries (e.g. Lithuania, Estonia, and Sweden), by charging a significant higher producer fee for steel packaging items in comparison with aluminum packaging items.

Finally, it has to be noted that the Netherlands, Sweden and Germany don't provide data on costs and revenue streams. The data for these countries that is included in Table 15 are estimations based on the amount of material that circulates in the DRS for recycling as well as the deposit fees.

Costs of DRS for recycling

The most important cost stream regarding DRS for recycling are handling fees, which is a compensation for retailers. Only the German DRS doesn't have a handling fee in place. Instead the retailers become the owner of the collected packaging items, so they can sell collected materials to recyclers. The revenues from selling collected materials are thus used in Germany to directly compensate retailers. For the other countries a detailed overview of handling fees for individual packaging items can be found in the table below. Differentiated handling fees are used for manual or automated handling (Reverse Vending Machines). In some countries a different handling fee applies to Reverse Vending Machines with or without compaction.

Table 17: Handling fees

	Plastic				Glass		Metal	
	Small bottles		Large bottles					
	Manual	RVM	Manual	RVM	Manual	RVM	Manual	RVM
Lithuania	€0.0159	€0.0193	€0.0159	€0.0193	€0.0199	€0.0328	€0.0138	€0.0144
Estonia	€0.0115	€0.033	€0.0115	€0.033	€0.013	€0.025	€0.0115	€0.033
Sweden	€0.02	Pick-up with compact truck €0.027	€0.02	Pick-up with compact truck €0.033	-	-	-	Pick-up with compact truck €0.018
		Pick-up by reseller €0.033		Pick-up by reseller €0.05	-	-	-	Pick-up by reseller €0.019
Germany	-	-	-	-	-	-	-	-

[42] Reloop (2022). Global Deposit Book: An Overview of Deposit Return Systems for Single-Use Beverage Containers 2022.
[43] Reloop (2022). Global Deposit Book: An Overview of Deposit Return Systems for Single-Use Beverage Containers 2022.
[44] Reloop (2022). Global Deposit Book: An Overview of Deposit Return Systems for Single-Use Beverage Containers 2022.

Overall, it can be seen that a higher handling fee is received by retailers and other take-back points when RVMs are used for collection of deposit items. In Sweden, automated collection points with compacting RVM(s) get even an additional fixed fee of €1,976 per year, on top of the variable compensation that is received for individual deposit items. Moreover, in Sweden take-back points are also encouraged (through a financial incentive) to arrange direct pick-up of the collected material by the reseller. In the Netherlands, a handling fee system has been introduced in 2021 with the inclusion of small plastic bottles in the DRS. The Dutch handling fee has a different structure than in the other case countries, as can be seen in the table below.

Table 18: Handling fees in the Netherlands

	Obligatory take-back (retail)		Obligatory take-back (out-of-home)		Voluntary take-back		Online delivery service	
	Small bottle	Large bottle	Small bottle	Large bottle	Small bottle	Large bottle	Small bottle	Large bottle
Manual	€0.025	€0.015	€0.0222	€0.0122	-	-	tbd	tbd
RVM w/h compaction	€0.0295	€0.0211	€0.0293	€0.0202	€0.0293	€0.0202	-	-
RVM compaction	€0.0386	€0.029	€0.0379	€0.0283	€0.0379	€0.0283	-	-
Counting centre w/h sorting	€0.0408	€0.0306	-	-	-	-	-	-
Counting centre incl. sorting	€0.0413	€0.0310	-	-	-	-	-	-

Interesting about the Dutch handling fee structure is the fact that a higher handling fee is received for collection of small plastic bottles in comparison with collection of large plastic bottles. While in the other case study countries an equal or even higher handling fee is received for the collection of large plastic bottles in comparison with small plastic bottles.

