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CONAI
CONSORZIO NAZIONALE IMBALLAGGI

MAPPING OF PACKAGING DEPOSIT RETURN SCHEMES IN THE EU

Cécile Reinkingh, MSc

Thomas van den Nieuwenhuizen, MSc

Tjerk Wardenaar, PhD

Content:

CHAPTER 1: Introduction into EGEN & assignment

EGEN – Part of PNO Group

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EGEN is the **green innovation** label of the PNO Group. EGEN consists of 35+ specialists on themes like circular economy, recycling, sustainable mobility, and renewable energy systems. Its our ambition to **accelerate the green transition** in Europe by supporting Europe's frontrunners.

PNO Group

Every innovation starts with one good idea and a lot of passion. From our start-up roots, we have grown to become **market leader in innovation and funding services in Europe**, with offices in seven European countries. Our company is **connected to a global network of national and regional creative partners**: multinationals, start-ups, RTOs and universities, sector and public organisations. From this unique network, we work on **fostering connections and stimulating, realising and financing innovation** in an ever faster and more complex innovation landscape.

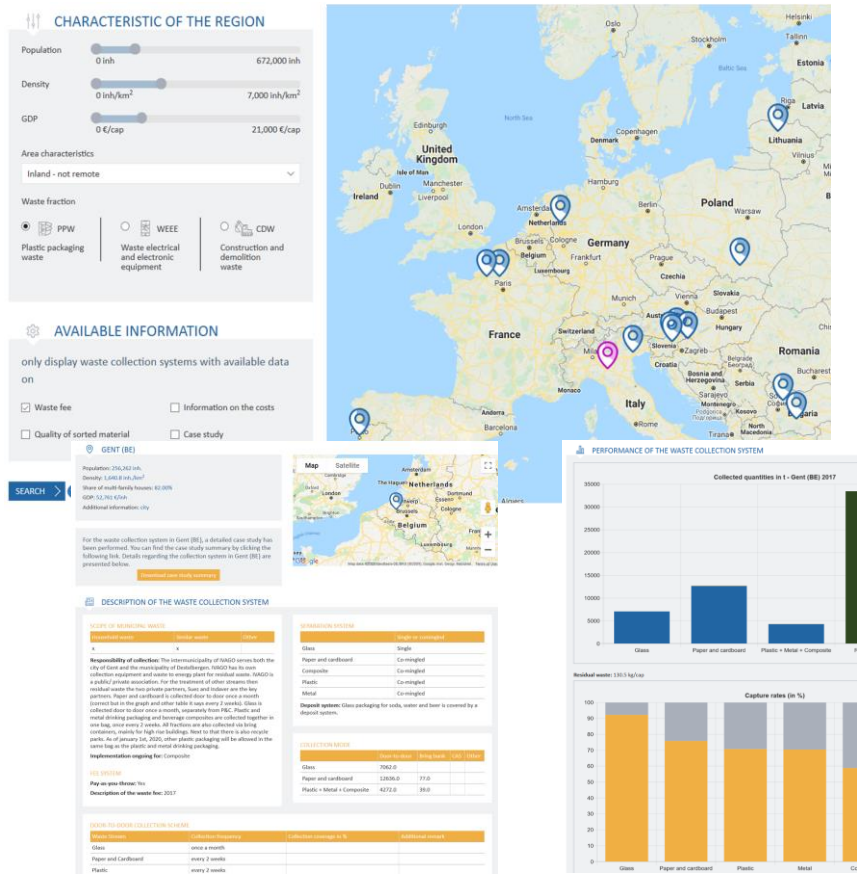
COLLECTORS
WASTE COLLECTION SYSTEMS ASSESSED AND GOOD PRACTICES IDENTIFIED

Project coordinator:
EGEN

Objective:
Mapping and assessment of waste collection systems throughout Europe for packaging and paper waste, WEEE, and CDW.

Relevance:
- European mapping
- Standardized inventory table
- Cost-benefit approach
- Data availability

Horizon 2020
European Union Funding
for Research & Innovation



Research approach:

PHASE 0: Research framework

PHASE 1: Quick-scan

PHASE 2: Country cases

PHASE 3: Input CBA-model

Quick scan:

- DRS Re-use & DRS Recycling
- Analysis of publicly available information
- Generic insights on set-up, organization, and performance
- Transparency & data-availability

Country cases:

- DRS Re-use & DRS Recycling
- In-depth desk research & stakeholder interviews
- Rationale of implementation, stakeholder attitudes, performance, material & deposit flows

CHAPTER 2: Summary of the key results of the quick scan in ten countries

DRS recycling: implementation & reason to be a DRS

Currently, deposit return systems (DRS) for recycling are running in ten EU Member States. DRS has a long history in Europe, but in their current form the first one was introduced in 1984 (Sweden). Lithuania was the latest Member State in 2016. Several other Member States are considering or have take initial steps to implement DRS in the coming years (Portugal, Slovakia, Romania, Latvia, Malta).

Broadly speaking, 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). This cohort of countries is followed by countries like the Netherlands and Germany. In these countries, the introduction of DRS can be seen as a response to the increase of packaging waste and related discussions on responsibility for the costs of waste management. Countries like Estonia and Lithuania make the third wave. In these countries, the introduction of DRS can be seen as a response to increase in packaging waste combined with the introduction and alignment with EU-policies (and targets).

	Country (Name):
1984	Sweden (Returpack)
1989	Iceland (Endurvinnslan)
1996	Finland (PALPA)
1999	Norway (Infinitum)
2002	Denmark (Dansk Retursystem)
2003	Germany (Deutsche Pfandsystem)
2005	Netherlands (Statiegeld Nederland), Estonia (Eesti Pandipakend)
2006	Croatia (FZOEU)
2016	Lithuania (USAD)

DRS recycling: scope & coverage

Materials: the large majority of DRS for recycling in Europe cover plastic, metal and glass packaging (seven out of ten countries). Sweden and Norway only cover plastic and metal, while the Netherlands cover only plastic (but will expand the scope to metal in 2022).

Product groups (included): soft-drinks and water are included in all systems, while beer is included in all systems except the Netherlands. Overall, a trend can be observed to expand to product groups like alcoholic beverages, mixer drinks, juices, sport drinks.

Product groups (excluded): milk and milk-based beverages are excluded from all DRS. Juices (or types of juices) are excluded from some DRS (like Germany, Netherlands, Sweden) as well as (strong) alcoholic beverages (Denmark, Estonia, Germany, Lithuania, Netherlands). Exclusion of smaller bottles is getting scarce (esp. with Netherlands changing its system in 2021) and is limited to items smaller than 0.1 or 0.2 L.

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

DRS recycling: take-back network

Types of take-back points: retailers are the main take-back point in all systems, except Iceland (working with return facilities). Distinction is made between large and small retailers, with small retailers either partly or fully exempted. Retailers have the possibility to collect materials manually or with a RVM (with/without compactor). Research in the Netherlands and Norway show that consumers bring the large majority of packaging back to locations with RVMs, i.e. large retailers.

Some DRS provide separate deposit banks (Denmark, Sweden) and many facilitate interaction with the informal economy (NGOs or vulnerable groups). This latest aspect increases the societal character of the DRS and contributes to a broad societal endorsement (see also pictures left).

Out-of-home locations included in half of the systems, in some cases voluntary. Norway anticipating on the growing number of groceries delivery services.

Examples of interaction with the informal economy: Dansk Retursystem introduced deposit shelves to public waste bins with the slogan “Giv din pant videre” (Pass on your deposit; picture: Twitter). The Icelandic scouting organization is one of the shareholders of the DRS Endurvinnslan. The collection bin refers to this with the name “Graenir Skáter” (Green Scouts; picture: Graenir Skáter facebook). Reverse vending machines in Norway feature an option for the deposit to be donated to the Norwegian Red Cross (picture: The Knowledge Exchange Blog)

DRS recycling: take-back network

Network density: a dense take-back network provides consumers with convenience, resulting ideally in a higher collection rate. The density of the network can be calculated in different ways.

In the first place with the inhabitant per take-back point ratio. This indicator is calculating the number of inhabitants that (on average) make use of a take-back point. The average for all ten DRS is 1,620 inhabitants per take-back point. Five DRS, however, have a relatively similar ratio in the range of 1,000 – 1,500. Iceland is a clear outline with a 6,068 to one ratio due to its different network (no retailers, but central locations). Norway and Germany, on the other hand, have relatively many take-back points per inhabitant, respectively ratios of 358 and 640 inhabitants per take-back point.

A second way to look at network density is the number of take-back points per square kilometer. DRS differ substantially on this indicator with 372 times more DRS/km^2 in the highest (Germany) than in the lowest case (Iceland). However, three broad groups can be made, i.e. (1) low density networks (Iceland, Finland, Estonia); (2) medium density network (Croatia, Denmark, Lithuania, Norway, Sweden); (3) high density network (Germany, Netherlands).

Detailed information on the geographical coverage of the ten systems is not readily available. However, it should be noted that the geographical spread of the take-back networks follow closely the spread of retailers (due to the dominance of this take-back location in most DRS). This means that we can expect that the density of the systems is much higher in urban areas, where more shops are located.

Density*	Country (Name):
. 372	Germany (Deutsche Pfandsystem)
. 356	Netherlands (Statiegeld Nederland)
. 079	Denmark (Dansk Retursystem)
. 053	Croatia (FZOEU)
. 043	Lithuania (USAD)
. 041	Norway (Infinitum)
. 034	Sweden (Returpack)
. 019	Estonia (Eesti Pandipakend)
. 016	Finland (PALPA)
. 001	Iceland (Endurvinnslan)

** Density is calculated by the number of take-back points per km^2*

DRS recycling: return rates

Overall return rates: the ten DRS report (very) high return rates (the number of collected packaging divided by the amount of packaging put-on-market). Taken together, the ten DRS have return rates of 88% for plastic, 87% for glass, and 89% for metal.

Differences per fraction: it is interesting to see that differences exists between the return rates of different material fractions in one country. In some countries this difference is quite substantial, i.e. Estonia (21%) and Croatia (11%). On average the return rate for metal is highest (89,3%), followed by plastic (88,4%) and glass (86,8%). This trend is not across all cases, e.g. Croatia reports highest rate for glass and lowest for metal, while Estonia reports highest for plastic.

System:	Plastic	Glass	Metal	Average
Croatia (FZOEU)	89%	90%	79%	**86%**
Denmark (Dansk Retursystem)	94%	88%	90%	**91%**
Estonia (Eesti Pandipakend)	67%	87%	88%	**81%**
Finland (PALPA)	90%	87%	95%	**91%**
Germany (Deutsche Pfandsystem)	97%	NA	95%	**96%**
Iceland (Endurvinnslan)	85%	83%	86%	**85%**
Lithuania (USAD)	92%	85%	93%	**90%**
Netherlands (Statiegeld NL)	95%	-	-	**95%**
Norway (Infinitum)	89%	-	90%	**90%**
Sweden (Returpack)	84%	-	86%	**85%**
Average:	**88%**	**87%**	**89%**	**88%**

* Information on return rates are from DRS own reporting (websites, annual reports). Numbers for the German DRS are estimations because a central administration of return data is missing. Data on the Netherlands is from before the extension with small plastic bottles in 2021.

DRS recycling: share of packaging waste collection

Share of packaging waste collection: the ten DRS included in this study run complementary to other (packaging) waste collection systems, like EPR-systems and curb-side systems. This means that the materials that are collected by these systems is only a share of the total packaging waste.

The share of plastic packaging that is collected by these systems is smallest for the plastic fraction, ranging from 24% for Croatia to only 4% for the Netherlands. For the Netherlands, this amount will increase with the inclusion of large PET-bottles in the DRS.

For glass, a distinction can be made between systems that collect a relatively large share of glass packaging (Croatia, Finland) and systems with a more limited share (Estonia, Denmark, Lithuania). Numbers for metal packaging are less available (as statistic are missing for several Member States in Eurostat for 2018), but the available data shows that DRS include relatively large shares. This is linked to the limited amount of packaging groups that rely on metals, next to beverage cans (that fall under the DRS).

System:	Plastic	Glass	Metal
Croatia (FZOEU)	24%	51%	50%
Denmark (Dansk Retursystem)	7%	17%	76%
Estonia (Eesti Pandipakend)	7%	18%	NA
Finland (PALPA)	10%	58%	NA
Germany (Deutsche Pfandsystem)	NA	NA	NA
Iceland (Endurvinnslan)	NA	NA	NA
Lithuania (USAD)	15%	11%	NA
Netherlands (Statiegeld NL)	4%	-	-
Norway (Infinitum)	10%	-	NA
Sweden (Returpack)	9%	-	68%
Average:	**11%**	**31%**	**65%**

* Percentages are calculated by dividing the reported amounts collected by the DRS (from websites, annual reports) by the total packaging waste generated included in Eurostat waste statistics for 2018.

DRS recycling: economic size of the DRS

Total revenues: the focus of the quick scan was on macro-dimension performance indicators and collected aggregated data. This means that it was not yet possible to get an in-depth understanding of the costs of the different DRS. To get a first understanding of the economic aspects of the DRS, information on the total revenues of the ten systems was collected. With all systems being not-for-profit organizations, total revenues can be seen as a proxy for total costs of the system.

Average revenues of the DRS per inhabitant is €24,99, with Lithuania lowest (€8,55) and Norway highest (€45,14). A broad distinction becomes visible between the more expensive systems in countries with high GDP (Norway, Sweden, Denmark) and cheaper systems in countries with a lower GDP (Croatia, Lithuania). However, the cases of Finland and Iceland show that this doesn't have to be the case.

The DRS in Germany and the Netherlands are less transparent on economic data. In Germany this is due to the distributed character of the DRS organization, while in the Netherlands it seems related to the current political debates on expanding the system.

System:	M€	€ / capita
Croatia (FZOEU)	M€ 70.5	€ 17.37
Denmark (Dansk Retursystem)	M€ 252.8	€ 43.42
Estonia (Eesti Pandipakend)	M€ 38.2	€ 28.74
Finland (PALPA)	M€ 80.0	€ 14.48
Germany (Deutsche Pfandsystem)	NA	NA
Iceland (Endurvinnslan)	M€ 6.0	€ 16.48
Lithuania (USAD)	M€ 23.9	€ 8.55
Netherlands (Statiegeld NL)	NA	NA
Norway (Infinitum)	M€ 242.3	€ 45.14
Sweden (Returpack)	M€ 266.0	€ 25.76
Average:	**M€ 122.5**	**€ 24.99**

CHAPTER 3: Summary of key characteristics of DRS for reuse in five EU-member states

Netherlands: BNR

Type of DRS:	DRS reuse (30 & 50 cl beer bottles, glass)
Legal basis deposit:	None (voluntary)
Deposit-subjected packaging:	None (voluntary)
Mandatory participation DRS:	No
Date of implementation:	1986
Organization type:	Not-for-profit
Shareholders:	Industry: Dutch Breweries Association
Deposit fee:	€0.10

Implementation date:

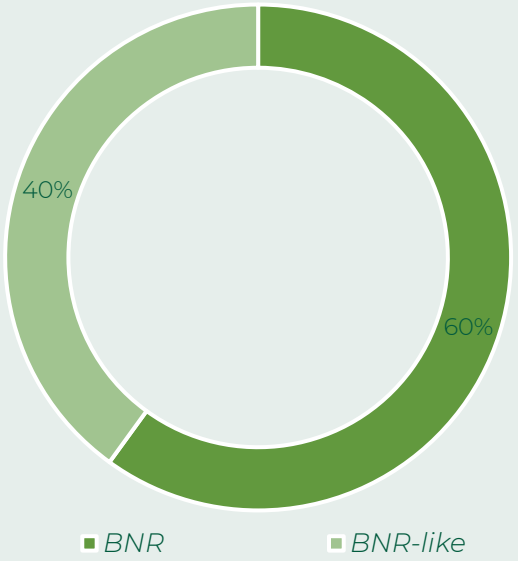
*DRS was initially initiated and implemented before the implementation of the EPR-scheme. No formal link between DRS and EPR (Afval Fondsverpakkingen), nor between DRS reuse and DRS recycling (Statiegeld Nederland). Producers in DRS do also pay a waste management fee to the EPR**

** Waste management fee for producers with reusable glass packaging is € 0.02 per kg ex. VAT versus € 0.048 per kg ex. VAT for one-way glass*

Netherlands: BNR

BNR and BNR-like systems:

BNR is a voluntary system with a pooling system consisting of standardized bottles (30 cl and 50 cl). In addition to the breweries participating in the BNR, several Dutch breweries decided to adopt a BNR-like system. This means that they introduce their own bottles in the market, but mimic the practices of the BNR DRS (amount of deposit, bilateral agreements with other breweries)



Examples of BNR-like systems:

Until 2013, Heineken was sold in the Netherlands in a BNR-bottle. In this way, the beer was available everywhere in the world in its famous green colors, except for the brewer's home market. Heineken introduced a new green bottle for the Dutch market in the spring of 2013 but decided to keep the BNR-like return system.

Some breweries, like Grolsch, operate in both BNR and BNR-like systems (with different types of bottles)

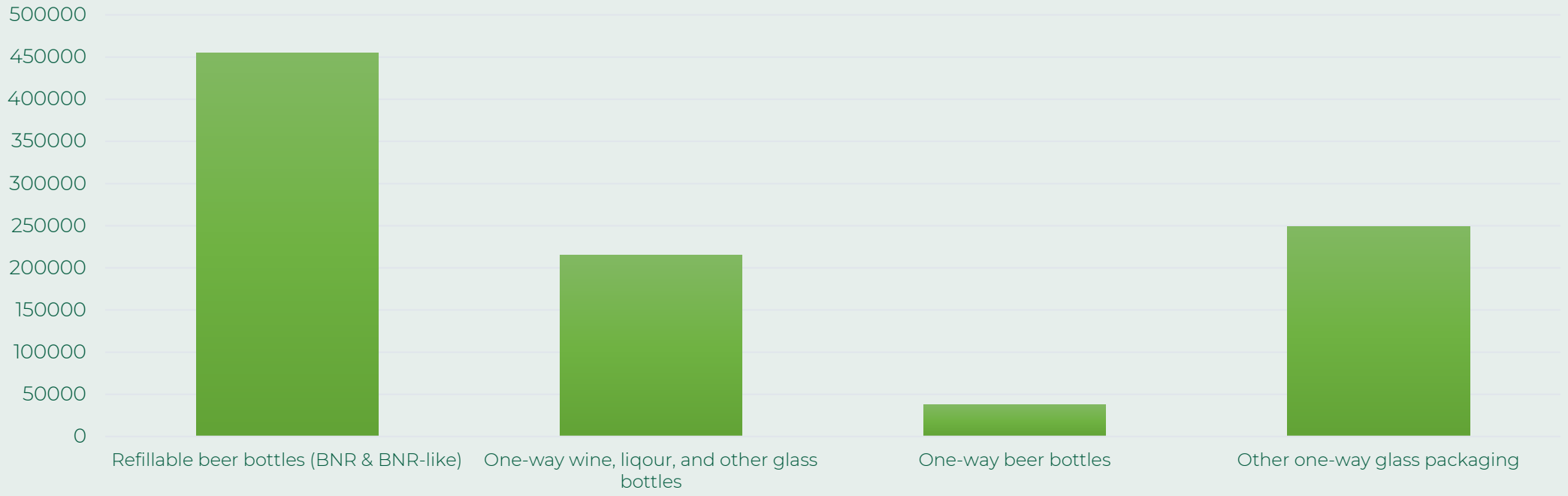
In total 455,000 tonnes of refillable beer bottles are put-on-the-market every year. Based on the interviews and market study, a rough estimation is made that 273,000 tonnes are under the responsibility of BNR and 182,000 under BNR-like systems.

Netherlands: BNR

Materials (in tonnes) under responsibility:

*BNR and BNR-like DRS have a "responsibility" for a total of approximately **455,000 tonnes** of refillable beer bottles.*

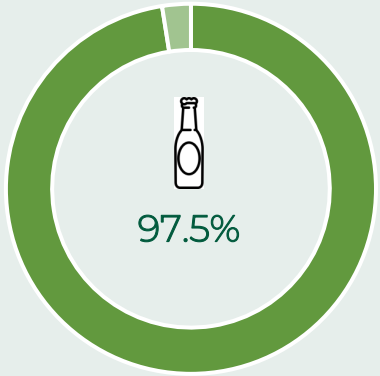
Size of DRS reuse compared to one-way glass packaging:



Netherlands: BNR

Return rates:

*Average annual return rate of BNR and BNR-like systems is **97.5%** (based on interviews)*

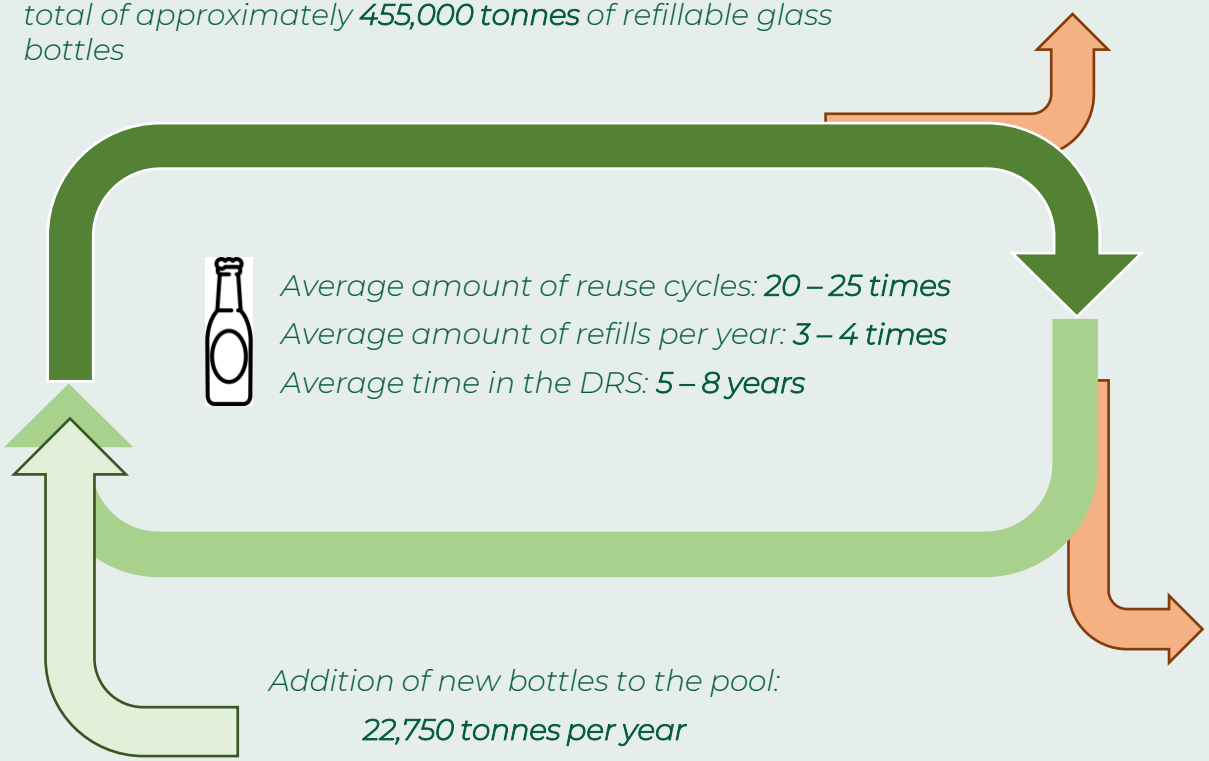


Reuse & recycling performance:

*BNR and BNR-like systems have a responsibility for a total of approximately **455,000 tonnes** of refillable glass bottles*

Annual consumer losses :

~11,375 tonnes



*Average amount of reuse cycles: **20 – 25 times***

*Average amount of refills per year: **3 – 4 times***

*Average time in the DRS: **5 – 8 years***

Annual producer losses :

~11,375 tonnes

Addition of new bottles to the pool:

22,750 tonnes per year

Netherlands: BNR 

Journey of the deposit through the system:

1. The producer joins the DRS by signing a user license, buying an amount of standardize bottles (in line with their respective share), and provide matching crates (often old ones already in the system).
2. The bottles are filled by the producer and sent off to distribution centers of supermarkets. Deposit money is transferred upon arrival at the distribution centers, as distribution centers pay the producer for the product + deposit. Deposit arrangements are made directly by the producers.
3. From the distribution centers, the bottles are transferred to the individual supermarkets, who again pay for the product + deposit.
4. The consumer buys the product for the price + the deposit.
5. The consumer returns the bottle (and, if relevant, the crate) upon which the consumer receives the deposit fee back from the retailer.
6. The bottles in crates are transported back to the breweries, who wash, relabel and refill the bottles. Breweries bilaterally correct misthrows of deposit refillable bottles by saving and exchanging them periodically.
7. The deposit is paid back to the retailer in line with the arrangements made directly between the retailer and producers.
8. The producer add new bottles to the bottle pool according to their own needs (purchasing only by certified bottle producers). The producer informs the system operator annually on the number of bottles purchased and bottles taken-back. Based on this information, the system operator informs all participants on the total size of the pool and their respective shares (fair share). Producers are subsequently expected to take-back bottles in line with their fair share.
9. To ensure quality of the system, producers pay (in ratio) for inspection and quality assurance checks. The DRS organizes and manages the quality assurance.

Netherlands: BNR

	Responsibilities system operator:	System operator:	If not, what actor:
Financial:	Collect deposit and producer fees from producers (based on put-on-market)	No	None (producers collect deposit directly from retailers)
	Pay out redeemed deposits and handling fees to retailers	No	Producer (based on direct agreements & collected materials)
	Pay out fee to transportation and other contractors	No	Producer
Operational:	Efficient organisation of transport and sorting of collected materials	No	Producer
	Counting and sorting of manual collected materials	No	Retailer and producer
	Administration and handling of invoicing	Shared	Producer (for direct arrangements with retailers)
	Quality assurance	Shared	Producer (responsible for own QA)
	Replace and replenish pool of bottles	No	Producer

Netherlands: BNR

Financial overview (details next slides):

Relevant costs and revenues for system operator

Type of operating costs:	*Relevant?*
Handling fees	-
Transportation costs	-
Admin & marketing costs	V
Other operating costs	V

Type of revenues:	*Relevant?*
Unredeemed deposit fees	-
Sale of collected materials	-
Producer and registration fees	-
Other operational revenues	V

Producers become members of the DRS by signing a user license (and buying their share in the pool by adding bottles). Costs for inspection and quality insurance of the system (including the production facilities of the bottle producers) are shared by the members (producers) based on ratio.

Netherlands: BNR 

Economic data on the Dutch DRS for reuse is not publicly available. In order to get an idea of the economics and size of the system an estimation of the deposit fees is provided.

Total deposit fees

(deposit received, paid, & unredeemed)

DRS reuse

Total deposit fees received	M€ 179.13	€ 10.29	per capita
Total deposit fees paid	M€ 174.65	€ 10.03	per capita
Total unredeemed deposit fees	**+ M€ 4.48**	**€ 0.26**	per capita

Netherlands: BNR 

Total operating cost:

The financial costs of operating the Dutch DRS for reuse are not publicly available. The system operator has very limited cost and most of the operating costs are directly covered by the producers. To get a basic understanding of the most important operating costs, we asked the interviewee of 'BNR' to specify the most important costs (qualitatively). In descending order of importance:

- Cost for washing the used bottles
- Cost for adding new bottles to the pool
- Transportation costs

Order of magnitude calculation:

To get a better feel of the relation between the revenues (unredeemed fees) and costs of the producers, we made an order of magnitude calculation to see how much € a producer would have for adding a new bottle to the system (if he/she didn't have other costs (e.g. washing costs)

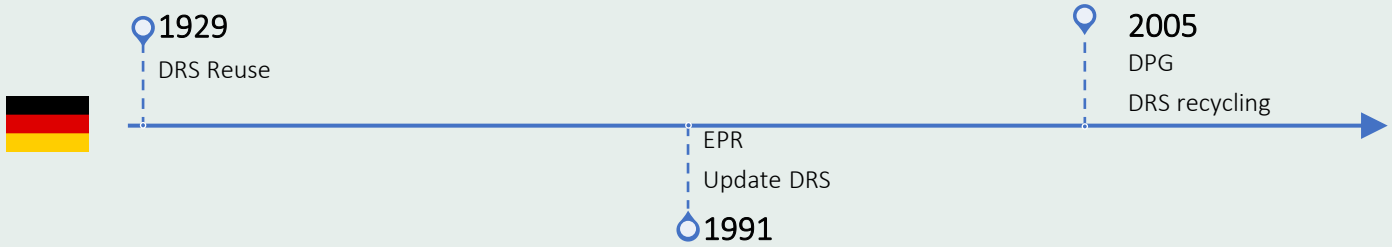
Total unredeemed deposit fees	M€ 4.48
Tonnes of bottles to be replaced (annual)	22,750
€ revenue available per bottle-to-be-replaced (254 gr)	€ 0.05

Germany: Mehrweg

Type of DRS:	DRS reuse (glass, PET) 
Legal basis deposit:	Voluntary (Packaging Ordinance, 1991; VerpackG, 2019)
Deposit-subjected packaging:	Beverages in refillable packaging are exempted from mandatory participation in the DRS for recycling
Mandatory participation DRS:	No (organization of own collection system is allowed)
Date of implementation:	1929, 1991
Organization type:	Not-for-profit
Shareholders:	Industry
Deposit fee:	Between €0.08 and €0.25

Implementation date:

DRS for reuse existed in Germany since 1929 (at least). This means that the country had DRS before the implementation of the EPR-scheme. No formal link between DRS and the EPR systems, nor between DRS reuse and DRS recycling. DRS for recycling was introduced to preserve refillable packaging on the German market.



Germany: Mehrweg

Different types of DRS reuse organization:

Within the German Mehrweg system, producers can decide upon their own (collaborative) collection system. In this way, a multitude of collection systems exists next to each other. In general, three types of organization can be identified:

Geschlossener Pool (Closed pool):

- Overarching pool organization (system administrator)
- System administrator controls the inventory, purchases, and distribution of the bottles in the pool
- Pooling system with multiple members (producers)

Genossenschaft Deutscher Brunnen eG

Example: German association of mineral water producers

Offener Pool (Open pool):

- No overarching pool organization (system administrator)
- Decentralized inventory management, with individual companies controls the purchases of the bottles in the pool
- Pooling system with multiple members (producers)

Examples: EURO-Flasche or VdF-Flaschen

Individualgebinde (Individual system):

- No overarching pool organization (system administrator)
- Individual bottles are filled by just one producer
- No pooling system (only one producer)

Examples: various individual brands

Germany: Mehrweg

Poolflaschen vs Individualflaschen:

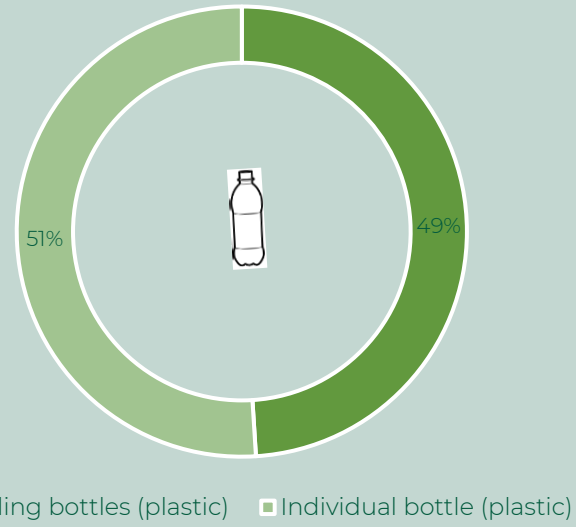
In 2018, 44.0 billion liters of beverages were consumed in Germany. The total share of refillable packaging was estimated at 41.2%. Of this total share of refillable packaging approximately 57% was a “pooling-bottle” (10.3 billion liters) and 43% was an “individual bottle” (7.8 billion liters).

Refillable glass:

Approximately 12.5 billion of liter of beverages with refillable glass packaging were consumed in Germany:

Refillable plastic:

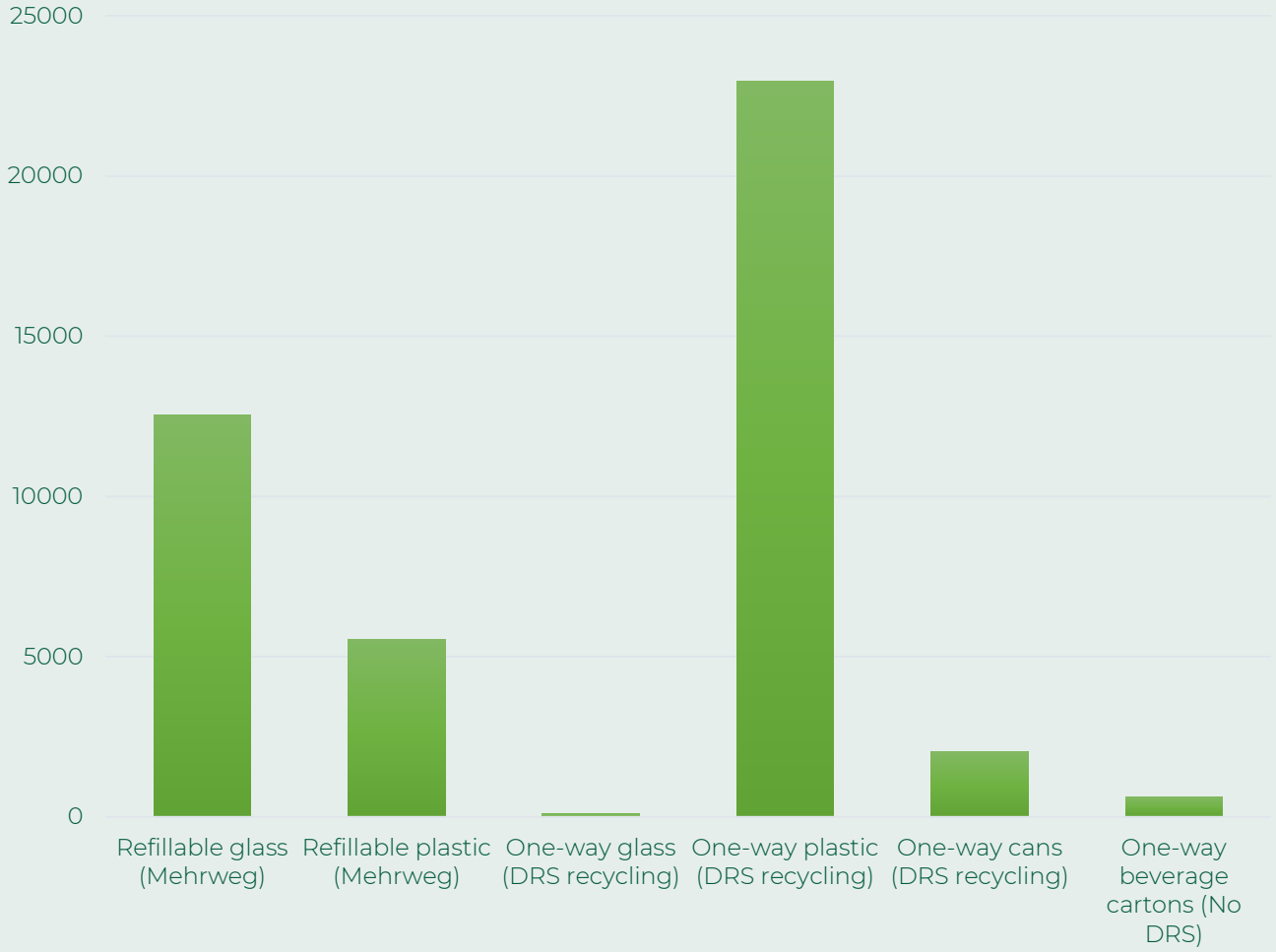
Approximately 5.5 billion of liter of beverages with refillable plastic packaging were consumed in Germany:



Germany: Mehrweg

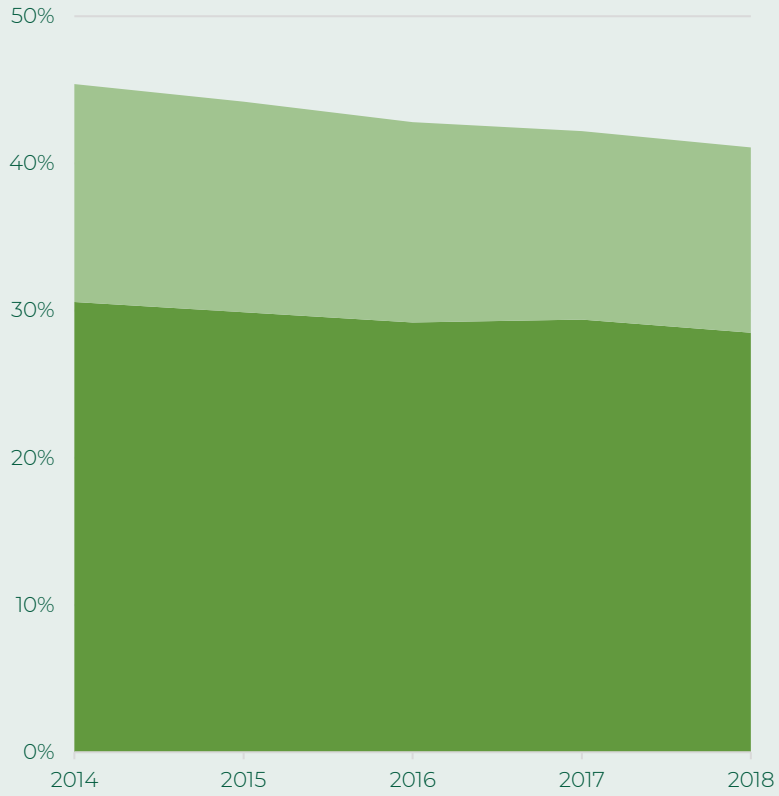
Size of DRS reuse compared to one-way glass packaging

(in million liters of beverages consumed):



DRS reuse market share

(Plastic = light & glass - dark)

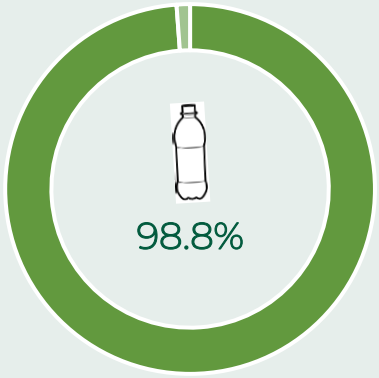


Germany: Mehrweg

Return rates & system performance:

Producers nor system operators are obliged to report data on return rates and/or system performance. The only requirement for participation in the Mehrweg system is that a producer can prove – upon inspection – that a collection infrastructure and washing facility is in place (its own or via a membership in a pooling system). This also means that central data on return rates is not available.

A recent study on the market share and recycling of PET-bottles shows that the return rates for refillable PET-bottles is high:



Germany: Mehrweg

Journey of the deposit through the system:

1. Upon entering the market, the producer has to make a decision on the type of collection system, i.e. closed system, open system, or individual system (see sheet above).
2. The bottles are filled by the producer and sold to the retailer. The producer and retailer agree among themselves upon the inclusion of a handling fee. Deposit money is transferred along with the bottles, i.e. the retailer pays the producer for the product + deposit.
3. The consumer buys the product for the price + the deposit.
4. The consumer returns the bottle upon which the consumer receives the deposit fee back from the retailer.
5. The bottles are transported back to either the system operator (closed system) or the individual producers (open system or individual system). In the closed system, the bottles are subsequently counted by the system operator and re-distributed over the participating producers.
6. The producer reimburses the deposit to the retailer - and a handling fee if agreed upon in their direct agreements. Unredeemed deposits stay with the producers.
7. Producers add new bottles to compensate for consumer losses. In the closed system, the system operator provide directions to the members on the amount of bottles to be purchased.

Germany: Mehrweg

	Responsibilities system operator:	System operator:	If not, what actor:
Financial:	Collect deposit and producer fees from producers (based on put-on-market)	No	-
	Pay out redeemed deposits and handling fees to retailers (based on collected materials)	No	Producers
	Pay out fee to transportation and other contractors	No	Producers
Operational:	Efficient organisation of transport and sorting of collected materials	Only in closed system	Other systems: producers
	Counting and sorting of manual collected materials	Only in closed system	Other systems: producers
	Administration and handling of invoicing	No	Producers
	Quality assurance	No	Producers
	Replace and replenish pool of bottles	No (in closed system directions are provided by the administrator)	Producers

Germany: Mehrweg

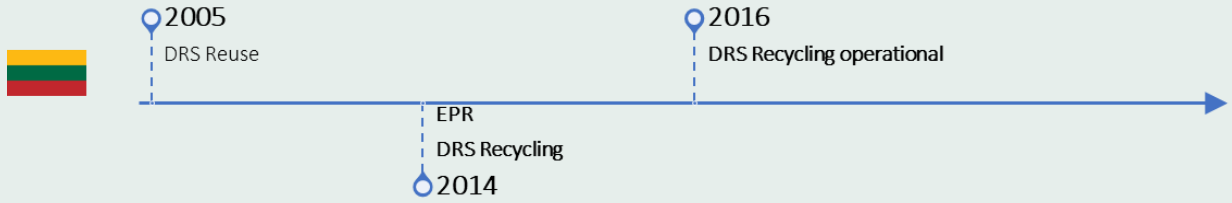
Economic data on the German DRS for reuse is not publicly available. The diversity in types of packaging, types of material, types of system, and direct agreement between producers and retailers make it not possible to get to a meaningful estimation. Important revenue stream are the unredeemed deposits. In the German DRS reuse system, this revenue stream is owned by the producers (paid by the consumers who do not return their materials).

Lithuania: DESA

Type of DRS:	DRS reuse (glass)
Legal basis deposit:	Mandatory (Law on packaging and packaging waste 2001, Amendment Law on Packaging Waste, 2018)
Deposit-subjected packaging:	Beer and beer cocktails, cider and other fermented beverages, mixed alcohol and non-alcohol beverages, all types of water, juice and nectars.
Mandatory participation DRS:	Yes, but organization of own DRS collection system is allowed
Date of implementation:	2005, 2016 (updated)
Organization type:	Not-for-profit
Shareholders:	Industry: seven Estonian breweries and Coca-Cola (since 2016)
Deposit fee:	€0.10

Implementation date:

DRS originally initiated and implemented before EPR-schemes. Updated DRS implemented at the same time of other EPR. No link exists with the EPR-schemes.

