The Digital Deposit Return System as the Key to a Global Approach to Litter in Which Every Packaging Counts

The food and retail sectors have been funding since many years a comprehensive programme – via Fost Plus – to provide a structured response to the recurrent litter problem, in conjunction with public authorities. Today we need an innovative solution that has the comfort of the citizens at heart, builds on the successes of the past and makes us frontrunners in the fight against litter. A feasibility study by PwC has demonstrated that a digital deposit return system can be that solution.

Much like the rest of society, the food and retail sectors have been concerned about litter for many years. Three reasons have pushed several companies and organisations to explore alternatives and today they rally behind a digital deposit return system.

1. Firstly, we have to concede that the amount of litter in Flanders is not declining fast enough and that the steps that have been taken so far to get the problem under control are not sufficiently effective. It is time for a new initiative.
2. Secondly, the Single Use Plastics directive stipulates that all European countries must collect 90% of drinks bottles by 2029. Today we are achieving that level but soon, the method used to measure collection is undergoing radical changes. Hence, no Member State – including frontrunner Belgium – will be able to continue to do so under current conditions.
3. Thirdly, drinks packaging in Europe must contain a certain percentage of recycled material. To achieve this, we need to reduce the loss of material to a minimum.

The only way to achieve these three objectives is by attaching financial value to empty packaging. In this respect, Minister Demir’s decision is forward-looking.

Two years ago, this observation marked the turning point for some industry pioneers to explore options for a deposit return system in Belgium. Following a period of in-depth consultation, the road towards a digital system started to emerge. Assisted by a small group of committed colleagues and with the support of consultancy firm PwC, we invested a lot of time and energy in developing that digital scheme – a scheme based on the idea that all packaging counts and that every household and public bin can be a potential collection point. To put it another way: would it be possible to keep the blue bag and maintain the same high level of sorting behaviour that goes hand in hand with that and still manage to collect more by attaching a monetary value to the packaging? The answer is a resounding 'yes'! After all, our world is becoming more and more digital.

The key tenet of the digital deposit return system is to build on the good sorting behaviour of the majority of the population and to give waste (digital) value, through recycling.

To achieve this, each item of packaging first must get a unique code. Luckily, this system already exists and is being expanded every day to cover products such as cigarettes, medicines and meat or fish sold in supermarkets. Even bpost already has a digital code on its stamps. The purpose of the code is to provide information and ensure traceability.

The same principle applies to the digital deposit return system; the packaging still follows the usual circuit but acquires an additional financial value upon purchase – money that you get back if you sort it properly.
Just as it is the case for those every-day products, a host of security safeguards will be put in place to protect privacy, to ensure hassle-free financial transactions and to protect against fraud. For example, you won't be able to scan unopened cans at the supermarket and collect the deposit undetected. And you won't be able to copy the code and just dump all the empty packaging in a forest somewhere.

The digital deposit return system is a modern-day solution that is in line with modern-day consumption trends; after all, the world is becoming increasingly digitised – and at a rapid pace. This smart system differs from other solutions as the blue bag will continue to be the main collection channel. That is good news for the many citizens who do not want to lose comfort. Furthermore, it offers a solution regardless of where the packaging becomes available for sorting. No need to carry around empty bottles for miles on a walk or wait for the collection point to open; you can just deposit them in the nearest blue bin. Litter is produced all day, every day, so we need a solution that is always accessible.

Just as we paved the way back in 1994 with the introduction of door-to-door collection via the PMD bag – which helped to put us at the top of international leader boards today –, this digital deposit return system will also help us to secure our frontrunner position in the fight against litter. On top of that, a deposit system will also help us to continue to meet Europe's very ambitious recycling targets. This development, combined with the fact that companies will now bear the cost of cleaning up their products that end up in litter, the packaging industry has every interest in this scheme being implemented as quickly as possible.

So, where are we today? PwC has completed its feasibility study and the verdict is unequivocal: a digital deposit return system can be done – from a technical, technological, logistical and legal viewpoint. Now that the Flemish government has also expressed its preference for a digital system, the project partners are translating the concept into an action plan with a practical roadmap. Pilots will also be conducted on the ground. The objective is to ensure that the system is implemented as efficiently as possible within the set deadlines. We firmly believe that the digital deposit return system is the only way forward for Belgium.

Every Packaging Counts

DDRS Blueprint - Consolidated report

Final version delivered on 27 September 2022

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Project overview

Scope of the DDRS blueprint

Development of a blueprint for a Digital Deposit Return System for beverage packaging put on market in Belgium

Fost Plus, Fevia and Comeos partnered with PwC to develop a blueprint for a Digital Deposit Return System for PET bottles and aluminum and steel beverage cans put on the market in Belgium.