Besides handling fees, other important cost items for DRS for recycling are costs related to logistics, administration and marketing. The most relevant types of costs are provided in the figure below as relative amount of the total costs of national DRS for recycling. As such, this graph clearly illustrates the most important types of costs for individual DRS for recycling.
Based on an assessment of the financials of the five case study DRS for recycling, the costs are on average distributed as follows:

- Handling Fees costs: **60,3 %;**
- Transportation costs: **13,3 %**
- Marketing and Administration costs: **3,6 %**

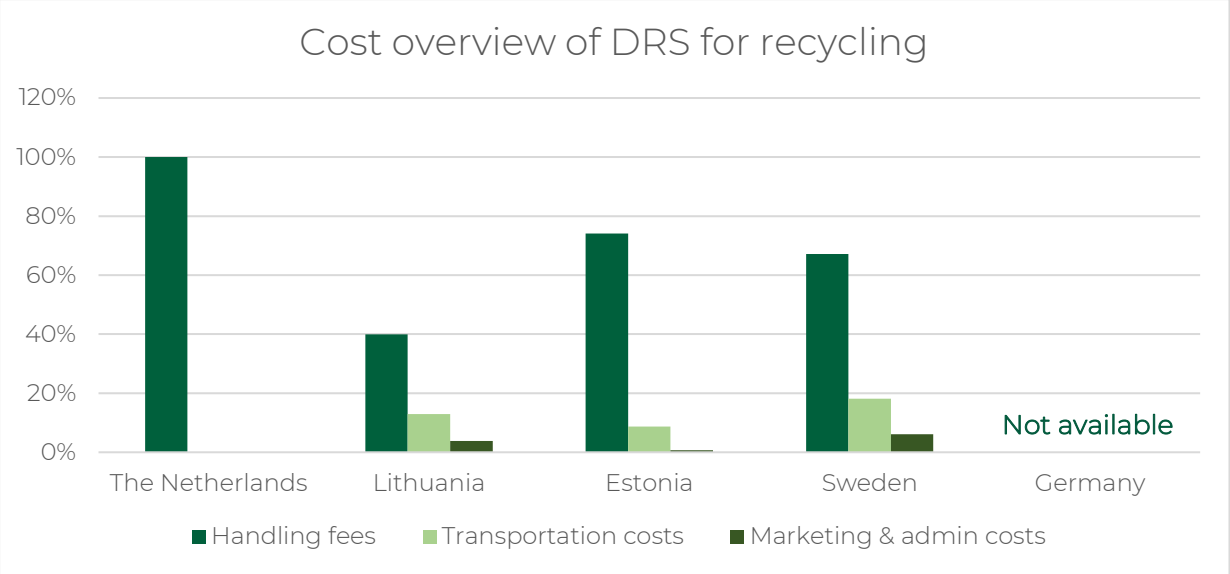


Figure 16: Cost overview of DRS for recycling

System costs allocated to material types

The table below shows the costs per type of packaging in the five case study systems. This calculation was made based on the total costs per system and the tonnages per type of material that have been collected through the DRS for recycling. System costs are allocated to each type of material (e.g. glass, PET, Metal) based on the relative amount of packaging (in tons), respective material streams contribute to total collected packaging. The costs of the type of material is calculated using the total amount of tonnages collected and the percentage of each type of material this is comprised of.

Table 19: Costs of Different Material Types in DRS Systems[45]

	Total system costs	Glass	Plastic	Metal
	€/ton	Relative cost share in €	Relative cost share in €	Relative cost share in €
Netherlands - Statiegeld Nederland	€1.126	N/A	€37.000.000	N/A
Lithuania - USAD	€1.125	€12.572.452	€13.146.893	€5.080.655
Estonia - Eesti Pandipakend	€985	€7.193.431	€4.138.686	€2.167.883
Germany - Deutsche Pfandsystem GmbH	€2.551	N/A	€1.006.580.352	€143.419.648
Sweden - Returpack	€2.339	N/A	€55.591.890	€53.208.110

7.3 Economic size of European DRS for recycling

To get a better understanding of the economic size of DRS for recycling in European countries, the total turnover from deposit flows has been estimated for ten European countries which have operated their DRS for more than one year. For DRS that have been implemented more recently, the required data is not yet available as the DRS itself and the

[45] It should be noted that only Lithuanian and Estonian DRS operator reports on their total costs. For the Netherlands, Germany and Sweden an estimation of their total costs is made based on publicly available information. However, it is likely that the total costs are higher for these countries, as required data is lacking for some cost items. As such, the table only represents an indicative overview of system costs.

infrastructure around it is still in development. The economic size of each national DRS has been estimated based on the deposit fees that have been received by DRS operators in 2021. In principal, DRS operators are non-profit organisations, as such the received deposit fees provide a useful indication of the economic size of the entire DRS (table 20).