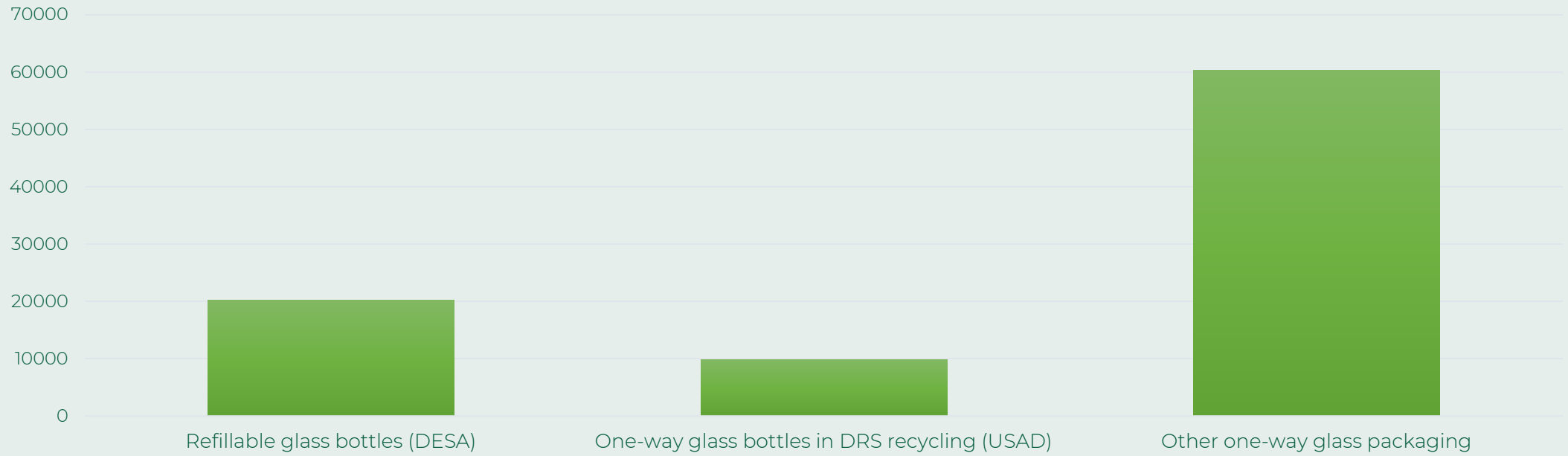


Lithuania: DESA

Materials (in tonnes) under responsibility:

*DESA has a responsibility for a total of approximately **20,161 tonnes** of refillable glass bottles under its responsibility (estimation based on items sold in refillable glass in 2019)*

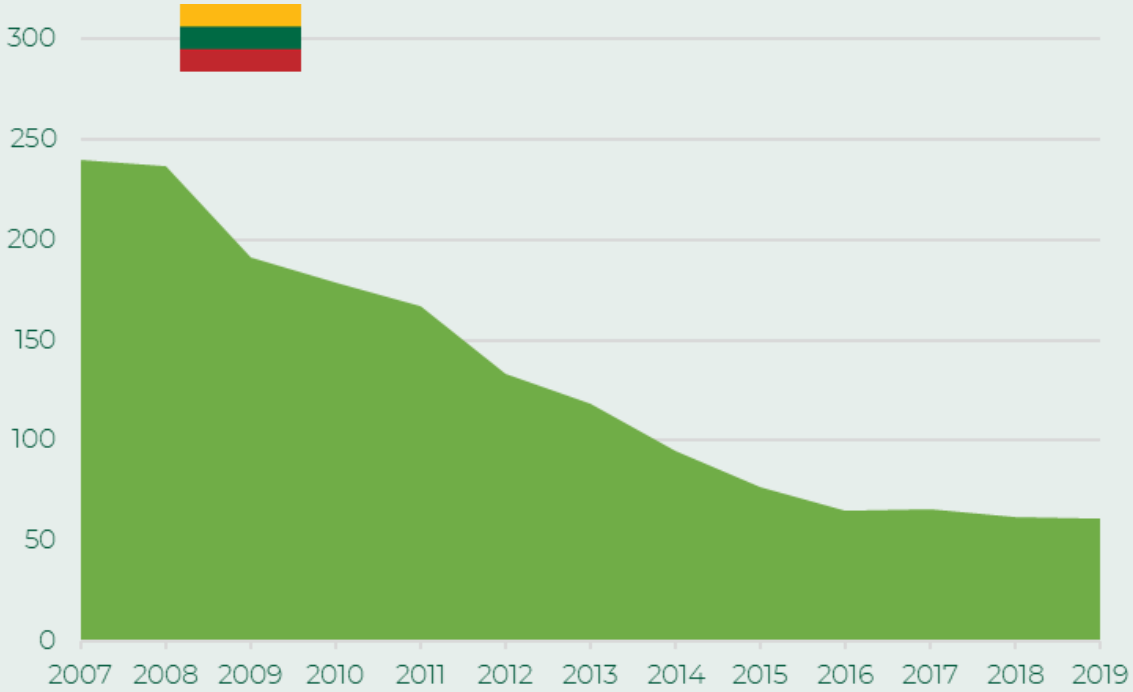
Size of DRS reuse compared to one-way glass packaging:



Lithuania: DESA

Refillable glass packaging trend in Lithuania:

Stabilizing trend (after sharp decline): sales of products in refillable glass packaging (in millions)

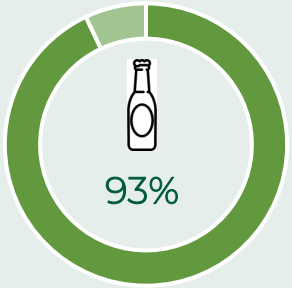


Increasing diversity of different types of reusable glass bottles included in the Lithuanian deposit return system (DESA, 2020). This is different from Estonia ("common-used packaging"), Netherlands and Sweden ("standardized bottles")

Lithuania: DESA

Return rates:

*Average annual return rate of DESA is **93%** (based on desk research)*

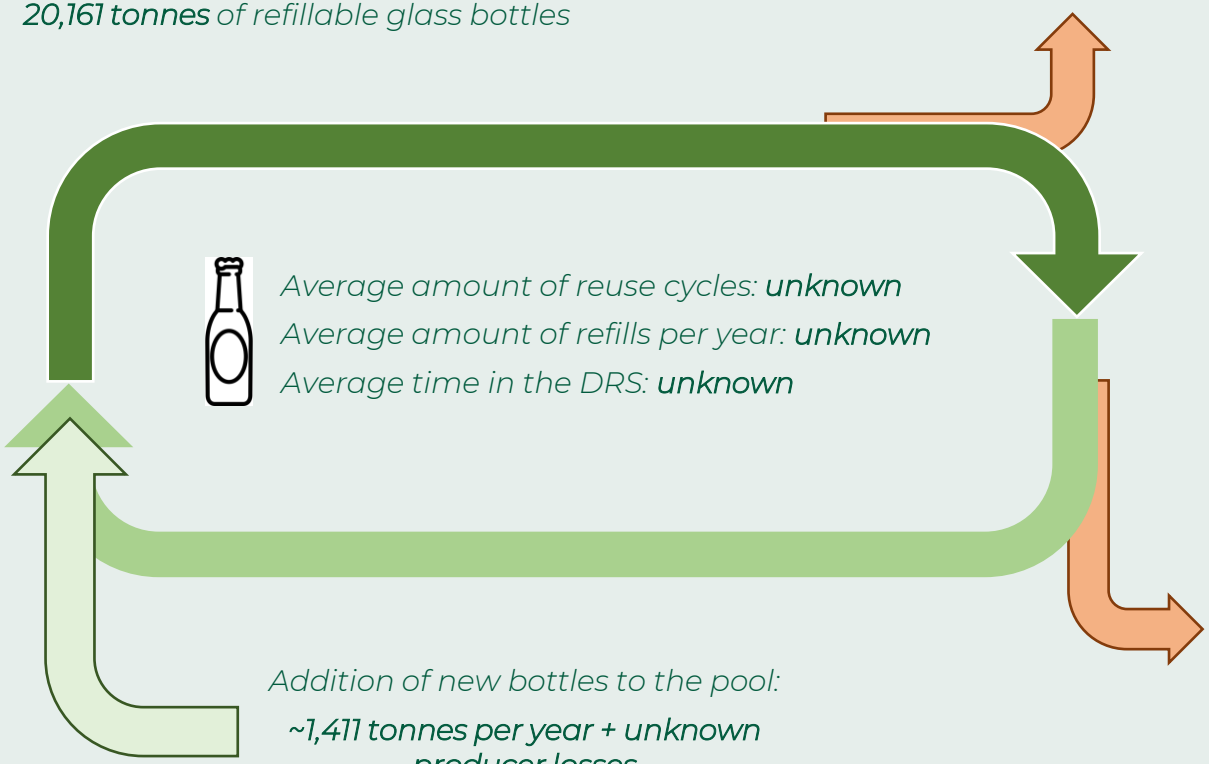


Reuse & recycling performance:

*DESA has a responsibility for a total of approximately **20,161 tonnes** of refillable glass bottles*

Annual consumer losses :

~1,411 tonnes



*Average amount of reuse cycles: **unknown***

*Average amount of refills per year: **unknown***

*Average time in the DRS: **unknown***

Annual producer losses :

unknown

Addition of new bottles to the pool:

~1,411 tonnes per year + unknown producer losses

Lithuania: DESA

Journey of the deposit through the system:

1. The bottles are filled by the producer/packaging company and sold to the retailer for price + deposit
2. Retailers sell the packaging for the price + deposit to the consumer
3. The retailer collects (via take-back network of DRS recycling USAD) and returns reusable packaging to the producer/packaging company (except for Coca-Cola that is using transportation from USAD)
4. The packaging producer/packaging company reimburses the deposit - and a handling fee to the retailer on basis of their direct agreements
5. Producers pay an additional fee to the DRS recycling USAD for using their take-back network
6. Producers add new bottles to their own stock to compensate for consumer losses

Lithuania: DESA

	Responsibilities system operator:	System operator:	If not, what actor:
Financial:	Collect deposit and producer fees from producers (based on put-on-market)	No	USAD (DRS recycling) collects producer fees
	Pay out redeemed deposits and handling fees to retailers (based on collected materials)	No	Producers
	Pay out fee to transportation and other contractors	No	Producers
Operational:	Efficient organisation of transport and sorting of collected materials	No	Producers & USAD (for Coca-Cola)
	Counting and sorting of manual collected materials	No	Retailers & producers
	Administration and handling of invoicing	Shared (only central administration)	Producers (for direct arrangements with retailers)
	Quality assurance	No	Producers
	Replace and replenish pool of bottles	No	Producers

Lithuania: DESA

Financial overview (details next slides):

Relevant costs and revenues for system operator

Type of operating costs:	*Relevant?*
Handling fees	-
Transportation costs	-
Admin & marketing costs	V
Other operating costs	-

Type of revenues:	*Relevant?*
Unredeemed deposit fees	-
Sale of collected materials	-
Producer and registration fees	-
Other operational revenues	-

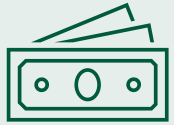
DESA is a very limited organization and only responsible for generic administration. Producer bear the costs and revenues of the system themselves (directly)

Lithuania: DESA

Economic data on the Lithuanian DRS for reuse is not publicly available. In order to get an idea of the economics and size of the system an estimation of the deposit fees is provided.

Total deposit fees

(deposit received, paid, & unredeemed)



	DRS reuse		
Total deposit fees received	M€ 6.10	€ 2.18	per capita
Total deposit fees paid	M€ 5.67	€ 2.03	per capita
Total unredeemed deposit fees	**+ M€ 0.43**	**€ 0.15**	per capita

Lithuania: DESA

Total operating cost:

The financial costs of operating the DRS for reuse in Lithuania are not publicly available.

Order of magnitude calculation:

To get a better feel of the relation between the revenues (unredeemed fees) and costs of the producers, we made an order of magnitude calculation to see how much € a producer would have for adding a new bottle to the system (if he/she didn't have other costs (e.g. washing costs, handling fee)

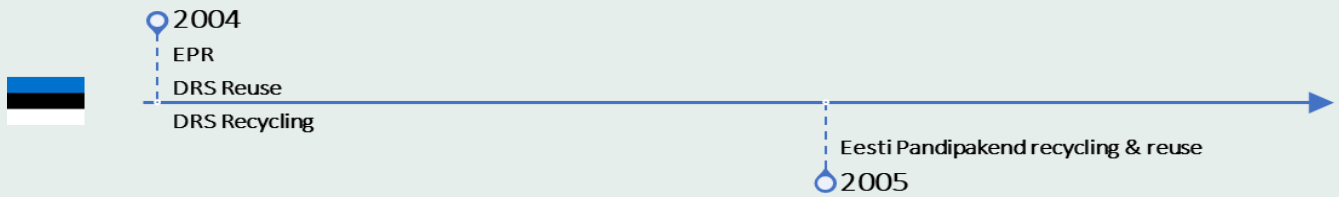
Total unredeemed deposit fees	M€ 0.43
Amount of bottles to be replaced (annual)	4.27M
€ revenue available per bottle-to-be-replaced	€ 0. 10

Estonia: Eesti Pandipakend

Type of DRS:	DRS reuse* and de jure (glass and PET)
Legal basis deposit:	Mandatory (Packaging Act 2004, Packaging Act latest update 2021)
Deposit-subjected packaging:	Beer, alcoholic beverages with low ethanol content, cider, perry and soft drinks
Mandatory participation DRS:	Yes, but organization of own DRS collection system is allowed
Date of implementation:	2005, updated 2016
Organization type:	Not-for-profit
Shareholders:	Industry: 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%)
Deposit fee:	€0.10

Implementation date:

DRS is initiated and implemented around the same time as the EPR-schemes. No link exists with the EPR-schemes.



Eesti Pandipakend is also a DRS for recycling (see case descriptions DRS recycling beneath)

Estonia: Eesti Pandipakend

Materials (in tonnes) under responsibility:

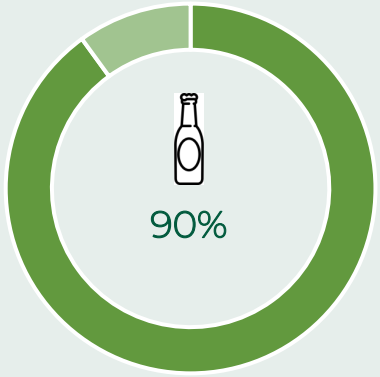
*Eesti Pandipakend has a responsibility for a total of approximately **9,915 tonnes** of refillable glass bottles under its responsibility (estimation based on items collected in 2017)*

Size of DRS reuse compared to one-way glass packaging:

Estonia: Eesti Pandipakend

Return rates:

*Average annual return rate of Eesti Pandipakend is **90%** (based on desk research)*

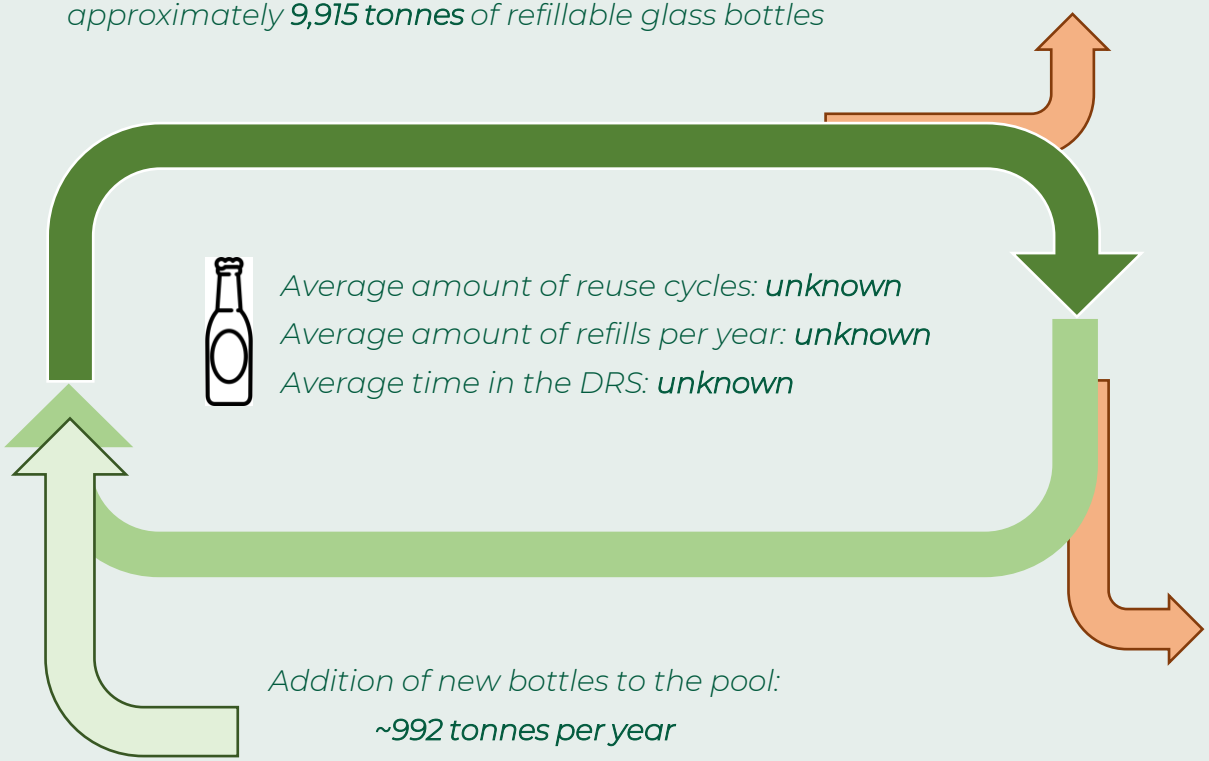


Reuse & recycling performance:

*Eesti Pandipakend has a responsibility for a total of approximately **9,915 tonnes** of refillable glass bottles*

Annual consumer losses :

~992 tonnes



*Average amount of reuse cycles: **unknown***

*Average amount of refills per year: **unknown***

*Average time in the DRS: **unknown***

Annual producer losses :

unknown

Addition of new bottles to the pool:

~992 tonnes per year

Estonia: Eesti Pandipakend

DRS structure change in 2016:

From "reusable packaging" to "common-use packaging"

14.2.2. In order to ensure smooth transition to the system of Non-Returnable and Common-Use Packagings entering into force together with the wording of these Standard Terms (in force starting with 1 September 2016), the provisions of these Standard Terms applicable to Common-Use Packagings shall be applied to the Packagings registered as "Reusable Packaging" (as defined in the standard terms in force before the entry into force of the wording of these Standard Terms) under the Contracts for Organising the Collection and Recovery of Packagings and Packaging Waste signed before the entry into force of the wording of these Standard Terms. Starting with the entry into force of these Standard Terms, EPP shall not register any new "Reusable Packagings" in the EPP Packaging Register and shall not provide services to the Packaging Company concerning the "Reusable Packagings" not registered in the EPP Packaging Register y the time of entry into force of these Standard Terms.

Update is limiting the role of the DRS to keeping the quantity of refillable glass packaging in the system optimal (and on keeping costs related to the use and collection of refillable packaging minimal)

Common-use packaging is currently limited to two types of bottles: „Baltic Amber" & „BBH"

Estonia: Eesti Pandipakend

Journey of the deposit through the system:

1. The producer joins the DRS by signing a “Common-Use Packaging Contract” and paying an accession fee. Upon signing the contract, the producer receives a license to use the “Common Packaging”.
2. The bottles are filled by the producer and sold to the retailer. The producer and retailer agree among themselves upon the take-back conditions, including a handling fee. Deposit money is transferred along with the bottles to the retailer, who pay the producer for the product + deposit.
3. The producer pays a monthly fee to the DRS (for its administrative services) and informs it quarterly on the amounts put on market.
4. The consumer buys the product for the price + the deposit.
5. The consumer returns the bottle upon which the consumer receives the deposit fee back from the retailer.
6. The bottles are transported back to the producer in line with their direct agreements.
7. Producers wash, relabel and refill the bottles. In addition, producers obtain, transfer and/or disuse bottles upon directions from the DRS. Directions are provided by the DRS with the intention to keep the bottle pool optimal for the market.

Estonia: Eesti Pandipakend

	Responsibilities system operator:	System operator:	If not, what actor:
Financial:	Collect deposit and producer fees from producers (based on put-on-market)	Partly (no deposit is collected from producers, but the system operator collects producer fees)	
	Pay out redeemed deposits and handling fees to retailers (based on collected materials)	No	Producers
	Pay out fee to transportation and other contractors	No	Producers
Operational:	Efficient organisation of transport and sorting of collected materials	No	Producers
	Counting and sorting of manual collected materials	No	Retailers & producers
	Administration and handling of invoicing	Partly (only administration & central reporting)	Producer (for direct arrangements with retailers)
	Quality assurance	Shared	Producer (responsible for own QA)
	Replace and replenish pool of bottles	Partly (only providing directions)	Producers obtain or transfer bottles

Estonia: Eesti Pandipakend

Financial overview (details next slides):

Relevant costs and revenues for system operator

Type of operating costs:	*Relevant?*
Handling fees	-
Transportation costs	-
Admin & marketing costs	V
Other operating costs	-

Type of revenues:	*Relevant?*
Unredeemed deposit fees	-
Sale of collected materials	-
Producer and registration fees	V
Other operational revenues	-

Estonia: Eesti Pandipakend

Specific economic data on the Estonian DRS for reuse is not publicly available (integrated into the general economic data of the DRS for recycling). In order to get an idea of the economics and size of the system an estimation of the deposit fees is provided.

Total deposit fees

(deposit received, paid, & unredeemed)

DRS reuse & recycling

Total deposit fees received	M€ 3.0	€ 2.26	per capita
Total deposit fees paid	M€ 2.7	€ 2.03	per capita
Total unredeemed deposit fees	**+ M€ 0.3**	**€ 0.23**	per capita

Estonia: Eesti Pandipakend

Total operating cost:

The specific financial costs of operating the Estonian DRS for reuse are not publicly separately.

Order of magnitude calculation:

To get a better feel of the relation between the revenues (unredeemed fees) and costs of the producers, we made an order of magnitude calculation to see how much € a producer would have for adding a new bottle to the system (if he/she didn't have other costs (e.g. washing costs)

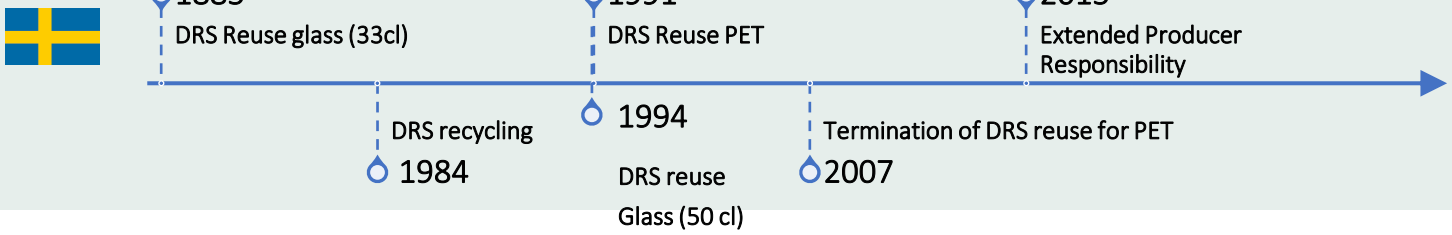
Total unredeemed deposit fees	M€ 0.3
Amount of bottles to be replaced (annual)	3 million
€ revenue available per bottle-to-be-replaced	€ 0.10

Sweden: Sveriger Bryggerier

Type of DRS:	DRS reuse (glass), two separate, identical systems
Legal basis deposit:	None (voluntary)
Deposit-subjected packaging:	None (voluntary)
Mandatory participation DRS:	No
Date of implementation:	1885 (Glass; 33 cl); 1994 (Glass; 50 cl); 1991-2007 (PET)
Organization type:	Not-for-profit
Shareholders:	Svenska Returglas 33 cl (Swedish Brewers Association (~49%), individual breweries) Svenska Returglas 50 cl (Swedish Brewers Association (~49%), individual breweries)
Deposit fee:	€0.059 (33cl); €0.089 (50cl)

Implementation date:

DRS was initiated and implemented before the implementation of the EPR-scheme. No formal link between DRS and EPR, nor between DRS reuse and DRS recycling.



Sweden: Sveriges Bryggerier

Materials (in tonnes) under responsibility:

Sveriges Bryggerier is responsible for approximately 49,474 tonnes of refillable glass per year (estimation based on desk research using different sources)

Size of DRS reuse compared to one-way glass packaging:

Sweden: Sveriges Bryggerier

Return rates:

Average annual return rate of Sveriges Bryggerier ~ 98 – 99 % (based on various sources):

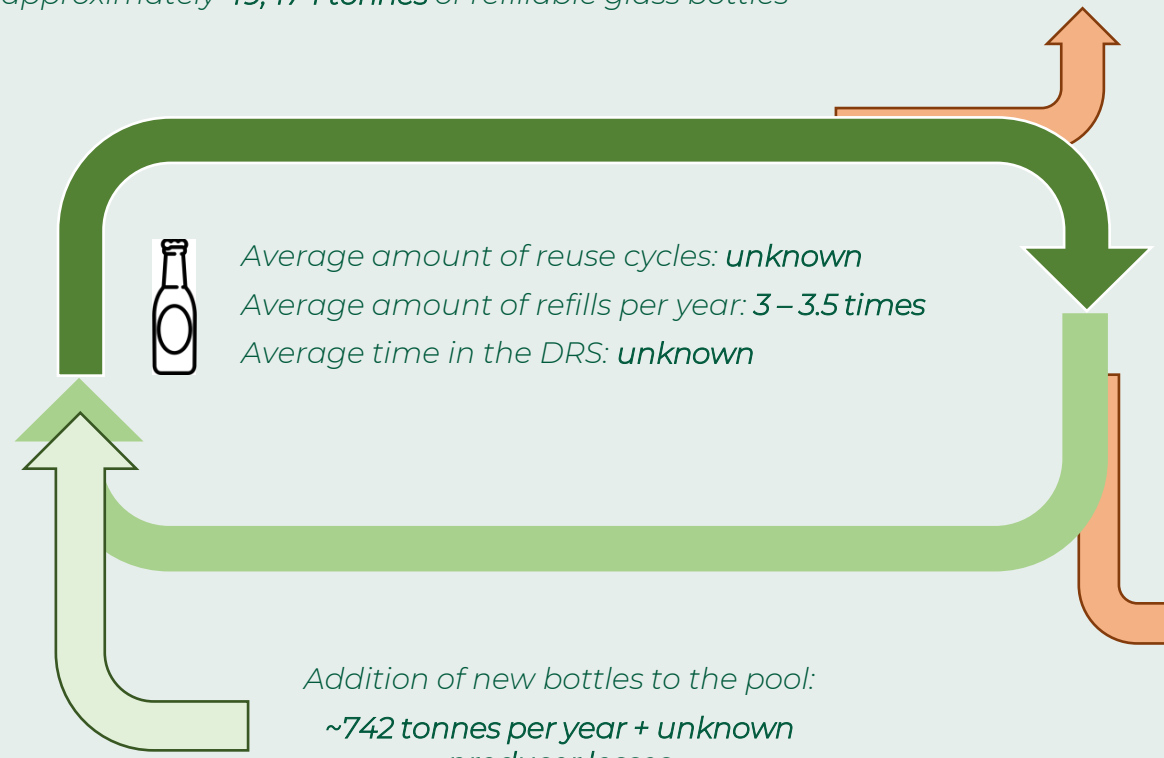
Interviewee of Sveriges Bryggerier emphasizes that for small bottles return rate is almost 100%. For large bottles, this is smaller (90 - 95%) because they aren't sold per crate and only in specific shops (Systembolaget)

Reuse & recycling performance:

*Sveriges Bryggerier has a responsibility for a total of approximately **49,474 tonnes** of refillable glass bottles*

Annual consumer losses :

~742 tonnes per year



*Average amount of reuse cycles: **unknown***

*Average amount of refills per year: **3 – 3.5 times***

*Average time in the DRS: **unknown***

Annual producer losses :

Unknown

Addition of new bottles to the pool:

~742 tonnes per year + unknown producer losses

Sweden: Sveriges Bryggerier 

Journey of the deposit through the system:

1. Brewers* buy their own bottles and fill those, after which they are sold for the price of the product + deposit to whole sellers. Payment of a handling fee is subject to direct agreements between producers and whole sellers.
2. The whole sellers sell the beverages to the retailers, for the price of the product + deposit.
3. The retailers sell the beverages to consumers for the price + after which the beverage is consumed.
4. Upon return, the consumer receives the deposit back from the retailer. The retailers temporarily store the empty bottles, until they are picked up by the whole sellers (who pay the deposit back to the retailers).
5. The bottles are picked up by large breweries who pay the deposit back to the whole sellers. The large breweries wash and check the quality of the bottles and refill them. Small breweries can purchase washed bottles from the large breweries, by paying the deposit of the bottles + a fee for washing the bottles.
6. The system operator decides if the system should expand or shrink. Any cost that follows upon a decision of the system operator is shared among the member breweries in proportion of their market share. The system operator also negotiates the price of the standardized bottles (with the bottle producer), but breweries are responsible for purchasing new bottles.

* The Swedish Competition Authority has ruled that individual breweries do not have to become a member of the industry association in order to participate in the DRS.

Sweden: Sveriges Bryggerier 

	Responsibilities system operator:	System operator:	If not, what actor:
Financial:	Collect deposit and producer fees from producers (based on put-on-market)	No	None (producers collect deposit from retailers)
	Pay out redeemed deposits and handling fees to retailers (based on direct agreements & collected materials)	No	Producers (based on direct agreements)
	Pay out fee to transportation and other contractors	No	Producers
Operational:	Efficient organisation of transport and sorting of collected materials	No	Producers
	Counting and sorting of manual collected materials	No	Retailers and producers
	Administration and handling of invoicing	Partly (only administration & central reporting)	Producer (for direct arrangements with retailers)
	Quality assurance	No	Producers
	Replace and replenish pool of bottles	Partly (only providing directions)	Producers purchase new bottles

Sweden: Sveriges Bryggerier 

Financial overview (details next slides):

Relevant costs and revenues for system operator

Type of operating costs:	*Relevant?*
Handling fees	-
Transportation costs	-
Admin & marketing costs	*V*
Other operating costs	-

Type of revenues:	*Relevant?*
Unredeemed deposit fees	-
Sale of collected materials	-
Producer and registration fees	-
Other operational revenues	*V*

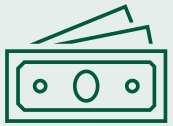
Sweden: Sveriges Bryggerier 

Economic data on the Swedish DRS for reuse is not publicly available. In order to get an idea of the economics and size of the system an estimation of the deposit fees is provided

Total deposit fees

(deposit received, paid, & unredeemed)

DRS reuse



Total deposit fees received	M€ 9.65	€ 0.93	per capita
Total deposit fees paid	M€ 9.51	€ 0.92	per capita
Total unredeemed deposit fees	**+ M€ 0.14**	**€ 0.01**	per capita

Deposit fee small bottles:	60 Öre (€0.058)
Deposit fee large bottles:	90 Öre (€0.086)

Sweden: Sveriges Bryggerier 

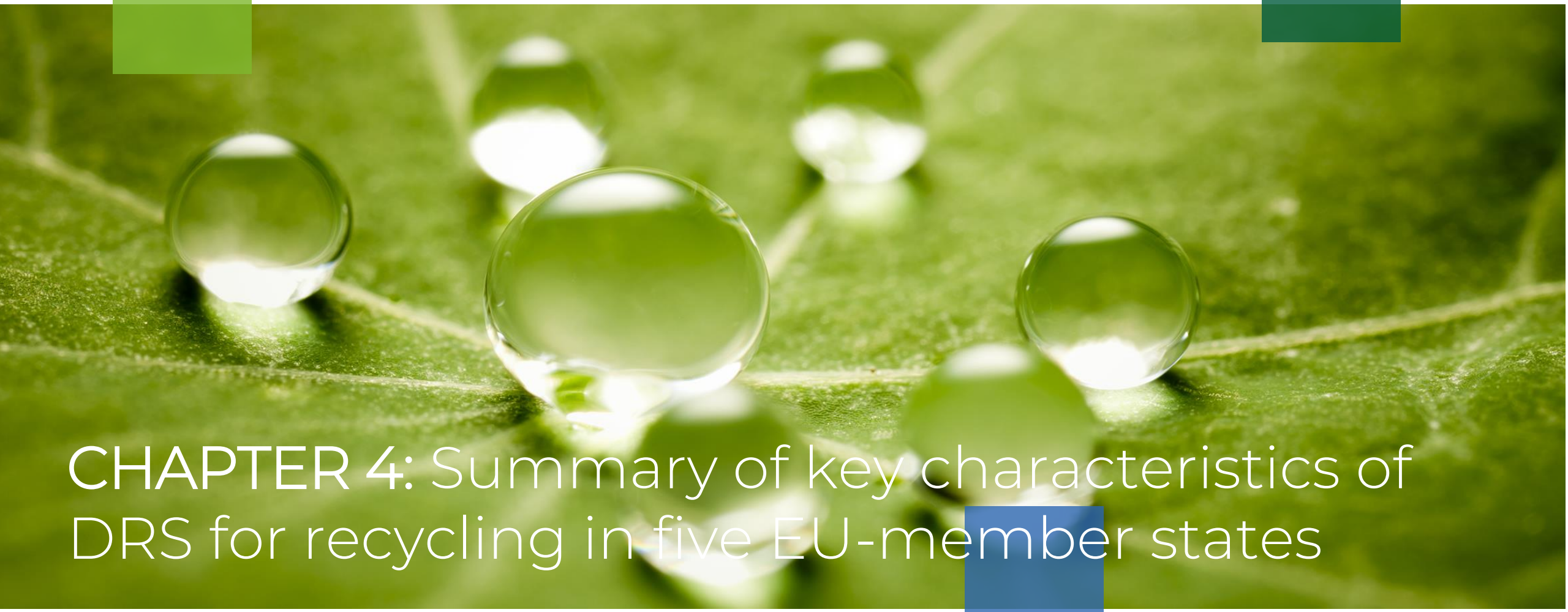
Total operating cost:

The financial costs of operating the Swedish DRS for reuse are not publicly available.

Order of magnitude calculation:

To get a better feel of the relation between the revenues (unredeemed fees) and costs of the producers, we made an order of magnitude calculation to see how much € a producer would have for adding a new bottle to the system (if he/she didn't have other costs (e.g. washing costs)

Total unredeemed deposit fees	M€ 0.14
Amount of bottles to be replaced (annual)	2.4 M
€ revenue available per bottle-to-be-replaced	€ 0.06



CHAPTER 4: Summary of key characteristics of DRS for recycling in five EU-member states

Netherlands: Statiegeld Nederland

Type of DRS:	DRS recycling (PET)
Legal basis deposit:	Mandatory (Packaging Act, i.e. Verpakkingsverordening Productschap Dranken 2003, latest update Amendment Besluit Beheer verpakkingen 2019)
Deposit-subjected packaging:	Soft drinks, water
Mandatory participation DRS:	Yes
Date of implementation:	2005, 2021
Organization type:	Not-for-profit
Shareholders:	Foundation according to Dutch law with an independent director, governed by representatives of take-back-points (Centraal Bureau Levensmiddelenhandel) and producers (Federale NL Levensmiddelenindustrie). Foundation is financed by the Dutch EPR-system (Afvalfonds Verpakkingen)
Deposit fee:	>1L: €0.25 ; <1L: €0.15

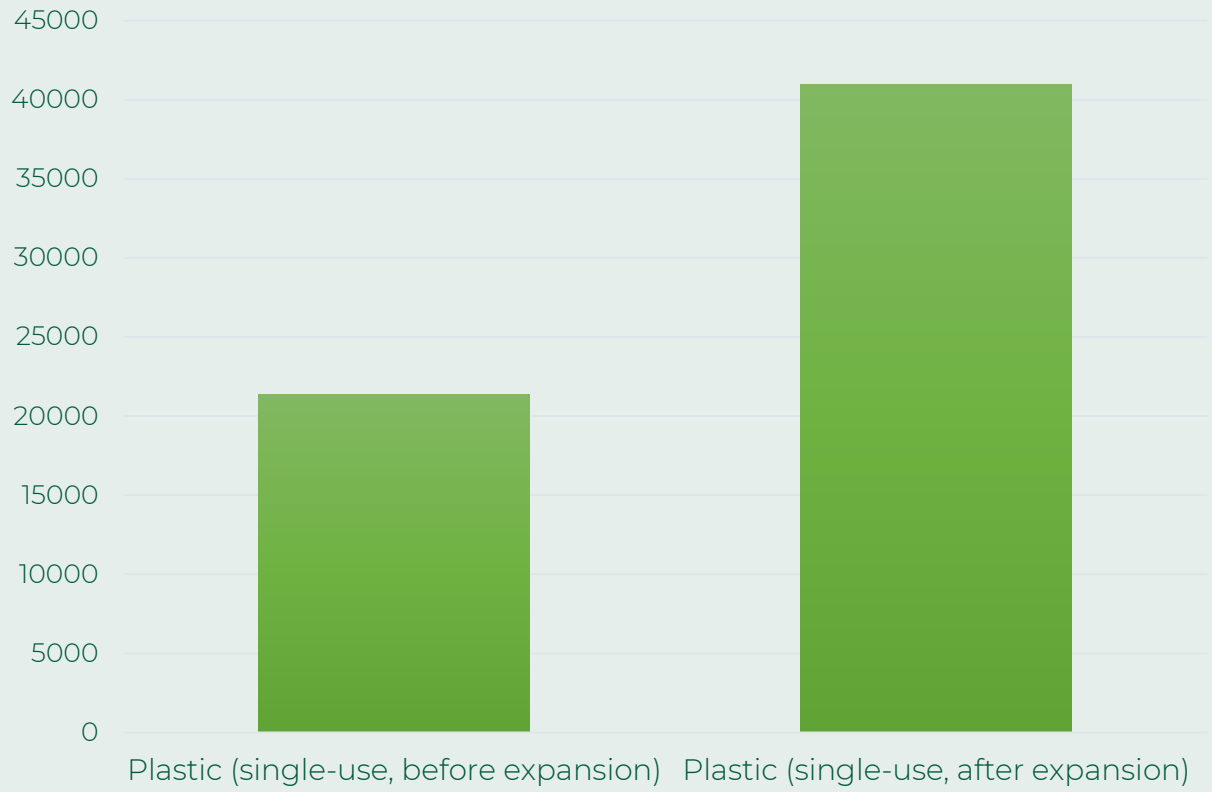
Implementation date:

DRS was initially initiated and implemented before the implementation of the EPR-scheme. Upon revisions of EPR and DRS, a formal link was established between DRS and the EPR (Afval Fondsverpakkingen) as packaging under DRS fall within responsibility of EPR.

Netherlands: Statiegeld Nederland

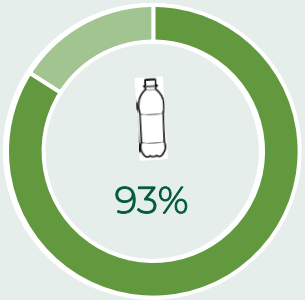
Materials (in tonnes) under responsibility:

*Before 2021, the Dutch DRS had a responsibility for a total of **27,100 tonnes** of packaging materials. With the inclusion of small plastic bottles, this is estimated to increase to approximately **41,000 tonnes** of packaging materials.*



Return rates:

Average return rate of Statiegeld Nederland is 93% (in 2018)



Plastic (single-use)

The Netherlands: Statiegeld Nederland

Market size of DRS (before expansion): Tonnes of plastic packaging under responsibility of DRS (versus total plastic packaging generated)	Tonnes:	% of total:
Plastic packaging:		
- *Total generated:*	245,934	100%
- *Put-on-market DRS fraction:*	27,104	11%
- *Collected DRS fraction:*	22,361	9.1%

The Netherlands: Statiegeld Nederland

Journey of the deposit through the system:

1. The producer sells packaging to a retailer and receives the price and the deposit.
2. The retailer then sells this to a consumer and receives the price + the deposit.
3. The producer informs Statiegeld Nederland on a periodic basis on the amount of packaging put-on-the-market. The DRS 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 the EPR)
4. When the bottle is returned by the consumer, she receives back the deposit from the retailer. The bottles are collected by the wholesaler (producers), transported to their distribution center, and hereafter to the counting center of Statiegeld Nederland.
5. Statiegeld Nederland scans the bottles (via EAN-code) and calculates the deposit (and handling fee) to be received by the retailer.
6. Statiegeld Nederland sends the collected bottles back to the producers (to sell or recycle the material), or, for smaller producers, Statiegeld Nederland sells the material and distributes the sales revenues.

The Netherlands: Statiegeld Nederland

	Responsibilities system operator:		If not, who:
Financial:	Collect deposit and producer fees from producers (based on put-on-market)	Yes	
	Pay out redeemed deposits and handling fees to retailers (based on collected materials)	Yes	
	Pay out fee to transportation and other subcontractors	Yes	
	Sale of collected materials to recyclers	No	Producers
Operational:	Efficient organisation of transport and sorting of collected materials	Shared	Producers (shared)
	Baling and sorting of materials collected with RVMs	Yes	
	Counting and sorting of manual collected materials	Yes	
	Administration and handling of invoicing	Yes	
	Reporting statistics to responsible authority	Yes	

The Netherlands: Statiegeld Nederland

Financial overview (details next slides):

Relevant costs and revenues for system operator

Type of operating costs:	*Relevant?*
Handling fees	*V*
Transportation costs	*V*
Admin & marketing costs	*V*
Other operating costs	*V*

Type of revenues:	*Relevant?*
Unredeemed deposit fees	*V*
Sale of collected materials	*-*
Producer and registration fees	*V*
Other operational revenues	*V*

The Netherlands: Statiegeld Nederland

Total operating cost:

The financial costs of the Dutch DRS for recycling are not publicly available. To get a basic understanding of the most important operating costs, we asked the interviewee of 'Statiegeld NL' to specify the most important costs (qualitatively). In descending order of importance:

- Handling fees;
- Transportation costs;
- Costs related to counting and administration;
- Marketing and communication costs.

The Netherlands: Statiegeld Nederland

Economic data on the Dutch DRS for recycling is not publicly available. In order to get an idea of the size of the system an estimation of the deposit fees and producer fees is provided.