The proposed blueprint must:

- Preserve the current system of selective collection and sorting (e.g. via the blue bag), and thus not cannibalise it
- Start from the premise that a value is given to packaging that a consumer wants to get rid of
- Serve as a clear argument for why this approach is better than the classic deposit system, supported by figures

The current blueprint provides for:

- A description of the jointly identified digital tool
- Identification of the different blocks of which it is composed
- How it will work (operational choices in the field)
- How the financial flows will run
- How the material flows will run
- How the legal and specifically GDPR obstacles will be tackled
- Which new parts in the logistic flow are needed
- Which steps need to be taken to make all this operational, etc.

Scope of the DDRS blueprint

Requested content of the blueprint

Technical layer (operations & infrastructure)

- Applicability to three collection options: blue bag, smart bin and RVM (Reverse Vending Machines)
- Operational choices in the field
- Development of a clear logistical flow
- Mapping of material flows, including tonnages & destination

Technology layer

- Feasibility of using unique QR codes (or other) for packaging
- Listing of criteria for the DDRS to work optimally, which allows for identifying suitable technology and corresponding vendor
- Weighing of the “Click” against these criteria to investigate its possible usefulness as a basis for the DDRS

Governance layer

- Ideal governance model to allow the system to function optimally, taking all stakeholders into account

Stakeholder layer

- Identification of all (new) stakeholders in this new DDRS
- Impact on each of them

Financial layer

- Cost estimate of the system for start-up
- Cost estimate for long-term running of the system

Legal layer

- Analysis of the applicable GDPR legislation & listing of the main GDPR aspects of the DDRS to be taken into account
- Assessment of fiscal aspects with recommendations

Project timeline - Original

DDRS Project plan		April			May					June			
MS	Activities	11	18	25	2	9	16	23	30	6	13	20	27
A.	**Project Kick-off**		22-Apr										
	Desktop research, Kick-off meeting	x											
B.	**DDRS Targets & Rulebase**				04-May								
	Intake calls, desk work, stakeholder mapping, workshop		x	x									
C.	**Design & select baseline scenarios**						M				13-Jun		
	Operations & Infrastructure	x	x	x	x	x	x	x	x	x			
	Finance & Control	x	x	x	x	x	x	x	x	x			
	Governance							x	x	x			
	Stakeholder commitments							x	x	x			
	Workshop prep & delivery									x	x		
D.	**Select blueprint scenario**											24-Jun	
	Legal & Tax										x	x	
	Workshop prep & delivery										x	x	
E.	**Blueprint development**												28-Jun
	Technology		x	x	x	x	x	x	x	x	x		
	Workshop prep & delivery											x	x
	Meeting location		Virtual		PwC		TBD				PwC	PwC	TBC
	Estimated time (hours/ person)		2		3		2*				3	3	3

PwC Project team

Technical layer (operations & infrastructure) | Governance layer | Stakeholder layer | Financial layer

Christoph Vanderstricht

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Legal Layer

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Technology Layer

Bart Willocx

Husen Kapasi

Tax Layer

Claire de Lepeleire

Annelies van de velde

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Executive summary

What is the DDRS?

Description of the DDRS

Definition

Digital Deposit Return System is a collection model for PET, aluminum & steel beverage packaging put on market in Belgium to complement the blue bag with other selective collection devices for out-of-home consumption.

Objectives

- Incentivize correct disposal of the scoped beverage packaging
- Reduce the presence of the scoped beverage packaging in litter
- Improve collection results for the scoped beverage packaging

Core principle & objective: Access & comfort for all consumers to redeem the paid deposit

Producers print unique data matrix on all PET bottles and aluminum and steel cans

Retailers (Points-of-Sale) activate unique code at check-out

Consumers redeem deposit when correctly deposing their beverage packaging.

Comment: regulatory support and collaboration will be required

What is the DDRS?

Operations from a consumer perspective

Consumer
redeems deposit
when correctly disposing
their beverage packaging

- Consumer scans bin identifiers
- Consumer scans product
- Consumer disposes of product and retrieves deposit through bank account

Home scanner for households without smartphones

Mobile application

Consumer scanning devices

Disposal at home

Blue bag

Disposal on-the-go*

Public blue bin

Smart bin

DDRS disposal options

* Existing public infrastructure (public bins) will be leveraged in the first years of DDRS to allow for a phased transition to public blue bins

What is the DDRS?