Table 20: Economic size of DRS for recycling

Country	Economic Size of DRS
Germany	M€4,810
Finland	M€360
Norway	M€336.4
Sweden	M€331.2
The Netherlands	M€309.5
Croatia	M€58.1
Estonia	M€35
Iceland	M€25.3
Lithuania	M€19.6

Multiple countries provide the required data in their annual report or via other official documents e.g., Estonia, Lithuania, Norway, Sweden, Denmark and Finland. For the other countries an estimation has been made based on the implemented deposit fee and the amount of deposit items that are yearly put on the market. As such, an estimation of the economic size of DRS for recycling has been made for the Netherlands, Iceland, Germany and Croatia.

The map illustrates that DRS for recycling of the Baltic States, Croatia and Iceland have a relatively small economic size, while the German DRS for Recycling is by far the largest. Furthermore, a middle group of countries exists consisting of the Netherlands and the Scandinavian countries (except for Iceland). The economic size of DRS is partially determined by the amount of inhabitants of a country, as well as by the deposit fees that are applied. The higher the deposit fee, the larger is the economic size of a respective DRS for recycling.

8. Conclusion

DRS for recycling have been implemented in thirteen European countries, while various other EU member states are currently preparing for the implementation of a DRS. From this perspective, there is a need to analyze how DRS are currently designed and implemented in EU countries. Identifying the key characteristics of these systems, analysing DRS governance and assessing their performance, helps to get a better understanding of how these systems work.

As such, five European DRS for recycling have been extensively analysed. The key characteristics of the Dutch, Lithuanian, Estonian, Swedish and German system are illustrated in Table 21. As is shown in the table, all DRS countries have a not-for-profit organisation that is responsible for managing their DRS for recycling. Furthermore, it is shown that the assessed countries have a legal basis for their deposit fee, as this deposit fee is clearly established in national legislation.

When assessing the operational performance of DRS for recycling, the table illustrates that typically three different types of material are included in DRS for recycling, namely: plastic, glass and/or metal beverage packaging. In some countries, such as Sweden and the Netherlands, glass is exclusively covered by DRS for reuse systems. From the analysis it appears that Germany has the most effective DRS for recycling in terms of return rate (average return rate of 98%), while the Dutch DRS for recycling is lagging behind with an average return rate of 84%. The other case study countries are somewhere in between, implying that on average DRS for recycling are in line with upcoming EU legislative targets.

The moment in time a DRS for recycling is introduced in comparison with the respective EPR scheme, is quite different in the assessed case study countries. Regarding the operational aspects of DRS for recycling, clear differences are found between case study countries with respect to administrative and reporting activities. In Estonia and Lithuania a best practice has been identified, as both countries provide a comprehensive annual report which clearly describes the recycling and financial performance as well as relevant developments concerning their DRS for recycling. It would be recommended that other DRS countries follow their example by providing comprehensive annual reports, and thus improve their currently limited transparency on their DRS for recycling.

When the amount of beverage packaging materials is assessed, it can be noticed that the German DRS for recycling processes by far the most material, while the Estonian DRS processes the smallest amount of material.

Another difference between the countries cases is the deposit fee that is applied to their input materials. Broadly speaking two different deposit fee structures can be recognized from the table below:

(I) a flat rate deposit fee, where a single deposit fee is applied to all beverage packaging items that are included in the system;
(II) a differentiated deposit fee, where different deposit fees are implemented depending on the packaging material.

A flat rate deposit fee system is easier to understand, which is more convenient for consumers. A differentiated deposit fee, however, can stimulate high return rates for certain packaging materials, enabling DRS to target the most valuable materials or streams with a low return rate. Regarding the deposit fee itself, it can be seen that both Lithuania and Estonia apply a relative low deposit fee (€0.10 for individual DRS packaging items), while Germany has implemented a relatively high deposit fee (€0.25 for DRS packaging items). The Netherlands has applied a high deposit fee for large bottles (€0.25 for DRS packaging items), but a lower fee for smaller bottles and cans (€0.15 for DRS packaging items). These fee differences are also reflected in the total deposit fee ratios (e.g. €/ton and €/capita).

Furthermore, it is shown that most DRS for recycling use a producer fee as well as a handling fee. Except for Germany, where the retailer keeps the collected material in possession. As such, the retailers in Germany are compensated for their expenses by selling the collected materials. Besides sales of collected material, the unredeemed deposit is in all DRS for recycling countries the most important source of revenue.