Total deposit fees

(deposit received, paid, & unredeemed)

DRS recycling

Total deposit fees received	M€ 300	€ 17.41	per capita
Total deposit fees paid	M€ 279	€ 16.03	per capita
Total unredeemed deposit fees	**+ M€ 21**	**€ 1.21**	per capita

Break-down estimation (deposits)

Large PET bottles

Amount of large PET bottles (>0.75L):	600 million
Deposit value large PET bottles (>0.75L):	€0.25
Deposit received large bottles (>0.75L):	**M€150**

Small PET bottles

Estimated amount of small PET bottles (<0.75L):	1 billion
Deposit value small PET bottles (<0.75L):	€0.15
Deposit received small bottles (<0.75L):	**M€150**
Total deposit fees received	**+ M€300**

Total producer fees

Large PET bottles

Amount of large PET bottles (>0.75L):	600 million
Producer fee large PET bottles (>0.75L):	€0.019
Producer fee large bottles (>0.75L):	**M€11.4**

Small PET bottles

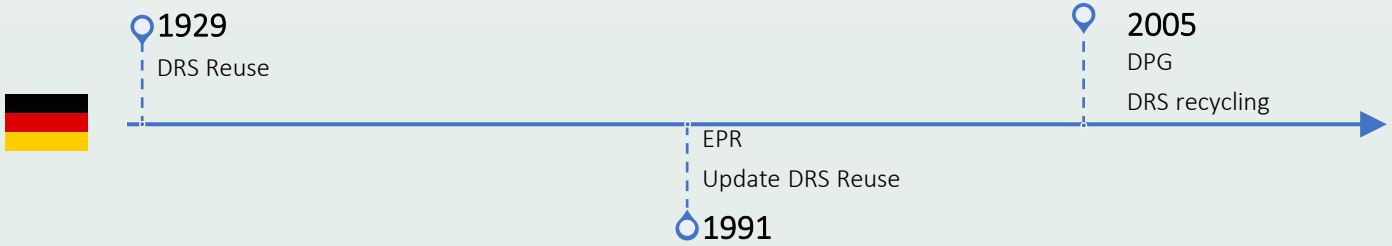
Estimated amount of small PET bottles (<0.75L):	1 billion
Producer fee small PET bottles (<0.75L):	€0.016
Producer fee small bottles (<0.75L):	**M€16**
Total producer fees	**+ M€27.4**

Germany: Deutsche Pfandsystem

Type of DRS:	DRS recycling (aluminum, PET, glass) 
Legal basis deposit:	Mandatory (Packaging Ordinance, 1991; VerpackG, 2019)
Deposit-subjected packaging:	Water, beer and mixed drinks containing beer (incl. alcohol-free beer), carbonated/non-carbonated soft drinks, mixed alcohol drinks, sparkling wine, mixed sparkling wine drinks*, wine and mixed wine drinks*, wine-like drinks and mixed drinks*, alcohol products and other mixed drinks containing alcohol*, fruit juices and vegetable juices*, non-carbonated fruit nectars and non-carbonated vegetable nectars*, milk and mixed milk drinks and other drinkable milk products**
Mandatory participation DRS:	Yes
Date of implementation:	2005
Organization type:	Not-for-profit
Shareholders:	Industry: 50% German Retail Federation e.V. (HDE), 50% Federation of German Food and Drink Industries e.V.
Deposit fee:	€0.25

Implementation date:

DPG was implemented in 2005, after the implementation of the national EPR-system. No formal link between DRS and the EPR systems, nor between DRS reuse and DRS recycling. DRS for recycling was introduced to preserve refillable packaging on the German market.

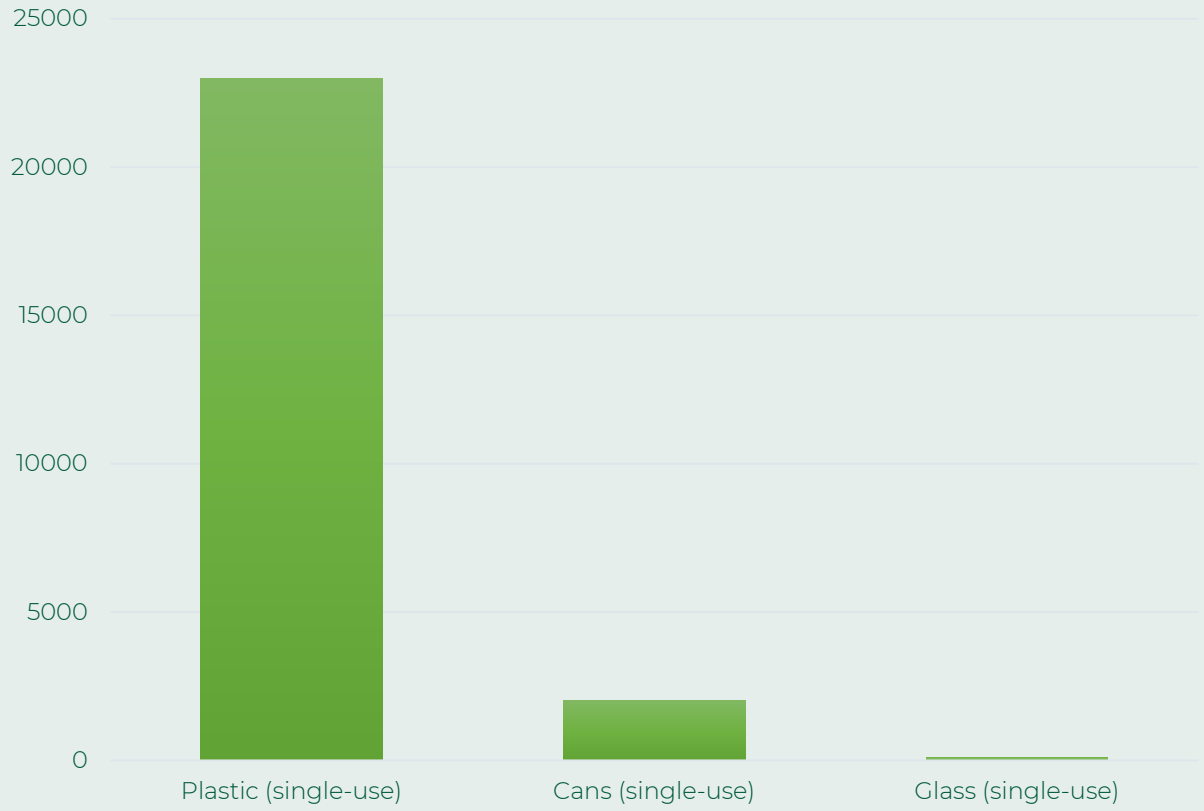


** from 1 January 2022* *** from 1 January 2022 except (mixed) milk drinks in plastic bottles (only to be included from 1 January 2024)*

Germany: Deutsche Pfandsystem

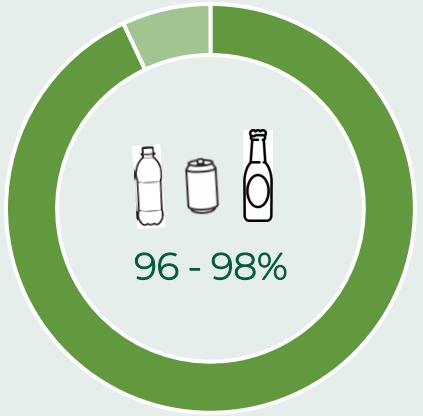
Beverage containers (in liters) under responsibility:

In 2018, 44.0 billion liters of beverages were consumed in Germany. The total share of DPG-packaging was estimated at 57.4%, i.e. 25.3 billion liters of beverages:



Return rates:

DPG reports an overall return rate between 96 – 98% (for all materials combined)



Germany: Deutsche Pfandsystem

Market size of the DRS:

Data on the volumes of the DPG-system are mainly reported in liters and not specified per fraction. Using a combination of data sources an estimation is made for the market size of the DRS in terms of fraction of total packaging waste generated (for plastic and cans):

	Tonnes:	% of total:
Plastic packaging:		
- *Total generated:*	3,235,800	100%
- *Put-on-market DRS fraction:*	406,100	12.6%
- *Collected DRS fraction:*	390,600	12.1%
Cans packaging:		
- *Total generated*	133,400	100%
- *Put-on-market DRS fraction*	90,563	67,9%
- *Collected DRS fraction*	88,752	66.5%

Germany: Deutsche Pfandsystem

Journey of the deposit through the system:

1. Before entering the market, the producer has to apply for a “global location number” (GLN, via GS1) and register with the DPG. The DPG has formulated a standardized Terms and Conditions of Participation, obliging the producer to respect the framework conditions and standards set by the system operator.
2. Hereafter, the producer has to register in the DPG System Database. This System Database will ensure – at a later step – that retailers can determine which producer to claim a deposit from. Producers are subsequently required to apply mandatory labelling with specific DPG ink on their packaging. DPG marking can only be applied by certified can manufacturers and label printers.
3. The producer then sells the product to a retailer and receives the price + the deposit.
4. The retailer then sells this to a consumer and receives the price + the deposit.
5. When the bottle is returned by the consumer, she receives back the deposit from the retailer. The retailer can subsequently claim the deposit back using the information from the DPG System Database. The retailer can settle the deposit invoice himself or make use of a refund claimant service provider. Also, the producer can make use of a service provider (deposit account service provider) instead of handling requests himself.
6. The retailer does not receive a handling fee, but becomes the owner of the collected packaging materials. Unredeemed deposits stay with the producers.

Germany: Deutsche Pfandsystem

	Responsibilities system operator:		If not, who:
Financial:	Collect deposit and producer fees from producers (based on put-on-market)	No	Not relevant
	Pay out redeemed deposits and handling fees to retailers (based on collected materials)	No	Producers (only redeemed deposits)
	Pay out fee to transportation and other subcontractors	No	Retailers
	Sale of collected materials to recyclers	No	Retailers
Operational:	Efficient organisation of transport and sorting of collected materials	No	Retailers
	Baling and sorting of materials collected with RVMs	No	Retailers
	Counting and sorting of manual collected materials	Partly (certification of sorting plants)	
	Administration and handling of invoicing	No	Retailers
	Reporting statistics to responsible authority	Yes	

Germany: Deutsche Pfandsystem

Financial overview (details next slides):

Relevant costs and revenues for system operator

Type of operating costs:	*Relevant?*
Handling fees	-
Transportation costs	-
Admin & marketing costs	V
Other operating costs	-

Type of revenues:	*Relevant?*
Unredeemed deposit fees	-
Sale of collected materials	-
Producer and registration fees	-
Other operational revenues	V

DPG does not have direct tasks or responsibilities in managing the material or financial flows of the system. Its activities (and costs) are restricted to the management of the nationwide system, including guarantee the reliable operation of the DPG System Database, develop binding labelling standards, maintain legally compliant contracts for all system partners, implement IT interface management, and marketing and the public relations work.

Germany: Deutsche Pfandsystem

Economic performance of the German system:

Detailed and up-to-date information on the economic performance of the system operator of the German system wasn't available for the current study. In order to get a better understanding of the economic performance of the full system, an extrapolation of data from older studies was made (see next sheets). This extrapolation provides an overall order-of-magnitude calculation of the costs and benefits per stakeholder in the system. It is important to emphasize that the used data and key assumptions, weren't verified by the actors and organizations above.

Key assumptions:

- Deposit amount per unit (PET): € 0.25 (Roland Berger, 2008)
- Total annual costs (2008): M€793 (Roland Berger, 2008)
  - Total costs retailers (2008): M€699 (Roland Berger, 2008)
  - Total costs industry (2008): M€94 (Roland Berger, 2008)
- Total units 2008 (PET, cans and glass): 14 billion (Roland Berger, 2008)
- Total units 2018 (PET & cans): 18 billion (DPG, 2020)

Literature & data sources:

- Roland Berger (2008) *Experience with the introduction of a mandatory deposit system in Germany.* (Report)
- Deutsche Pfandsystem GmbH (2020) *Aufkommen und Verwertung von PET-Getränkeflaschen in Deutschland 2019.* (Report)

Germany: Deutsche Pfandsystem

Costs of the system:

The total cost of the deposit return system are carried by two stakeholders: (1) retail and (2) industry .

To make an estimation for total costs and cost per stakeholder in 2018, we used the cost per unit derived from data in the Roland Berger report from 2008. The total cost per unit amounted €0,06, with about €0,05 per unit for retail and €0,01 for industry.

Total costs therefore amounted to approximately €1,09 billion in 2018:

- Cost for retail were around €0,95 billion
- Cost for industry were around €0,13 billion

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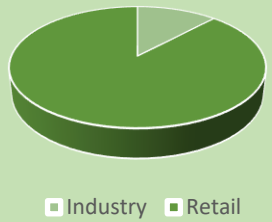


Revenues of the system:

The revenue of the German DRS consists of two elements: (1) unredeemed deposits, which go to industry, and (2) sale of recovered materials, of which the retail sector profits.

(1) **Unredeemed deposits:** relying on the annual report of DPG, about 18 billion PET-bottles were distributed onto the German market in 2019. As we know that the German system has a return rate of 97%, this means that revenue from unredeemed deposit was about €0,14 billion.

(2) **Material sales:** prices of collected material are subject to many different variables such as demand and quality of the material. Prices are therefore volatile, and calculations are based on rough estimates. Based on other case studies exercised in this report, we estimate the following prices for collected material:

Between €250-€450 per ton PET
Between €800-€1200 per ton cans

In 2018, the German DRS collected 453,4 kiloton PET and 21,9 kiloton cans (respectively 92% and 8%)

Based on this, the revenue of material sold accumulates to approximately €0,13 billion to €0,23 billion.

Financial overview:

Total costs	€ 1,09 billion
Total revenue	€0,27 billion - €0,37 billion
Netto costs	€ 0,71 billion and € 0,81 billion

Financial performance:

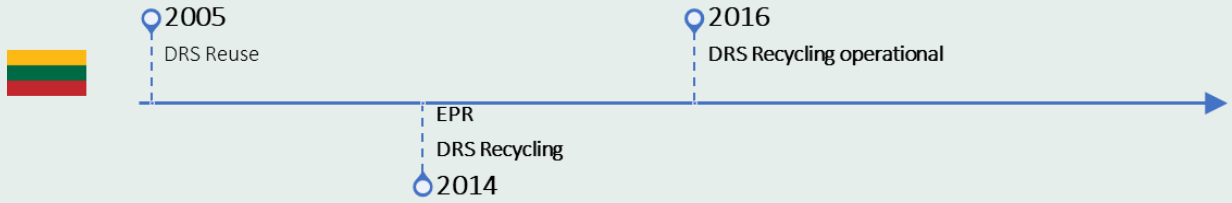
Following the calculations above, the system has a negative financial performance for 2018: between € -0,71 and -0,81 billion. With a population of 83,9 million (in 2018), this means a cost per capita between €8,46 and €9,65. With a collected amount of material of 475,3 kiloton, this means a cost per collected tonne between € 149,38 and € 170,41.

Lithuania: USAD

Type of DRS:	DRS recycling (aluminium, PET, glass) 
Legal basis deposit:	Mandatory (Law on packaging and packaging waste 2001, Amendment Law on Packaging Waste, 2018)
Deposit-subjected packaging:	Beer and beer cocktails, cider and other fermented beverages, mixed alcohol and non-alcohol beverages, all types of water, juice and nectars. Fruit wines and wine-product cocktailers are included when sold in plastic and metal packaging
Mandatory participation DRS:	Yes
Date of implementation:	2016
Organization type:	Not-for-profit
Shareholders:	Industry: The Lithuanian Brewers Association, the Association of Lithuanian Trade Enterprises and the Lithuanian Natural Mineral Water Manufacturers' Association
Deposit fee:	€0.10

Implementation date:

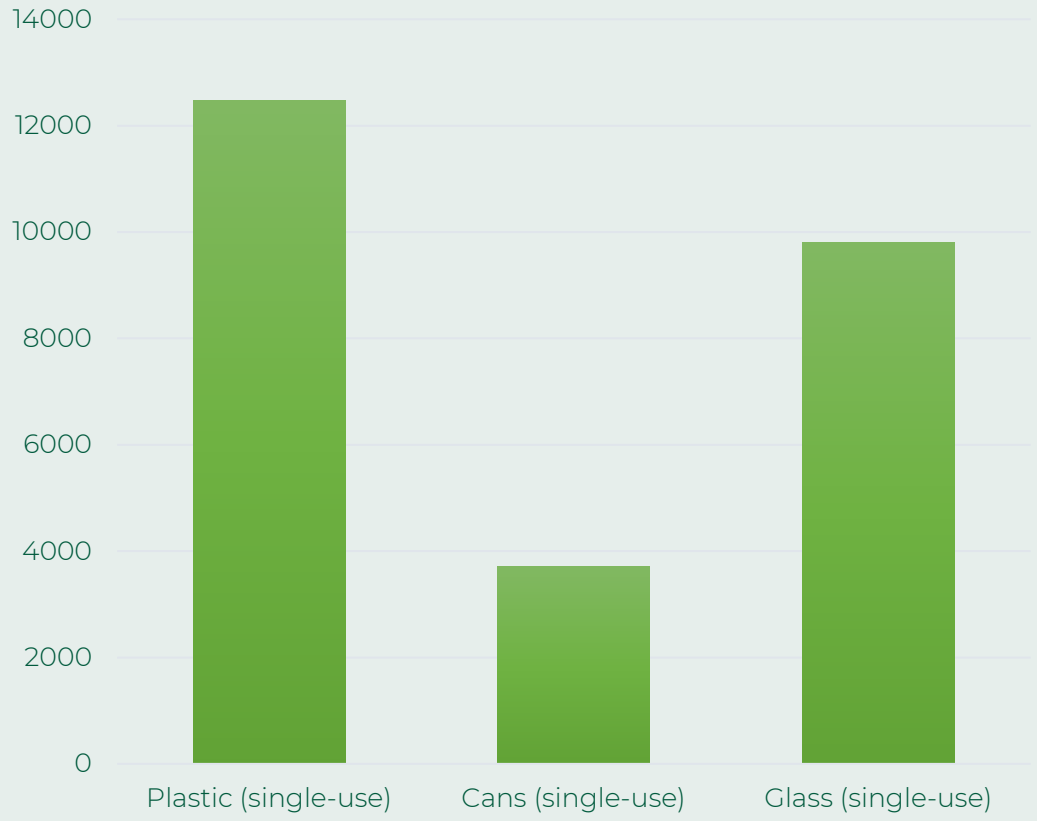
DRS is initiated and implemented around the same time as the EPR-schemes. No link exists with the EPR-schemes.



Lithuania: USAD

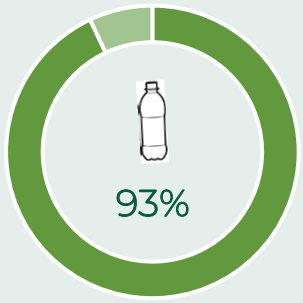
Materials (in tonnes) under responsibility:

*USAD has a responsibility for a total of **25,997** tonnes of packaging materials (representing 7.3% of all packaging waste generated in Lithuania (2018))*

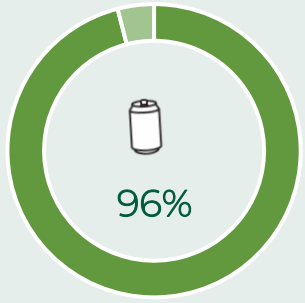


Return rates:

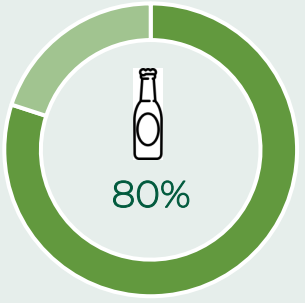
Average return rate of USAD is 90% (in 2018)



Plastic (single-use)



Cans (single-use)



Glass (single-use)

Lithuania: USAD

Market size of DRS: Tonnes of packaging under responsibility (versus total POM per packaging type)	Tonnes:	% of total:
Plastic packaging:		
- *Total generated:*	75,857	100%
- *Put-on-market DRS fraction:*	12,481	16.45%
- *Collected DRS fraction:*	11,609	15.30%
Cans packaging:		
- *Total generated*	16,734	100%
- *Put-on-market DRS fraction*	3,717	22.21%
- *Collected DRS fraction*	3,573	21.35%
Glass packaging:		
- *Total generated:*	70,161	100%
- *Put-on-market DRS fraction:*	9,799	13.97%
- *Collected DRS fraction:*	7,825	11.15%

Lithuania: USAD

Journey of the deposit through the system:

1. The producer sells the packaged product to the retailer, who pays the price of the product + the deposit.
2. The producer informs the system operator on the amount of product put on market and pays the corresponding deposit (on a monthly basis). The system operator functions as the deposit holder.
3. The retailer sells the product to consumers, who pay the price of the product + the deposit for the packaging.
4. Upon return, the retailer reimburses the deposit to the consumer.
5. Packaging is transported from the retailer to the system operator (USAD), where the material is inspected and counted. Hereafter, the system operator refund the retailer for all accepted packaging.
6. USAD is the owner of the materials in the DRS. After collecting and sorting the packaging material, USAD sells it to recycling companies.

Lithuania: USAD

Responsibilities system operator:			If not, who:
Financial:	Collect deposit and producer fees from producers (based on put-on-market)	Yes	
	Pay out redeemed deposits and handling fees to retailers (based on collected materials)	Yes	
	Pay out fee to transportation and other contractors	Yes	
	Sale of collected materials to recyclers	Yes	
Operational:	Efficient organisation of transport and sorting of collected materials	Yes	
	Baling and sorting of materials collected with RVMs	Yes	
	Counting and sorting of manual collected materials	Yes	
	Administration and handling of invoicing	Yes	
	Reporting statistics to responsible authority	Yes	

Lithuania: USAD

Financial overview (details next slides):

Relevant costs and revenues for system operator

Type of operating costs:	*Relevant?*
Handling fees	*V*
Transportation costs	*V*
Admin & marketing costs	*V*
Other operating costs	*V*

Type of revenues:	*Relevant?*
Unredeemed deposit fees	*V*
Sale of collected materials	*V*
Producer and registration fees	*V*
Other operational revenues	*V*

Lithuania: USAD

Total operating costs

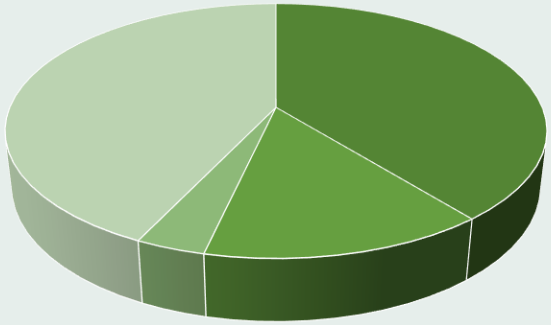
(total, per inhabitant, & per tonnes)

	DRS recycling
Total costs	M€ 27.94
Costs / inhabitant	€ 10
Costs / collected tonnes	€ 1214.24

Total operating costs

(break-down per cost item)

System operating costs:



	DRS recycling
Handling fees	M€ 10.94
Transportation costs	M€ 4.02
Admin & marketing costs	M€ 0.98
Other operating costs	M€ 11.99

Lithuania: USAD

Total deposit fees

(deposit received, paid, & unredeemed)

DRS recycling

Total deposit fees received	M€ 66.96	€ 23.96	per capita
Total deposit fees paid	M€ 61.27	€ 21.93	per capita
Total unredeemed deposit fees	**+ M€ 5.69**	**€ 2.04**	per capita

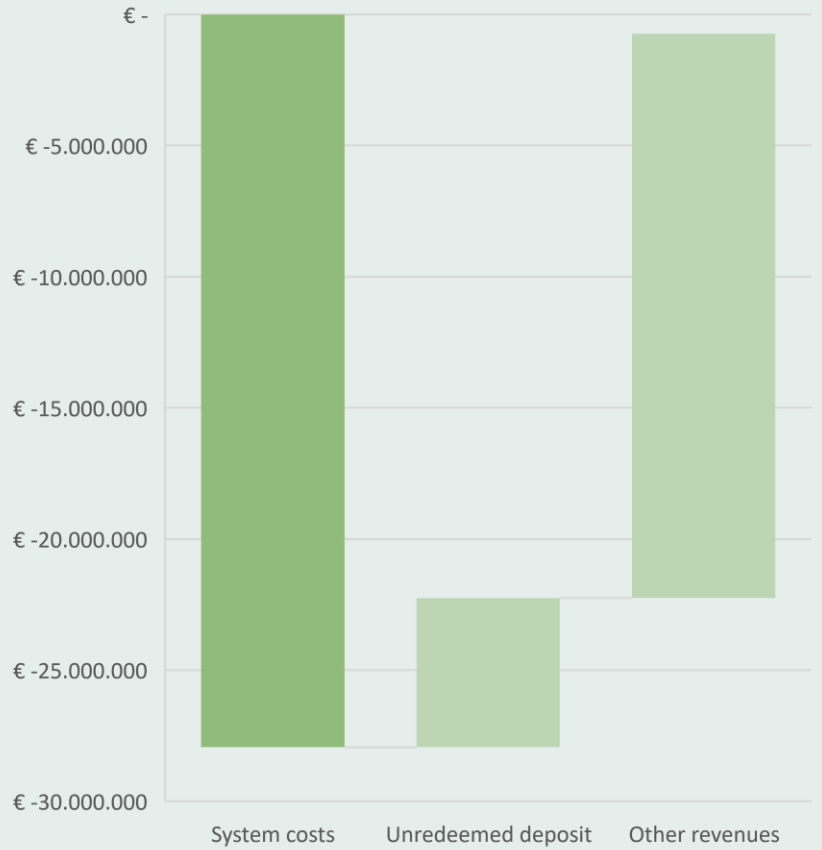
Other revenues

(producer fees & sales of materials)

DRS recycling

Sale of collected materials	M€ 7.86
Producer and registration fees	M €13.58
Other operational revenues	M€ 0.08
Total other revenues	**+ M€ 21.52**

Share of system costs covered by unredeemed deposits and other revenues

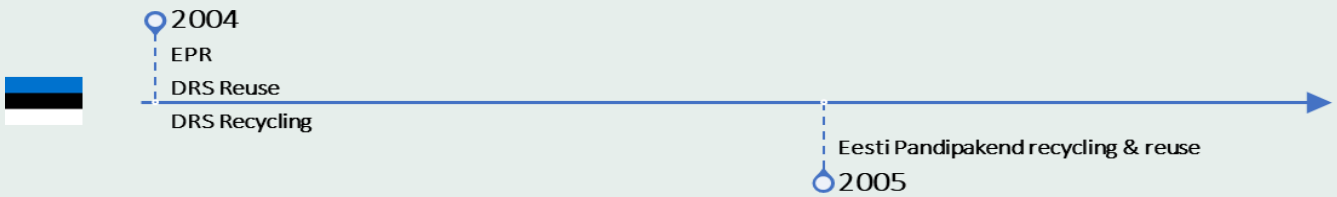


Estonia: Eesti Pandipakend

Type of DRS:	DRS recycling (aluminum, PET, glass) 
Legal basis deposit:	Mandatory (Packaging Act 2004, Packaging Act latest update 2021)
Deposit-subjected packaging:	Soft drinks, water, juice, juice concentrates, nectars, beer, cider, perry, low-alcohol (<– 6% alcohol content) beverages
Mandatory participation in DRS:	Yes
Date of implementation:	2005
Organization type:	Not-for-profit
Shareholders:	Industry: 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%)
Deposit fee:	€0.10

Implementation date:

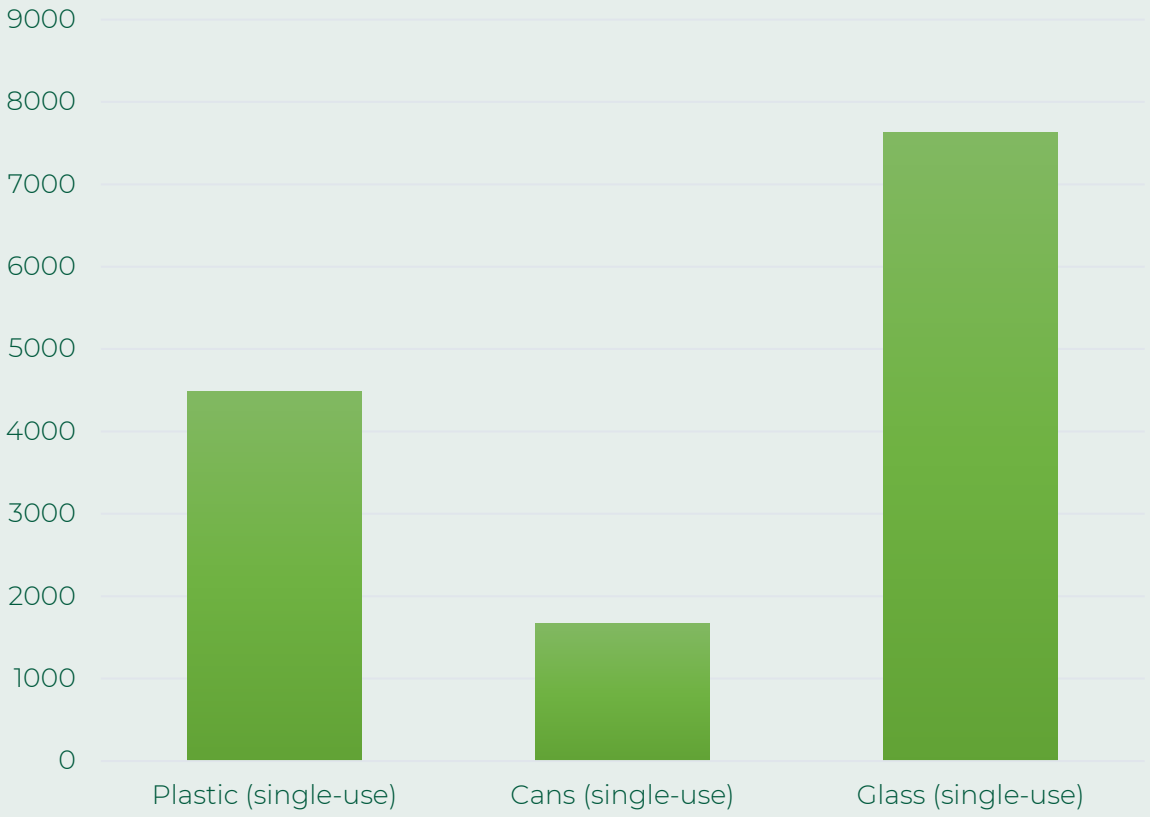
DRS is initiated and implemented around the same time as the EPR-schemes. No link exists with the EPR-schemes.



Estonia: Eesti Pandipakend

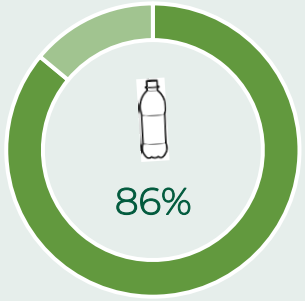
Materials (in tonnes) under responsibility:

*Eesti Pandipakend has a responsibility for a total of **13,780 tonnes** of packaging materials for recycling (representing 6.6% of all packaging waste generated in Estonia (2018))*

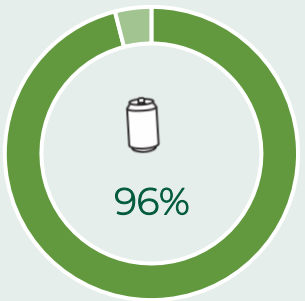


Return rates:

Average return rate of Eesti Pandipakend (refillable excluded) is 91% (in 2018)



Plastic (single-use)



Cans (single-use)

Glass (single-use)

Estonia: Eesti Pandipakend

Market size of DRS: Tonnes of packaging under responsibility (versus total POM per packaging type)	Tonnes:	% of total:
Plastic packaging:		
- *Total generated:*	55,393	100.0%
- *Put-on-market DRS fraction:*	4,480	8.1%
- *Collected DRS fraction:*	3,853	7.0%
Cans packaging:		
- *Total generated*	16,541	100%
- *Put-on-market DRS fraction*	1,670	10.1%
- *Collected DRS fraction*	1,603	9.7%
Glass packaging:		
- *Total generated:*	37,262	100%
- *Put-on-market DRS fraction:*	7,630	20.5%
- *Collected DRS fraction:*	6,867	18.4%

Estonia: Eesti Pandipakend

Journey of the deposit through the system:

1. When a producer puts a product on the market, deposit money is paid to the system operator, Eesti Pandipakend. Eesti Pandipakend, from that moment on, functions as a deposit holder
2. The beverage is sold, from the producer to the retailer, for the price + deposit money, paid by the retailer
3. The retailer sells the product for the price + deposit
4. Packaging is returned to the retailer, upon which the deposit is paid back to the consumer.
5. Material is collected and sent to Eesti Pandipakend's handling center Tallinn where it is counted and sorted and prepared for recycling. Based upon the counted amount of packaging, a monthly payment is made to the retailer by Eesti Pandipakend.
6. Eesti Pandipakend remains the owner of the material throughout the entire process. When packaging is returned, the system operator sells it: all collected cans to other EU countries (mainly France and England); plastic bottles & transparent call auctioned to Estonian recyclers; and coloured glass to recyclers abroad

Estonia: Eesti Pandipakend

	Responsibilities system operator:	If no, who is responsible:
Financial:	Collect deposit and producer fees from producers (based on put-on-market)	Yes
	Pay out redeemed deposits and handling fees to retailers (based on collected materials)	Yes
	Pay out fee to transportation and other contractors	Yes
	Sale of collected materials to recyclers	Yes
Operational:	Efficient organisation of transport and sorting of collected materials	Yes
	Baling and sorting of materials collected with RVMs	Yes
	Counting and sorting of manual collected materials	Yes
	Administration and handling of invoicing	Yes
	Reporting statistics to responsible authority	Yes

Estonia: Eesti Pandipakend

Financial overview (details next slides):

Relevant costs and revenues for system operator

Type of operating costs:	*Relevant?*
Handling fees	*V*
Transportation costs	*V*
Admin & marketing costs	*V*
Other operating costs	*V*

Type of revenues:	*Relevant?*
Unredeemed deposit fees	*V*
Sale of collected materials	*V*
Producer and registration fees	*V*
Other operational revenues	*V*

Estonia: Eesti Pandipakend

Total operating costs

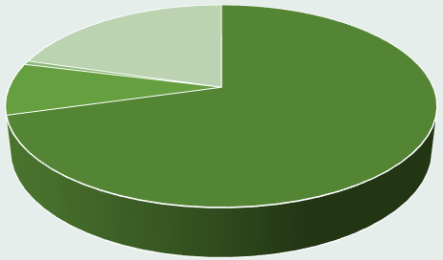
(total, per inhabitant, & per tonnes)

	DRS reuse & recycling
Total costs	M€ 10.63
Costs / inhabitant	€ 8.05
Costs / collected tonnes	€ 862.61

Total operating costs

(break-down per cost item)

System operating costs:



	DRS reuse & recycling
Handling fees	M€ 7.05
Transportation costs	M€ 0.89
Admin & marketing costs	M€ 0.07
Other operating costs	M€ 2.17

Handling fees *Transportation costs* *Admin & marketing costs* *Other operating costs*

Estonia: Eesti Pandipakend

Total deposit fees

(deposit received, paid, & unredeemed)

DRS reuse & recycling

Total deposit fees received	M€ 27.89	€ 21.05	per capita
Total deposit fees paid	M€ 23.97	€ 18.04	per capita
Total unredeemed deposit fees	**+ M€ 3.92**	**€ 2.95**	per capita

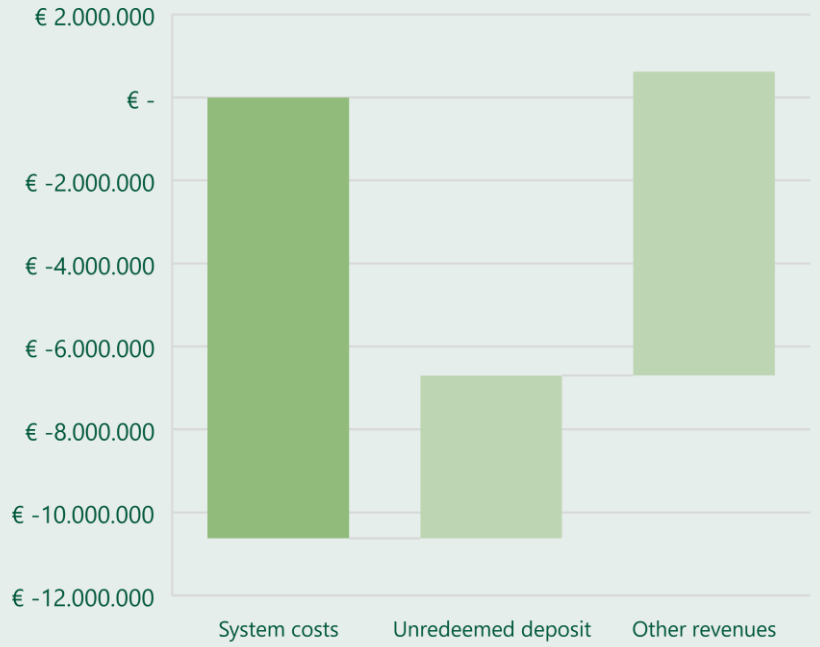
Other revenues

(producer fees & sales of materials)

DRS reuse & recycling

Sale of collected materials	M€ 4.24
Producer and registration fees	M €2.85
Other operational revenues	M€ 0.24
Total other revenues	**+ M€ 7.33**

Share of system costs covered by unredeemed deposits and other revenues



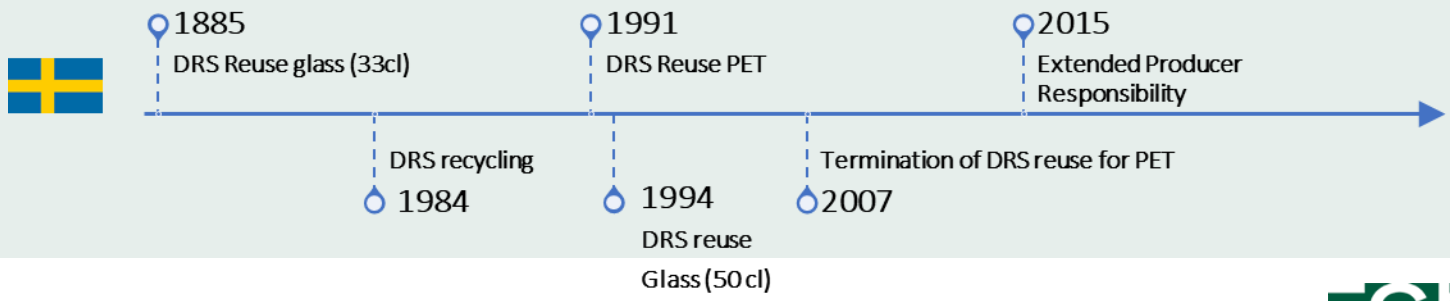
Sweden: Returpack

PANTAMERA

Type of DRS:	DRS recycling (aluminum, PET)
Legal basis deposit:	Mandatory (Packaging Act, i.e. Förordning om producentansvar för förpackningar 1994, latest update Enhetlig och effektiv marknadskontroll 2020)
Deposit-subjected packaging:	All ready-to-drink beverages including beer, soft drinks, cider, bottled water
Mandatory participation DRS:	Yes
Date of implementation:	1984; 1994
Organization type:	Not-for-profit
Shareholders:	Industry: Sveriges Bryggerier (50%), Svensk Dagligvaruhandel (25%), Livsmedelshandlarna (25%)
Deposit fee:	€0.096 to €0.19

Implementation date:

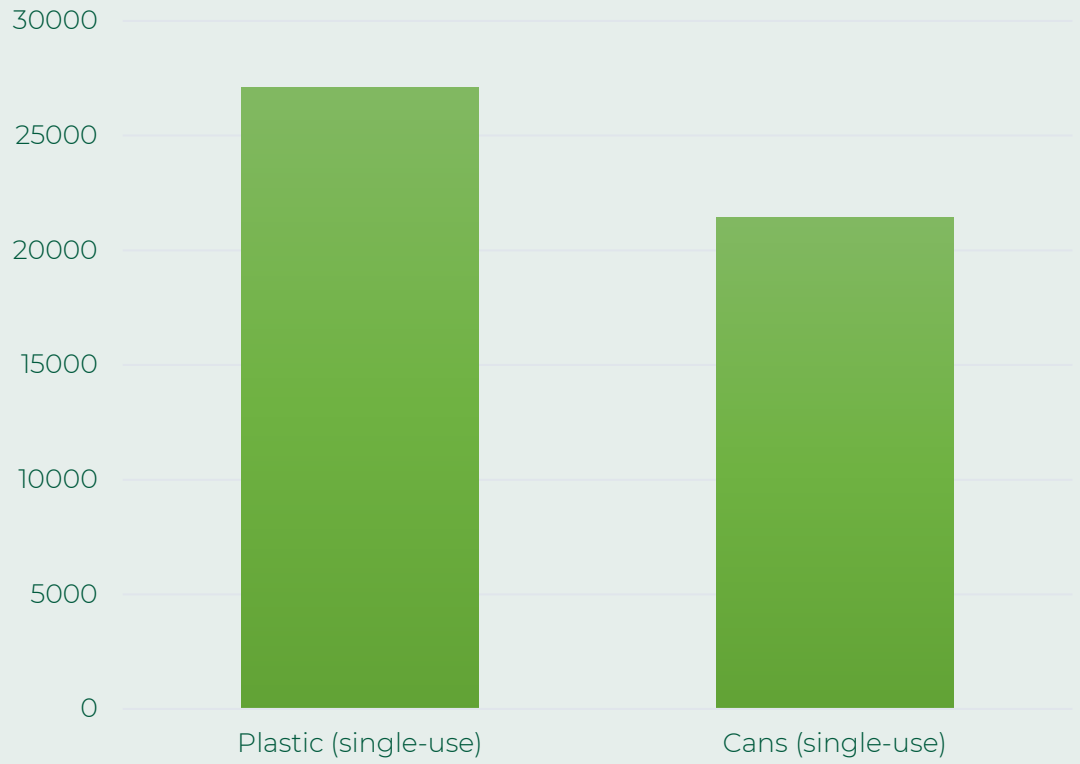
DRS was initiated and implemented before the implementation of the EPR-scheme. No link exists with the EPR-schemes.