Key elements for the DDRS

I Unique data carrier is printed on all PET, aluminum & steel beverage packaging (BE)

II Deposit is marked “activated” at PoS check-out

III Smartphone app is used by Consumers to redeem deposit

IV “Correct disposal” is “proven” by using disposal identifiers

Interpretation:

The elements presented here are key for the overall functioning of the DDRS.

If an element is missing, it unlikely that the DDRS will function properly. For example, if the deposit is activated before the Point-of-Sale, there is a possibility for redeeming a deposit in store without purchasing the product.

The DDRS does provide a fundamental alternative to accommodate consumers without smartphones (i.e. home scanners, Element III).

What is the DDRS?

Key elements for the DDRS

I Unique data carrier is printed on all beverage packaging

II Deposit is marked “activated” at PoS check-out

III* Smartphone app is used by Consumer to redeem deposit

IV “Correct disposal” is “proven” by using disposal identifiers

Selected data carrier:
GS1 DataMatrix

Is it feasible? YES, but…

- Adaptation cost for production lines is substantial and varies among producers (est. between EUR 1 mio. to 11 mio. per producer)*
- Implementation time: est. min. 1.5 years (+ 6 month transition period) up to 3 years (adjusting multiple production lines sequentially)
- Development required to print unique codes on cans
- Additional impact on material cost and speed of production

Highlighted challenges	Proposed solution
Activation of multi-packs (product aggregation)	• Producers report which individual units are linked to a multi-pack. • Retailers report which multi-pack is activated. • The back-end system matches the activated codes. *Could require an extra print to identify the packaging units placed in a multi-pack and thus require additional development.*
SME producers without MES/ other systems	Besides automatic data transfer (API), Producers can upload list of codes (manually)
Producers based outside Belgium	Responsibility resides with importers to communicate product codes to DDRS

* The estimation was provided by a limited number of producers. Others deemed it impossible to make an estimation in the timeframe provided.

What is the DDRS?

Key elements for the DDRS

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Is it feasible? YES, but…

- Need for integration between check-out solutions and central DDRS organisation
  - Estimated cost for implementation, testing and roll-out is EUR 500* (for 1 check-out solution)
  - Implementation time: est. min. 2 years

Highlighted challenges	Proposed solution
Activation of multi-packs	● Producers report which individual units are linked to a multi-pack. ● Retailers report which multi-pack is activated. ● The back-end system matches the activated codes.
Point-of-sale without check-out system	Provision of “retail scanner” for activation of codes

* The estimation was provided by select number of retailers based on their experience with similar adaptations, for example those under Tobacco traceability.

What is the DDRS?

Key elements for the DDRS

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Mobile app:

- Used to reclaim deposit by reading GS1 DataMatrix to extract product code
- Initialization by providing basic user information (name, address, bank account information)
- Authentication should use ‘Itsme’, but alternatives are foreseen (e.g. manual)

Alternative for “digitally impaired”: Home scanner

- **One scanner is registered per household** (e.g. address, primary user)
  - Initial registration & distribution through municipalities
  - Citizen completes account information through DDRS website (Itsme, ID-reader, manually)
  - After information is completed, scanner can be used
- **This solution is also applicable to:**
  - Grouped/ collective living & working environments (schools, prison, offices, elderly homes, hospitals, etc.)
  - Points-of-sales without check-out solution
- The cost per scanner (home & retail) is estimated at 27.50 €

What is the DDRS?

Key elements for the DDRS

I Unique data carrier is printed on all beverage packaging

II Deposit is marked “activated” at PoS check-out

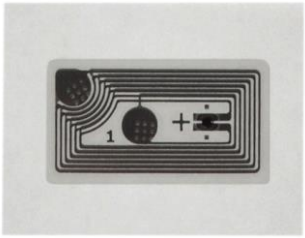
III* Smartphone app is used by Consumer to redeem deposit

IV “Correct disposal” is “proven” by using disposal identifiers

Disposal identifier (blue bag, public blue bins) - Options

1. **DataMatrix** (other machine readable data carrier)
   a. Serial number to distinguish disposal options
   b. Physical form: sticker
   c. Est. cost: EUR 0.01 - 0.15

1. **Near field communication tags** (NFC)*
   a. Minimally NFC Type 2
   b. Outdoor vs Indoor version to distinguish disposal options
   c. Est. cost: EUR 0.25 - 2.50



*__Please note:__ A second scan (of the bin/bag) proves the packaging is returned correctly. We include information on NFC tags as it could avoid the need for a secondary scan. Moreover, NFC tags are more difficult to replicate compared to a sticker. Despite these advantages, it is a developing technology and not all smartphones are equipped to interact with NFC tags (yet).