Taking into account all the data collected from the desk research, Eurostat and the DRS reports, this study has confirmed that DRS for recycling are very effective collection systems, realizing high return rates among all DRS countries. However, it should also be noted that beverage packaging only contains a minor part of the total packaging waste stream. For the assessed countries the relative share of packaging waste that is returned to DRS for recycling, ranges from only 4% in the Netherlands to 39% in Croatia (in comparison to the total amount of packaging material that is put-on-market). As such, DRS for recycling only collect a part of the total packaging waste that is generated in European countries.

Therefore, it can be concluded that DRS is no silver bullet solution for high recycling rates at national scale. When a DRS for recycling or EPR scheme is implemented, the characteristics of the respective country should be taken into account. Overall, DRS for recycling seem to be relatively effective, but these systems also come at a certain expense. The effectiveness of DRS for recycling is determined by the amount of (automated) take-back points, the underlying deposit fee, but also communication activities and cultural values affect the return rate. On the other hand countries with only EPR schemes can also achieve relatively high collection rates. However, various EPR countries exists that are significantly lagging behind with European targets. As such, within the group of countries that only have an EPR scheme in place significant differences are noticed as well. Identifying how to successfully implement an EPR scheme is beyond the scope of this analysis and therefore, requires additional research.

Table 21: Key characteristics of five EU DRS for recycling

	Not-for-profit	Legal Basis deposit	Type of packaging	Average return rate	Introduction of the Extended Producer Responsibility			System Operator Responsibilities		Transparency
					Prior	After	Same time	Financial	Operational	
Statiegeld NL *The Netherlands*	X	X		84%		X			X	Limited
USAD *Lithuania*	X	X		89%			X		X	Clear
Eesti Pandipakend *Estonia*	X	X		87%			X		X	Clear
Returpack *Sweden*	X	X		88%		X			X	Limited
Deutsche Pfandsystem *Germany*	X	X		98%	X				Shared	Limited

	Packaging Volumes (Tons p/y)				Deposit Value	Handling Fee €/T****				Producer Fee €/T****				Total Deposit Fee		Total Deposit Fee Paid		Total Unredeemed Deposit	
	Plast	***Glass***	***Metal***	***Total***		***Plast***	***Glass***	***Metal***	***Total***	**Plast**	**Glass**	**Metal**	**Total**	**€/Ton**	**€/cap**	**€/Ton**	**€/cap**	**€/Ton**	**€/cap**
Statiegeld NL *The Netherlands***	39,600	-	-	39,600	€0.25 or €0.15	934.34	-	-	934.34	656.57	-	-	656.57	€7,197	€16.26	€6,053	€13.67	€1,144	€2.58
USAD *Lithuania*	12,278	11,247	4,439	27,964	€0.10	540.49	67.02	1,106.13	439.85	861.27	106.79	1,762.61	700.90	€702	€7	€517	€5.17	€185	€1.84
Eesti Pandipakend *Estonia*	4,400	7,600	2,200	14,200	€0.10	1,015.78	125.95	2.078.81	704.23	284.42	35.26	582.07	197.18	€2,463	€26.39	€2,082	€22.30	€382	€4.09
Returpack *Sweden****	26,690	-	23,561	50,251	€0.088 or €0.18	843.57	-	2,146.99	1,454.70	685.47	-	1,744.61	1,182.07	€6,591	€32	€5,847	€28.39	€745	€3.62
Deutsche Pfandsystem *Germany*	394,548	-	56,216	450,764	€0.25	NA	NA	NA	NA	NA	NA	NA	NA	€10,671	€55.76	€10,479	€56.80	€192	€1.04

** Producer fee contains the amount that is paid for each beverage packaging item that is put on the market and excludes any system contributions or taxes for international packaging (e.g., as used in the Netherlands or Estonia).*
*** Handing fees for the Netherlands concerns handling fees for obligatory retail take-back points. A differentiated fee system is used in the Netherlands: A different handling fee is provided to obligatory and voluntary take-back points. Furthermore, a distinction is made between manual, RVM (with or without compacting) and counting center collection systems. A comprehensive overview is provided in the Analysis of European DRS for recycling (word document).*
**** In Sweden, a higher handling fee is received for materials that are collected by RVMs and which are directly transported by resellers (recycling organisations).*
***** The handling and producer fee in €/T are calculated by multiplying the average handling or producer fee per individual item with the number of items per ton of specific material streams. As such, a relative low amount of costs is allocated to heavy weight material streams (i.e., glass) which has a low number of items per ton in comparison with plastic and metal packaging.*