Sweden: Returpack

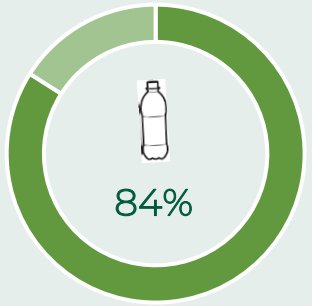
Materials (in tonnes) under responsibility:

*Returpack has a responsibility for a total of **48,548 tonnes** of packaging materials*

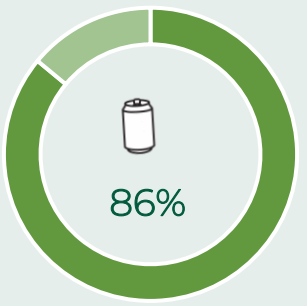


Return rates:

*Average return rate of Returpack is **85%** (in 2018)*



Plastic (single-use)



Cans (single-use)

Sweden: Returpack

Market size of DRS: Tonnes of packaging under responsibility (versus total packaging)	Tonnes:	% of total:
Plastic packaging:		
- *Total generated:*	245,934	100%
- *Put-on-market DRS fraction:*	27,104	11%
- *Collected DRS fraction:*	22,361	9.1%
Cans packaging:		
- *Total generated*	59,503	100%
- *Put-on-market DRS fraction*	21,444	36%
- *Collected DRS fraction*	18,356	30.8%

Sweden: Returpack

Journey of the deposit through the system:

1. When producers bring packaging to the market, they report the amount to the system operator, Returpack. Returpack then sends out an invoice based on this amount – this covers the deposit fee of the packaging brought onto the market.
2. The producer then adds the deposit to the price of the product, when selling it to retailers, so the producer receives the deposit when selling their product to the retailer.
3. Then, the retailers put a deposit price on the products and sell them: when the products are returned, the consumers will receive the deposit back.
4. The materials are collected by Returpack; and subsequently sorted and counted at their facilities.
5. Following the counting, Returpack pays to the store the amount of the total deposit that was paid to the consumer for their returned packaging.
6. Returpack remains the owner of the material throughout the entire process. When packaging is returned, Returpack sells it to recyclers in Sweden (mainly PET) and abroad (mainly aluminium to France or Germany as Sweden has no melting plants). Revenues from the sold materials are used to keep the producer fees as low as possible.

Sweden: Returpack

Operational and financial responsibilities:

Role of the system operator

	Responsibilities:	System operator:	If not, who:
Financial:	Collect deposit and producer fees from producers (based on put-on-market)	Yes	
	Pay out redeemed deposits and handling fees to retailers (based on collected materials)	Yes	
	Pay out fee to transportation and other contractors	Yes	
	Sale of collected materials to recyclers	Yes	
Operational:	Efficient organisation of transport and sorting of collected materials	Yes	
	Baling and sorting of materials collected with RVMs	Yes	
	Counting and sorting of manual collected materials	Yes	
	Administration and handling of invoicing	Yes	
	Reporting statistics to responsible authority	Yes	

Sweden: Returpack

Financial overview (details next slides):

Relevant costs and revenues for system operator

Type of operating costs:	*Relevant?*
Handling fees	*V*
Transportation costs	*V*
Admin & marketing costs	*V*
Other operating costs	*V*

Type of revenues:	*Relevant?*
Unredeemed deposit fees	*V*
Sale of collected materials	*V*
Producer and registration fees	*V*
Other operational revenues	*V*

Sweden: Returnpack

Total operating cost:

The detailed financial costs of the Swedish DRS for recycling are not publicly available. In their sustainability report, it is only mentioned that the total purchasing cost is 361 million Swedish Krones (M€ 34.6) per year. This excludes other operating costs like labor costs and handling costs.

The share of the most important purchasing costs are as follows:

- Transport and logistics: 55%
- Information and marketing: 17%
- Production machines & RVMs: 12%

Sweden: Returpack

Total deposit fees

(deposit received, paid, & unredeemed)

DRS recycling

Total deposit fees received	M€ 322.0	€ 31.18	per capita
Total deposit fees paid	M€ 269.9	€ 26.13	per capita
Total unredeemed deposit fees	**+ M€ 52.1**	**€ 5.04**	per capita

CHAPTER 5: Overview tables DRS

DRS Reuse: overview

			Netherlands		Lithuania		Estonia		Sweden		Germany	
DRS RE-USE	System Operator		BNR fles		DESA		Eesti		Sveriges Bryggerier		Mehrweg pfand	
	Organization Type (Not-for-profit)		x		x		x		x		x	
	Legal Basis Deposit				x		x					
	Mandatory introduction of Reusable packaging											
	Mandatory Participation DRS				x		x					
	EPR (Extended Producer Responsibility)	Before										
		After	x		x				x		x	
		Same time					x					
	System Operator Responsibilities	Financial										
		Operational	Shared		Shared				Shared		Some cases	
		Financial & Operational					Shared					
	Type of packaging included						**					
	Volumes of packaging (Tonnes per year)		455.000		20.161		9.915		49.474		-	
	Average Return Rates (%)		97,5		93		90		99		98,8	
	Deposit Value (cent€)		10		10		10		5,9 (33cl)-8,9(50cl)		8-25	
			M€/y	€/hab	M€/y	€/hab	M€/y	€/hab	M€/y	€/hab	M€/y	€/hab
	Total deposit fees		179,13	10,3	6,1	2,18	3	2,26	9,65	0,93	N/A	N/A
	Total deposit fee paid		174,65	10	5,67	2,03	2,7	2,03	9,51	0,92	N/A	N/A
	Total unredeemed deposit fee		4,48	0,26	0,43	0,15	0,3	0,23	0,14	0,14	N/A	N/A
	Transparency		Limited		Limited		Limited		Limited		Limited	

** plastic only by law (not in practice)

DRS Recycling: overview

			Netherlands		Lithuania		Estonia		Sweden		Germany	
DRS RECYCLE	System Operator		Statiegeld NL		USAD		Eesti		Returpack		Pfand System	
	Organization Type (Not-for-profit)		x		x		x		x		x	
	Legal Basis Deposit		x		x		x		x		x	
	Mandatory introduction One-way packaging											
	Mandatory Participation DRS		x		x		x		x		x	
	EPR (Extended Producer Responsibility)	Before									x	
		After	x (DRS's Owner)						x			
		Same time			x		x					
	System Operator Responsibilities	Financial										
		Operational									Shared	
		Financial & Operational	x		x (Material owner)		x (Material owner)		x (Material owner)			
	Type of packaging included											
	Volumes of packaging (Tonnes per year)		41.000		25.997		13.780		48.548		-	
	Average Return Rates (%)		93		90		91		85		96-98	
	Deposit Value (cent. €)		25		10		10		11-22		25	
	Total deposit fees		M€/y	€/hab	M€/y	€/habi	M€/y	€/hab	M€/y	€/hab	M€/y	€/hab
			300	17,41	67	23,96	28	21,05	322	31,18	4500	54,11
	Total deposit fee paid		279	16,03	61	21,93	24	18,04	270	26,13	4365	52,48
	Total unredeemed deposit fee		21	1,21	6	2,04	4	2,95	52	5,04	135	1,62
	Transparency		Limited		Clear		Clear		Limited		Limited	

CHAPTER 6: Specification of the qualitative items identified for a CBA on Deposit Return Schemes

Introduction:

Cost-Benefit Analysis (CBA) is an analytical tool for judging the economic advantages and disadvantages of an investment decision by assessing its costs and benefits in order to assess the welfare change attributable to it (DG REGIO, 2014). A CBA is conducted from the point of view of society as a whole, including the total costs and benefits from the perspective of all stakeholders that have positive or negative benefits from the investment decision. CBA differs, in this respect, from financial analyses which only take into account the costs and benefits that accrue to the owner of the project as a result of the investment decision.

A CBA executed in line with the guidelines specified by the European Commission for the economic appraisal of investment projects consists of two parts: (1) a financial analysis; and (2) an economic analysis. The financial analysis outlines the cash inflows and outflows and the eventual project profitability, through incremental analysis between the project and the reference case. The economic analysis appraises the evaluated investment project's contribution to welfare, through incremental analysis of the economic effects of the project in comparison to the reference case.

This overview provides a specification of the qualitative items identified in the case studies that are relevant for a CBA on the implementation of a Deposit Return Scheme for packaging waste. Items relevant for the financial analysis consist of: (1) investment costs; (2) operating costs (redeemed deposit fees, handling fees, transportation costs, marketing and administration costs, other operating costs); and (3) revenues (received deposit fees, producer fees, sale of materials, and other operational revenues). Items relevant for the economic analysis consist of: (1) additional economic costs for stakeholders; (2) avoided costs of waste collection and treatment; (3) creation of jobs; and (4) reduced environmental impact.

Incremental investment costs:

Incremental investment costs that are relevant for Deposit Return Systems (DRS) relate to investments in equipment, machinery, plants, buildings and other real property that is owned by the DRS system operator. Financial data on this type of costs is not publicly available for the majority of the case studies. However, in the annual reports of Norway, Lithuania and Estonia some relevant information is disclosed.

Norway (DRS for recycling):

In Norway, the value of land, buildings and real property owned by Infinitum has increased strongly in 2019, due to the fact that Infinitum invested in the construction of a recycling plant at Heia (total value €20.1 million) (Infinitum, 2020). Infinitum is the owner of the building, while the factory is operated by Veolia Norway. Infinitum has three production plants (Heia, Bjerkvik, Heimdal), one logistics centre (Heia), and a headquarters in Oslo. In the annual report of 2020, a total value of €12.4 million is stated for the land, buildings and real property that is owned by Infinitum.

Furthermore, in the same annual report it is shared that machinery, equipment and other fixtures that are owned by Infinitum are worth €4.4 million. The value of this figure decreased slightly in comparison with 2019, due to the fact that no large investments have been made in 2020 and the figures are corrected for annual depreciation.

Lithuania (DRS for recycling):

In Lithuania, the initial investment that was made in order to initiate and operate the Deposit Return System was €5 million (Balcers et al, 2019). A central counting and handling center near Vilnius has been realised, which required an investment of €3 million. The other €2 million was invested in IT and the working capital for setting-up the organisation. The Lithuanian system didn't require retailers and/or producers to invest in RVM collection infrastructure as a different funding model is used. Initially the RVM collection infrastructure has been financed by the tender winning RVM provider (Tomra). The RVM provider, in its turn, receives a fee per packaging item that is processed by the RVM collection infrastructure.

Incremental investment costs:

Estonia (DRS for recycling & reuse)

In their most recent annual report (2018) Eesti Pandipakend, the Estonian DRS system operator, reports a total value of €2.8 million for owned land and buildings (Eesti Pandipakend, 2018). Approximately €400.000 is allocated to land that is owned by Eesti Pandipakend, while the value of buildings is €2.4 million. Furthermore, it is shared that roughly €3 million of equipment and machinery is in possession of Eesti Pandipakend, which consists of €2.6 million for machinery and equipment, €0.2 million for other fixed assets, and €0.2 million for investments in projects which are currently in development.

In 2018 Eesti Pandipakend spent €223,000 on these investment projects. The largest investments concerned the renewal of their server park, digitalization of the logistics operations, and the design and construction of a container washing line. In more recent years, Eesti Pandipakend has invested in a reusable cup project, another automatic container washing line significantly reducing the water consumption, and they have launched a digitalised process in order to realise a more convenient process for packaging companies. In 2020, these investments amounted to a total value of €331,000.

The total investment in land, buildings, machinery and equipment is between 5-15% of the annual revenues of a DRS system operator.

Incremental operating costs: overview

A system operator of a Deposit Return System is faced with various (recurring) operating costs. The following types of incremental operating costs are presented on the following sheets:

- Redeemed deposit fees
- Handling fees
- Transportation costs
- Marketing & administration costs
- Other operating costs

Incremental operating costs: redeemed deposit fees

This type of cost typically concerns the deposit fee payment made by the system operator to the retailers when collected materials are returned. This system is applied in DRS for recycling in countries like Estonia, Lithuania, Finland, Sweden, Norway, and the Netherlands. However, in Germany there is no organisation that is responsible for the centralized handling of paying redeemed deposit fees. In this case, paying redeemed deposits is managed directly between retailers and producers. The DRS for reuse in the five case studies (Netherlands, Lithuania, Estonia, Sweden, and Germany) have the same model, i.e. redeemed deposits are paid directly by the producers.

The system operators of the DRS in Norway and Estonia have published the total payments concerning redeemed deposits in their annual reports. For the other countries this information was not publicly available. Therefore, an estimation for these countries has been made based on the deposit fee and the amount of recycled packaging items. The deposit fees that are annually paid for the returned packaging items can be found in the tables below.

Incremental operating costs: redeemed deposit fees

Annual deposit fees paid in DRS (recycling):

Country	Paid deposit fees	Deposit fee/capita	Paid by system operator
Norway (Infinitum)	€328.2 million	€61.98	Yes
Sweden (Returpack)	€269.9 million	€26.67	Yes
Finland (Palpa)	€360 million	€65.30	Yes
Estonia (Eesti Pandipakend)	€21.3 million	€16.15	Yes
Lithuania (USAD)	€61.3 million	€21.82	Yes
The Netherlands (Statiegeld NL)	€279 million	€16.24	Yes
Germany (DPG GmbH)	€4,365 million	€52.72	No

Incremental operating costs: redeemed deposit fees

Annual deposit fees paid in DRS (reuse):

Country	Paid deposit fees	Deposit fee/capita	Paid by system operator
Sweden (Sveriges Bryggerier)	€4.4 million	€0.43	No
Estonia (Eesti Pandipakend)	€2.7 million	€2.05	No
Lithuania (DESA)	€5.7 million	€2.03	No
The Netherlands (BNR fles)	€174.7 million	€10.17	No
Germany (Mehrweg)	N.A.	N.A.	No

Incremental operating costs: redeemed deposit fees

The deposit fees that are annually circulating the DRS system differs significantly between the countries. Especially, the deposit system in Germany has a relatively large amount of deposit fees that is annually paid. This is not only caused by their larger population, but also by their relatively high deposit fees. For each DRS system the deposit fee per packaging item have been identified. The values for each individual type of packaging is provided in the table in the next sheets.

The deposit fees per packaging item typically range between €0.10 and €0.25, except for the Swedish deposit on glass items (€0.06-€0.09), the German deposit on glass packaging items (€0.08) and the Finnish deposit on large plastic packaging items (€0.40). The deposit fees have a relatively small range as the deposit fee should be large enough to stimulate the involved actors to return the packaging to collection points, while a relatively high deposit fee would encourage system fraud (Eunomia, 2019).

In general, two types of deposit fee systems are applied in the assessed case studies. First of all, a flat rate deposit fee system is applied in Estonia and Lithuania, where the deposit fee for all packaging items is €0.10. Secondly, a differentiated deposit fee system is implemented in the other countries. A flat rate deposit fee is of course easy to implement and convenient for the involved producers, retailers, consumers as well as administrative bodies. However, with a differentiated deposit fee system producers can be stimulated to put reusable packaging items instead of disposable items on the market. Furthermore, the return of certain packaging items (e.g., larger packaging items) can be emphasized by a differentiated deposit rate, this can contribute to a higher recycling rate for targeted material streams.

Incremental operating costs: redeemed deposit fees

The table on the next sheet also shows that in the most countries a lower deposit fee is applied for glass packaging items in comparison with plastic and metallic packaging items. Glass packaging items are included in a separate DRS system for refillable packaging items in most countries (e.g. Sweden, Finland, Lithuania, The Netherlands and Germany). A lower deposit fee for refillable packaging items aims to encourage producers to put refillable packaging items on the market instead of disposable. In Germany, this differentiation between refillable and disposable packaging items is the most obvious as it is by law required to apply a higher deposit amount (€0.25) on disposable packaging items than on refillable packaging items (up to €0.15).

Incremental operating costs: redeemed deposit fees

Deposit fee per packaging item:

	Glass		Plastic		Metal
	DRS reuse	*DRS recycling*	*DRS reuse*	*DRS recycling*	*DRS recycling*
Norway	-	-	-	€0.20 (PET<0.5L); €0.28 (PET>0.5L)	€0.20
Sweden	Small bottle (33cl) €0.059; Large bottle (50cl) €0.089	-	-	€0.096 (PET<1L); €0.19 (PET >1L)	€0.096
Finland	-	€ 0.10	-	€0.10 (PET<0.35L); €0.20 (PET 0.35-1L); €0.40 (PET>1L)	€0.15
Estonia	€0.10	-	-	€0.10	€0.10
Lithuania	€0.10	-	-	€0.10	€0.10
The Netherlands	€0.10	-	-	€0.15 (PET<1L); €0.25 (PET>1L)	€0.15 (from 2023)
Germany	€0.08	€0.25	€0.15	€0.25	€0.25

Incremental operating costs: handling fees

Handling fees are paid to retailers or redemption centres as compensation for their efforts related to collecting, sorting, and settling deposit fees with consumers. On a long-term basis, handling fees should also cover expenses related to investments in reverse vending machines (RVMs), electricity costs, space requirements, and possible additional personnel required to handle the containers. The fee is often paid by the producer or importer via the system operator, and in some (limited) cases it is paid by the government. For the assessed case studies the handling fees per packaging item are provided in the overview table on the next sheet.

Only handling fees for DRS recycling are included in the table. Standardized handling fees doesn't exist in the DRS reuse systems in this study. However, it can be part of negotiations between producers and retailers. As such the handling fees are not publicly available and can vary over different actors within the same DRS.

Incremental operating costs: handling fees

Handling fees per packaging item (DRS recycling)

	Glass			Plastic			Metal		
	Manual	*RVM*	*RVM with compactor*	*Manual*	*RVM*	*RVM with compactor*	*Manual*	*RVM*	*RVM with compactor*
Norway	-	-	-	€0.008	€0.008	€0.020	€0.004	€0.004	€0.016
Sweden				€0.02	-	Fixed compensation of €2018.36; Pickup with truck: €0.027 (PET<1L), €0.034 (PET>1L) Pickup by reseller: €0.034 (PET<1L), €0.051 (PET>1L)	€0.00	-	Fixed compensation of €2018.36; Pickup with truck: €0.018; Pickup by reseller: €0.02
Finland	€0.019	€0.019	-	€0.019	€0.019	€0.029	€0.019	€0.019	€0.023
Estonia	€0.0138	€0.0268	-	€0.0123	€0.0215	€0.035	€0.0123	€0.0215	€0.035
Lithuania	€0.0148	€0.0148	€0.0284	€0.0138	€0.0138	€0.0175	€0.0118	€0.0118	€0.0137
The Netherlands	-	-	-	Obligatory take back point: €0.025 (PET<1L), €0.015 (PET>1L) Voluntary: N.A. Out-of-home take back point: €0.0222 (PET<1L), €0.0122 (PET>1L)	Obligatory take back point: €0.0295 (PET<1L), €0.0211 (PET>1L) Voluntary & out-of-home take back point: €0.0293 (PET<1L), €0.0202 (PET>1L)	Obligatory take back point: €0.0386 (PET<1L), €0.029 (PET>1L) Voluntary & out-of-home take back point: €0.0379 (PET<1L), €0.0283 (PET>1L)	-	-	-
Germany	-	-	-	-	-	-	-	-	-

Incremental operating costs: handling fees

In all case countries a handling fee structure is in place for beverage packaging items that are collected for recycling by the DRS system, except for Germany. In Germany, retailers keep the materials and sell them on the global market or use them for bottle-to-bottle recycling. Retailers are in direct contact with recyclers who pay the scrap value for the recycled materials to the retailers. Retailers are allowed to engage with a processor of their own choice, thus the price of these transactions is managed by individual contracts between processors and retailers. Therefore, this information is not publicly available and not provided in the table.

In all countries with a handling fee structure a differentiation is made between the type of handling, meaning with RVM, manual or with a compacting RVM. A higher handling fee is paid to retailers that collect the packaging items by means of a RVM system with compactor. This is intended to reflect the transportation efficiencies generated by compacting the containers and the fact that compaction reduces the opportunity for system fraud. In most countries with a handling fee structure a differentiation is made between the types of packaging items (material) in order to reflect differences in storage and transportation costs.

In some countries the total costs for the system operator that are related to the handling fee structure are mentioned in their annual reports. For Norway the costs related to handling fees amount to €29.74 million, the Estonian DRS operator pays an annual amount of €7.5 million as compensation to the retailers and in Lithuania a total amount of €10.94 million is spent as handling fee.
As such the payment of handling fees is a significant cost item of the DRS systems. Typically ranging from 8-22% of the total operating costs.

Incremental operating costs: transportation costs

Transportation costs are related to transport of collected materials. Transportation costs are only publicly available for DRS recycling. These costs are retrieved from the annual reports of Infinitum (Norway), Eesti Pandipakend (Estonia) and USAD (Lithuania). In Norway €39.17/km2 (€14.3 million in total) is annually spent on the transportation of collected materials, in Estonia a relatively small amount of €20.47/km2 (€0.89 million in total) is paid for transportation and the annual transport costs in Lithuania are €64.19/km2 (in total €4.02 million). In the sustainability report of Sweden, it is mentioned that the purchasing costs amount to €34.6 million. This excludes other operating costs like paid deposit fees, labor costs and handling costs. Nevertheless 55% of the purchasing costs are related to transportation of collected materials, amounting to €46.72/km2 (€19.03 million in total).

In general, transportation costs just contain 3-5% of the total Deposit Return System costs.

Incremental operating costs: marketing & administration

The marketing and administration costs are only publicly available for the DRS recycling case studies in Norway, Sweden, Lithuania and Estonia. The costs differ significantly between each country, depending on the tasks and responsibilities of the system operator. In Norway, Sweden, Finland, Lithuania and Estonia the system operator is responsible for the marketing and communication with all relevant stakeholders, or even deploys an educational programme, while in Germany the system operator has a purely administrative role. In the Netherlands the system operator also used to have a limited, merely administrative role. However, recently the scope of the system operator has slightly changed. Besides system administration the responsibilities now include communication with stakeholders as well, reflected in a communication campaign introducing the system expansion.

In Norway the costs related to marketing an administration are the highest (€6.7 million), in Sweden a total of €5.88 million is spent on marketing and administration, the administrative expenses in Lithuania are €0.98 million and in Estonia a total amount of €0.07 million is spent on marketing. For Lithuania it is known that an annual amount of €0.3 million is invested in the educational programme.

The marketing and administration costs are fairly small in comparison with the other operating cost items.

Incremental operating costs: other operating costs

Other operating costs refer to other cost categories that are required for the operation of the DRS system. Regarding the Norwegian DRS system, it is known that Infinitum has spent €8.7 million on other operating costs, that were not detailed out in their annual report. In Estonia the other operating costs amounted to a total of €2.17 million, which consisted of approximately €1.1 million of labour costs; €0.4 million is spent on rent, electricity, maintenance and other production costs; and €0.7 million is related to the installation of RVMs and costs for the required materials and supplies.

In Sweden and Lithuania, the other operating costs are different in comparison with the other countries. In both countries the system operator pays for RVM infrastructure, which avoids an initial investment from the retailers. In Sweden an annual fixed fee of €2018.36 is provided to retailers with compacting RVM(s). This fixed fee is received on top of the variable handling fees and aims to compensate for the purchase and maintenance costs of RVMs. In 2019 Returpack has spent €4.15 million on RVM compensation. In Lithuania, the investment in RVM collection infrastructure was made by the tender winning RVM provider. The RVM provider recuperates its investment via a “throughput” fee that USAD pays for each packaging item collected through an RVM. In the annual report of 2020 USAD states that they spend €10.66 million on compensation for the RVM infrastructure including repair and maintenance of these systems. The annual report of USAD provides other operational costs as well: Wages and salaries (€0.85 million) and the annual costs for an automated counting system €0.07 million.

Incremental revenues: overview

The possible incremental revenues of a system operator of a deposit return system consist of:

- Received deposit fees
- Producer fees
- Sale of materials
- Other operational revenues

Incremental revenues: received deposit fees

This revenue stream typically concerns the deposit fees paid by producers to the system operator. The amount paid by the producers is equal to the amount of deposit fees they receive from retailers when putting products on the market. The system operator is often responsible for reimbursing the deposit fees to retailers for the collected packaging items. This system is applied in the DRS for recycling in Estonia, Finland, Lithuania, Norway, the Netherlands and Sweden.

In the German deposit return system, the involved retailers pay deposits to the producers/importers as well. However, when eligible packaging items are returned to the retailer in Germany, this retailer claims the deposit back from retailers. The retailer can settle the deposit invoice himself or make use of a refund claimant service provider. The reclaimed deposits are based on the accounting records of collected empty containers in the DPG System Database (GIZ, 2018). The collected materials are owned by the retailers once consumers return them – retailers can then sell the packaging to recyclers.

In DRS for reuse systems producers/importers receive the deposit from retailers as well. After consumers have returned the beverage packaging item to the retailer, producers pay the deposit fees for collected items directly to retailers. This transaction can include a possible handling fee. However, this is arranged in contracts between producers and retailers. The unredeemed deposits can be used by producers to add new bottles to the DRS for reuse in order to compensate for consumer losses.

Estimations of the annual deposit fees that are received in the studied deposit return systems for recycling and reuse can be found in the tables on the next sheets.

Incremental revenues: received deposit fees

Annual deposit fees received in DRS (recycling):

Country	Received deposit fees	Deposit fee/capita
Norway (Infinitum)	€348.7 million	€65.85
Sweden (Returpack)	€322 million	€31.82
Finland (Palpa)	€387.2 million	€70.23
Estonia (Eesti Pandipakend)	€24.9 million	€18.88
Lithuania (USAD)	€67 million	€23.85
The Netherlands (Statiegeld NL)	€300 million	€17.46
Germany (DPG GmbH)	€4,500 million	€54.35

Incremental revenues: received deposit fees

Annual deposit fees received in DRS (reuse):

Country	Received deposit fees	Deposit fee/capita
Sweden (Sveriges Bryggerier)	€9.65 million	€0.95
Estonia (Eesti Pandipakend)	€3 million	€2.27
Lithuania (DESA)	€6.1 million	€2.17
The Netherlands (BNR fles)	€179.1 million	€10.42
Germany (Mehrweg)	N.A.	N.A.

Incremental revenues: received deposit fees

A certain share of the packaging items will not be returned. As such, it is almost impossible to realise a 100% collection rate. In the assessed case studies this is seen as well, not a single country has achieved a 100% collection rate for any of their packaging materials. Therefore, a part of the deposit fees that is received from producers/importers is not redeemed by consumers (this also includes possible material losses that take place by retailers).

Overall, the unredeemed deposit fees in the case studies are in the range of 3-16% of the received deposit fees, with the relative amount of unredeemed deposit fees decreasing when the collection rate is increasing and vice versa.

For the DRS for recycling in this study, these unredeemed deposit fees remain in possession of the system operator (with the exemption of Germany) and are used to (partly) finance the operational costs of the system. This lowers the (registration) fees producers have to pay. As such the unredeemed deposit fees are providing indirect benefit to the producers. For the assessed DRS for reuse in this study, these unredeemed deposit fees remain in the possession of the producer (like is the case in Germany for the DRS for recycling).

For some of the case studies either the unredeemed deposit fees, or the paid and received deposit fees are published. For the other case studies the unredeemed deposit fees are estimated based on the deposit fee for individual packaging items, the amount of packaging items that are yearly processed by the DRS, and the recycling rates for specific material streams.

Estimations of the amount of unredeemed deposit fees on annual basis can be found in the tables on the next sheets.

Incremental revenues: received deposit fees

Annual unredeemed deposit fees in DRS (recycling):

Country	Unredeemed deposit fees	Deposit fee/capita
Norway (Infinitum)	€20.5 million (Reported)	€3.87
Sweden (Returpack)	€52.1 million (Estimated)	€5.15
Finland (Palpa)	€27.2 million (Estimated)	€4.93
Estonia (Eesti Pandipakend)	€3.6 million (Reported)	€2.73
Lithuania (USAD)	€5.7 million (Reported)	€2.03
The Netherlands (Statiegeld NL)	€21 million (Estimated)	€1.22
Germany (DPG GmbH)	€135 million (Estimated)	€1.63

Incremental revenues: received deposit fees

Annual deposit fees received in DRS (reuse):

Country	Unredeemed deposit fees	Deposit fee/capita
Sweden (Sveriges Bryggerier)	€0.14 million (Estimated)	€0.01
Estonia (Eesti Pandipakend)	€0.3 million (Estimated)	€0.23
Lithuania (DESA)	€0.4 million (Estimated)	€0.14
The Netherlands (BNR fles)	€4.4 million (Estimated)	€0.26
Germany (Mehrweg)	N.A.	N.A.

Incremental revenues: producer fees

Producer fees are used to compensate for the cost of running the scheme and it puts the cost of recovering and recycling beverage packaging material onto the producers. In general, producers will report the number of containers they have placed on the market to the system operator on a regular basis. The system operator will then invoice the producer for the amount required. In the table on the next sheet, the producer fee on company level and per individual packaging item can be found for the DRS recycling cases in this study.

In most DRS for recycling systems companies have to pay a registration fee in order to join the DRS system, this is applicable to the DRS in Norway, Sweden, Finland, Estonia, and Lithuania. In Germany the contribution from producers/importers consists of a registration fee that needs to be paid when a producer wants to join the DPG database. In the Netherlands the fee that producers need to pay is based on multiple elements: the producer fee that needs to be paid is based on an invoice sent by the EPR-scheme (Afvalfonds Verpakkingen). The invoice consists of the deposit and producer fees based on the items that are put on the market (for the DRS system operator) as well as a waste management fee (for the Dutch EPR).

Moreover, in the majority of the case studies a financial contribution has to be provided by producers for the registration of new packaging items. This packaging registration can be different for the individual material types. However, in most countries a uniform registration fee is applied to all types of packaging. This fee compensates for the costs related to administrating and testing the new packaging item, as well as the implementation of the new packaging item in the entire DRS system.

Incremental revenues: producer fees

Besides specific fees per type of material are implemented in the majority of the addressed deposit return systems. In most case countries a differentiation is made between the producer fees charged for various material streams. This price difference reflects the difference in collection rates for the individual material streams, the effort that needs to be made by the collector in order to collect each type of packaging material, and the difference in sales prices for the recovered materials. A high collection rate, low effort required by the collector and high sales price lead to a relatively low producer fee and vice versa. The material specific fees are often split in a basic fee per item put on the market and an additional fee for specific items. The basic fee per packaging item compensates for the operational costs of the system in general. While the additional fee per packaging item compensates for specific costs such as cleaning reusable glass bottles or removing sleeves/labels from packaging items. In this way producers are also discouraged to put different kind of labels on various packaging items.

The total amount of producer fees are not published for each DRS system. However, it is known that in Estonia a total amount of €2.85 million is paid by producers and in Lithuania this is €13.58 million. For the Netherlands, the total producer fees are estimated on €27.4 million based on the basic fees per item and the items that are put on the market annually.

Incremental revenues: producer fees

Producer fees in DRS (recycling):

	Company registration	Packaging registration			Basic fee per item			Additional fee per item		
		Glass	*Plastic*	*Metal*	*Glass*	*Plastic*	*Metal*	*Glass*	*Plastic*	*Metal*
Norway	€1000	-	€200		-	€0.02	Aluminium: -€0.003 Steel: €0.02	-	Sleeves/Labels covering 75% of the package: €0.02 Colored: €0.01	Sleeves/labels on cans: €0.003
Sweden	€1012	-	-	-	-	<1L: €0.02 >1L: €0.05	-	-	-	-
Finland	€1000	€325.20	€284.55	€284.55	€0.08	<0.35L: €0.08 0.35-1L: €0.16 >1L: €0.32	€0.12	<0.5L: €0.07 >0.5L: €0.11	Transparent - <1L: €0.01; >1L: €0.02 Colored - <1L: €0.02; >1L: €0.03 Mixed - <1L: €0.05; >1L: €0.08	€0.003
Estonia	€100		€52							
Lithuania	€50		€35		€0.04	€0.03	Aluminium: €0.011 Steel: €0.03	Refillable: €0.0175	-	-
The Netherlands	-		-		-	<1L: €0.0164 >1L: €0.0188	-	-	-	-
Germany	Participation costs are based upon weight and material type of packaging		-		-	-	-	-	-	-

Incremental revenues: sale of materials

This revenue stream is only relevant for DRS for recycling and related to the sales of collected materials to recyclers or other off-takers. In Germany, the returned materials are directly sold by the retailers who have collected the packaging items. While in the other case studies the system operator is responsible for the sale of recycled materials. Some of the system operators have their own recycling facilities where they can process returned packaging items (e.g. Infinitum), while other system operators sell the packaging items to external recycling organisations. Sometimes materials are also sold across the border as the required recycling facilities are not always present in a country, or the sales price can simply be higher in another country.

From the annual reports it appears that the materials sales in Estonia provides a revenue of €4.24 million, in Lithuania this is €7.86 million, while in Norway material sales yield a total revenue of €20.6 million. As such, the sale of materials is about 6-12% of the total revenue in a Deposit Return System.

Only the DRS system operator in Lithuania has reported the revenues of sold material per type of material. For a tonne of recycled PET €251.42 is received, for a tonne of recycled aluminium €1.174.74 is received, for a tonne of recycled metal (steel) this is €120 and for a tonne of recycled glass €41 is received.

In a study performed by CE Delft concerning the implementation of a DRS system for small PET bottles and cans in the Netherlands, a price range for the sale of individual material types is also provided (CE Delft, 2017). This study reports a price range of €450-750 for a tonne of transparent PET, €225-325 per tonne of coloured PET and mixed plastics, the sales price of a tonne of steel is €100-200, a tonne of recycled aluminium is worth €600-800 and a tonne of recycled glass is valued at €22.

A study by EGEN on municipal waste collection systems reports the average unit price for various materials waste streams in Europe (EGEN, 2020). According to this study the value of one tonne of recovered plastic is €325, for recovered non-ferro metals this is €560 per tonne, the value of one tonne of recovered ferro metals is €125, and for recovered glass this is €51 per tonne.

Incremental revenues: other operational revenues

Besides the most important revenue streams described in the paragraphs above, other operational revenues can be generated by the DRS system as well. For instance, Infinitum receives €6.4 million of other operational revenues, for which no further specifics are provided. Also in Lithuania (€0.08 million) and in Estonia (€0.24 million) other operational revenues are yielded by the DRS system.

Economic analysis: introduction

Besides financial costs and benefits, also economic costs and benefits are generated by a Deposit Return System. Financial and economic analyses have similar features. Both estimate the net-benefits of a project investment based on the difference between the with-project and the without-project situations. However, the financial analysis of the project compares the benefits and costs for the direct stakeholder (the project owner), while the economic analysis compares the benefits and costs for all stakeholders (in theory expanding to the whole society). This means that this includes economic costs related to the extra efforts made by consumers and retailers, while the economic benefits stem from avoided costs of waste collection and treatment, reduced costs from littering, avoided GHG emissions and environmental impact, as well as the creation of additional jobs.

Data and information on the economic costs and benefits of the involved case studied proved limited. The involved DRS have done limited evaluation of their broader economic impact or haven't published the information. This chapter subsequently provides information on economic costs and benefits for DRS based on external literature. The information provided is not exclusive, but provides references to studies into several of the economic costs and benefits of DRS. These indicators concern discounted prices (unless otherwise mentioned) as they are based on the outcome of a Net Present Value analysis (NPV). The literature is limited to references concerning DRS for recycling (in-depth analysis on DRS for reuse is relatively scarce).

Economic analysis: economic costs for direct stakeholders

Direct stakeholders: Most of the direct costs of a DRS for recycling are covered by the system operator by means of unredeemed deposits, received producer fees and revenues from material sales (see above). However, indirect costs that are related to Deposit Return Systems are borne by consumers and retailers.

Consumers: Consumers have to make an extra effort in a Deposit Return System in comparison with a regular kerbside collection system. In a DRS, consumers have to collect and transport the eligible beverage packaging items to a DRS collection point. While in a kerbside collection system this is arranged by the local authority or a producer responsibility organization. A study from Australia estimated the costs of household collection and transportation for the Australian Capital Territory, which has an estimated population of 426,700 people, on €1.76 million under a 20-year timeframe (Yu, 2021). The household participation costs include, costs for vehicle operation, travel time and container deposit redemption time.

Retailers: DRS collection points are mostly located at retailers for the convenience of consumers. This allows consumers to return the packaging items to the place where they buy these items. However, this incurs some economic costs for the involved retailers. The involved costs are related to taking beverage containers to temporary storage facilities and to cleaners and personnel from the retailer involved in the deposit system. These costs are estimated at €2.64 million in total under a 20-year timeframe for the Australian Capital Territory (Yu, 2021). Besides these economic costs of a DRS, a more indirect and ambiguous economic cost for retailers is related to lost selling space in their store. A DRS collection point requires space for the RVM infrastructure/manual collection and for storage of collected beverage packaging items (Eunomia, 2019). A study that is conducted for the Ministry of Environment in Slovakia, covering the implementation of a DRS for recycling in Slovakia, estimates the costs related to lost selling space at 22.80% of the total economic costs for retailers (Institute for Environmental Policy, 2018).

The handling fee paid by producers in many DRS for recycling is intended to cover these economic costs for retailers.

Economic analysis: avoided of collection and treatment

An important set of economic benefits that are potentially generated by the implementation of a DRS are the avoided costs related to collection, transportation and processing of beverage packaging items. In current kerbside systems the beverage packaging items are processed in waste treatment facilities. Directly collecting the packaging waste items in a separate DRS system, might reduce the costs of kerbside systems. Moreover, costs related to removing littering of public spaces are often reduced, as a significant part of the littering consists of beverage packaging items.

Collection & transportation: in most studied countries a kerbside collection system is implemented, meaning that household waste and recyclables are directly collected from households. Costs from this system are often incurred by the local authority and passed through to responsible EPR-systems (or to residents via taxation). As residents themselves will be transporting a part of the recyclables to collection points in a Deposit Return System, this might save collection & transportation costs for the kerbside system, as less material has to be collected and transported. Various studies have estimated the economic benefit of avoided collection and transportation of recyclables. For the Netherlands, this economic benefit is estimated on €6-8 million annually when a deposit system for small PET bottles and cans is implemented (CE Delft, 2017). A study conducted by Eunomia estimated the annual cost savings for collection at €0.29 million for a studied area in the UK, with an estimated population of 702,590 people (Eunomia, 2017). For the Australian Capital Territory, the saved collection costs are valued at €7.04 million over a 20-year timespan (Yu, 2021).

It should be noted that this decrease of collection costs, might be outweighed by the increase of collection costs for the DRS (and that taken together the total collection costs are higher than before implementation at the DRS). This will depend largely on local conditions and can only be assessed by a specific and full economic appraisal following a CBA methodology.

Economic analysis: avoided of collection and treatment

Waste treatment: Important economic benefits that are generated by the implementation of a Deposit Return System are related to recycling or reusing packaging materials. Various studies have assessed the avoided costs of processing recyclables. The Eunomia study addressing an area in the UK with an estimated population of 702,590 people, values the avoided costs of processing recyclables at €0.23 million annually (Eunomia, 2017). Another study assesses the impact of the implementation of a DRS for metal, glass, plastic and tetra carton beverage packaging items in Catalonia (Retorna, 2014). The estimated savings of processing recyclables are €6.03 million on a yearly basis for Catalonia (population is 7.57 million). The saved processing costs for recyclables are valued at €1.76 million over a 20-year timespan for the Australian Capital Territory (Yu, 2021).

Littering: In most case study countries a (comprehensive) street sweeping programme is implemented to remove litter from the roadsides and other public spaces. The avoided cost from littering comes from reduced street sweeping costs due to reduced litter in public spaces. The saved street sweeping costs are estimated by various studies to be in a range of €0.19- €0.50/y per inhabitant (Yu, 2021; Institute for Environmental Policy, 2018; Zero Waste Scotland, 2017; Eunomia, 2017).

Economic analysis: creation of new jobs

When a Deposit Return System is implemented besides a kerbside collection system this might create new jobs. New jobs are created by new sorting, recycling and disposal facilities. This leads to employment creation in adjacent sectors as well, such as the transportation sector. In this way, it has been estimated by a study assessing the implementation of a DRS in Ontario (Canada), that a DRS can lead to a 12% increase in FTEs (Reloop, 2019). The additional FTEs that are created by the DRS system, mainly involve the sorting, processing and disposal of materials. On average the annual economic benefit of an additional FTE is estimated on €13,450 (this figure is not discounted) (Institute for Environmental Policy, 2018).

It should be noted, however, that at the same time a loss in jobs might also occur (e.g. less jobs in the current waste management and littering operations). Also, effects on the labour market are often so-called waterbed effects, i.e. jobs created in one sector often result in jobs lost elsewhere. A proper estimation of the economic benefits on the job market should as also take wage differentials between jobs as well as differences in exposure to physical risk (avoiding risk of death or injury) into account.

Economic analysis: reduced environmental impacts

Avoided GHG-emissions: implementation of a DRS results in additional tonnages of materials that are recycled. The amount of additional materials that are recycled depends on the scope of the DRS in terms of materials as well as packaging items, and the recycling rate that is realised by current kerbside and other waste collection systems. Additional recycling of materials might lead to reduced greenhouse gas emissions as well as an improved air quality (depending on existing waste treatment and production facilities). A study performed by Eunomia assessing the effects of the implementation of a DRS in the Czech Republic estimates the economic value of the avoided GHG emissions at €162.32 and €253.11 for each additional tonne of recycled plastic and recycled metal, respectively (Eunomia, 2019). A study performed for the Netherlands by CE Delft regarding the implementation of a DRS system for small PET bottles and metal cans estimates the value of Avoided GHG emissions at €126.32 and €336 per tonne of additionally recycled plastic and metal, respectively (CE Delft, 2017).

Avoided external costs related to plastics: besides avoided CO2 emissions the increased recycling of beverage packaging items will lead to environmental benefits in the form of saved energy and material in comparison with the production of primary raw material, as well as reduced impact from litter ending up in the natural environment. In the study of the CE Delft it is estimated that the introduction of a DRS for small plastic bottles can reduce the plastic waste in the natural environment of the Netherlands with 15% (CE Delft, 2017). According to the study assessing a DRS in Slovakia, recycling is especially efficient for aluminium. This study estimates that in comparison with the production of aluminium, each tonne of recycled aluminium saves up to 90-95% of energy and secondary aluminium can be used for the same purpose as virgin material. The Slovakian study also provides a combined estimate for the monetarized environmental benefits that are related to recycling PET and aluminium cans. Per tonne of recycled material the annual environmental benefits are estimated at €83.77 - €725.27 (Institute for Environmental Policy, 2018).

Economic analysis: reduced environmental impacts

The reduced GHG emissions, reduced amount of materials and energy savings form only a part of the environmental benefits that are related to the implementation of DRS. Moreover, the introduction of a DRS will lead to many indirect environmental benefits that are hard to quantify, i.e. in the form of a higher aesthetic value of cleaner territories where litter was lying around or a lower load on ecosystems due to lower presence of non-biodegradable material in the wild (Institute for Environmental Policy, 2018). Besides, it is still difficult to express the benefits of reduced plastic littering for human health as the research of health impacts of microplastics is still in the early phase. This means that these (potential) additional benefits are extremely difficult to monetarize and are often only qualitatively described in existing Cost-Benefit Analyses.

References:

- **Balcers et al (2019)** Deposit Return Systems for Beverage Containers in the Baltic States (link)
- **CE Delft (2017)** Costs and Impacts of a Deposit on Cans and Small Bottles in the Netherlands (Link)
- **Eesti Pandipakend (2018)** Majandusaastank)
- **EGEN (2020)** Assessment of socio-economic and financial performance of twelve selected case studies (Link)
- **Eunomia (2017)** Impacts of a Deposit Refund System for One-way Beverage Packaging on Local Authority Waste Services (Link)
- **Eunomia (2019a)** Managing Risk and Mitigating Fraud in Deposit Refund Systems (Link)
- **Eunomia (2019b)** A Deposit Refund System for the Czech Republic (Link)
- **Infinitum (2020)** Annual report 2020 (link)
- **Institute for Environmental Policy (2018)** Real Price of Deposit: Analysis of the Introduction of the Deposit-Refund System for Single-Use Beverage Packaging in the Slovak Republic (Link)
- **Reloop (2019)** Better Together How a Deposit Return System Will Complement Ontario's Blue Box Program and Enhance the Circular Economy (Link)
- **Retorna (2014)** Implementing a Deposit and Return Scheme in Catalonia - Economic Opportunities for Municipalities (Link)
- **Yu (2021)** Economic Cost-Benefit Analysis of ACT Container Deposit Scheme (Link)
- **Zero Waste Scotland (2017)** Deposit Return Evidence Summary (Link)

CHAPTER 7: Background country information for DRS in seven EU-member states

ESTONIA

National context: Estonia

Packaging & packaging waste directive:

After the accession to the European Union in 2004, Estonia had to implement several new EU-directives, including the directive for packaging and packaging waste. Estonia started the active process of adopting waste hierarchy principles set out in the EU Waste Framework Directive of 2008, as rapid changes were needed to reach the EU Packaging Directive 94/62/EC recovery targets (Balcers et al., 2019). As a result, Estonia's new Waste Act and Packaging Act were created. The new Packaging Act (2004) regulated all aspects of packaging and packaging waste put on the market in Estonia. The beverage packaging deposit system was also introduced by this new regulation.

In general, the 2004 Packaging Act integrated full producer responsibility logic in different types of systems, including the introduction of a deposit return system regarding low-alcohol beverages and soft drinks and the introduction of a container collection system for other packaging items. The Estonian DRS is centralised, with a "return to retail" model, which means they can return their packaging at the same store it was purchased. Estonian retailers can also organise their own collection (which a little over 50% does), in which case they lease or buy a reverse vending machine and arrange the work procedures in-house (Balcers, 2019). The latest update to waste legislation in Estonia was done in 2021.

Estonia: GENERAL CHARACTERISTICS (in 2018)	
Population:	1.319.133
Population density:	30,4
GDP per capita:	€ 14.970
Total waste generated:	23.185.581 tonnes
Household waste generated:	346.170 tonnes
Household waste per capita:	262 kg
Packaging waste generated:	209.073 tonnes
- Plastic packaging:	55.393 tonnes
- Glass packaging:	37.262 tonnes
- Metal packaging:	16.541 tonnes

Material	Glass	Metal	Plastic
Estonian target	*70%*	*60%*	*45%*
EU-target in 2025	*70%*	*70% Ferro 50% Al*	*50%*

Estonian recycling targets:

The current Estonian recycling targets are around the EU targets in 2025 (see table left). For plastic packaging, a more detailed definition is provided stipulating a 55% recovery target and 22.5% reprocessing into plastic target.

Relevant literature:

- Balcers, D., et al. (2019), *Deposit Return Systems for Beverage Containers in the Baltic States* (report)

National context: Estonia

Collection systems for packaging waste:

With the implementation of the new regulations, several new collection systems were established in Estonia. Four producer responsibility organisations (PROs) were licensed by the Ministry of Environment: OÜ TVO, Eesti Taaskasutusorganisatsioon, Eesti Pakendiringlus, and Eesti Pandipakend. This last organization, Eesti Pandipakend, runs the deposit return scheme, while the other three run general extended producer responsibility schemes.

The deposit return system and other EPR container-based collection systems were thus implemented at the same time. However, a clear division is made in the target material groups for both systems in Estonia. The Estonian deposit return system covers one-way and refillable beverage packaging. One-way packaging includes plastics (mainly PET), cans (both aluminium and steel) and glass. In the regulation, refillable packaging covers packaging items made from plastic and glass. In practice, however, only refillable glass is used by and collected from the market (Balcers et al., 2019).

Cooperation between systems: The DRS for reuse and DRS for recycling were both established in the same year as the EPR-schemes. However, no formal or direct link exists with the EPR-schemes.

Relevant literature:

- EEA (2013) *Municipal waste management in Estonia* (webpage)
- Balcers, D., et al. (2019), *Deposit Return Systems for Beverage Containers in the Baltic States* (report)
- Earth Care Consulting (2021), *Baltics DRS - Estonia, Lithuania, Latvia* (presentation)

Waste collection containers in the Estonian capital Tallinn (photo: dreamstine.com)

DRS re-use: Eesti Pandipakend

DRS for reuse: in Estonia, there is a deposit return system for refillable packaging which is also operated by the same organization as the DRS for recycling (Eesti Pandipakend). The DRS was implemented in 2005, at the same time as the DRS for one-way packaging.

Legal basis: the legal basis for the deposit system for reuse, like the deposit system for one-way packaging, lies in the Estonian Packaging Act. The system was established at the same time as EPR and the DRS for recycling in 2004 and became operational in 2005. A recent legal amendment has mandated that, from the end of 2021, the system will expand its system to wine and vodka bottles for reuse. Estonia operates on a full producer ownership basis, meaning that bottles circulating in the system remain property of the producer (Balcers, 2019).

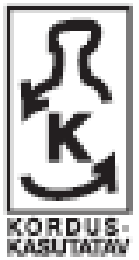
Packaging requirements DRS for reuse: Beer, alcoholic beverages with a low ethanol percentage, cider, perry and soft drinks are included in the DRS for reuse. Additionally, in 2016 it was determined by law to restrain the reusable system to only two types of bottles (BA and BBH) in order to maintain high quality of the glass and low cost of the material.

System operations: Eesti Pandipakend has shared responsibility of collecting the deposit and producer fees – no deposit is collected from producers, but the system operator does collect some (limited) producer fees. Additionally, Eesti Pandipakend arranges administration and central reporting and provides data to the producer to help them with stocking their supply of bottles. The system exists of both a pooling and ownership of brewers. However, the legislation has been updated in 2016, which declares that only two types of refillable bottles can be put on the market. This is decided to optimize the system and to keep the costs as low as possible. Deposit on refillable packaging is €0.10 and type of packaging is limited to two "common use" bottles with predefined volumes (Eesti Panidpakend, 2021).

Relevant literature:

- Eesti Pandipakend (2021) *Packaging Company ABC* (webpage).
- Balcers, D., et al. (2019) *Deposit Return Systems for Beverage Containers in the Baltic States* (report)

Eesti Pandipakend (re-use):	
Established:	2005
Packaging included:	**Glass, plastic** (de jure, de facto only glass packaging is included in the system)
Deposit Fee:	**€0.10** (all sizes)
Legal status:	**Mandatory**
Collection Rate	**90%**



The deposit symbols for refillable packaging items in Estonia.

DRS re-use: Eesti Pandipakend

Quality: The Estonian Packaging Law of 2016 introduces the start of limiting the system to two types of common-use refillable bottles, instead of bottles of all volumes. The market will be limited to the "Baltic Amber" and "BBH" bottles, in order to optimize the quantity and quality of refillable glass. The amount of reuse cycles per bottle is unkown.

Quantity: Eesti Pandipakend DRS holds the responsibility for an annual amount of approximately 9,915 tonnes of refillable glass bottles. This estimation was based on data collection of 2017. The amount of refillable glass bottles collected is larger than the number of one-way bottles in the DRS recycling system of Eesti Pandipakend.

DRS re-use: Eesti Pandipakend

Journey of the deposit through the system

1. The producer joins the DRS by signing a “Common-Use Packaging Contract” and paying an accession fee. Upon signing the contract, the producer receives a license to use the “Common Packaging”.
2. The bottles are filled by the producer and sold to the retailer. The producer and retailer agree among themselves upon the take-back conditions, including a possible handling fee. Deposit money is transferred along with the bottles to the retailer, who pay the producer for the product + deposit.
3. The producer pays a monthly fee to the DRS (for its administrative services) and informs it quarterly on the amounts put on market.
4. The consumer buys the product for the price + the deposit.
5. The consumer returns the bottle upon which the consumer receives the deposit fee back from the retailer.
6. The bottles are transported back to the producer in line with their direct agreements.
7. Producers wash, relabel and refill the bottles. In addition, producers obtain, transfer and/or disuse bottles upon directions from the DRS. Directions are provided by the DRS with the intention to keep the bottle pool optimal for the market.

DRS recycling: Eesti Pandipakend

Reason to be a DRS: As part of a national clean-up campaign in 2003, Estonia analyzed the composition of litter along roadsides. Up to 80% of the litter collected from the roadsides consisted of beverage packaging items. Plastic bottles and aluminium cans formed a major part of the beverage containers (Hogg et al., 2011). This analysis demonstrated that the current market-driven take-back system (Packaging Act 1994) appeared to be insufficient for the collection of beverage containers.

Although the system had a 60% recovery target, it was difficult to monitor the system, and its services were unfairly distributed amongst consumers as it only offered service in towns and cities, leaving rural areas without any collection points (Balcers, et al., 2019). In order to comply with the European packaging directive, Estonia had to improve the collection system for beverage containers. As a result, a DRS was implemented in 2005, at the same time as the EPR scheme. However, no formal link or cooperation exists and the two remain separate entities.

Operational responsibilities: as the DRS operator, Eesti Pandipakend has the following responsibilities on behalf of its members (importers and packaging companies):

- Collecting packaging and recovery of the collected packaging aligned with the requirements of applicable legislation;
- Accepting returned packaging from retailers;
- Complying to the packaging company's obligations under the Packaging Excise Duty Act, including payment of excise duty on packaging on behalf of the packaging companies;
- Baling and sorting of materials collected with RVM's.

Additionally, Eesti Pandipakend organises the registration system for information about packages used by packaging companies via an online tool. Eesti Pandipakend has established a barcode system which packaging producers are obliged to use, in order to facilitate the collection of deposit-subjected packaging.

Eesti Pandipakend OÜ: GENERAL CHARACTERISTICS	
Full name:	Eesti Pandipakend OÜ
Implemented:	2005
organisationtype:	Non-for-profit
Shareholders:	The Association of Producers of Soft Drinks (25%) The Association of Importers of Soft Drinks and Beer (25%) The Estonian Retailers Association (25%) The Estionain Association of Brewers (25%)
Total revenues:	34,98 M€

Relevant literature:

- Hogg, D., et al. (2011). *Options and Feasibility of a European Refund System for Metal Beverage Cans* (report)
- EPP, (2019). Annual report 2018 (report)

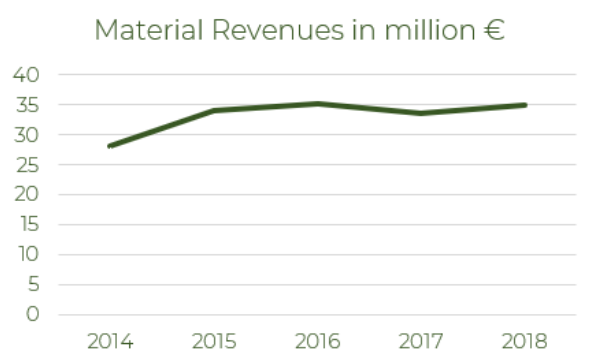
DRS recycling: Eesti Pandipakend

Financial responsibilities: Eesti Pandipakend's financial responsibilities can be divided into collection of fees; distribution of fees; sale of collected materials.

Eesti Pandipakend collects the fees via packaging companies. The packaging companies must pay (1) a one-time accession fee for joining the DRS system, (2) a registration fee for each new packaging that is introduced on the market, and (3) 100% of the deposit fees for all packaging that is put on the market (Eesti pandipakend, 2021).

Eesti Pandipakend has direct contracts with retailers, paying them monthly deposit fees and a retail handling fee per collected package item. In Estonia, retailers need to invest into collection infrastructure: this investment is eventually returned through a compensation mechanism called a "retail handling fee". The handling fee is an agreement between the central DRS and the Estonian Retailers Association. The retail handling fee must cover the direct costs of the stores, which arise from collecting the packages with deposit marking from consumers and handing them over to the DRS. The agreement between the retailers and the DRS is that DRS will cover the direct expenses of the collection of packages with deposit marking and the retailers will not earn a profit from this activity.

Eesti Pandipakend OÜ: PRODUCER FEES	
Company registration fee:	€ 100
Packaging registration fee:	€ 52
Basic fee per unit:	*€0.010*



Relevant literature:

- Balcers, D., et al. (2019) *Deposit Return Systems for Beverage Containers in the Baltic States* (report)
- Eesti Pandipakend (2021). *Packaging Company ABC* (webpage).

DRS Recycling: Eesti Pandipakend

Journey of the deposit through the system:

1. When a producer puts a product on the market, deposit money is paid to the system operator, Eesti Pandipakend. Eesti Pandipakend, from that moment on, functions as a deposit holder
2. The beverage is sold, from the producer to the retailer, for the price + deposit money, paid by the retailer
3. The retailer sells the product for the price + deposit
4. Packaging is returned to the retailer, upon which the deposit is paid back to the consumer.
5. Material is collected and sent to Eesti Pandipakend's handling center Tallinn where it is counted and sorted and prepared for recycling. Based upon the counted amount of packaging, a monthly payment is made to the retailer by Eesti Pandipakend.
6. Eesti Pandipakend remains the owner of the material throughout the entire process. When packaging is returned, the system operator sells it: all collected cans to other EU countries (mainly France and England); plastic bottles & transparent call auctioned to Estonian recyclers; and coloured glass to recyclers abroad

DRS recycling: Eesti Pandipakend

Type of packaging: the Estonian DRS covers one-way and refillable beverage packages. One-way packages being plastics (mainly PET), cans (both aluminium and steel) and glass. By law, refillable packages are defined as plastic and glass packaging. However, in practice only refillable glass is put on and collected from the market. The most common package capacities for beverages are included in the deposit system. This capacity range also takes the technical capabilities of automated collection into account, meaning the technical specifications of reverse vending machines (RVMs) (Balcers et al., 2019).

Packaging items are collected by retailers. Transport of the collected packaging materials to the sorting centre is organised by Eesti Pandipakend. Packaging items without the Eesti Pandipakend marking cannot be accepted for return and are not refunded. This includes packaging items such as bottles containing strong alcoholic beverages, glass jars, salad boxes, food packaging, Tetra beverage packaging, etc., (Eesti Pandipakend, 2021). However, in 2021 the Packaging Waste Act has been changed and from now on it is possible to add wine and hard liquor bottles to the DRS system, so far only one company with one product has joined the DRS system.

Packaging requirements: a packaging company must digitally sign a contract before their packaging can be included in the deposit system. Furthermore, an accession fee must be paid by packaging companies. Hereafter, an application shall be submitted via the e-environment for every product to be registered in the DRS. In order to test the packaging, the physical samples of packaging shall be delivered to Eesti Pandipakend in Talinn. A contractual client should add a deposit emblem to the label of a registered product. Each month a sales report must be submitted to Eesti Pandipakend. The sales report will be used to compile an invoice based on the number of packages that are sold.

The packaging items included in the DRS system should be made from materials covered by the DRS: included are PET, metal cans (both aluminium and steel) and glass bottles, both one-way and refillable. The lid of metal cans should consist of aluminium or steel, the caps of plastic packaging should be made from PET, PP or PE and the cork for glass packaging should be made from PET, PP, PE or metal. The packaging should have a capacity between 0.1L and 3L, a deposit logo and a (unique or universal) barcode should be clearly visible (Eesti Panipakend, 2021).

Relevant literature:

- Balcers, D., et al. (2019), *Deposit Return Systems for Beverage Containers in the Baltic States* (report)
- Eesti Pandipakend (2021). *How does the deposit system work?* (webpage)
- Eesti Pandipakend (2021). *Requirements of packaging* (webpage)

The deposit symbols for packaging items in Estonia. Producers must submit new packaging with the logo to Eesti Pandipakend for approval.

DRS recycling: Eesti Pandipakend

Return points and types of handling: Estonia has a centralised DRS with a "return to retail model". Consumers can easily return packaging to nearby retail stores: there are approximately 820 take back points, excluding those in horeca locations (Balcers et al., 2019). This means there is 1 take back point per 1621 inhabitants and 0.019 per square kilometre. Retailers selling deposit containers are required to take back the containers on their premises. When a retailer sales area is over 200m^2 retailers are obliged to take back the packaging items. If the retailer sales area is between 20-200m^2, a retailer can apply to be exempted from the obligation to take back the deposit containers. Local municipalities oversee and handle these requests. Urban vendors under 20m^2 of sales area are not obliged to take back deposit containers. Retailers may take back deposit packages through manual or RVM collection. The Estonian DRS aims to have as much RVM collection points as possible to ensure efficiency throughout the entire system. To achieve this, Estonia tries to install as many RVMs with compactors in order to decrease manual collection point On-spot compacted materials will decrease fraud to a minimum and will increase efficiency in logistics and processing collected packages (Balcers et al., 2019). In Estonia already 80% of the total volume of one-way deposit packages are compacted in retail shops. In 2018, the Estonian retailer's deposit packages collection infrastructure was 6% manual collection, 94% RVM collection (Earth care consulting, 2021).

Handling fee structure: in Estonia, the system operator and retailer associations have agreed upon a generic calculation for determining handling fees (Eesti Pandipakend, 2021). This calculation is adjusted annually to incorporate inflation and must reflect all costs involved, including retailer space requirements and staff wages, to reach a cost and revenue neutral outcome. As such, Estonia has different handling fees for RVM systems with compaction and manual collection systems. The handling fee for retailers with an RVM with compaction is almost three times higher than retailers relying on manual returns.

Handling fees 2021			
	Aluminium can	Plastic bottle	Glass bottle
Manual Collection	*€0.0115 + VAT*	*€0.0115 + VAT*	*€0.013 + VAT*
RVM with compaction	*€0.033 + VAT*	*€0.033 + VAT*	*€0.025 + VAT*

Relevant literature:

- Balcers, D., et al. (2019), *Deposit Return Systems for Beverage Containers in the Baltic States* (report)
- Earth Care Consulting (2021), *Baltics DRS - Estonia, Lithuania, Latvia* (presentation)
- Eesti Pandipakend (2021). *Packaging Company ABC* (webpage).

DRS recycling: Eesti Pandipakend

Historic development of performance: Since the implementation of the DRS system in Estonia, the performance in terms of the relative amount of the materials that is collected and returned, keeps surpassing the targets set by the Estonian government. In 2017, of the 291.26 million units that were sold, 231.33 million items were collected and returned. In 2020 this number has even increased as 268 million items were collected and recycled. In the same year, 311 million packaging units were sold on the market, leading to return rates of 91% for plastic packaging (legal target is 85%), 94% for metal cans (legal target is 50%), and 87% for glass packaging (legal target is 85%). Moreover, the number of collected items in 2020 was more than 5 times the number of collected items in 2005 (the first full year the system was implemented).

Quality and recycling of collected materials: As a result of the closed loop, the quality of the collected materials is relatively high. All collected cans are directly sold to recycling organisations in other EU countries (mainly France and England), where the cans are melted and sold to the beverage industry (Balcers, 2019). Plastic bottles are auctioned to Estonian recyclers or for recyclers abroad. Part of the material from the bottles is even recycled in the food industry as new packaging material. Transparent glass packaging is recycled in Estonia and turned into new bottles and jars. Coloured glass is sold to recyclers abroad.

Eesti Pandipakend OÜ: MARKET SIZE in 2018	Tonnes:	% of total:
Plastic packaging return rate: 86%		
- *Total generated:*	55.393	100.0%
- *Put-on-market DRS fraction:*	4.480	8.1%
- *Collected DRS fraction:*	3.853	7%
Metal packaging return rate: 96%		
- *Total generated*	16.541	100%
- *Put-on-market DRS fraction*	1.670	4.5%
- *Collected DRS fraction*	1603	4.3%
Glass packaging return rate: 90%		
- *Total generated:*	37.262	100%
- *Put-on-market DRS fraction:*	7.630	46.1%
- *Collected DRS fraction:*	6.867	41.5%

Calculating EPP's market size:

Numbers in the table above are calculated for the year 2018. At present, this is the latest year with relevant data in Eurostat's waste statistics. The number for "total generated" refers to the amount of all packaging waste generated in 2018 for a specific material. "Put-on-Market" fraction refers to the total amount of packaging brought on the market with DRS deposit and collected to the amount that was collected by EPP. These numbers are from EPP's annual report 2018.

FINLAND

National context: Finland

Packaging & packaging waste directive: the EU waste directive and the EU packaging and packaging waste directive were transposed in Finnish legislation in 1993 with the Finnish Waste Act 1072/1993 and in 1997 with the Council of State Decision on Packaging and Packaging Waste 962/1997 (Expra, 2021). These directives – updated in 2004 – introduced various policies and measures that impacted the management of packaging waste. Most notably, an eco-tax on beer and carbonated soft drinks containers (in 1994), a mandatory DRS for one-way containers (in 1996), and an extended producer responsibility (EPR) for non-DRS packaging (in 2015). In 2005, the Finnish government mandated recycling and reuse targets: 90% for refillable packaging, 90% for metal cans and 80% for one-way packaging. The EPR established in May 2015 made producers responsible for the recycling of their products – in 2016 they also became responsible for the collection of the material (RINKI, 2021). In 2021, the latest update of the waste act went into force, extending producer responsibility (to foreign online shops) for packaging and enabling the start of RINKI eco-take-back points for residential waste collection. In addition to the introduction of these measures, the directives stipulate the required minimum collection, recycling and reuse targets for different packaging materials. Also, the directives set the minimum deposits on beverage containers and determine the minimum number of take-back points for the EPR collection system.

Collection systems for packaging waste: the abovementioned decrees have resulted in the introduction of various waste collection systems in Finland. In the first place, a mandatory DRS for one-way containers (cans, PET and glass) coordinated by Palpa and a voluntary DRS for refillable containers managed by Ekopullo (both described in-depth in the next slides). In addition to these DRS, Finland has a central collection system consisting of recycling stations managed by RINKI Ltd. for the Finnish EPR schemes. RINKI organizes this collection system for four producer organizations: Mepak-Kierrätys Oy (metal), Suomen Keräyslasiyhdistys ry (glass), Suomen Kuitukierrätys ry (fibre) and Suomen Uusiomuovi Oy (plastic). For Suomen Keräyslasiyhdistys ry, RINKI also organizes the glass recycling. As mentioned above, the EPR for packaging waste came into effect in May 2015 and obliged producers to establish a minimum of 1,850 collection points for consumer packaging (glass, metal and fibre). According to RINKI, a large majority of the Finnish population (70%) is reliant on the recycling stations of this system instead of from a curbside collection (FEVE, 2018).

FINLAND: GENERAL CHARACTERISTICS (in 2018)	
Population:	5 513 130
Population density:	18.2
GDP per capita:	€ 36 740
Total waste generated:	128 251 735 tonnes
Household waste generated:	1 519 835 tonnes
Household waste per capita:	276 kg
Packaging waste generated:	705 593 tonnes
- Plastic packaging:	135 252 tonnes
- Glass packaging:	79 828 tonnes
- Metal packaging:	51 857 tonnes

Relevant literature:

- Expra (2021) *Finland* (webpage)
- FEVE (2018) *Raise the glass* (report)
- Rinki (2021) *The law stipulates producer responsibility* (website)

DRS re-use: Ekopullo

DRS for reuse: in Finland, a separate system exists for reusable bottles. This system, Ekopullo, is responsible for the reuse, repair and redistribution of glass beverage packaging and transport units in Finland. Finnish consumers return approximately 97% of all glass bottles places on the market – Ekopullo ensures washing and refilling them up to 33 times. Ekopullo is a not-for-profit organisation which operates on entrance and membership fees of its members (Ekopullo 2021). The Ekopullo system accepts refillable glass bottles of 0.33L, 0.5L and 1.0L, but also hard PET bottles of 0.5L and 1.0L.

Ekopullo: GENERAL CHARACTERISTICS	
Full name:	Ekopullo
Established	2004
Organisation type:	Non-for-profit
Shareholders:	Palpa
Legal status	Voluntary
Collection rate	97%

Legal basis: in Finland, there are two laws in place affecting the handling of refillable packaging. The first law applies to non-refillable, one-way containers and imposes a packaging fee, charged to the producer. The second law is aimed at refillables and exempts these containers from the previously mentioned tax law. The later (exemption certain containers) is established under the waste management act of 1990. Together, these laws stimulate the use of refillable packaging over one-way packaging (Bottle bill, 2021).

System operations: Consumers can bring back empty refillable packaging from the Ekopullo DRS to the same return points as packaging from the Palpa DRS (Ekopullo, 2021; on the Palpa DRS see beneath). In this way, it is prevented that consumers experience any additional inconveniences when bringing back their packaging materials. The close alignment between Palpa and Ekopullo makes this also relatively easy to organize. Retailers, however, are obliged to sort carefully the different fractions. Moreover, materials collected for the Ekopullo system can't be sent to Palpa, but only directly to the breweries in specific secondary/tertiary packaging. Glass bottles are reused in a pool of packages, managed by Ekopullo. Ekopullo's tasks are to administrate the pool, ensure enough packaging, keeps track of their members' need of replacement, stock and buys this for them and they distribute the costs of the system amongst the members (Palpa, n.d.)
Each member of the pool owns their own bottles, transportation units and pallets. Consumers return their bottles to the reverse vending machine at the retailer, after which the packaging is transported back to the producer or brewer, who are responsible for washing and relabeling the bottles. Hereafter, the products can be put back on the market. Bottles circulate in the system about 33 times.

Relevant literature:

- Ekopullo (2021) *Retail, Horeca and consumers* (website)
- Nurminem (2016) *The Finnish reuse system for beverage packages* (presentation)
- Bottle Bill (2021) Finland (website)
- Ekopullo (undated) *Types of packaging, places and lining* [company regulation]
- Palpa (n.d.) *The Finnish Reuse system for beverage packages* (presentation)

DRS re-use: Ekopullo

Type of packaging DRS for reuse: the "reuse" DRS does not publicly report the number of items that were collected and reused in the last years. In 2016, however, it was reported that the system included 40 million deposit bottles that were refilled 67 million times (Nurminem, 2016). This refers to the standard refillable brown 0.33-litre beer bottles (see figure). In addition to these bottles (mainly for consumers), Ekopullo includes DRS for reuse for products used by horeca, e.g., larger and special bottles (glass, PET), secondary packaging (crates, trays), and tertiary packaging (pallets, dollets). Ekopullo notes that "*for the time being, consumers can also return Ekopullo's discarded refillable 0.5-litre and 1.0-litre glass bottles and 0.5-liter and 1.5-litre PET bottles (hard plastic bottles) to the* reverse vending machines, as long as they are intact and recognizable by shape." (Ekopullo, 2021)

Packaging requirements DRS reuse: in the case of the "reuse" DRS, participants (members) do not design their own packaging. After becoming a member of the Ekopullo DRS, participants specify in their application what types (and units) of the Ekopullo system they want to use.

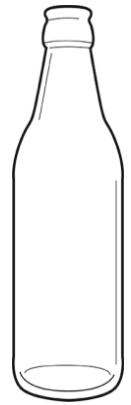
Quality: There is no explicit information published on the quality of materials circulating in the Finnish deposit return system for refillable and reusables. The bottles in the system are refilled approximately 33 times.

Relevant literature:

- Ekopullo (2021) *Retail, Horeca and* consumers (website)
- Ekopullo *(2021) Importers and breweries* (website)
- Nurminem (2016) *The Finnish reuse system for beverage packages* (presentation)

Ekopullo: PRODUCER FEES

Company registration fee:	€ 1,000



Picture of the standard glass bottle in the Ekopullo DRS. These standard bottles are coloured (brown) glass with a content of 0.33 L.

DRS re-use: Ekopullo

Ekopullo (2004): Primary materials	
Uniform Bottles	
Clear glass, 0.33, 0.35L	*€0.10*
Clear glass 1L	*€0,40*
Clear PET, 0.5:L	*€0,20*
Clear and blue PET 1L	*€0,40*
Clear PET 1,5L	*€0,40*
Other bottles	
Clear Glass 0.3L , 0.35L	*€0.10*
Clear PET 0.5L , green PET 0.5L	*€0.20*
Clear PET 1.5L, green PET 1.5L	*€0.40*

Secondary materials	
Cell plates 0.33L Glass	*€3,90*
Cell plates 0.5L PET	*€3,90*
Cell plates 1.5L PET	*€3,90*
KMP cell plates 0.5L	*€2,60*
KMP cell plates 1.5L	*€2,60*
KMP cell plates 2.0L	*€3,70*
Wine cell plates	*€4,50*
Can cell plates	*€2,60*

Tertiary materials	
Pallets	
1/1 pallet platform	*€24*
½ pallet platform	*€6*
EURO Pallet	*€24*
Pallet adapter	*€57,20*
Pallet adapter mini dolly's	*€70*
Dolly's	
Drinks dolly	*€30*
Mini dolly	*€23,50*

Included materials

Ekopullo includes multiple materials besides refillable bottles. The transportation units are also used for the bottles and are also washed and repaired if needed and make the same journey through the system for refillables. The Finnish system is rather unique in including these secondary and tertiary materials as well and enable reduction of the amount of packaging waste in landfills and the environment.

DRS recycling: PALPA

Reason to be a DRS: The Finnish bottle return system was established in the 1950s, thus the country has long been used to a system of returning their packaging. The initial system included refillable containers and was used to incentivize return of packaging, reusing and recycling. In 1994, the Finnish government established a packaging tax on soft and alcoholic drinks, to improve the return system and to increase the amount of packaging returned. The tax was levied at the point where products were placed on the market. This decision led to a considerable reduction of the taxes for producers and importers participating in the government-registered deposit refund system and eventually performed as a key driver of the establishment of Palpa in 1996 (IEEP, 2016). Establishment of the system for one-way bottles was primarily led by the brewer's industry, yet the institutional change from refillables to one-way cans was mostly driven by retailers, as the latter party preferred the practicality of lighter cans that could be crushed, over heavy bottles taking up a lot of space. One-way packaging tax, however, slowed the switch to this material. When this tax was halved in 2004, and government announced its elimination within four years, one-way packaging quickly started to gain momentum on the Finnish market, leading to the direct introduction of a deposit refund system for one-way PET and glass bottles (IEEP, 2016).

Operational responsibilities: Palpa is a non-profit organisation and has a network of companies to which most of its operations are outsourced. This means that the collection, recycling and reselling is done by Palpa's partner organisations. Palpa itself manages and develops the return system. The manufacturers and importers that are part of the DRS fund this system through payments – such as membership fees and package-specific recycling fees. When consumers return their empty packaging to stores and kiosks, the packaging is returned to (distribution) operators by transport companies that collect their cargo at beverage suppliers like hotels, restuarants, offices, schools and event organisations. After the transporters drop off the packaging at the operators, these are responsible for calculating plastic bottles and cans (when not returned at reverse vending machines but manually) and handle the transport of bottles further to recycling plants. Glass bottles meant for reuse are picked up from retailers (Palpa, 2021).

PALPA: GENERAL CHARACTERISTICS	
Full name:	Suomen Palautuspakkaus Oy.
Established	1996
organisationtype:	Non-for-profit
Shareholders:	50/50 industry and retailers The owner companies are Sinebrychoff Supply Company Oy, Hartwall Ltd, Olvi Oyj, Alko Inc, Kesko Oyj and Inex Partners Oy.
Total revenues:	80 M€ ex. 360 M€ worth of deposit fees

Relevant literature:

- PALPA (undated) *What is Palpa?* (website)
- PALPA (2020) *1.9 billion enviornmental acts in a year* (presentation)
- Institute European Environmental Policy (2016) *Deposit Refund System (and Packaging Tax) in Finland* [policy paper]

DRS recycling: PALPA

Financial responsibilities: as mentioned, the operational responsibilities of the deposit return system Palpa are spread amongst different organisations. In order to keep the system running, the costs thereof are covered by membership fees and package-specific fees paid by manufacturers and importers.

The financial responsibility thus carried by Palpa includes (1) paying handling fees to return points (retailers accepting packaging from consumers) (2) paying transport compensations to the drivers (3) paying expenses of the processing of beverage packaging in processing plants (4). In addition to that, Palpa also receives money from the reprocessor, who buys the material.

Journey of the deposit: When a consumer buys a package holding a deposit return fee, it pays the total amount to the retailer. The retailer has paid the importer or manufacturer of the beverage; when the consumer returns the package to the store, it receives back the deposit on the empty container. When the packaging is returned to the plant, the operator counts the packaging. Based on this number, Palpa pays the deposit to the return points (Palpa, 2021). Palpa receives membership fees from manufacturers and importers of beverage packaging – Palpa collects these fees and uses these to cover the costs of the return system, including logistics, transportation, compensation to return points and processing of material. This money is separate from the money circulating between the producer, retailer and the consumer. Revenue comes from material sales, unredeemed deposits and recycling fees (Palpa, n.d.)

Relevant literature:

- Palpa (undated) *Who pays for the recycling of beverage packages?* (website)
- Palpa (2021) *1.9 billion enviornmental acts in a year* (presentation),

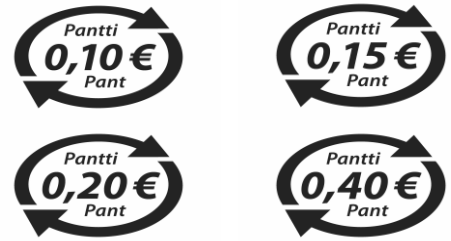
PALPA: PRODUCER FEES		
Company registration fee:	€ 1,000	
Packaging registration fees (€ / barcode):	Cans:	€ 284.55
	Glass:	€ 325.20
	Plastic	€ 284.55
Deposit fee (€ / item):	*Cans:*	€ 0.12097
	Glass:	€ 0.08065
	Plastic (small / medium / large):	€ 0,08065 / € 0.16129 / € 0.32258
Recycling fee cans (€ / item):	€ 0.003	
Recycling fee glass (€ / item):	International barcode: **€ 0. 0661** for < 0.5 L bottles & **€ 0.11016** for > 0.5 L bottles	
	National barcode: **€ 0. 0661** for < 0.5 L bottles & **€ 0.11016** for > 0.5 L bottles	
Recycling fee plastic (€ / item):	Clear / transparent: **€ 0. 01052** for small bottles (less than 1 L) and **€ 0.02105** for large bottles (1 L or more)	
	Colored: **€ 0. 01672** for small bottles (less than 1 L) and **€ 0.02675** for large bottles (1 L or more)	
	Mixed material: **€ 0. 05245** for small bottles (less than 1 L) and **€ 0.07867** for large bottles (1 L or more)	

DRS recycling: PALPA

Type of packaging DRS for recycling: the “recycling” DRS collects approximately 1.9 billion empty deposit beverage packages per year (Palpa, 2021a). This includes packaging in “customs tariff 22” as well as other drinks such as juice concentrates, and fruit and vegetable juices (Palpa, 2021b). Customs tariff 22 contain beverage containers for products like waters, soft drinks, malt beverages, wines, beer, cider, liquor, and spirits Excluded packaging from the DRS are containers for milk and milk products. The Palpa DRS for recycling includes beverage cans, plastic bottles and glass bottles. This means that the material scope of the system is limited to aluminium, PET, and steel.

Four different deposit fees:

The Finnish DRS system has a differentiated deposit fee rate structure with four different rates: € 0.10 for glass bottles and for small plastic bottles (0.35 L or less), € 0.15 for cans and aluminium bottles, € 0.20 for medium-sized plastic bottles (between 0.35 L and 1 L), and € 0.40 for large bottles (larger than 1 L). The values are determined by the minimum deposit values set by the Finnish government. The deposit values haven’t changed since 2005. The Finnish DRS for re-use (Ekopullo) uses the same deposit symbols for the refillable packaging included in their system (see sheets below).



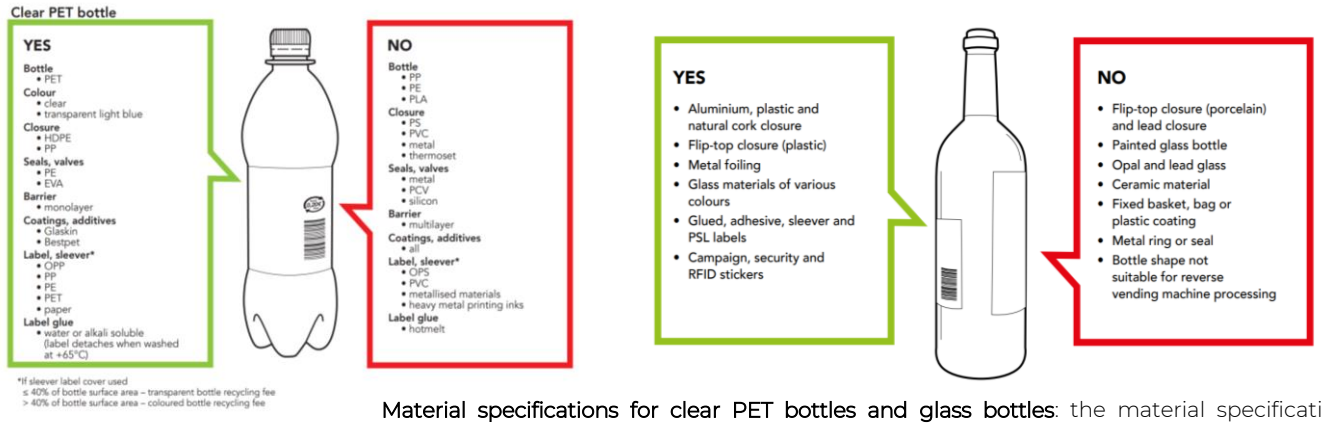
The deposit symbols for € 0.10, € 0.15, € 0.20, and € 0.40. Producers have to submit new packaging with the logo to PALPA for approval.

Relevant literature:

- PALPA (2021a) Everything circulates (report)
- PALPA (2021b) Product groups accepted into return systems (document)

DRS recycling: PALPA

Packaging requirements DRS recycling: after becoming a member of Palpa, product owners can register their packaging to the DRS. Registration takes around 2 to 4 weeks and includes a check of a model of the packaging. Palpa uses this check to see if the proposed packaging is in line with the specific packaging requirements. Packaging requirements include aspects such as: shape and dimensions; bar code; deposit and material symbol; labelling. For plastic and glass bottles, also material specifications are included that enable higher-quality recycling (for example see figures below):



Material specifications for clear PET bottles and glass bottles: the material specifications emphasize the exclusion of certain materials (e.g. other polymers than PET or opal glass) as well as certain seals, valves, coatings, etc.

Relevant literature:

- Palpa (2021a) *Design principles aluminium cans* (document)
- Palpa (2021b) *Design principles glass bottles* (document)
- Palpa (2021c) *Design principles plastic bottles* (document)

DRS recycling: PALPA

Return points and types of handling: any retailer selling deposit-bearing beverage containers is obliged to take back the empty containers. The law includes an exemption, whereby small retailers can refuse to accept packaging if the volume is disproportionately high in relation to its size. As of 2016, around 4,000 RVMs were in operation with 5,000 retail collection points for consumers and an additional 9,000 horeca recycling points. This means a take-back point to inhabitant ratio of 1105 and one take-back point in every 0.016 km^2. Consumers return most containers to take-back points with RVMs (95%), while manual take-back points take the remaining 5% (INNOWO, 2020).

Handling fee structure: in the national DRS rules and regulations, it is specified that companies (return-points) that manage consumer returns and pay deposits to consumers are compensated. This compensation (processing refunds, or handling fees) is calculated in a way that it should compensate the expenses resulted from receiving deposit packages and paying deposits to their recipients (Palpa, 2021). It should be noted, however, that relatively little differentiation is made between type of handling and type of container (material). Retailers using a compacting RVM do receive a higher fee than shops that take containers with only RVM or manually. This probably reflects the higher investment costs for the retailer, as well as the transportation efficiencies that are generated by compacting the containers.

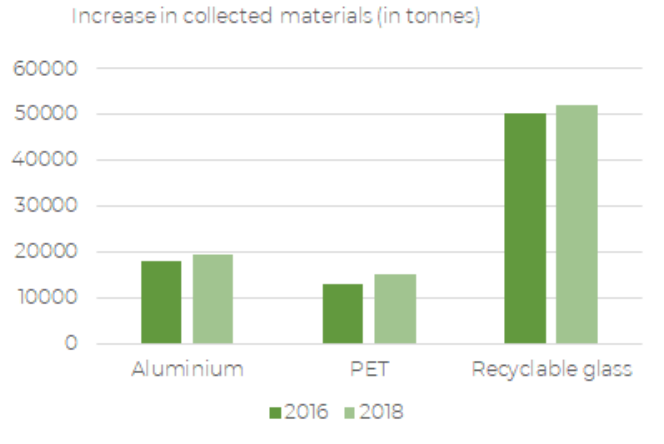
HANDLING FEE:	*Plastic:*	*Metals:*	*Glass:*
Manual:	€ 0.019	€ 0.019	€ 0.019
RVMs:	€ 0.019	€ 0.019	€ 0.019
RVM with compactor:	€ 0.029	€ 0.023	-

Relevant literature:

- Ekopullo (2021) Consumers (website)
- INNOWO (2020) How do effective deposit refund systems work? (report)
- Palpa (2021) retail and horeca (website)

DRS recycling: PALPA

Historic development of performance: Palpa reports its collection performance in the number of items collected and annual return rates. Its most recent brochure shows that the annual return rate for the three one-way packaging types is relatively stable since 2012 (Palpa, 2021). The annual return rate for aluminium cans is in the range of 94% and 96%; plastic bottles in the range of 90% and 94%; recyclable glass bottles 87% and 91%. In absolute numbers, a growth can be observed in collected items (Nurminem, 2016; Palpa, 2021).



This comparison between 2016 and 2020 shows that – in tonnes - the amount of PET collected grew strongest with 21%, followed by aluminium cans (12%) and recyclable glass (4%). These trends aren't fully in line with the growing amount of aluminium and glass packaging that was put-on-market. The growth of alminium packaging was smaller (4%), while the growth of recyclable glass was larger (15%).

Relevant literature:

- Nurminem (2016) *The Finnish reuse system for beverage packages* (presentation)
- PALPA (2021) *Everything circulates* (report)

PALPA: MARKET SIZE in 2018		Tonnes:	% of total:
Plastic packaging return rate:	90.0%		
- *Total generated:*		135 252	100.0%
- *Put-on-market DRS fraction:*		15 400	11.4%
- *Collected DRS fraction:*		13 860	10.2%
Glass packaging return rate:	87.0%		
- *Total generated*		79 828	100.0%
- *Put-on-market DRS fraction*		52 900	66.3%
- *Collected DRS fraction*		46 023	57.7%
Metal packaging return rate:	95.0%		
- *Total generated*		51 857	100.0%
- *Put-on-market DRS fraction*		19 700	38.0%
- *Collected DRS fraction*		18 715	36.1%

Calculating Palpa's market size: Numbers in this table are calculated for 2018. At present, 2018 was the latest available year with relevant data in Eurostat's waste statistics. The number for "total generated" refers to the amount of all packaging waste generated in 2018 for a specific material. "Put-on-Market" refers to the total amount of packaging sold within the scope of the DRS and collected the amount collected by PALPA.

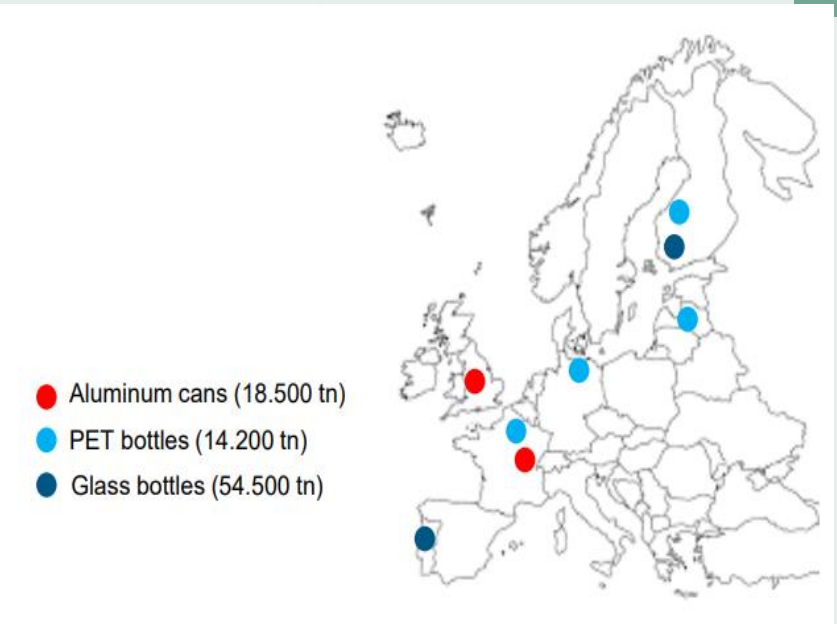
DRS recycling: PALPA

Quality and recycling of collected materials: Palpa reports that the quality of the collected materials is high due to the closed system. The collected cans are 100% recycled and directly used to manufacture new cans (PALPA, 2021). Recycling of the cans take place outside Finland, i.e. in the UK and France in 2019 (Vihavainen, 2020). Palpa doesn't report information on the recycling rate of the collected PET. However, they explain that clear PET-bottles are recycled directly into new bottles and other food packaging. Coloured PET-bottles are recycled to raw material of packaging and the textile industry (Nurminem, 2016). PET recycling takes place both in Finland as well as in Latvia, Germany, and France.

Glass bottles are recycled to new bottles or raw materials i.e. insulation products in construction industry. A study commissioned by FEVE, reports that the quality of the glass being recovered through the PalpaDRS is much better than that of the EPR scheme run by RINKI. According to Palpa, this is because the DRS only accepts the approved packages based on the EAN code (the barcode). RINKI confirms that the glass collected by them is of poorer quality than the DRS glass with a 5% contamination rate which must be dealt with in the sorting facilities but emphasizes that when a whole value chain approach is taken their scheme is still better value for money (FEVE, 2018). Recycling of the collected glass takes place in Finland and Portugal.

Relevant literature:

- FEVE (2018) *Raise the glass* (report)
- Nurminem (2016) *The Finnish reuse system for beverage packages* (presentation)
- PALPA (2021) *Everything circulates* (report)
- Vihavainen (2020) *1,9 Billion environmental acts in a year* (presentation)



Recycling of materials collected by the Finnish DRS:

Materials that are collected by the operators in the Palpa network deliver them directly to various operators in Europe. Only for aluminium cans, a 100% closed recycling loop is reported by PALPA. For recyclable glass and PET, both closed-loop and open-loop recycling takes place. Figure above, depicts the situation in 2019 as presented by Vihavainen (2020).

GERMANY

National context: Germany

Packaging and packaging waste directive: The German Packaging Act mandates the deposit on single-use beverage packaging. The primary instrument for waste regulation in Germany is the Waste Management Act (WMA), dating back to 1986. At first, the WMA was a voluntary mandate, and introduced the 'polluter pays principle', to relieve local authorities from tasks such as disposing packaging: manufacturers and distributers of packaged products had to accept and recycle empty packaging. The Duales System Deutschland (DSD), was set up in 1990 to fulfill this goal and became the main organization handling this. Under the Packaging Ordinance (1991), a national market share was mandated on refillable drinks packaging. The 72% recycling target installed with the Packaging Ordinance of 1991, however, was by far not reached.

Due to this reason, in addition to an already existing deposit system on reusable containers, the German government, from 2003 on, mandated a compulsory DRS for single-use packaging made from glass, plastics of composite materials has existed. Also, other Packaging Responsibility Organizations (PROs) were allowed access to the market alongside DSD, changing the German EPR system for packaging from a single non-profit PRO to a system with multiple for-profit PROs.

Germany: GENERAL CHARACTERISTICS (in 2018)	
Population:	82.792.351
Population density:	234,7
GDP per capita:	€ 35.690
Total waste generated:	405.523.624 tonnes
Household waste generated:	20.638.829 tonnes
Household waste per capita:	249 kg
Packaging waste generated:	18.860.600 tonnes
- Plastic packaging:	3.235.800 tonnes
- Glass packaging:	2.902.900 tonnes
- Metal packaging:	990.100 tonnes

National context: Germany

Until 2006, the DRS system functioned on basis of a ‘island solution’, meaning that single use containers had to be returned to the store where they were purchased initially. After 2006, this changed to a nationwide deposit system with the establishment of the DPG (Deutsche Pfandsystem GmbH). DPG was established by the retail industry to define shared framework conditions for participants in the nationwide system and to establish a completely new one-way deposit system through which a smooth deposit cycle could be implemented (BMU, 2021). In 2019, the VerpackG went into force, replacing the Packaging Ordinance, now obliging all new packaging to be taken back by enterprises and all manufacturers and distributors must register with the Central Agency Packaging Register. Companies can delegate this task to one of the 'dual systems' (Zentek, 2021). The latest amendment of the German Pacakging Act was made in 2021: within the scope of this amendment, wine, sparkling wine and juices in cans and disposable plastic beverage bottles, for example, also became subject to the mandatory deposit. The DPG is a deposit system according to § 31 German Packaging Act (VerpackG). If the requirements in the Packaging Act change, the changes/extensions will be considered accordingly in the DPG System. The DPG itself has no direct influence and no decision-making power about the framework conditions set out in the Packaging Act on the mandatory deposit for one-way beverage packaging. The latest update of the VerpackG quotes recycling targets of 90% for glass and aluminium and 63% for plastics, from 2022 on.

Relevant literature:

- Bundesministerium für Umwelt (2021) *Waste Policy* [website]
- Zentek (2021) *All about the packaging act* [website]
- Duits-Nederlandse Handelskamer (2021) [website]
- DPG-Pfandsystem (2021) *About the DPG* [website]
- GIZ (2018) *Deposit-Refund Systems (DRS) for Packaging* (paper)
- Happach et al. (2013) *The establishment of container-deposit on single-use beverage packaging in Germany* [paper]

National context: Germany

Collection systems for packaging waste: When the Packaging Ordinance came into force in 1993, a system was established that was responsible for collecting, sorting and recycling packaging throughout Germany. The Duales System Deutschland (DSD), which was established in 1990, was set up in order to fulfill this goal and the DSD became the main organization handling. In 2003, other Packaging Responsibility Organizations (PROs) were allowed access to the market alongside DSD, changing the German EPR system for packaging from a single non-profit PRO to a system with multiple for-profit PROs. Currently, there are nine dual systems in Germany: when a company signs a contract with one of these dual systems, which shifts their duty of taking back packaging to a PRO. Companies pay a fee to one of these systems, based on the type and amount of packaging (DNHK, 2021).

Within the mandatory DRS (for one-way packaging), a deposit of 0.25 EUR is levied on (1) packaging of a volume between 0.1L and 3L, (2) packaging made of non-ecologically advantageous materials and (3) packaging containing drinks including beer, water, soft drinks, and mixed alcoholic drinks. The voluntary deposit system is one for reuse. This system, "Mehrweg Pfand", operates separately from the system for recycling and includes hard PET beverage packaging, and refillable glass that are not covered under the DRS for recycling. The Mehrweg Pfand system is applied via three types of take-back systems: closed pool systems, open pool systems, and the option to build an individual system for deposit return. These systems will be explained in more detail in the next slides.

Cooperation between systems: DRS for reuse existed in Germany since 1929 (at least) and DRS recycling since 2005. This means that the country had DRS reuse before the implementation of the EPR-scheme, recycling followed later. No formal link exists between DRS reuse and recycling and the EPR systems, nor between DRS reuse and DRS recycling. DRS for recycling was introduced to preserve refillable packaging on the German market.

Der Gelbe Sack: in the Duales System Deutschland municipal packaging waste is collected in specific yellow sacks since 1991. (photo: Wikimedia commons)

Relevant literature:

- Bundesministerium für Umwelt (2021) *Waste Policy* [website]
- Zentek (2021) *All about the packaging act* [website]
- Duits-Nederlandse Handelskamer (2021) [website]
- DPG-Pfandsystem (2021) *About the DPG* [website]

DRS re-use: Mehrwegpfand

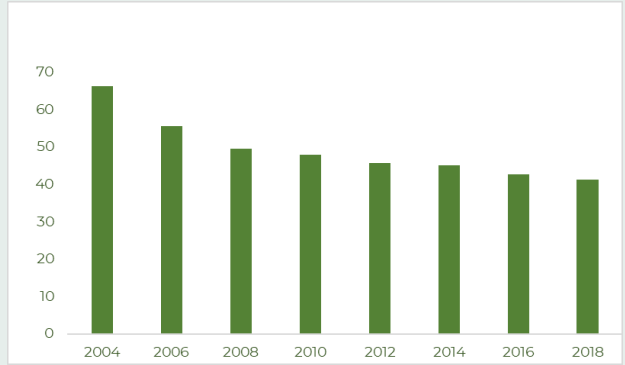
DRS for reuse: Germany has a long history of deposit systems for refillable packaging. Deposit on refillable packaging was already initiated at least in 1929 by Coca Cola, making this system a predecessor of the current deposit systems (IASS, 2020). Re-use systems have functioned quite well ever since and nowadays about 41.2% of beverages sold in Germany come in reusable packaging. Germany is actively promoting the increase in use of refillable bottles over one-way packaging. The new packaging regulation has enforced a quota of 70% of beverage packaging being reusable by 2022 (Euractiv, 2019). While this target is not consequential yet, German government is considering implementation of taxes to increase this. Additional measures to stimulate refillable packaging were specified in the packaging act of 2019. This act has mandated additional labelling for the bottles on the shelfs of disposable beverage packaging, ensuring more transparency for the consumer (see picture on the next slide). Additionally, "mehrweg" should be clearly stated on the bottle.

The practical implementation of DRS for reuse is on voluntary basis and producers have different options to organize the take-back of their packaging. Currently, approximately 57% of refillable packaging are "pooling bottles" and 43% were "individual bottles“ (see also beneath). The ”pfand” or deposit on reusable bottles varies between €0.08 and €0.25: beer bottles are €0.08. There is no formal link between DRS and the EPR systems, nor between DRS reuse and DRS recycling. The current recycling rate lies at 98.8%. Participating in this system is voluntary.

Mehrwegpfand	
Established:	2003
Ownership material	Mehrweg system
Packaging included:	Glass, 0.33l, 0.5l , swing-top bottles Hard PET
Deposit fee	Between €0.08 and €0.25
Collection rate	98.8%

DRS re-use: Mehrwegpfand

System operations: As mentioned before, there are three options when a producer wants to join a system for reusable bottles. The system operations differ (slightly) per type of reuse organization. There is a choice between 'Geschlossner pool' 'offener pool' and 'individualflaschen' - indicating the difference between closed, open pool or private bottles. The closed pool bottles are controlled by a system administrator, who purchases bottles and distributes them throughout the pool and exists of multiple members. In the open pool, there is no overarching system operator arranging these tasks, and individual companies control their own inventory and have a pooling system in which they arrange their own washing and restocking of bottles. Finally, the individually owned bottles are filled and washed by one company/producer.



Share of drinks filled in reusable drinks packaging (BMU, 2021)

Relevant literature:

- Institute for Advanced Sustainability Studies (2020) *Moving towards stronger packaging waste legislation in Germany: an analysis of the German Packaging Act* (report)
- DPG-Pfandsystem (2021) *Die Funktionsweise des Pfandsystems* (website)

DRS re-use: Mehrwegpfand

Legal Basis: the circular economy act of 2012 identified re-use as one of the main pillars of the circular economy. The Packaging Act of 2019 (VerpackgG) has set targets for the increased share of beverages filled in reusable packaging to over 70% by 2022 (IASS, 2020). Currently, the German government is considering options to make this bounding, however, no consequences yet exist when the quota is not reached. VerpackG also states that reuse must be facilitated through adequate logistics and appropriate incentive systems; such as the deposit return scheme. Yet, while the Packaging Act regulates which one-way bottles are subject to the deposit return scheme and how they should be returned, the Act does not state such rules for reusable beverage packaging (Verbracher Zentrale, 2020). In the closed pooling system, the system remains owner of the material – in the other two types of reusable bottle systems, the material is owned by the producers. This can lead to issues with theft, as no sanctions can be maintained. This is a growing issue related to increasing prices of the material.

Packaging requirements DRS reuse: Included in the German system for refillables are beer bottles, non-alcoholic glass bottles, thick PET soft drink bottles and yoghurt glasses. Also, crates are included in this system. Mehrweg, or refillable bottles, are recognised by either the word "Mehrweg" stated on the bottle, or the "Mehrweg pfand" logo as shown on the previous slide.

The 2019 Packaging Law states that additional labelling on store shelfs should clarify the type of beverage packaging (Interpack, 2021)

Relevant literature:

- Institute for Advanced Sustainability Studies (2020) *Moving towards stronger packaging waste legislation in Germany: an analysis of the German Packaging Act* (report)
- DPG-Pfandsystem (2021) *Die Funktionsweise des Pfandsystems* (website)
- Verbraucher Zentrale (2020) *Reusable or Disposable: Total Confusion with the Deposit* (website)
- Interpack (2021) *Beverage Packaging: More Transparency for Returnable and Disposable Packaging* (website)

Symbol of the DRS for reusable packages. In Germany, there is no uniform labelling for reusable packaging: reusable deposit bottles can be identified by the word "Mehrweg"

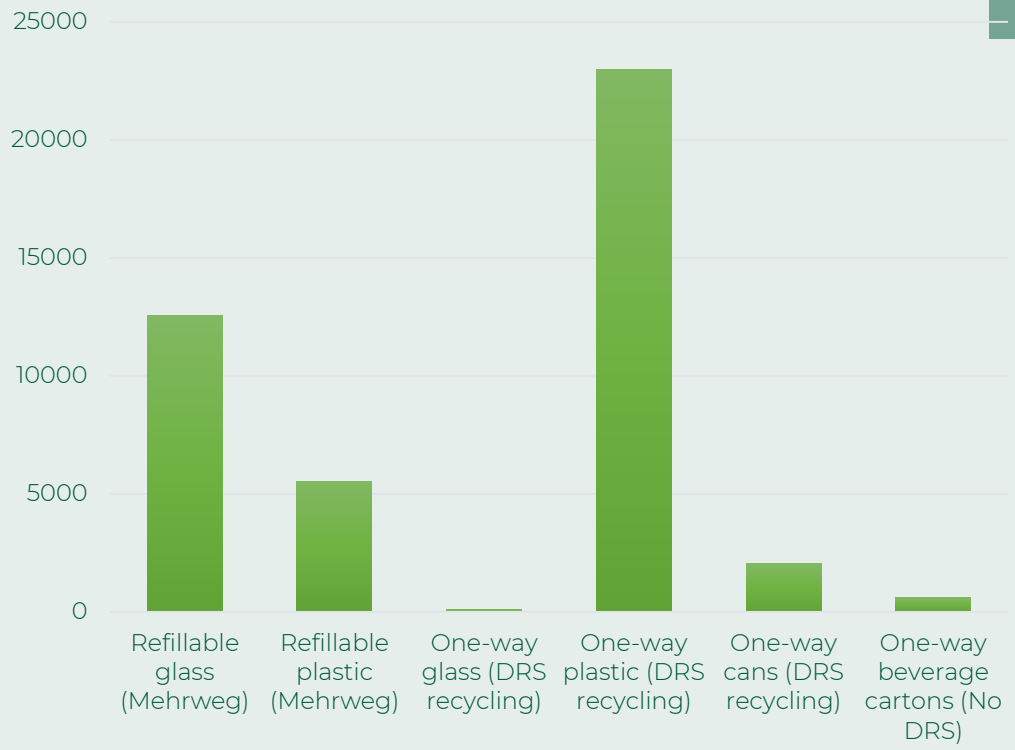
DRS re-use: Mehrwegpfand

Quality: According to study, the German system for reuse enables reuse of glass bottles up to 50 times – 25 times for PET bottles. This number is remarkably high, particularly in comparison to other systems.

Furthermore, there is no specific information about quality of reusable bottles in Germany. The systems for reuse are based on both a pooling system and bottles from individual brands. Most glass packages are standardised pool bottles (which have only different labels) and can be returned to all participants in the system (BMUB, 2021). Other bottles circulating in Germany are bottles from foreign brands which are returned there after use. Deposit fees for refillable packaging are not fixed, but range between €0.08 and €0.25.

Quantity: In 2018, 44.0 billion liters of beverages were consumed in Germany. The total share of refillable packaging was estimated at 41.2%. Of this total share of refillable packaging approximately 57% was a "pooling-bottle" (10.3 billion liters) and 43% was an "individual bottle" (7.8 billion liters).

Around 12.5 billion liter of beverages in refillable glass were consumed in Germany, whereas 5.5 billion liter of beverages in refillable plastics were consumed.



DRS re-use: Mehrwegpfand

Journey of the deposit through the system

1. Upon entering the market, the producer has to make a decision on the type of collection system, i.e., closed system, open system, or individual system (see sheet above).
2. The bottles are filled by the producer and sold to the retailer. The producer and retailer agree among themselves upon the inclusion of a handling fee. Deposit money is transferred along with the bottles, i.e., the retailer pays the producer for the product + deposit.
3. The consumer buys the product for the price + the deposit.
4. The consumer returns the bottle upon which the consumer receives the deposit fee back from the retailer.
5. The bottles are transported back to either the system operator (closed system) or the individual producers (open system or individual system). In the closed system, the bottles are subsequently counted by the system operator and re-distributed over the participating producers.
6. The producer reimburses the deposit to the retailer - and a handling fee if agreed upon in their direct agreements. Unredeemed deposits stay with the producers.
7. Producers add new bottles to compensate for consumer losses. In the closed system, the system operator provide directions to the members on the number of bottles to be purchased.

DRS recycling: Deutsche Pfandgesellschaft (DPG)

Reason to be a DRS: The German Packaging Ordinance (1991) was introduced as a result of a growing amount of packaging waste and a persistent debate on the responsibility for waste management costs. Until the end of the 1980s, most waste was sent to a landfill. Nevertheless, glass and paper were already collected in some areas on behalf of the municipality, but most collections were made informally by commercial organisations and community bodies. In order to ensure a policy for the recycling of glass and plastic bottles, the Pfand System was introduced in 2005, requiring drink retailers to charge an additional €0.25 for every drink purchased in one-way packaging (Barrin, 2018). There is no formal link between the EPR-system and the DRS for recycling; nor between recycling and reuse deposit return systems in Germany.

System operations: There are different responsibilities for stakeholders in the DRS system. The Deutsche Pfandgesellschaft (DPG) was established in 2005 in order to be the exercising force behind the legal obligations of the DRS system in Germany. The German system operator creates framework conditions and standards for all actors involved in the German one-way deposit system – to implement the deposit collection and deposit refund obligation. The tasks carried out in order to fulfill this duty are (1) operating a central DPG system database for the implementation of deposit clearing, (2) developing binding labelling standards, (3) maintaining legally compliant contracts for the system partners, (4) implementing complex IT interface management and (5) signing for marketing and public relations. DPG functions as a system administrator rather than operator and provides a framework for participating companies in which they can independently come to settlements.

The main operators of the system are the industry and retailers, who can work with service providers that can take over the responsible, i.e. refund service claimant providers (producers), or deposit account service providers (retailers). It is possible that one service provider is both servicing the retailer and producer. Responsibilities posed upon the producers include (1) charge a deposit for one-way beverage packaging, (2) ensure identifiability of the packaging as part of the system and (3) take part in the nation-wide DRS (DPG, 2021).

DPG: GENERAL CHARACTERISTICS	
Full name:	DPG Deutsche Pfandsystem GmbH
Implemented:	2005
Organisation type:	Dual
Shareholders:	50% German Retail Federation e.V. (HDE), 50% Federation of German Food and Drink Industries e.V.
Recycling targets	Metal, glass and paper 90%

Relevant literature:

- DPG-Pfandsystem (2021) Die Funktionsweise des Pfand systems (website)

DRS recycling: Deutsche Pfandgesellschaft (DPG)

Financial responsibilities: In Germany, retailers are responsible for the financial flows in the German deposit system. Retailers buying drinks that fall under the DRS pay a deposit for the packaging: this deposit is administered by them. When selling the drinks, this deposit is paid by the consumer. The money already has gone from the retailer to the producer or importer of the product when buying the product, with the additional deposit. Eventually, the fee is refunded back to the consumer when the packaging is returned. When returned packaging is sold, retailers receive the material scrap value from processors.

Deposit settlement between producers and retailers is organised via the DPG system. Upon selling a beverage in Germany, a company becomes a “first distributor”. DPG provides a contract to the beverage producer, in order to ensure compliance with the regulation under the Packaging Act and to enable unbureaucratic settlement of deposit money, or “deposit clearing”. Further deposit collection and management is arranged between the “first distributors” and the “collectors”, which are the retailers providing take-back points. This system or settlement is a cooperation between first distributors and collectors: the DPG system functions as a mediator between these organisations (DPG, 2021). The system is financed through unredeemed deposits, material revenues and membership fees, which are paid annually by the members of the DPG, depending on the amount of packaging brought on the market. Throughout the recycling system, retailers remain owner of the circulating materials.

DPG: PRODUCER FEES		
Company registration fee:	Participation costs are based upon weight and material type of packaging	
Packaging registration fee:	N.A.	
Additional fee per collected unit	*Non-refillable*	€ 0.25
	Refillable	€0.08-€0.25

Relevant literature:

- DPG-Pfandsystem (2021) Die Funktionsweise des Pfandsysteems (website)

DRS recycling: Deutsche Pfandgesellschaft (DPG)

Journey of the deposit through the system:

1. Before entering the market, the producer has to apply for a “global location number” (GLN, via GS1) and register with the DPG. The DPG has formulated a standardised Terms and Conditions of Participation, obliging the producer to respect the framework conditions and standards set by the system operator.
2. Hereafter, the producer has to register in the DPG System Database. This System Database will ensure – at a later step – that retailers can determine which producer to claim a deposit from. Producers are subsequently required to apply mandatory labelling with specific DPG ink on their packaging. DPG marking can only be applied by certified can manufacturers and label printers.
3. The producer then sells the product to a retailer and receives the price + the deposit.
4. The retailer then sells this to a consumer and receives the price + the deposit.
5. When the bottle is returned by the consumer, she receives back the deposit from the retailer. The retailer can subsequently claim the deposit back using the information from the DPG System Database. The retailer can settle the deposit invoice himself or make use of a refund claimant service provider. Also, the producer can make use of a service provider (deposit account service provider) instead of handling requests himself.
6. The retailer does not receive a handling fee but becomes the owner of the collected packaging materials. Unredeemed deposits stay with the producers.

DRS recycling: Deutsche Pfandgesellschaft (DPG)

Type of packaging: In accordance with the German Packaging Act, beverages in one-way beverage packaging with a filling volume of 0.1 to 3.0 liters are subjected to the deposit return system. This includes mineral water, lemonades, cola, energy drinks and beer. Before 2022, the DRS did not include fruit and vegetable juices, dairy drinks (drinks containing more than 50% milk), wines, liquors and beverages for child/baby consumption, however, since January 2022, the DRS has expanded to mandatory deposit on all wine and wine-like products, alcohol products, mixed drinks, fruit juices and vegetable juices, non-carbonated fruit nectars and non-carbonated vegetable nectars in disposable bottles or cans.

Packaging requirements: The producer holds the responsibility for achieving the packaging requirements. All packaging items are obliged to have clearly identifiable labels. Moreover, packaging for the single-use deposit system should carry a DRS logo and EAN code – both should be printed with DPG ink, which is required for DPG labels and packaging. This ink can be purchased through the system operator.

The aim of the packaging law "VerpackG" was to increase recycling quotas, distribute costs more fairly and encourage the use of ecological packaging. Under this new law, manufacturers and sellers of packaging are obliged to register with the new central packaging register: the Stiftung Zentrale Stelle Verpackungsregister. As an exporter, you may also have to comply with the new packaging law. The law in Germany places responsibility for recycling on everyone who is the first to put packaging on the German market. The packaging register is public and must ensure that companies also check each other. Companies must always indicate the type of packaging material they use.

Symbols of the obligatory deposit for single-use beverage packaging.

Relevant literature:

- DPGPfandsystem (2021) *Die Funktionsweise des Pfandsystems* (website)
- Bundesministerium für Umwelt (2021) *Waste Policy* [website]

DRS recycling: Deutsche Pfandgesellschaft (DPG)

Return points and types of handling: In Germany, collection of materials is done both manually and through RVM. When retailers sell Pfand, or, deposit containers, they must accept returns. It is obliged to accept containers from other brands as well. Reverse vending machines can be found mostly in supermarkets, or in liquor stores. When retailers only sell one-way plastic packaging (PET), they are not obligated to accept cans or glass bottles. In stores with a surface larger than 200 square meters, all one-way beverage packaging must be taken back, when the same material is also offered by the retailer. The number of take-back points in Germany is about 130.000, which comes down to approximately 1 take-back point for every 640 inhabitants.

Handling fee structure: Different from most European countries, there are no handling fees in Germany; retailers keep the materials and sell them on the global market or use them for bottle-to-bottle recycling. When a consumer purchases a packaging, they will pay the additional €0.25 for the one-way packaging, which is paid back upon returning the packaging in store. The retailer has already purchased this from the producer or importer, for the price and deposit. The importer is responsible for the reimbursement of the deposit to the retailer, to which the packaging is returned by the consumer. Processors pay the material scrap value to the retailers, with whom they have a contract with their own agreements, as retailers are allowed to engage with a processor of their own choice.

Relevant literature:

- BMU, Waste Management in Germany, 2020 [report]
- Duits-Nederlandse Handelskamer (2021) [website]
- DPG-Pfandsystem (2021) Die Funktionsweise des Pfandsystems (website)

DRS recycling: Deutsche Pfandgesellschaft (DPG)

Historic development of performance: With the updates of the Packaging Ordinance to the Packaging Law in 2019, the German DRS has altered its recycling targets. Germany has set new targets for 2022 onwards, increasing the recycling rates for all materials (glass to 90%, aluminium 90%, beverage cartons 80%, plastics 63%). Under the Packaging Law of 2019, ecologically advantageous one-way packaging has been eliminated. As there is no central management of the German DRS, the recycling rates are an estimation: around 98%-98.5% of materials are recycled. The newest legislation on packaging mandates the inclusion of fruit juice and wine packaging in the DRS from 2022 onwards and milk packaging by 2024. The high collection rate is one of the positive results of the deposit system in Germany, as people often collect litter for the deposit and thus cause minimum loss of bottles from the system.

Relevant literature:

- BMU, *Waste Management in Germany, 2020* [report]
- Umwelt Bundesambt (2021), *How to make packaging more recyclable?* [website]

DPG: MARKET SIZE in 2018	Total	% of total
Plastic Packaging return rate		
- Total Generated	3.235.800	
- Put-on-market DRS fraction:		
- Collected DRS fraction		
Metal Packaging Return Rate		
- Total generated	133.400	
- Put-on-market DRS Fraction		
- Collected DRS Fraction		
Glass Packaging Return Rate	2.902.900	
- Total generated		
- Put-on-market DRS Fraction		
- Collected DRS Fraction		

For Germany, the most up-to-date data found is from 2017. Therefore, this table is based upon the market share in 2017. Additionally, as there is no central organization for packaging waste management in Germany, numbers are sometimes hard to gather or estimate.

LITHUANIA

National context: Lithuania

Packaging & packaging waste directive: In Lithuania, a voluntary deposit return system for refillable glass bottles has existed since many years. This system could be characterized as a so-called "buy-back" system, where the value of a packaged item created an economic incentive to buy back the material. This system was aimed at beer bottles and was used by almost all Lithuanian retailers. In 2004, this system became obligated by law, after the European Court of Justice stated that from then on, member states were allowed to also set a mandatory DRS system with general conditions (European Court of Justice, 2004).

Later, Lithuania translated the EU-directive for packaging and packaging waste into its own Law on Packaging and Packaging Waste Management (Balcers et al., 2019). In 2014, the Lithuanian Parliament adopted a law in which deposit return on one-way containers became obligatory. After a year of installing the system, as of February 2016, a single-use beverage container deposit-refund system was introduced, meaning that systems for refillable and one-way beverage packaging now existed next to each other (Balcers et al., 2019). The deposit return system for recycling covers plastic (PET), glass and metal (aluminium and iron) packaging (Earth Care Consulting, 2021). The same target is set for all these types of packaging (Balcers et al., 2019). The deposit return system is founded and managed by directly involved industries which together release more than 80% of the packaging covered by the deposit system to the market. The overall operation of the system is run by a non-profit organisation (USAD). The country maintains no mandatory recycling targets.

Lithuania: GENERAL CHARACTERISTICS (in 2018)	
Population:	2.808.901
Population density:	44,7
GDP per capita:	€ 13.390
Total waste generated:	7.080.538 tonnes
Household waste generated:	827.952 tonnes
Household waste per capita:	295 kg
Packaging waste generated:	354.630 tonnes
- Plastic packaging:	75.857 tonnes
- Glass packaging:	70.161 tonnes
- Metal packaging:	16.734 tonnes

National context: Lithuania

Collection systems for packaging waste: In Lithuania, producers and/or manufacturers are responsible for the packaging waste resulting from goods placed on the market. Therefore, they organise separate collection of all packaging waste and/or participate in packaging management as established by the waste management system of the municipalities. The general packaging waste container collection in Lithuania is managed by three EPR companies (Earth Care Consulting, 2021). These are Žaliasis taškas (Green Dot), Pakuočių tvarkymo organizacija (Package management organization) and Gamtos ateitis (the Future of the Nature). Nonetheless, consumers also return these refillable bottles to RVMs or retailers (Balcers et al., 2019).

Cooperation between systems: The two DRS organizations, USAD and DESA operate through shared collection points, with USAD, the organisation for one-way packaging, functioning as the designated operator of the system. While the collection points are shared, USAD and DESA remain separate organisations.

Relevant literature:

- Balcers, D., et al. (2019), *Deposit Return Systems for Beverage Containers in the Baltic States* (report)
- Earth Care Consulting (2021), *Baltics DRS - Estonia, Lithuania, Latvia* (presentation)
- USAD, *Lithuania's Deposit System* (presentation and transcript from the CEO of USAD)
- European Court of Justice (2004) *Beverage packaging, deposit systems and free movement of goods* (law)

DRS Reuse: DESA

DRS for reuse: In Lithuania, a voluntary buy-back system for refillable glass beer bottles has existed for an extensive period. This system was operated by almost all retailers and collection was done by them manually. Brewers in the system were using standardised bottles – with only five types of bottles in total. When an obligatory deposit system for refillable glass bottles was mandated by law in 2004, this was motivated by the appearance of the EU-directive on packaging and packaging waste: Lithuania translated this in their own Law on Packaging and Packaging Waste. Finally, after long debate between retailers on topics such as deposit fee, an operational system went into force by the end of 2006. The deposit return scheme initially included only refillable glass containers; glass beer bottles, alcoholic beverages, soft drinks, mineral water and juice.

The current system (as it operates today) is built for refillables and was established in 2006, about ten years before the establishment of the DRS for one-way bottles. It is administrated by DESA, the deposit system administrator. The system works on a voluntary, buy-back basis, but is operated by many retailers (DESA, 2020). Collection of the materials was done solely through manual collection in shops, until 2016. After the merger with the system for one-way packaging, this expanded to collection through reverse vending machines (see also box on the next slide).

The type of bottles circulating in the system has been steadily diversifying; in 2007 there were already six types of refillable glass bottles on the market, in 2019, there were 32 types of refillable glass (DESA, 2020). Yet, the sale of products in refillable glass bottles has been strongly declining, from 240 million items in 2007 to 61 million items in 2019 (DESA, 2020). This assumes that the relative costs of operating the system have increased substantially in the same period.

Relevant literature:

- Balcers, D., et al. (2019) *Deposit Return Systems for Beverage Containers in the Baltic States* (report)
- DESA (2020) *Integration Of Collection Infrastructure For Refillable & One Way Packaging In Lithuania* (presentation)
- Tomkeviciute and Stasiskiene (2006) *Assessment of Opportunities for Beverage Packaging Waste Reduction by Means of Deposit-Refund Systems* (report)

DESA (2005)	
Established	2005
Materials included in the system	**Standardised glass bottles** (system is continuously expanding to include new types of bottles)
Deposit	€0.10
Owner of material	Producer/manufacturer
Collection rate	93%

The deposit symbols for refillable packaging items in Lithuania

DRS Reuse: DESA

Legal basis: A return system for glass bottles already existed for a long time in Lithuania. In 2004, this became an obligatory deposit scheme. By the end of 2006, the deposit system went into force after negotiations with retailers and discussions on handling fees. The system was founded by five Lithuanian breweries (DESA, 2020). After 2016, DESA merged its collection network with USAD, the deposit return system for one-way containers. This meant that from that moment on, collection of the refillable glass bottles could also be done through the reverse vending machines of USAD, for which producers using refillable containers pay a fee to USAD. In 2018, the Amendment Law on Packaging Waste made the legislation more stringent, stating that producers of packaging are supposed to arrange the collection either themselves or through a system operator. DESA cooperates with USAD, but there is no link or cooperation with other EPR schemes.

Cooperation DESA & USAD

After the Lithuanian deposit return system for one-way packaging (USAD) went into force in 2016, it immediately merged with the existing collection system for refillable packaging.

From then on, one-way bottles and refillables were both collected through reverse vending machines – the one-way packaging is sent to USAD, whereas refillable glass bottles are sent straight to the producers. Producers of refillable glass bottles redeem the deposit fee to retailer, but also pay a fee to USAD for collection of the refillable packaging through reverse vending machines.

This system has increased convenience for consumers, as collection points and deposit fees are all the same (€0.10). Additionally, the decrease in sale of refillable glass bottles has stabilized (DESA, 2020).

DRS Reuse: DESA

Packaging requirements DRS for reuse: the Lithuanian system for refillables is created for glass bottles. Whereas the system started off with five different types of refillable glass bottles of standard sizes in 2005, it quickly grew and expanded: by 2019, there were 32 types of bottles circulating in the system. Additionally, the Lithuanian packaging law prescribes inclusion of refillable glass bottles of beer, alcoholic and soft drinks, mineral water and juice.

System operations: System operator DESA solely holds an operational function and has shared responsibility over central administration of the system – even this task is shared with the producers (who make direct arrangements with the retailers). DESA has no further financial or operational responsibilities.

Different types of reusable glass bottles included in the Lithuanian deposit return system (DESA, 2020)

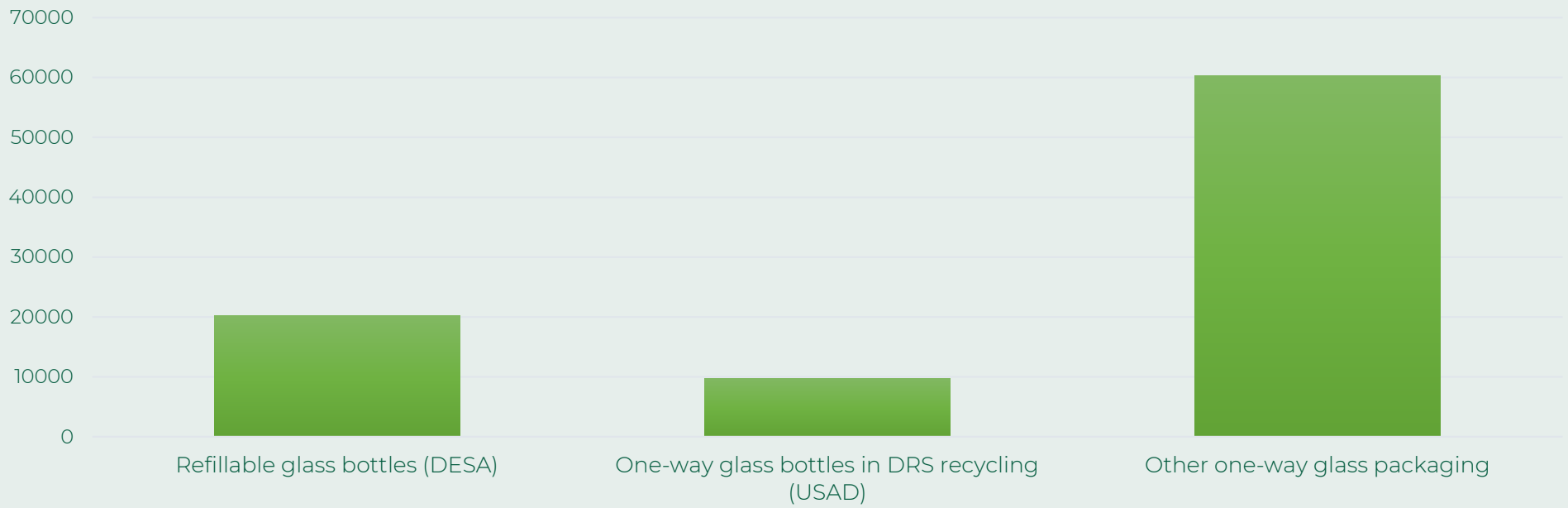
Relevant literature:

- Balcers, D., et al. (2019), Deposit Return Systems for Beverage Containers in the Baltic States (report)
- Desa (2020) *Integration Of Collection Infrastructure For Refillable & One Way Packaging In Lithuania* [presentation]

DRS Reuse: DESA

Quality: There is no explicit information about the quality of material circulating in the Lithuanian deposit return scheme for refillable bottles. The number of cycles of the reused bottles is unknown.

Quantity: DESA is responsible for approximately 20,161 tonnes of refillable glass bottles per year. This calculation is based on the amount of botttles that were sold in 2019, the most recent report that was found.



DRS Reuse: DESA

Journey of the deposit through the system

1. The bottles are filled by the producer/packaging company and sold to the retailer for price + deposit
2. Retailers sell the packaging for the price + deposit to the consumer
3. The retailer collects (via take-back network of DRS recycling USAD) and returns reusable packaging to the producer/packaging company (except for Coca-Cola that is using transportation from USAD)
4. The packaging producer/packaging company reimburses the deposit - and a handling fee to the retailer on basis of their direct agreements
5. Producers pay an additional fee to the DRS recycling USAD for using their take-back network
6. Producers add new bottles to their own stock to compensate for consumer losses

DRS recycling: USAD

Reason to be a DRS: In 2013, only 53.8% of packaging waste was collected in Lithuania. This meant that the EU recycling target of 60% was not reached. Even for PET bottles, the recycling rate was below 33%. This was the main driver for the Lithuanian Ministry of Environment to investigate DRS. The ministry noticed the benefits of successful DRS implementation in other member states and therefore initiated the deposit process in April 2013. In 2014, amendments to The Law on Packaging and Packaging Waste Management were passed on through parliament. USAD was implemented as the system operator for DRS in 2016 (Balcers et al., 2019). This meant that from this point, the deposit return system also became obligatory for one-way packaging. Additionally, the collection of all material (one-way and refillable) was merged and now falls under the same collection infrastructure. The collection was done manually until 2016 and became automated after the implementation of USAD that year.

Operational responsibilities: USAD has the objective of managing the deposit system as indicated in the Law on Packaging and Packaging Waste. The system operator is responsible for managing the deposit system, starting from the collection of the packaging and ending with transparent data management, deposit clearing, reporting, logistics, and sales of the collected materials. The system operator also has the function of educating stakeholders and consumers and it must spend at least 1 % of its annual income on such marketing activities. Moreover, 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 (Balcers et al., 2019).

USAD: GENERAL CHARACTERISTICS

Full name:	Užstato Sistemos Administratorius
Implemented:	2016
organisationtype:	Non-for-profit
Shareholders:	Industry: The Lithuanian Brewers Association, the Association of Lithuanian Trade Enterprises and the Lithuanian Natural Mineral Water Manufacturers' Association
Total revenues:	27.99 M€

Relevant literature:

- Balcers, D., et al. (2019), *Deposit Return Systems for Beverage Containers in the Baltic States* (report)
- USAD (2021) (webpage)
- USAD (2021) Annual reports for 2020 (website)

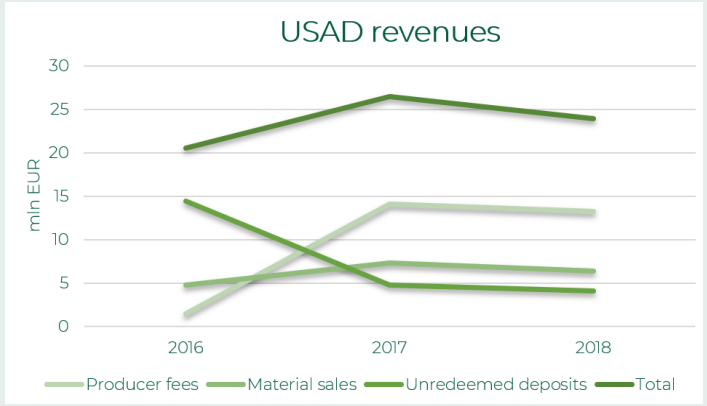
DRS recycling: USAD

Financial responsibilities: USAD's financial responsibilities can be divided into: (1) collection of fees; (2) distribution of fees; (3) sale of collected materials.

USAD collects fees via producers and importers of goods with packaging. The fees that these actors pay consists of: (1) one-time registration fee for the company upon joining the DRS and a one-time packaging registration fee; (2) 100% of the deposit fees for all packaging that is put on the market, and; (3) a fee for each new packaging put on the market differentiation between material type. Additionally, since refillable packaging is also accepted by the RVMs, producers of reusable containers pay an additional fee for each refillable container collected via RVM to the DRS (Balcers et al., 2019).

Beside collection of these fees, USAD is responsible for compensating retailers for the handling, receiving, sorting, and storing of used containers (more detailed information on the handling fee is displayed on the slide "deposit collection system"). Moreover, USAD reimburses the collected deposit fees to the retailers. Retailers are only reimbursed for the packaging that is collected and registered in the system, i.e., unredeemed deposit fees accrue to USAD (Balcers et al., 2019).

These costs, paying the retailers, are 75% of all costs for USAD. About 10% of the retailers privately own a reverse vending machine. USAD owns the materials in the DRS. After collecting and sorting the packaging material, USAD sells it to recycling companies (USAD, undated). The material revenues, unredeemed deposit fees and producer fees are used to pay the operational expenses of USAD.



USAD: PRODUCER FEES		
Company registration fee:	€ 50	
Packaging registration fee:	€ 35	
Basic fee per unit:	*Aluminum:*	€ 0.011
	Steal:	€ 0.03
	PET:	€ 0.03
	Glass	€ 0.04
Additional fee per collected unit	*Refillable:*	€ 0.0175

Relevant literature:

- Balcers, D., et al. (2019), *Deposit Return Systems for Beverage Containers in the Baltic States* (report)
- USAD (updated), *Lithuania's Deposit System* (presentation and transcript from the CEO of USAD)

DRS recycling: USAD

Type of packaging: The annual volume covered by the Lithuanian DRS system for recycling is around 600 million beverage containers. Types of packaging covered include beer and beer cocktails, cider, pear cider, fruit wine and fruit wine cocktails, fruit wine drinks, other fermented drinks, alcohol cocktails and alcohol-free drinks (soft drinks, table water, kvass), natural mineral water, spring water, bottled potable water, juice and nectar packages. Milk, wine and spirits are excluded from the system (Balcers et al., 2019). When Lithuanian politicians were deciding on what containers to include in the deposit system, they primarily considered the operational scope of the DRS in neighboring countries, in particular the Estonian system, which they decided to copy. Currently, the Environmental Ministry and Parliament are considering extending the system to liquor, wine and spirits with glass packaging. It has also been considered to extend the scope to drinking cartons, but it is thought that RVM technology is not 100% ready. However, it is expected to be developed in the future (USAD, undated).

Packaging requirements: The containers involved in the DRS system should be made from the included materials: PET, metal cans (both iron and aluminum) and glass bottles, both one-way and refillable. Packaging should have a capacity between 0.1L and 3L (USAD, undated; Balcers et al., 2019) and the deposit logo and (unique or universal) barcode should be clearly visible.

Flat-rate deposit:

The Lithuanian system has a single, flat-rate deposit of €0.10. The price of the deposit packaging (both one-way and refillable) under the system is approved by the Ministry for the Environment in consultation with the system operator for a period of at least one year. So far, it has not been changed. This value is appropriate for the Lithuanian economy and cost of living and provides an equal incentive for consumers to return the containers. Adjusted for purchasing power, the Lithuanian deposit rate equals €0.16 (USAD; Balcers et al., 2019).

Relevant literature:

- Balcers, D., et al. (2019), *Deposit Return Systems for Beverage Containers in the Baltic States* (report)
- USAD (undated), *Lithuania's Deposit System* (presentation and transcript from the CEO of USAD)

The deposit mark and a (universal or unique) barcode should be present on the packaging.

DRS recycling: USAD

Return points and types of handling: Lithuania's DRS collection infrastructure is based on the return to retail model – meaning stores selling beverage containers must also receive used containers back for recycling. Larger stores collecting 40,000 one-way packaging containers a month can be provided with an RVM (Model T-9) that automatically sorts and compresses the packaging but requires an area of at least 30 m^2. Medium size stores (10,000 – 40,000 units a month) use an RVM (Model T-63) which does not require a special facility. It could be set up on the shop floor as it requires an area of at least 4 m^2 (USAD, undated; Balcers et al., 2019). For the latter, collected packaging is automatically sorted, compressed and then moved to storage by personnel. Moreover, retailers sort one-way packages to vessels (bags) given by the central DRS and send them to the central DRS (transport provided by DRS), while refillables are put into designated crates and are sent to producers (transport provided by producers) (see DRS reuse above).

The amount of collection points in Lithuania is more than 2,700, with a take-back point to person ratio of 1:1035, or 0,001 take-back points per square kilometer. Over 1,700 of them are manual collection points, but close to 1,000 collection points are operated with RVM equipped collection points. In total, over 1,100 RVMs have been installed. 900 RVMs are owned by the RVM producer Tomra (provided by the Lithuanian DRS central operator), but over 100 RVMs are owned by the retailers themselves. 89% of packages are collected at RVM collection points (USAD, undated; Balcers et al., 2019).

Relevant literature:

- Balcers, D., et al. (2019), *Deposit Return Systems for Beverage Containers in the Baltic States* (report)
- USAD (undated), *Lithuania's Deposit System* (presentation and transcript from the CEO of USAD)

RVM tender

USAD conducted a tender among RVM suppliers to acquire RVMs for retailers, free of charge. The provided machines are compensated per collected package fee and paid to the tender winning RVM provider. This Lithuanian approach ensures that all RVMs are compatible with their IT and controlling requirements. It saves retailer's time, takes away the retailer's need to make an initial investment and enables more favorable terms with the RVM manufacturer due to the number of RVMs needed for the whole country.

This means producers and retailers did not have to invest into RVM collection infra-structure, meaning this investment of 22 million EUR was made by the tender winning RVM provider.

DRS recycling: USAD

Handling fee structure: USAD pays a handling fee per collected container to the store, to cover collection-related costs like space, personnel related costs, utilities, etc. This fee is similar for retailers with an RVM without compaction and manual collection. Additionally, USAD is also responsible for supplying retailers with other necessary materials, e.g., collection bags, stickers, and bag sealers. Nonetheless, for refillable packaging, a retail handling fee is negotiated between producer and retailer and paid by the producer to the retailer with deposit money per return (USAD, undated; Balcers et al., 2019).

HANDLING FEE:	*PET:*	*Aluminum & Metal:*	*Glass:*
Manual & RVMs without compactor:	€ 0.0138	€ 0.0118	€ 0.0148
RVM with compactor:	€ 0.0175	€ 0.0137	€ 0.0284

Relevant literature:

- Balcers, D., et al. (2019), *Deposit Return Systems for Beverage Containers in the Baltic States* (report)
- USAD (undated), *Lithuania's Deposit System* (presentation and transcript from the CEO of USAD)

DRS recycling: USAD

Historic development of performance: The target of the DRS system was to ensure that 90% of beverage packaging would be recycled by 2025. The same target is set for all types of material in packaging (glass, plastic and metal). Lithuania achieved 74% in its first year of applying DRS (2016). The 2025 target was already exceeded in 2017, reaching on average 91.9 % (glass 83%, PET 92%, and metal 93%) as consumers gained a better understanding of the system and became accustomed to returning their containers to the system. In the first three years, the system has collected 1,600 million beverage containers which resulted in 56,000 tons of recyclable material.

Quality and recycling of collected materials: the material is found to be of very high quality – clean and well sorted (USAD, undated). All the collected packaging material is sold in an open tender to waste recyclers (Balcers et al., 2019). Due to the high quality of the collected material, the biggest recyclers in the world (for PET and aluminum) are competing for this waste flow. Therefore, they can ask higher prices than they got with the Green Dot system (USAD, undated). The deposit return system in Lithuania is not planning on expanding their system soon – they now mainly focus on light, convenient packaging as these are widely used, also outside of homes and consumers must be able to return these easily.

Relevant literature:

- Balcers, D., et al. (2019), *Deposit Return Systems for Beverage Containers in the Baltic States* (report)
- USAD (undated), *Lithuania's Deposit System* (presentation and transcript from the CEO of USAD)
- USAD (2021), annual reports (webpage)

USAD: MARKET SIZE in 2018		Tonnes:	% of total:
Plastic packaging return rate:	93%		
- *Total generated:*		75,857	100%
- *Put-on-market DRS fraction:*		12,481	16.45%
- *Collected DRS fraction:*		11,609	15.30%
Metal packaging return rate:	96%		
- *Total generated*		16,734	100%
- *Put-on-market DRS fraction*		3,717	22.21%
- *Collected DRS fraction*		3,573	21.35%
Glass packaging return rate:	80%		
- *Total generated*		70,161	100%
- *Put-on-market DRS fraction*		9,799	13.97%
- *Collected DRS fraction*		7,825	11.15%

Calculating USAD's market size: Numbers in the table above are calculated for the year 2018. At present, this is the latest year with relevant data in Eurostat's waste statistics. The number for "total generated" refers to the amount of all packaging waste generated in 2018 for a specific material. Lithuania has not reported this data for 2018. "Put-on-Market" fraction refers to the total amount of packaging brought on the market with DRS deposit and collected to the amount that was collected by USAD..

NETHERLANDS

National context: Netherlands

Packaging & packaging waste directive: In the Netherlands, waste collection is subjected to the extended producer responsibility principle. This means that producers and importers of packaged products hold responsibility for the prevention, collection and recycling of packaging. The way in which this is operated results from national legislation, the so-called "packaging management decree". This decree is derived from the European directive on packaging and packaging waste of 2014. Another legal instrument concerning waste management is the Waste Management Contribution Agreement, which is binding to all importers and producers: since 2018, including foreign entrepreneurs who are the first to distribute new packaged products in the Netherlands (Afvalfonds, 2021).

The latest update to the legislation was made in July 2021, expanding packaging subjected to mandatory DRS to small plastic bottles. With the expansion of the deposit system, Statiegeld Nederland was established as DRS and has arranged the deposit return system since. In the new situation, producers are obliged to levy a deposit of €0.15 on bottles containing less than 1L of liquid, in addition to the already existing obligated deposit of €0.25 on bottles with a content over 1L. As of December 31st, 2022, the Dutch DRS will also expand to cans and levy €0.15 on this type of packaging (Government of the Netherlands, 2021). The recycling targets in the Netherlands is 85% for metals, 90% for glass and 70% for PET bottles.

Netherlands: GENERAL CHARACTERISTICS (in 2018)	
Population:	17.181.084
Population density:	504
GDP per capita:	€ 41.450
Total waste generated:	145.240.967 tonnes
Household waste generated:	6.213.249 tonnes
Household waste per capita:	362 kg
Packaging waste generated:	3.120.000 tonnes
- Plastic packaging:	523.000 tonnes
- Glass packaging:	502.000 tonnes
- Metal packaging:	213.000 tonnes

National context: Netherlands

Collection systems for packaging waste: Collection of waste is the responsibility of municipalities, who can choose the way this is organised; through curbside pickup, or central collection points. Most municipalities choose a communal approach for the collection of plastic, metals and drinks packaging. Municipalities are compensated for the collection (and littering) costs by the Dutch PRO, Afvalfonds Verpakkingen. The deposit return system is centralized which means that all bottles can be returned to all take-back points; there are reverse vending machines, reverse vending machines with compactors and manual collection. Voluntary collectors only receive a handling fee when offering machinal collection. Another system for collection of packaging waste exists separately, set up for glass bottles of 30cl or 50cl. This system, Bruine Nederlandse Retourfles (BNR), is the Dutch DRS for reuse and is operated by Dutch breweries, providing a circulating pool of bottles. This voluntary system applies to standardised brown glass beer bottles and crates in which these are transported.

Cooperation between systems: the DRS recycling was implemented before the enforcement of an EPR-scheme. Upon revisions of the EPR and DRS, a formal link was established between the two organizations, as packaging in the DRS falls under the responsibility of the EPR – Afvalfonds Verpakkigen.

Relevant literature:

- Afvalfonds verpakkingen (2021) *Legislative Framework*, [Website]
- Government of the Netherlands (2021) *Household waste and recycling* [website]
- Nederlandse Brouwers (2021) *Bruine Nederlandse Retourfles* [website]
- Velzen & Brouwer (2021) Recyclebaarheid van Nederlandse Kunststofverpakkingen: de status van 2021 [report]

DRS Reuse: Bruine Nederlandse Retourfles (BNR)

DRS for reuse: in the Netherlands, there is a deposit return system separately organised for reuse. This organisation, Bruine Nederlandse Retourfles, is called after the type of bottles that are included in the system and was developed in the eighties by the Dutch brewers. In the late 1980s, an industry-wide agreement was made, to standardize the material, colour, form and shape of beer bottles, introducing the BNR (Weenk and Henzen, 2021). Nowadays, only about 10% of beer bottles available in the Netherlands are not refillable and the brewers not participating in the DRS system are mostly foreign or small brewers. Yet, including these in the system could lead to difficulties as the quality of the bottles can be lower than the bottles made to be included in the system (Velzen & Brouwer, 2021). The participating brewers are bound to strict quality rules. The bottles remain property of the brewer – which is stated on the label. Brewers can put reusable bottles on the market, after which deposit is levied on the bottles to regain the material.

When in the DRS for reuse, the Nederlandse Brouwers, the industry association for Dutch brewers maintains a framework of rules concerning the production, sale and use of the reusable bottle (Nederlandse brouwers, 2021). BNR bottles (and crates) can be returned in any supermarket that sells the bottles: the reverse vending machines take back PET bottles and refillable bottles and crates. The latter are returned to the brewers, who wash the bottles and relabel them. BNR remains a voluntary system, the pooling consisting of standardised bottles. There are several Dutch brewers who have established their own BNR-like system – introducing their own bottles to the market but 'mimic' the practice of BNR participants. The number of 'real' BNR bottles account for 40% of the system, 60% is BNR-like. An example of a BNR-like system is Heineken, whose bottles are now famous for their distinct green color and have been on the market since 2013.

Bruine Nederlandse Retourfles (BNR)	
Established:	1986
Legislation	
DRS bottle:	30cl or 50cl 207mm high 1.5mm thick glass
Owner of the material	Bruine Nederlandse Retourfles
Collection Rate	97.5%

DRS Reuse: Bruine Nederlandse Retourfles (BNR)

Legal basis: From 1991-2005, the first covenants for packaging were launched, with the first declaring a minimum of 50% recycling rate for PET bottles and glass bottles. This was not achieved, leading to the abandonment of this agreement in the second covenant. After failure to reach the goals of the third covenant (43%), the government decided to prescribe recycling goals in the law, leading to the first Packaging Law of 2006. Yet, while reusable packaging is mentioned by the ordinance on packaging management (2014) there are no specific laws on its reusing process. The only suggestions stated is that, when possible, producers must pack their products in reusable packaging rather than one-way packaging, yet it is no obligation (Law on Packaging and Environment , 2014).

Packaging requirements DRS for reuse: Packaging eligible for the deposit return system for reuse have a capacity of 30cl or 50cl. Additionally, the glass is relatively strong and should be 1.4mm thick. The bottles should be of brown, UV averting material and must have a length of 207 mm. Deposit fee on the bottles is €0.10. The packaging requirements are standardised by the system operator BNR, who try to optimise the system through installing strict packaging requirements. Included in the system for reuse are crates, small beer bottles and swing-top bottles.

The standardized BNR-bottle with its characterizing brown color and format.

DRS Reuse: Bruine Nederlandse Retourfles (BNR)

System operations: the bottles can be returned in almost all supermarkets in the Netherlands and are collected via the same reverse vending machines as the DRS for recycling. Bottles are mostly transported and bought in crates, which are also returned to the machines. Bottles are transported to the distribution center where they are checked for irregularities. After, the bottles are transported to the brewers where they are washed and refilled (Nederlandse Brouwers, 2021).

The tasks of the system operator are primarily to keep check of quality of the glass and the system, with BNR having annual audits at glass producers. Other operational tasks such as collection, transportation are arranged via direct agreements between retailers and brewers. Additionally, all brewers have mutual agreements for when bottles are transported to the wrong brewer; in most cases (when there are enough bottles of this kind) these will be returned to the right brewer.

The license system of the Dutch DRS for reuse enables them to keep track of the producers and users of the standardised bottle: this makes the system successful, as it also controls the quality of the bottles and further specificities such as the right type of glue and labels.

Participation for small brewers

The Dutch DRS for reuse is working on a system to include small (craft)brewers in their system. This will reduce the use of other packaging such as aluminium and one-way glass and increase sustainability of the bottles. These smaller brewers are often excluded due to the high costs of owning a washing facility. Therefore, the test will try to find a way to divide tasks and costs amongst all brewers by letting the small breweries buy and fill the bottles for the first time after which they will go to bigger brewers who will wash them and refill them. Installing a washing fee for smaller brewers is also an option.

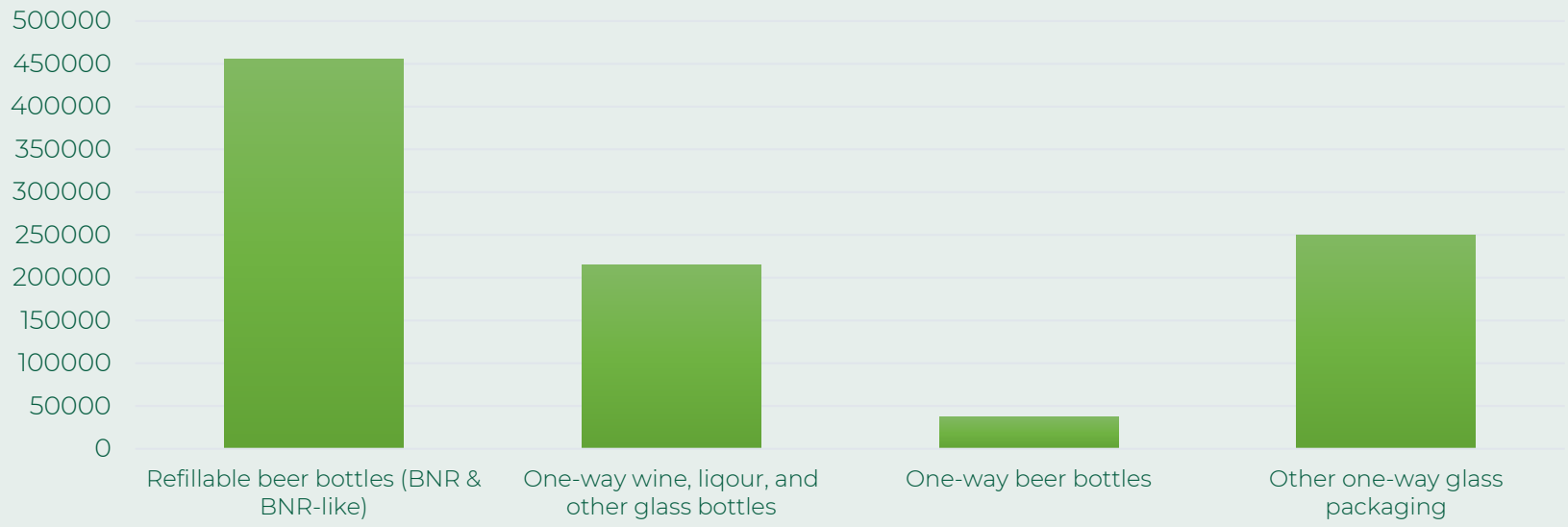
Relevant literature:

- Nederlandse Brouwers (2021) Bruine Nederlandse Retourfles [website]
- Weenk and Henzen (2021) *Mastering the Circular Economy: A Practical Approach to the Circular Business Model Transformation* [book]
- Law on Packaging and the Environment (2014) [law]

DRS Reuse: Bruine Nederlandse Retourfles (BNR)

Quality: In the 1950s, refillable bottles were widely used in the Netherlands; milk, beer and sodas were put in glass bottles until the 1980s. From then on, changes in this system were seen as beer brewers started to sell their beer throughout the country rather than locally which meant the start of the Dutch system for refillable beer bottles. Benefiting the system was the use of one type of bottle, which meant that brewers were able to rotate the bottles up to 35 times. In the early 00's, brewers started to increase their brand visibility by using their own bottles. Also, international brands reached the Dutch market, which caused the system to become less efficient and reducing the number of bottle-rotations from 35 to approximately 20 times. The average amount of refills per year is 3-4 times and bottles spend around 5-8 years recirculating in the DRS system for reuse. Nowadays, the Dutch brown refillable beer bottles still is the most widely used bottle on the Dutch market and some brewers are starting to shift towards the use of this bottle and system again. The high quality of the material is maintained through strict regulation on the size and capacity of the bottles. Bottles are checked for damages and removed from the system if the quality is considered insufficient.

Quantity: Bruine Nederlandse retourfles is responsible for an amount of approximately 455,000 tonnes of refillable beer bottles per year.



DRS Reuse: Bruine Nederlandse Retourfles (BNR)

Journey of the deposit through the system:

1. The producer joins the DRS by signing a user license, buying an amount of standardize bottles (in line with their respective share), and provide matching crates (often old ones already in the system).
2. The bottles are filled by the producer and sent off to distribution centers of supermarkets. Deposit money is transferred upon arrival at the distribution centers, as distribution centers pay the producer for the product + deposit. Deposit arrangements are made directly by the producers.
3. From the distribution centers, the bottles are transferred to the individual supermarkets, who again pay for the product + deposit.
4. The consumer buys the product for the price + the deposit.
5. The consumer returns the bottle (and, if relevant, the crate) upon which the consumer receives the deposit fee back from the retailer.
6. The bottles in crates are transported back to the breweries, who wash, relabel and refill the bottles. Breweries bilaterally correct misthrows of deposit refillable bottles by saving and exchanging them periodically.
7. The deposit is paid back to the retailer in line with the arrangements made directly between the retailer and producers.
8. The producer add new bottles to the bottle pool according to their own needs (purchasing only by certified bottle producers). The producer informs the system operator annually on the number of bottles purchased and bottles taken-back. Based on this information, the system operator informs all participants on the total size of the pool and their respective shares (fair share). Producers are subsequently expected to take-back bottles in line with their fair share.
9. To ensure quality of the system, producers pay (in ratio) for inspection and quality assurance checks. The DRS organizes and manages the quality assurance.

DRS recycling: Statiegeld Nederland

Reason to be a DRS: The main reason to start a deposit return system for recycling in the Netherlands has been the fear of litter resulting from the introduction of one-way bottles. Before the introduction thereof, there was a system for reusing bottles, to keep costs as low as possible. Around the 1980s, costs of packaging decreased; the introduction of one-way bottles made reuse obsolete for most industries. First, used glass was collected and recycled instead of reused. To further decrease packaging waste and increase recycling, the Netherlands introduced a DRS. It has evolved ever since, with several highlights such as the inclusions of small PET bottles in 2021 and aluminum cans, who will be added in 2023. Additionally, the system from 2019 allowed bottles and other included materials to be handed in at all collection points, regardless of where they were bought. All changes are made with the motivation to decrease litter (Government of the Netherlands, 2019). Statiegeld Nederland (DRS) and Afvalfonds Verpakkingen (PRO) have been actively campaigning these operational changes to consumers, producers, importers and retailers operating return points (Statiegeld Nederland, 2021).

Operational responsibilities: Operational tasks exercised by Statiegeld Nederland comply with the binding agreements laid out by the Afvalfonds Verpakkingen. Statiegeld Nederland therefore is, accordingly, responsible for the guidance of new take-back points and producers, registering new producers and importers and their products that are under the jurisdiction of the DRS; counting, sorting and compacting bottles and they arrange transport from the take-back points to the recyclers. Additionally, they organize nation-wide campaigns to create awareness. Also, they are responsible for enforcement and fraud prevention which they do through conducting audits (Statiegeld Nederland, 2021). Other activities exercised by Statiegeld Nederland are optimization of the recycling process in the Netherlands and the deposit fee regulations. They also work as the intermediary between producers and importers and recyclers as they help in selling packaging to the recyclers. Lastly, informing the producers and sellers of reverse vending machines on any changes or updates in the database of registered bottles within the deposit return system (Statiegeld Nederland, 2021)

Statiegeld Nederland: GENERAL CHARACTERISTICS	
Full name:	Statiegeld Nederland
Implemented:	2005, 2021 small bottles, 2023 cans
Organisation type:	**Non-for-profit:** foundation according to Dutch law with an independent director, governed by representatives of take-back-points (Centraal Bureau Levensmiddelenhandel) and producers (Federale Nederlandse Levensmiddelenindustrie). Foundation is financed by the Dutch EPR-system (Afvalfonds Verpakkingen)
Total revenues:	-

Relevant literature:

- Statiegeld Nederland (2021) [website]
- Statiegeld Nederland (2021) *Beleid Innamepunten Statiegeld Nederland* [report]
- Government of the Netherlands (2019) *Aanpak kleine flessen en blik in het zwerfafval* [policy letter]

DRS recycling: Statiegeld Nederland

Financial responsibilities: Both Afvalfonds Verpakkingen (PRO) and the DRS system, Statiegeld Nederland, are important actors in the financial composition of the packaging collection. The Dutch EPR has the final responsibility and keeps track of the legally binding 90% separate collection of plastics. Statiegeld Nederland is a separate organization but reports to the PRO. Responsibilities of Statiegeld Nederland include the collection of deposit and producer fees, paying redeemed deposits and handling fees to retailers, and paying fees to transportation and other subcontractors. Producers and importers of packaging must register their EAN codes and report their sales every month and pay the deposit money of their sold items to Statiegeld Nederland. For small bottles, producers pay an additional fee and producers fees are standard for all producers. At the beginning of the recycling-chain, deposit is levied upon all products in packaging that are brought on the market. The responsibility of the Dutch DRS begins here, as now they oversee the collection of fees in cooperation with the PRO and paying back the retailers for redeemed deposits. Statiegeld Nederland receives the producer fees from the producers and importers.

Statiegeld Nederland: PRODUCER FEES	
Company registration fee:	€ 0
Packaging registration fee:	€ 0

Afvalfonds Verpakkingen: Packaging Management Waste Contribution €/KG	
Bottles in a deposit system	>1 liter €1.88 cents + €0.25 deposit <1 liter €1.64 + €0.15 cents deposit

Relevant literature:

- Afvalfonds Verpakkingen (2021) *Beleid Innamepunten Statiegeld Nederland* [report]
- Afvalfonds Verpakkingen (2021) *Tarieven* [website]

DRS Recycling: Statiegeld Nederland

Journey of the deposit through the system:

1. The producer sells packaging to a retailer and receives the price and the deposit.
2. The retailer then sells this to a consumer and receives the price + the deposit.
3. The producer informs Statiegeld Nederland on a periodic basis on the amount of packaging put-on-the-market. The DRS 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 the EPR)
4. When the bottle is returned by the consumer, she receives back the deposit from the retailer. The bottles are collected by the wholesaler (producers), transported to their distribution center, and hereafter to the counting center of Statiegeld Nederland.
5. Statiegeld Nederland scans the bottles (via EAN-code) and calculates the deposit (and handling fee) to be received by the retailer.
6. Statiegeld Nederland sends the collected bottles back to the producers (to sell or recycle the material), or, for smaller producers, Statiegeld Nederland sells the material and distributes the sales revenues.

DRS recycling: Statiegeld Nederland

Type of packaging: Subject to deposit are packaging for soft drinks and water. Recently (2021), small PET bottles (<1L) have been added to the system and from January 1st, 2023 on, aluminium cans will also be included. Excluded from the system are PET bottles for fruit juices and dairy products, wine, beer and other alcoholic beverages, HDPE bottles, PP and PS drink packaging, glass bottles (except bottles included in the system for reuse), beverage cartons and divergent packaging such as beverage pouches (Velzen & Brouwer, 2021). Yearly, around 600 million large bottles, and 900 million small bottles are added to the deposit return system.

Packaging requirements: Packaging included in the DRS for recycling should be provided with the deposit fee logo and an EAN code. The barcode provided on the package should be easy to read. Also, bottles should be empty, and they should be undamaged. The lid should be kept onto the bottle in order to return it in the reverse vending machines. When bottles do not carry the deposit symbol, it is still possible to return the bottles, however, no deposit fee will be returned (Statiegeld Nederland, 2021). Since 2021, the logos on the bottles in the DRS have been changed. This new logo and EAN-code are printed on the bottles to make it clearer to customers what bottles hold a deposit fee.

Relevant literature:

- Velzen & Brouwer (2021) *Recyclebaarheid van Nederlandse Kunststofverpakkingen WUR* [report]
- Statiegeld Nederland (2021) [website]

The deposit symbols in the Netherlands. This new logo has been on Dutch DRS bottles since July 1, 2021

DRS recycling: Statiegeld Nederland

Return points and types of handling: There are about 12000 take-back point in the Netherlands. This comes down to approximately 1 return-point for every 1451 inhabitants. Most return points are in supermarkets, that are responsible for an estimated 90% of all collection. However, also in train stations or along highways are collection points. Supermarkets with a surface bigger than 200m^2 and gas stations with service are obligated to collect plastic bottles and return deposit to the consumer.

Additionally, there are many voluntary take-back points in the Netherlands, yet these are not obligated to return deposit as they can choose to donate the money to charity. Some locations offer both options (Afvalfonds verpakkingen, 2021). Additionally, the Netherlands offers an option of out-of-home return locations. Lastly, caterers or catering locations can sign up to the DRS system.

Handling fee structure: At locations that are obligated to provide take-back points (supermarkets with a surface larger than 200m^2 and gas stations with employees), the costs that are made for handling the deposit return system are reimbursed. When operating a take-back point, these locations will receive a handling fee from Statiegeld Nederland.

Voluntary return points only receive a handling fee when bottles are taken back through reverse vending machines and should at least receive 30 bottles per week.. The stores that operate a take-back point pay the deposit of bottles to Statiegeld Nederland, upon return of the bottle by the customer.

Handling fee	*PET bottle < 1L*	*PET Bottle >1L*
Manual, out of home:	€ 0.0222	€ 0.0122
RVMs, out of home:	€ 0.0293	€ 0.0202
RVM with compactor, out of home:	€ 0.0379	€ 0.0283
Manual, voluntary:	N.A.	N.A.
RVMs, voluntary:	€ 0.0293	€ 0.0202
RVM with compactor, voluntary:	€ 0.0379	€ 0.0283
Manual, obligatory take-back point:	€ 0.025	€ 0.015
RVMs:, obligatory take-back point	€ 0.0295	€ 0.0211
RVM with compactor, obligatory take-back point:	€ 0.0386	€ 0.0290

Relevant literature:

- Afvalfonds Verpakkingen (2021) *Beleid Innamepunten Statiegeld Nederland* [report]
- Afvalfonds Verpakkingen (2021) *Tarieven* [website]

DRS recycling: Statiegeld Nederland

Historic development of performance: Before 2006, PET bottles in the Netherlands were all refillables. After 2006, packaging for drinks switched to one-way bottles. From then on, producers and importers were held responsible for the recycling of their packaging. This resulted in a deposit fee on large PET bottles of €0.25 in the Netherlands. The return rate of PET bottles in the Netherland lies around 93%. Before 2021, the Dutch DRS had a responsibility for a total of 27,100 tonnes of packaging materials. When small PET bottles became part of the system, this amount increased to approximately 41,000 tonnes of packaging materials.

Quality and recycling or collected materials: As all large PET bottles are designed for recycling, this process is efficient and provides high quality recycled material. Also, in order to maintain quality, voluntary take-back points only receive a handling fee when collecting bottles with an RVM. Applying to all kinds of take-back points, they don't receive a handling fee when their returned materials are heavily damaged or are too contaminated.

While there are no specific numbers published on it yet, the expansion of the DRS recycling with smaller bottles in 2021 is not expected to have a negative influence on the quality of the material after recycling (Velzen & Brouwer, 2021). In case of a 'misthrow', or when consumers don't return their packaging to a reverse vending machine, there is no collaboration between the different systems to return this to the DRS. Additionally, the quality of the bottle will assumably be degraded and for Statiegeld Nederland there is no profit in retrieving this packaging.

Statiegeld Nederland: MARKET SIZE in 2018	Tonnes:	% of total:
Plastic packaging return rate: 93%		
- *Total generated:*	523,000	100%
- *Put-on-market DRS fraction:*	22,500	4.3%
- *Collected DRS fraction:*	21,375	4.1%

Relevant literature:

- Rijksoverheid (2021) *Packaging and packaging waste* [website]
- Velzen & Brouwer (2021) *Recyclebaarheid van Nederlandse Kunststofverpakkingen WUR* [report]
- Afvalfonds Verpakkingen (2021) *Beleid Innamepunten Statiegeld Nederland* [report]
- Afvalfonds Verpakkingen (2021) *Tarieven* [website]

NORWAY

National context: Norway

Packaging & packaging waste directive: In 1999, Norway was one of the first countries to introduce a formally regulated DRS, focusing on plastic beverage bottles. Norway is not a member of the EU, but as an EFTA member it has signed the agreement on the European Economic Area. Through this agreement, Norway has to implement the directives in the environment area (EEA, 2013). The EU-directive for packaging and packaging waste has been implemented by Norway through a covenant between the trade and industry associations and the Norwegian Ministry of Environment.

Separate agreements are made for each packaging material, covering packaging such as plastics, beverage cartons and cardboard, glass and metal. There is one material company for each of the materials, except for glass. Each agreement has its own separate recycling and recovery target. Recycling numbers are being reported annually to the Norwegian environment agency. Targets are subject to discussions between the material companies and the Ministry of Environment (Expra, 2021).

Collection systems for packaging waste: Norway has three different systems for the collection of packaging waste (Maldum, 2019). In the first place, the DRS for recycling for beverage cans and bottles that is managed by Infinitum (described in-depth in the next slides). Second, a curb-side system, which includes the collection of one-way glass and metal containers. Producers of beer cans can join this system. However, this system reports lower collection rates than the DRS, leading to a higher environmental tax for producers participating in this system. This means that most (beer) can producers join the DRS (including now 99% of the cans sold in Norway). Third, the Green Dot system that is run by the Norwegian municipalities. Producers can join this system and sell plastic bottles without deposit. Also, this system reports lower collection rates, resulting again in a higher environmental tax for producers participating in this system. In Norway a DRS for reuse operated until 2015 – this will be discussed further in the next sheets.

NORWAY: GENERAL CHARACTERISTICS (in 2018)	
Population:	5.295.619
Population density:	17,2
GDP per capita:	€ 69.440
Total waste generated:	14.137.718 tonnes
Household waste generated:	926.382 tonnes
Household waste per capita:	175 kg
Packaging waste generated:	855.811 tonnes
- Plastic packaging:	221.693 tonnes
- Glass packaging:	98.867 tonnes
- Metal packaging:	23.865 tonnes

Relevant literature:

- EEA (2013) *Municipal waste management in Norway* (webpage)
- Expra (2021) *Norway* (webpage)
- Maldum, K.O. (2019) *Norwegian deposit system – Circular Economy Par Excellence* (presentation and transcript from the CEO of Infinitum)

DRS Reuse: Rentpack(till 2015)

DRS for reuse: the Norwegian waste legislative system includes a basic tax on non-reusable packaging of beverages, called the "grunnavgift". The tax is levied on all non-reusable containers, independent of recovery or recycling rates (EFTA, 1995). When this packaging tax was introduced, it was argued that washing bottles and transporting soda and beer crates around the country was better than crushing and recycling (Maldum, 2020).

In line with this reasoning, a fourth collection system operated in Norway for refillable glass and PET-bottles until 2015. Interestingly the system – managed by Rentpack – was shut down because the amount of refillable glass diminished making the system too costly to operate (Maldum, 2019).

The DRS for reuse included both PET and glass bottles, as well as secondary packaging (pallets). Rentpack owned and leased its standardised packaging to its member organisations (manufacturers and breweries). This meant that the rights to the packaging were owned by Rentpack. Breweries and beverages companies that wished to use these had to enter into a lease agreement. Currently, Rentpack is still operating its DRS for reuse for pallets (Rentpack, 2021).

Rentpack is owned by the Norwegian Brewery and Beverages Association, i.e., Bryggeri- og drikkevareforeningen (BROD). This association is also a major shareholder of the DRS for recycling (Infinitum; see beneath).

Environmental claims on reuse:

Little information is available on the history and development of Rentpack as a DRS for reuse. The argument that Rentpack stopped operating because it became too costly with a decreasing amount of refillable packaging put on the market seems valid. Recently, the CEO of the Norwegian DRS for recycling has been arguing that the DRS for reuse also isn't more environmentally-efficient than DRS for recycling. His argument is that a new DRS for reuse isn't needed because "*the most eco-friendly option is mechanical recycling so that the materials can be used time and again in new cans or bottles*" (Maldum, 2020).

Rentpack

Relevant literature:

- EFTA (1995) A tax exemption for glass packaging from a basic tax on non-reusable beverage packaging (document)
- Maldum, K.O. (2019) *Norwegian deposit system –Circular Economy Par Excellence* (presentation and transcript from the CEO of Infinitum)
- Maldum, K.O. (2020) Senseless packaging tax (column in annual report)
- Rentpack (2021) *Rentpack: om oss* (website)

DRS recycling: Infinitum

Reason to be a DRS: the Norwegian DRS Infinitum is a collective, voluntary industry response to an environmental tax introduced in 1994. This tax provides producers the possibility to reduce their environmental tax by achieving a high collection rate (full rebate by 95% return rate). This set-up provided the incentive for retailers and industry to establish and manage their own DRS. This DRS was founded under the name Norsk Resirk and started operating in 1996. In 2014, the name was changed into the current name Infinitum, "*inspired by the infinite number of times bottles and cans can be recycled in the system*" (Infinitum, 2019).

Operational responsibilities: Infinitum is responsible for the efficient and environmentally friendly operation of the Norwegian DRS for recycling of plastic and metal packaging. Infinitum is responsible for retrieving the bottles and the deposit, after which the bottles are prepared for transport. Infinitum is also responsible for arranging transportation to sorting facilities, which are also operated by Infinitum. Also, Infinitum purchase the reverse vending machines for the retailers who are willing to provide one. They compensate for the staff that is required for handling the machines. After all the material is transported to the plants, Infinitum sorts and bales all materials and arranges its transportation to the recyclers. These operations are all covered by the participation fees paid by the producers participating in the system. Producers wishing to participate in the system must first submit their packaging to Infinitum, who checks the suitability of the product for the system in order to maintain high quality of the recycled products (Maldum, 2019). As Infinitum has responsibility over all operational tasks and is owner of the material throughout the entire process, it is also responsible for counting, data collection and reporting.

INFINITUM: GENERAL CHARACTERISTICS	
Full name:	Infinitum AS
Implemented:	1999
organisationtype:	Non-for-profit
Shareholders:	50/50 industry and retailers (Bryggeri- og Drikkevare-foreningens (35,0%), Daglig-varehandelens Miljøforum (33,5%), COOP Norge (15,0%), NHO (7,5%), Daglivare-leverandørens (7,5%), Virke Kiosk og Bensin (1,5%))
Total revenues:	242,3 M€

Relevant literature:

- Infinitum (2019) Annual report 2018 (report]
- Maldum (2019) *Norwegian Deposit System* [presentation]

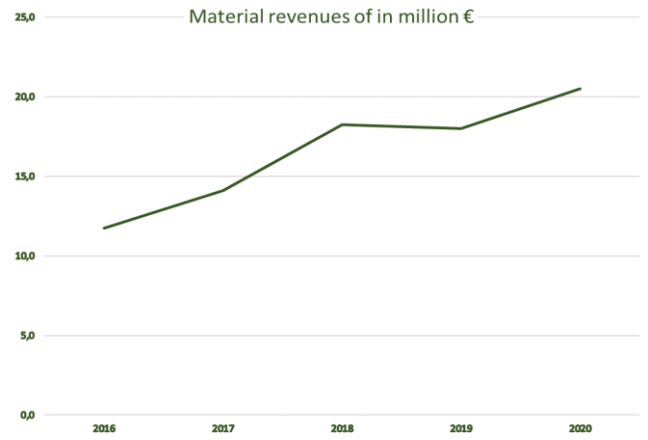
DRS recycling: Infinitum

Financial responsibilities: Infinitum's financial responsibilities can be divided into: (1) collection of fees; (2) distribution of fees; (3) sale of collected materials.

Infinitum collects the fees via the producers and importers. The fees that these actors pay consists of: (1) one-time registration fee for the company upon joining the DRS; (2) a fee for each new packaging put on the market; (3) an EPR-fee consisting of a basic fee, plus additional fees for deviations from the standard and/or difficult to recycle PET-packaging (EPR-fee differs per material type); (4) 100% of the deposit fees for all packaging that is put on the market.

In addition to the collection of these fees, Infinitum has the responsibly to compensate retailers for the handling, receiving, sorting, and storing used beverage containers (see more detailed information on the handling fee on the slide "deposit collection system"). Also, Infinitum reimburses the collected deposit fees to the retailers. Retailers are only reimbursed for the packaging that is collected and registered in the system, i.e. unredeemed deposit fees accrue to Infinitum.

Infinitum owns the materials in the DRS. After collecting, sorting, and balling the material, Infinitum sells it to recycling companies in Norway, Sweden and Germany. The material revenues and the unredeemed deposit fees are used to pay the operational expenses (see above), invest and innovate the system, and to reduce the level of fees paid by the producers and importers.



INFINITUM: PRODUCER FEES		
Company registration fee:	€ 1,000	
Packaging registration fee:	€ 200	
Basic fee per unit:	*Aluminium:*	- € 0.003
	Steel:	€ 0.021
	PET:	€ 0.015
	HDPE:	€ 0.015
Universal barcode fee (also valid in Sweden):	€ 0.003	
Additional fees:	€ 0.008 for lightblue & colored PET	
	€ 0.015 for sleeves or labels that cover > 75% of the packaging	
	€ 0.003 for sleeves or label boxes on cans	

Relevant literature:

- Infinitum (2021) Annual reports for 2016 - 2020 period (website)
- Maldum, K.O. (2019) *Norwegian deposit system – Circular Economy Par Excellence* (presentation and transcript from the CEO of Infinitum)
- Maldum, K.O. (2020) *Plastic challenge* (presentation)

DRS recycling: Infinitum

Type of packaging: the Infinitum DRS collected 1.3 billion cans and bottles in 2018. This covers packaging for a wide range of beverages: water, carbonated beverages, non-carbonated beverages, fruit and vegetable juices, and alcoholic beverages (INNOWO, 2020). In 2018, PET deposit wine bottles were added to this list when Norway's state-owned alcoholic beverage retailer (Vinmonopolet) introduced this product on the market. Excluded packaging from the DRS are containers for milk, milk products, cocoa, and chocolate drinks and powders. With glass covered by a separate curb-side collection system, this DRS includes only plastic and metal packaging. This means that the material scope of the system is limited to PET, HDPE, aluminium, and steel.

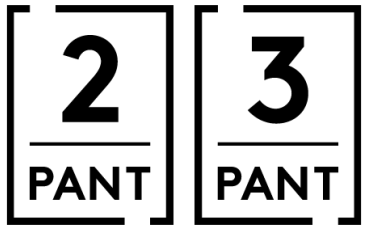
Packaging requirements: Before a producer can join the Infinitum DRS, they must register their products and submit their containers to Infinitum for testing. This provides Infinitum an opportunity to control and implement design for recycling. For plastic bottles, Infinitum applies a checklist that restricts the use of certain materials in the cap (thermoset PS, PVC, metals), liner and sealing (PVC, metal, silicone), barrier (coatings, scavengers, additives), and label and glue (PVC, PET, OPS, Self-adhesives, hot-melt, heavy metal inks). Light blue and other colored PET bottles are accepted, but producers must pay a higher fee. The rationale for this is that colored PET-packaging has fewer possible applications after it has been recycled and can even have a negative impact on the recycling process (Maldum, 2020).

Increased deposit fees:

The Norwegian DRS system has a differentiated deposit fee rate structure: low rate for cans and small plastic bottles (smaller than 500 ml) and a high rate for large bottles (larger than 500 ml). In 2017, the Norwegian government decided to increase deposit rates from NOK 1 and NOK 2.50 to NOK 2 and NOK 3. The change meant the first increase in deposit rates since the 1990s and was successfully implemented by Infinitum in 2018. With the increase to 2 NOK (€0.20) and 3 NOK (€0.28), the Norwegian rates are in line with countries such as Denmark, Finland, and the Netherlands.

Relevant literature:

- Infinitum (2019) *Annual report 2018* (report)
- INNOWO (2020) *How do effective deposit refund systems work?* (report)
- Maldum, K.O. (2019) *Norwegian deposit system – Circular Economy Par Excellence* (presentation and transcript from the CEO of Infinitum)
- Maldum, K.O. (2020) *Plastic challenge* (presentation)



The deposit symbols for 2 and 3 NOK. Producers have to submit new packaging with the logo to Infinitum for approval.

DRS recycling: Infinitum

Return points and types of handling: All retail outlets selling beverages are obliged to accept containers belonging to the system and pay out the deposit refund (INNOWO, 2020). Retailers can decide themselves to handle the take-back manually, with RVMs, or with compacting RVMs. Throughout the country, there are 11,400 manual return points and 3,600 return points with RVM. This means a take-back point to inhabitant ratio of 358 and one take-back point in every 24.3 km^2. Consumers return the vast majority of containers to take-back points with RVMs (94%). Manual take-back points take most of the other 6% and less than 1% is returned via internet grocery companies (e-commerce) (Maldum, 2020).

Handling fee structure: the handling fee structure in Norway is calculated in a way that should give retailers a fair compensation for handling, receiving, sorting, and storing used beverage containers. A differentiation is made between type of handling and type of container (material) in order to reflect differences in storage and transportation costs. Retailers using a compacting RVM, for example, receive a higher fee than shops that take containers with only RVM or manually. This is intended to reflect the transportation efficiencies generated by compacting the containers and the fact that compaction reduces the opportunity for fraudulent, multiple redemptions.

HANDLING FEE:	*Plastic:*	*Metals:*	*Glass:*
Manual:	€ 0.008	€ 0.004	-
RVMs:	€ 0.008	€ 0.004	-
RVM with compactor:	€ 0.020	€ 0.016	-

Future-proof?

The general growth in e-commerce becomes increasingly visible also in a growth of on-line groceries. Infinitum anticipates on this trend and produced a 50-liter bag that they deliver to consumers who purchase beverages online. The bags contain unique barcode, which Infinitum's logistic partners scan and allows Infinitum to know exactly who owns which bags. Consumers buying online receive the deposit back the next time they buy beverage containers on-line. According to Infinitum, e-commerce companies are very satisfied with this solution because it means that their customers won't need to go to other shops to bring back their empty containers (Maldum, 2019).

Relevant literature:

- INNOWO (2020) How do effective deposit refund systems work? (report)
- Maldum, K.O. (2019) *Norwegian deposit system – Circular Economy Par Excellence* (presentation and transcript from the CEO of Infinitum)
- Maldum, K.O. (2020) *Plastic challenge* (presentation)

DRS recycling: Infinitum

Historic development of performance: Infinitum reports its collection performance in the number of items collected and annual return rates. Its annual report of 2017 shows that the number of items collected increased from 65 million in 1999 to 1,044 million in 2017 (Infinitum, 2017). In 2020, this number increased further to 1,386 million items, thus more than 20 times larger than in 1999. The Norwegian environmental tax provides producers a full rebate by a return rate higher than 95%. This happened for the first time in 2011 for recyclable plastic bottles and in 2012 for cans. Important to note, this return rate was achieved by the DRS system and the additional systems (curb-side and Green Dot). Infinitum achieved its highest ever collection figures in 2018 with return rates of 88.6% of bottles and 87.3% of cans, respectively 95.1% and 98.9% with the collection via the additional systems (Infinitum, 2020).

Quality and recycling of collected materials: Infinitum reports that the quality of the collected materials is high due to the closed system (no contact with e.g. food waste) and its control on packaging design (e.g. no mixed materials). The collected cans are 100% recycled by Norsk Hydro (a large Norwegian aluminium and renewable energy company). Collected plastic was sold to German and Swedish recyclers till 2021. It was assumed that in this recycling process 8% of the collected materials was lost, but that 80% of the material was good enough to be closed-loop recycled (bottle-to-bottle)(Østfoldforskning, 2017; Maldum, 2019). In June 2021, the new PET-recycling plant, operated by Veolia Norway, was opened in Heia, further reducing transportation costs and impacts.

Relevant literature:

- Infinitum: annual report 2017 (report), annual report 2020 (report)
- Maldum, K.O. (2019) *Norwegian deposit system* (presentation and transcript from the CEO of Infinitum)
- Østfoldforskning (2017) *Comparison of recycling and incineration of PET bottles* (report)

INFINITUM: MARKET SIZE in 2018		Tonnes:	% of total:
Plastic packaging return rate:	88.6%		
- *Total generated:*		221 693	100.0%
- *Put-on-market DRS fraction:*		23 203	10.4%
- *Collected DRS fraction:*		20 568	9.3%
Metal packaging return rate:	87.3%		
- *Total generated*		23 865	100.0%
- *Put-on-market DRS fraction*		9 071	38.0%
- *Collected DRS fraction*		7 918	33.2%

Calculating Infinitum's market size:

Numbers in this table are calculated for the year 2018. At present, 2018 was the latest available year with relevant data in Eurostat's waste statistics. The number for "total generated" refers to the amount of all packaging waste generated in 2018 for a specific material. Norway hasn't reported this data for metallic packaging in 2018. "Put-on-Market" fraction refers to the total amount of packaging sold within the scope of the DRS and collected the amount that was collected by Infinitum. These numbers are from Infinitum's annual report 2018.

SWEDEN

National context: Sweden

Packaging & packaging waste directive: Recycling of aluminium cans became mandated by law in 1984. Following the EU-directive Extended Producer Responsibility (EPR) was introduced into Swedish law with the Ecocycle Bill in 1994. The Ecocycle Bill is a governmental policy that aims for better waste management and collection. As such the Swedish system shifted the waste management cost of physical collection fully from local governments to producers. The policy applies to different types of products, such as newsprint and packaging waste. The collection and recycling of each material is managed by a different Producer Responsibility Organisation (PRO).

Drinking bottles and cans are excluded from the EPR system, as they are covered by a Deposit Return System (DRS). Ambitious policy targets are set for each type of product. As of January 2021, producers are obliged by the Swedish Ordinance on Producer Responsibility for Packaging to register with the Environmental Protection Agency and report their packaging volumes (Valpak, 2021). The latest update was done in 2020; the Enhetlig och effektiv marknadskontroll 2020. The national recycling targets for both aluminium and PET in Sweden are 90%.

Sweden: GENERAL CHARACTERISTICS (in 2018)	
Population:	10.120.242
Population density:	25
GDP per capita:	€ 43.760
Total waste generated:	138.667.585 tonnes
Household waste generated:	2.382.541 tonnes
Household waste per capita:	235 kg
Packaging waste generated:	1.353.711 tonnes
- Plastic packaging:	245.934 tonnes
- Glass packaging:	231.308 tonnes
- Metal packaging:	59.503 tonnes

National context: Sweden

Collection systems for packaging waste: In Sweden, there are separate systems for recycling and reuse. The system for reusable packaging is oldest and was established in 1885, including glass bottles of 33cl. This was a voluntary system operated by Swedish Brewers. In 1984, the system for recycling was established, Returpack, including all ready-to-dink beverages including beer, soft drinks, cider, and bottled water. Later in 1991 and 1994, additional systems for reusable packaging were established – subsequently for PET and reusable bottles of 50cl. The system for PET was terminated in 1991, but the other three systems remain, albeit as separate entities. The systems share several take-back points (RVMs), but a system of special bins for glass was implemented and placed at strategic locations, such as outside shops and parking lots (IVL, 2021). Returpack, the system for recycling, operates with packaging subjected to law, whereas Returglas 33cl and Returglas 50cl operate a voluntary deposit return scheme.

Collaboration between systems: Collaboration between the different systems for packaging collection comes down to agreements on misthrown packaging. Returpack and other EPR schemes are very keen to keep their materials in their own streams to maintain quality: Returpack shares reverse vending machines with the DRS for re-use (in some places). There are no specific agreements on 'misthrown' bottles due to the separate collection. The DRS for recycling was initiated and implemented before the implementation of the EPR-scheme in 2015. No link exists with the EPR-schemes; the same accounts for collaboration between the DRS for reuse and DRS for recycling.

Relevant literature:

- IVL (2021) *Extended Producer Responsibility in Sweden: Towards better waste management* (website)
- Valpak (2021) *EU packaging Waste Regulation Updates* (website)

DRS Reuse: Sveriges Bryggerier

DRS for Reuse: During the late 1980s, Sweden had several deposit systems running parallel: one was Returpack, others were organised by different organisations. The latter type included Retur-PET for reusable PET bottles. Returplast was organised by smaller breweries and the Pripps system, which was specifically for Pripps brewery materials. This abundance of deposit return systems appeared too unstructured and in 1994, Returpack-PET took over Returplast and the Pripps system (Jorgenson, 2011).

Additionally, the system for reusable PET (Svenska Retur PET AB) was discontinued in 2007, due to hygienic considerations and the bottles were replaced by one-way packaging. Nowadays, the Swedish return system for refillables exists of two separate handlers, owned by Swedish breweries. The systems each handle their own type of bottle:Svenska Returglas 33cl handles the 33cl glass bottles and Svenska Returglas 50cl the larger, 50cl glass bottles. In addition, the plastic crates in which the glass bottles are often sold are included in the system. This secondary packaging material was later added to the DRS. (Sveriges Bryggerier, 2007).

There used to be a deposit return system for wine and liquor bottles, yet this system stopped at the end of the 1990s, due to the introduction of many different types of bottles on the Swedish market after its EU accession in 1995 (Naoko, 2011).

Relevant literature:

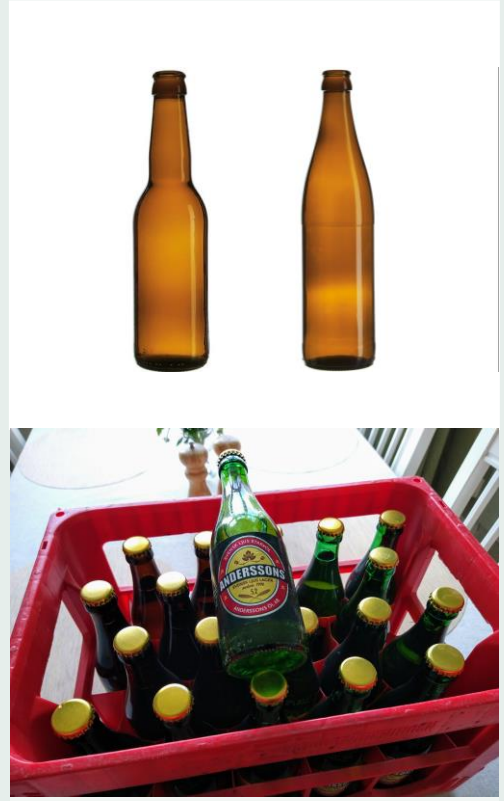
- Swedish Breweries (2021) *Organisation website* (website)
- Swedish Breweries (2007) *Viktig information angående 4:- pant för hårda retur-PET flaskor Sveriges* (Press Release)
- Tojo (2011) *Deposit Refund Systems in Sweden* (publication)
- Jorgenson (2011) *Making a Green Machine: the Infrastructure of Beverage Container Recycling* (book)

Sveriges Bryggerier:	
System operator:	**Svenska Returglas 33cl** **Svenka Returglas 50cl** **Svenska Retur PET AB** (till 2007)
Established	**1885** (glass)
	1991 (PET)
Included packaging:	**Glass bottles** (33cl, 50cl; refillable) **PET bottles** (1.5L; refillable; till 2007)
Deposit Fee:	**€0.059** (Glass 33cl) **€0.089** (Glass 50cl)
Secondary packaging:	**€2.21** (Crate 20 bottles 33cl); **€2.77** (Crate 15 bottles 0.5cl)
Collection rate 33cl	**~ 100%**
Collection rate 50cl	**90-95%**

DRS Reuse: Sveriges Bryggerier

Packaging requirements DRS for reuse: included in the DRS for reuse are glass bottles with specified sized and capacity. Additionally, Sveriges Bryggerier handled large, refillable PET bottles of 1.5L till 2007. The 33cl glass bottles weigh 305 grams and the 50cl bottles weigh 356 grams. The standardised size of the bottles has only changed slightly since 1886, but the basic shape is the same (Mattson, undated).

System operations: Sveriges Bryggerier's main tasks are the division of tasks, costs and assets within the system. They keep track of the bottles within the system – when new bottles need to be added, the system operator will make sure this happens and divides the costs amongst the participants. The reuse system is a pooling system with shared bottles and non-profit. There is no collaboration with the system for recycling and both make sure their waste streams are kept clean. When bottles for reuse end up in the recycling stream, they are not transported back to the reuse system as Sweden also has a recycling system for glass – additionally, when misthrown, bottles are often too damaged to be used again.



Standard glass bottles included in the DRS reuse and a standard 20-bottles crate (photos: humle.se; byggahus.se)

Relevant literature:

- Tojo (2011) *Deposit Refund Systems in Sweden* (publication)
- Mattson (undated) *Report Sweden* (report)

DRS Reuse: Sveriges Bryggerier

Quality: Sveriges Bryggerier reports that the quantity and quality of glass recovered is extremely high due to the long-established habit (since the 1950s) of bringing waste packaging to bring banks for refilling the bottles. Additionally, a thorough check of quality and intactness of the bottles is performed, and damaged or low-quality bottles are removed from the system (Naoko, 2011). The number of circulations of bottles in the system is unknown, however, bottles in this system are refilled between 3-3.5 times before being crushed and reshaped into new bottles.

Quantity: Sveriges Bryggerier is responsible for approximately a total of 49,474 tonnes of refillable glass per year. This amount can be divided in two streams: refillable small beer bottles of 0.33 liter and bottles of 0.5 liter. The amount of refillable small bottles is larger than the amount of larger beer bottles.

DRS Reuse: Sveriges Bryggerier

Journey of the deposit through the system:

1. Brewers* buy their own bottles and fill those, after which they are sold for the price of the product + deposit to whole sellers. Payment of a handling fee is subject to direct agreements between producers and whole sellers.
2. The whole sellers sell the beverages to the retailers, for the price of the product + deposit.
3. The retailers sell the beverages to consumers for the price + after which the beverage is consumed.
4. Upon return, the consumer receives the deposit back from the retailer. The retailers temporarily store the empty bottles, until they are picked up by the whole sellers (who pay the deposit back to the retailers).
5. The bottles are picked up by large breweries who pay the deposit back to the whole sellers. The large breweries wash and check the quality of the bottles and refill them. Small breweries can purchase washed bottles from the large breweries, by paying the deposit of the bottles + a fee for washing the bottles.
6. The system operator decides if the system should expand or shrink. Any cost that follows upon a decision of the system operator is shared among the member breweries in proportion of their market share. The system operator also negotiates the price of the standardised bottles (with the bottle producer), but breweries are responsible for purchasing new bottles.

* The Swedish Competition Authority has ruled that individual breweries do not have to become a member of the industry association in order to participate in the DRS.

DRS recycling: Returpack

Reason to be a DRS: As opposed to most other countries which implemented a deposit return system, the main driver for the Swedish DRS was the anticipated increased market uptake of single-use aluminium packaging items. In the early 1980s, Sweden opened an aluminium can factory and wanted to introduce one-way packaging on the market. As such, the decision to adopt a deposit return system in Sweden was caused by a concern of increased littering related to the introduction of aluminum cans in the 1970s (Returpack, 2019). The packaging industry, breweries and the retail sector formed AB Svenska Returpack to handle the emergence of aluminum cans in the system. Due to the same reason PET packaging items were included in the DRS in 1994. Additionally, Swedish producers can voluntarily enter the DRS, which is often done to fulfill consumers' expectations. The Swedish DRS for recycling was set up prior to the introduction of an extended producer responsibility scheme.

Operational responsibilities: Returpack operates the only approved deposit return system for recycling for beverage packaging with a deposit in Sweden and maintains financial and operational tasks within the system. Returpack is responsible for the (1) registration of packaging producers and packaging items, (2) collection of packaging, and (3) sorting of packaging into material flows and reselling the collected material streams (Pantamera, 2021). Additionally, Returpack pays the handling fee and additional compensation to the retailers for operating the reverse vending machines and participating in the DRS system. For the registration of packaging, the producer enters into an agreement with Returpack and then registers its packaging to the deposit system. With the support of carriers, Returpack ensures that the packages are collected from the deposit recipients. Subsequently, Returpack processes packaging by sorting and compacting the material into bales at their factory in Norrköping, before then selling it on to material buyers for recycling. The collected material streams are used to produce raw materials for new cans and bottles (Pantamera, 2019).

Besides Returpack is responsible for logistics as well as marketing of the DRS system. As such Returpack provides information, educates and communicates the importance of each can and bottle being returned to relevant stakeholders (Pantamera, 2019).

Returpack: GENERAL CHARACTERISTICS	
Full name:	Returpack (BKA Pantamera)
Implemented:	1984
organisationtype:	Not for profit
Shareholders:	Sveriges Bryggerier (50%), Svensk Dagligvaruhandel (25%), Livsmedelshandlarna (25%).
Total revenues:	311,484 M€

Relevant literature:

- INNOWO (2020) How do effective deposit refund systems work? (report)
- Pantamera (2021) *Our business* (website)
- Returpack (2019) Sustainability Report (report)

DRS recycling: Returpack

Financial responsibilities: The finances of Returpack can be grouped as: (1) collection of fees, (2) distribution of fees, and (3) sale of collected materials.

Producers enter into an agreement with Returpack and register its packaging to the deposit system. An annual fee of €1,012 forms the basis for membership of the DRS. Besides the producer pays Returpack a fee for every package sold: the fee covers the administration, collection and sorting of the packaging. Moreover, a deposit fee is paid to Returpack by packaging producers, which revolves around between producer, Returpack, store and consumer (Tojo, 2011)

Secondly, distribution of fees by Returpack consist of reimbursements for handling paid to deposit recipients (i.e., stores and restaurants). The fee is meant to cover the store's costs for handling the deposit (service of reverse vending machine, customer service, work, facility, materials). Besides, transport costs, operation of the business, marketing and development costs are financed by Returpack. These costs are covered by selling the collected materials. As such the proceeds from selling the collected materials is an income to Returpack. When the deposit packaging items are sorted and baled at their sorting plant in Norrköping, the sorted streams are sold to recycling companies. Aluminium is sold to Constellium and Novelis, PET material is sold to Veolia and HDPE caps are distributed to Axjo. Aluminium cans are bailed and sold in Germany and France, as Sweden does not have a recycling plant for aluminium. The high quality of the materials, resulting from the separate waste streams enables makes the Swedish material of high demand. The Swedish system for deposit return is a closed-loop system – a large part of the sold aluminium goes back to the factories in Sweden where new cans are created. Returpack remains the owner of the materials throughout the recycling loop – their profit is invested in refurbishment of their facilities or is invested in communication campaigns to keep up high return rates among Swedes.

Returpack: PRODUCER FEES		
Affiliation fee	€ 1,012 p/year	
Basic fee per unit:	*Aluminium:*	NA
	PET > 1L	€0.047
	PET: <1L	€0.020
	HDPE:	NA
Universal barcode fee:	NA	
Additional fees:	Sorting fees for packaging marked with the Returpack barcode	

Relevant literature:

- Tojo (2011) *Deposit Refund Systems in Sweden* (publication)
- Returpack (2019) *Sustainability Report* (report)
- Suter (2019) *Beyond PET, An Extended Deposit Return System for Plastic Packaging in Sweden* (report)

DRS recycling: Returpack

Type of packaging: DRS started with the collection of aluminium cans in 1984, followed by the inclusion of PET bottles in 1994. This includes packaging for water, carbonated beverages, non-carbonated beverages and alcoholic beverages. Optional registration is possible for fruit syrup producers, which means that packaging not covered by the ordinance on return systems can be registered to the deposit system. The producers and importers registered to the deposit system ensure their packaging meets the required packaging requirements. All parties professionally serving or importing drinks ready for consumption in plastic bottles or metal cans must ensure that the product is included in an approved return system.

Packaging requirements: There are extensive technical requirements for the packaging returned to the Returpack system. Requirements vary per material, for example, metal cans must be almost exclusively made from aluminum and the size must be between 15-95 cl. The only bottles included are PET bottles, with HDPE lids with a volume of 19-300 cl. All packages should be marked with the Returpack special deposit symbol, which should be clearly readable. In some exceptional cases, Returpack allows producers to use the same label of recycling in both Sweden and Norway – this is done when the market for a product is too small in only Sweden. In this case, producers only report and pay for what they use in Sweden, however, this is an exception.

Packages in Returpack's system must be marked with special deposit symbols, indicating that they belong in the Returpack system. In addition, packaging requirements are specified per type of material.

Relevant literature:

- INNOWO (2020) *How do effective deposit refund systems work?* (report)
- Returpack (2019) *Sustainability Report* (report)

DRS recycling: Returpack

Return points and types of handling: Retailers may choose manual or automatic collection of containers. The latter option accounts for 95% of the total collection. In this scenario, the retailer buys a reverse vending machine, while the system operator specifies the conditions to be met by the RVM. The retailer is renumerated for the service, providing and operating a collection point (INNOWO, 2020). There are 14,000 return points in total, the take-back point to inhabitant ratio is 738:1. 95% of returns take place at food retail markets. Returpack also uses mobile collection stations (Pant-o-Bil) to facilitate collection of beverage containers at festivals (Returpack, 2017).

Future-proof? Currently, Sweden is exploring multiple innovations in their DRS. Proposals considering the digitalization of the DRS (DDRS) have been circulating, potentially able to stop consumers from having to lug empty bottles back to the supermarket and reducing retailer costs.

One of these considers the paper voucher, that is to be replaced by a machine-to-consumer payout solution (Payer, 2021). Additionally, Sweden tries to find ways to collect the remaining packaging that is not yet included in the system and is working on ways to include dairy packaging in the DRS. Future developments of the system will also focus on machines that accept deposit in bulk.

Relevant literature:

- INNOWO (2020) *How do effective deposit refund systems work?* (report)
- Returpack (2021) *Handling fee 2021* (report).
- Returpack (2017), *Idag rullar Pant-o-bilen in i Linköping* (article)
- Suter & Cuomo, *The Swedish Deposit Return System – What Could the UK Learn?, 2019 (website)*

DRS recycling: Returpack

Handling fee structure: Locating them in retail stores makes it convenient for consumers to return bottles and cans and get the deposit back. Additionally, 9500 collectors are spread throughout the country in traffic stores, sports clubs, camping sites, etc. (Nörkoppings Kommun, n.d.). While the retailers have a fast and efficient way of processing the returned goods, they can also attract potential consumers to their store and are compensated with a handling fee for each container.

However, retail stores in central locations experience high volumes of returned goods while losing valuable selling space. Deposit return systems need to be flexible enough to accommodate these differences (Suter & Cuomo, 2019). In the late 1990's, Returpack granted approximately €2,000 to each manual collection point willing to invest in RVM, which allowed the return scheme to be converted to an exclusive automated take-back solution. Nowadays, Returpack still pays an annual 'fixed' compensation of €2018.36 to each automated collection point with compacting RVM(s), in addition to the handling fees (Returpack, 2021).

HANDLING FEE:	*Plastic:*	*Metals:*	*Glass:*
Manual:	PET > 1L € 0.020 PET < 1L €0,020	€ 0.00	-
RVMs with compactor (pickup with truck):	PET > 1L €0.034 PET < 1L €0.027	€ 0.018	-
RVM with compactor (pickup by reseller):	PET > 1L € 0.051 PET < 1L €0.034	€ 0.02	-

Relevant literature:

- INNOWO (2020) *How do effective deposit refund systems work?* (report)
- Returpack (2021) *Handling fee 2021* (report).
- Returpack (2017), *Idag rullar Pant-o-bilen in i Linköping* (article)
- Suter & Cuomo, *The Swedish Deposit Return System – What Could the UK Learn?, 2019 (website)*

DRS recycling: Returpack

Journey of the deposit through the system:

1. When producers bring packaging to the market, they report the amount to the system operator, Returpack. Returpack then sends out an invoice based on this amount – this covers the deposit fee of the packaging brought onto the market.
2. The producer then adds the deposit to the price of the product, when selling it to retailers, so the producer receives the deposit when selling their product to the retailer.
3. Then, the retailers put a deposit price on the products and sell them: when the products are returned, the consumers will receive the deposit back.
4. The materials are collected by Returpack; and subsequently sorted and counted at their facilities.
5. Following the counting, Returpack pays to the store the amount of the total deposit that was paid to the consumer for their returned packaging.
6. Returpack remains the owner of the material throughout the entire process. When packaging is returned, Returpack sells it to recyclers in Sweden (mainly PET) and abroad (mainly aluminium to France or Germany as Sweden has no melting plants). Revenues from the sold materials are used to keep the producer fees as low as possible.

CHAPTER 8: Complete literature list

Literature: A-list

Title	Author	Year
Baltics DRS – Estonia, Lithuania (Latvia)	Earth Care Consulting	2021
Boosting closed loop recycling in Europe	FEVE	2021
Statiegeld gaat in Nederland een nieuwe fase in ('Deposit schemes enter a new phase in the Netherlands')	Statiegeld NL	NA
Deposit Return Systems for Beverage Containers in the Baltic States	Ojars Balcers (PhD), Janis Brizga (PhD), Harri Moora (PhD), Rauno Raal (MBA)	2019
Deposit return in Sweden – A case study	Zero Waste Scotland	NA
Deposit - Return Schemes Data and figures from 16 member countries of the EPA Network	European Network of the Heads of Environment Protection Agencies (EPA Network) – Interest group on Plastics	2018
Germany's pioneering bottle deposit scheme has lessons for the EU	Dave Keating, EURACTIV	2021
Scotland's Deposit Return Scheme	Zero Waste Scotland	NA
Rethinking and optimising post-consumer packaging waste: A sentiment analysis of consumers' perceptions towards the introduction of a deposit refund scheme in Scotland.	Adekunle Oke, Oluyomi Osobajo, Lovelin Obi and Temitope Omatayo	2020
Consultation on Introducing a Deposit Return System in England, Wales and Northern Ireland	Department for Environment Food & Rural Affairs	2021
Raise the Glass – A report to provide the glass packaging industry with the scientific evidence to inform debate on any proposed introduction of mandatory policies on food and drink containers in the EU-28 Member States	Oakdene Hollins – Research & Consulting	2018
Waarom is er nog geen statiegeld op blikjes in Nederland?	Recycling Network BENELUX	NA
Extended Producer Responsibility for Packaging and Paper Products: Policies, Practices, and Performance	Product Stewardship Institute	2020
Deposit Return Schemes – Consumer Insight Research	RECOUP	2018
Making empties count: Deposit Return Schemes across the world	Renewable Matter	2021
Sustainability of the German Deposit System: Case Study in Berlin	Arianna de Bellis	2020
A Load of Rubbish? Introducing a Deposit Return Scheme to the UK	Institute of Economic Affairs	2019
Beyond PET: An extended DepositReturn System for plastic packaging in Sweden	Marco Suter	2019
Plastic Bottle Deposit Refund Schemes in Europe	Mehdi, Habibi Rad	2020
Deposit-Refund Systems in Europe	ACR+	2019
Deposit-Refund System (DRS) – Facts & Myths	Deloitte	2019
EU action to tackle the issue of plastic waste	European Court of Auditors	2020
New EU rules on packaging shows beverage carton is not as renewable as previously thought	Renewable Matter	2021
Insight (CONAI Sutainability Report)	Renewable Matter	2018
Cost-benefit analysis of a Container Deposit Scheme	Sapere Research Group	2017
The Swedish Deposit Return System – What Could the UK Learn?	Anthesis Group	2019
A European refunding scheme for drinks containers	Directorate-General for External Policies	2011
Estonian DRS system administrator	Eesti Pandipakend	NA
Response to the Call for Evidence for a Deposit Return System for Scotland	The Alliance for Beverage Cartons and the Environment	NA
Written evidence Submitted by Tetra Pak	Tetra pack	2021
Uitbreiden statiegeld (extension deposits)	EY, Parthenon	2019
Returpack/Pantamera	Pantamera	NA
Grazinti verta+	USAD	NA
Plastic Smart Cities	WWF	NA

Literature: A-list

Title	Author	Year
Milieu impact van verpakkingen	Milieu Centraal	NA
Impact assessment for introduction DRS	Department for Environment, Food and Rural Affairs	2021
Kosten en effecten van statiegeld op kleine flesjes en blikjes	CE Delft	2017
THE BEVERAGE CARTON INDUSTRY POSITION ON COLLECTION AND DEPOSIT RETURN SCHEMES	GRACE - Global Recycling Alliance for Beverage Cartons and the Environment	2020
Written evidence submitted by Alliance for Beverage Cartons and the Environment (ACE UK)	ACE UK - Alliance for Beverage Cartons and the Environment	2021
Social footprint of a packaging waste deposit-refund system in Spain	Ivan Muñoz , Bo P. Weidema, Alba Bala, Pere Fullana-i-Palmer	2018
Deposit Refund Systems – Webinar	Oakdene Hollins	2017
What motivates households recycling behaviour in recycling schemes of different maturity? Lessons from Lithuania and Sweden	Jurate Miliute-Plepiene	2016
Comparison between the British Glass Scottish DRS model and the Zero Waste Scotland DRS model	Anthesis Group	2019
Report on the Proposed Deposit and Return System for Beverage Containers in Ireland	McCloughan, PMCA Economic Consulting	2017
Comparative LCA of container deposit scheme and green dot system for PET bottles, cans and beverage carton waste in Spain	Sevigné et al.	2017
Life cycle impact assessment of beverage packaging systems: focus on the collection of post-consumer bottles	Simon et al.	2016
A cost-benefit analysis of a deposit-refund program for beverage containers in Israel	Lavee	2009
Deposits on single use containers - a social cost-benefit analysis of the Danish deposit system for single use drink containers	Vigsø	2004
Introducing a Deposit Return Scheme on beverage containers, impact assessment	Defra	2019
Introducing a Deposit Return Scheme on beverage containers, consultation	Defra	2019
Introducing a Deposit Return Scheme on beverage containers, second consultation	Defra	2021
Introducing a Deposit Return Scheme on beverage containers, updated impact assessment	Defra	2021
Sustainability study on the introduction of a mandatory DRS for packaging in Spain: comparative environmental, social and economic analysis versus current situation	UNESCO, uniTwin, ESCI	2017
Real Price of Deposit - Analysis of the introduction of the deposit-refund system for single-use beverage packaging in the Slovak Republic.	DRÁB, J. and SLUČIAKOVÁ, S. (Ministry of Environment of the Slovak Republic)	2018
Reuse and Recycling Systems for Selected Beverage Packaging from a Sustainability Perspective An analysis of the ecological , economic and social	PricewaterhouseCoopers AG WPG.Dr. Patrick Albrecht, Jens Brodersen, Dieter W. Horst	2011
Aufkommen und Verwertung von PETGetränkeflaschen in Deutschland 2015 " Inhaltsübersicht 4 . Recycling- und Verwertungsquoten 5 . Übertragbarkeit auf Teilgesamtheiten 6 . Fazit und Ausblick	Der Studie and K. Stroffstrommodells	2016
Economic policy instruments for plastic waste: a review with Nordic perspectives. Copenhagen K: Nordic Council of Ministers	Hennlock, M., ZU Castell-Rüdenhausen, M., Wahlström, M., KJÆR, B., Milios, L., VEA, E., Watson, D., Hanssen, O.J., Fråne, A., Stenmarck, Å, and Tekie, H. (Nordon, Nordic council of ministers)	2015
Deposit Refund Systems in Sweden - Case studies for four types of beverage containers. Lund: Lund University	Tojo, N.	2011
Drivers to Sustainable Plastic Solid Waste Recycling: A Review. Procedia Manufacturing	Mwanza, B.G. and Mbohwa, C.	2017
Has Germany hit the jackpot of recycling? The jury's still out". The Guardian. Retrieved March 30, 2018	Oltermann, Philip	2018
Increasing Recycling through Container Deposit	Thörnelöf, I. Uppsala University, Uppsala	2016
Discontinuous Behavioral Responses to Recycling Laws and Plastic Water Bottle Deposits. American Law and Economics Review, Vol. 15, No. 1, p. 110–155.	Viscusi, W.K., Huber, J., Bell, J., and Cecott, C.	2013
Statiegeld lost het probleem van zwerfvuil niet op. Fostpost, (31). Retrieved from https://www.fostplus.be/download/2154/fostpost_nl_final.pdf	Fost Plus	2015
The impacts of the California beverage container recycling and litter reduction act on consumers. The Journal of Consumer Affairs, 24, 190–220.	Naughton, M., Sebold, F., & Mayer, T.	1990
Deposit-refund schemes for one-way beverage packaging. Master Thesis. Universiteit Gent, Gent	Deprez, N.	2016
Look at the German model for a deposit return scheme. Retrieved September 7, 2018, from https://www.packagingnews.co.uk/features/comment/soapbox/carsten-schleeberger-look-german-model-deposit-return-scheme-07-09-2018	Qureshi, W.	2018
Drinks bottles and can deposit return scheme proposed. Retrieved May 16, 2018, from https://www.bbc.com/news/science-environment-43563164	Harrabin, R.	2018
German associations call for binding reusable packaging quotas. Retrieved March 30, 2019, from https://www.euractiv.com/section/energy-environment/news/german-associations-urge-government-to-introduce-binding-reusable-quotas	Schulz, F.	2019

Literature: A-list

Title	Author	Year
Palpa	Palpa	2021
Palpa: 1,9 billion environmental acts in a year	Tommi Vihavainen	2021
How do effective Deposit Systems work?	INNOWO	2020
Dutch-German Trade Association	DNHK	2021
DPG-Pfandsystem GmbH	DPG-Pfandsystem	2021
Waste Policy : the Development of Waste Policy in Germany	Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection	2021
An Analysis of the German Packaging Act	Institute for Advanced Sustainability Studies	2020
Mehrweg oder Einweg: Verwirring Total beim Pfand	Verbraucher Zentrale	2020
Beverage Packaging: More Transparency for Returnable and Disposale Packaging	Interpack	NA
Waste Management in Germany 2020	Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection	2020
How to Make Packaging more Recyclabe?	Umwelt Bundesamt	2021
Assessment of Opportunities for Beverage Packaging waste Reduction by Means of Deposit-Refund System	Tomkeviciute and Statiskiene	2006
Integration of Collection Infrastructure for Refillable & one-way packaging in Lithuania	DESA	2020
USAD	USAD	2021
Legislative Framework: Dutch and EU Packaging Waste Legislation	Afvalfonds Verpakkingen	2021
Mastering the Circular Economy: A Practical Approach to the Circular Business Model Transformation	Weenk and Henzen	2014
Statiegeld Nederland	Statiegeld NL	2021
Beleid Innamepunten Statiegeld Nederland	Statiegeld NL	2021
Municipal Waste Management in Norway	EEA	2013
Norwegian Deposit Ystem - Circular Economy par Excellence	Maldum, K.O.	2019
Senseless Packaging Tax, Annual Report 2020	Maldum, K.O.	2020
Plastic Challenge	Maldum, K.O.	2020
Sveriges Bryggerier	Sveriges Bryggerier	2021
Making a Green Machine: the Infrastructure of Beverage Container Recycling	Jorgenson	2011
Sustainability Report 2019	Returpack	2019
The Swedish Deposit Return System - What Could the UK Learn?	Suter and Cuomo	2019
Umwelt Bundesambt: how to make packaging more recyclable?	Umwelt Bundesamt	2021
Eesti Pandipakend: Majandusaasta Aruanne	Eesti Pandipakend	2019
Annual Report 2020	Infinitum	2020
The Establishment of container-deposit on single-use beverage packaging in Germany	Happach et al.	2013
Deposit-Refund Systems (DRS) for Packaging	GIZ	2018
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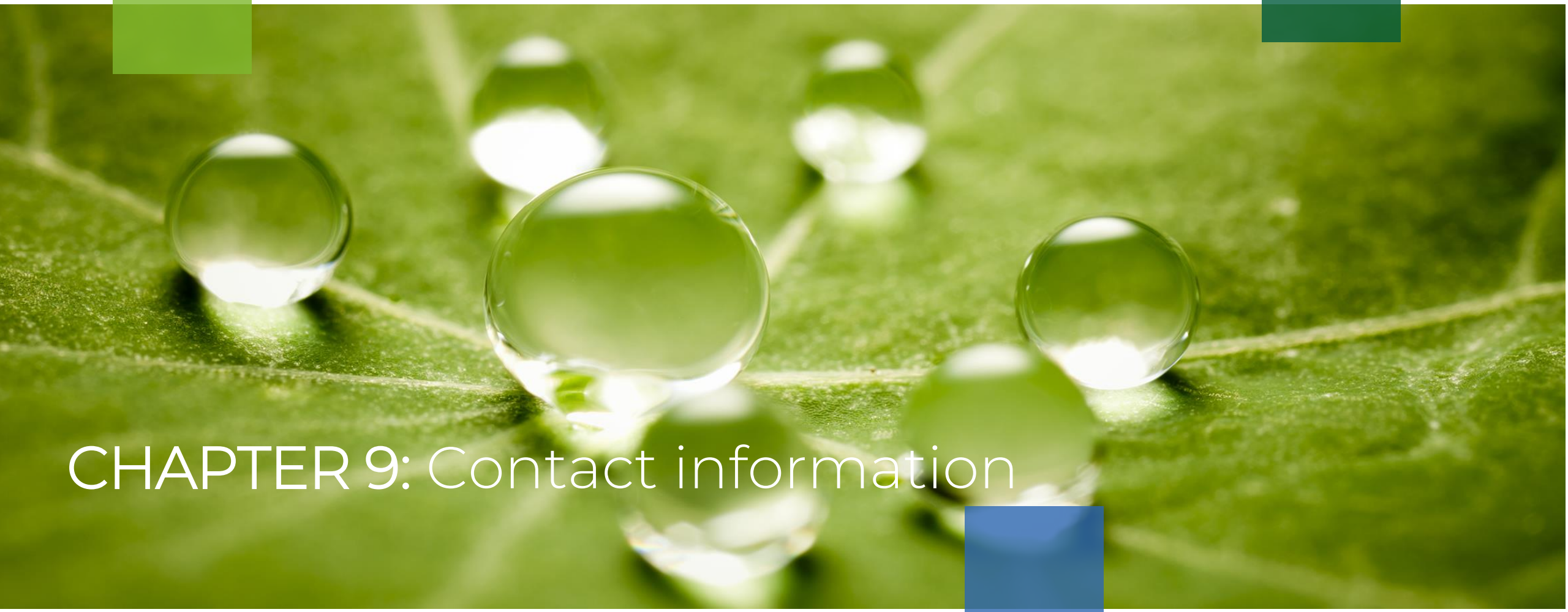

CHAPTER 9: Contact information

CONTACTS

Tjerk Wardenaar, PhD
Managing consultant - Environment
T: +31 6 5277 2204
tjerk.wardenaar@egen.green