How does a “Digital DRS” compare to a “Classic DRS”?

From an operational perspective

Characteristics / KPI	DDRS		DRS
Collection of beverage packaging at home and out of home	Yes.	>	No, only “out-of-home” will be available.
Designed to target on-the-go consumption	Yes.	>	No.
Overall transaction cost for consumers (qualitative)			
Access - Geographical (as average distance between collection points)	1.13 km (excl. At home)	>	16.33km (14x times distance compared to DDRS)
Access - Time	24/7	>	Dependent on opening hours. Likelihood only 50% accessible in comparison to DDRS
Accessibility - Digitally impaired	Solution provided through home scanners.	=	No, but not required.
Accessibility - Physically impaired	At home disposal.	>	No.

For each of the KPI, the DDRS proposal in its current format performs explicitly better than the identified traditional DRS system

How does a “Digital DRS” compare to a “Classic DRS”?
From an overall perspective (excl finance)

	Digital Deposit Return System	Classic Deposit Return System
PROs	• Positive impact on the litter (compared to no incentive) • Positive impact on the return and recycling rate (compared to no incentive) • Flexibility in the means of collection (at home & on the go) • Builds on existing success of blue bag system • Minimal change for consumers in relation to the disposal • Optimal access and availability of collection points to capture maximum amount of the identified fractions • Implementation of unique code provides data on traceability and consumer disposal habit • Creates additional communication channels towards consumers in relation to litter (app) • Adaptable system to access other fractions • Minimal risk of fraud (no cash returns, no import)	• Positive impact on the litter (compared to no incentive) • Positive impact on the return and recycling rate (compared to no incentive) • Limited change for producers (requires one-time change in label)
CONs	• Significant change for producers in setup phase (serialisation) • Digitally impaired require additional solution (is feasible) for reimbursement on the go • Implementation requires support from local authorities • Risk of fraud (duplication of codes, hacking of the system) • Risk that the redeemer does not dispose the fraction in the appropriate collection point	• End of blue bag collection for identified fractions • End of door-to-door collection for identified fractions • Shift in waste transportation from intercommunales to private waste operators, potentially lowering the negotiation power to reduce cost for collection & transportation • Significant change in waste management for households and private consumers • Significant cost for consumers to return identified fraction • Constraint in access and availability to sufficient collection points to allow for consumption on the go and beyond opening hours of collection points with RVMs • Impact of implementing a deposit system for retailers (machine for returning waste infrastructure) • Risk of fraud (Import, multiple reimbursements for same unit [tbc], cash reimbursement) • Impact of adaptation to labels (especially cans)

How does a “Digital DRS” compare to a “Classic DRS”?
From a financial perspective

Comparison of average yearly cost on the basis of 100% collection rate (illustrative)							
	Investment cost	**Operational cost**	**Litter cost**	**Total cost**	**Unredeemed deposit**	**Recycling revenue**	**Total income**
DDRS	-11,848,649.07 €	-82,455,916.62 €	0.00 €	**-94,304,565.69 €**	0.00 €	51,109,278.33 €	**51,109,278.33 €**
DRS	-15,486,450.00 €	-110,873,413.22 €	0.00 €	**-126,359,863.22 €**	0.00 €	51,109,278.33 €	**51,109,278.33 €**
Delta (DDRS - DRS)	3,637,800.93 €	28,417,496.60 €	0.00 €	**32,055,297.53 €**	0.00 €	0.00 €	**0.00 €**

Overall DDRS creates more ease and comfort for the consumer at a lower cost while achieving the same performance

A scenario where we collected 100% of all beverage packaging put on market for the simulated period is unrealistic in practice. However, it does provides useful information in terms of cost effectiveness. When we compare each category of cost and income using the average per year (calculated based on the simulated period) between DDRS & DRS, we observe an **overall lower costs at the side of DDRS** for the same performance (namely collection success).

Although DDRS requires additional IT infrastructure and significantly more collection points, the investment cost is lower. However, we do need to mention that DDRS will require producer-specific adaptations to their production lines, as they will be required to print unique codes on all beverage packaging. This cost is not included in the simulation.

DDRS is also more efficient in terms of operational costs, mainly as a result of the blue bag collection. Under a DRS, the operational burden lies with the retailers. We do need to mention that the current model does not include adaptation cost (training, etc.) at the side of the retailer.

Please see the financial layer for simulations based on more realistic collection rates for each of the fractions.

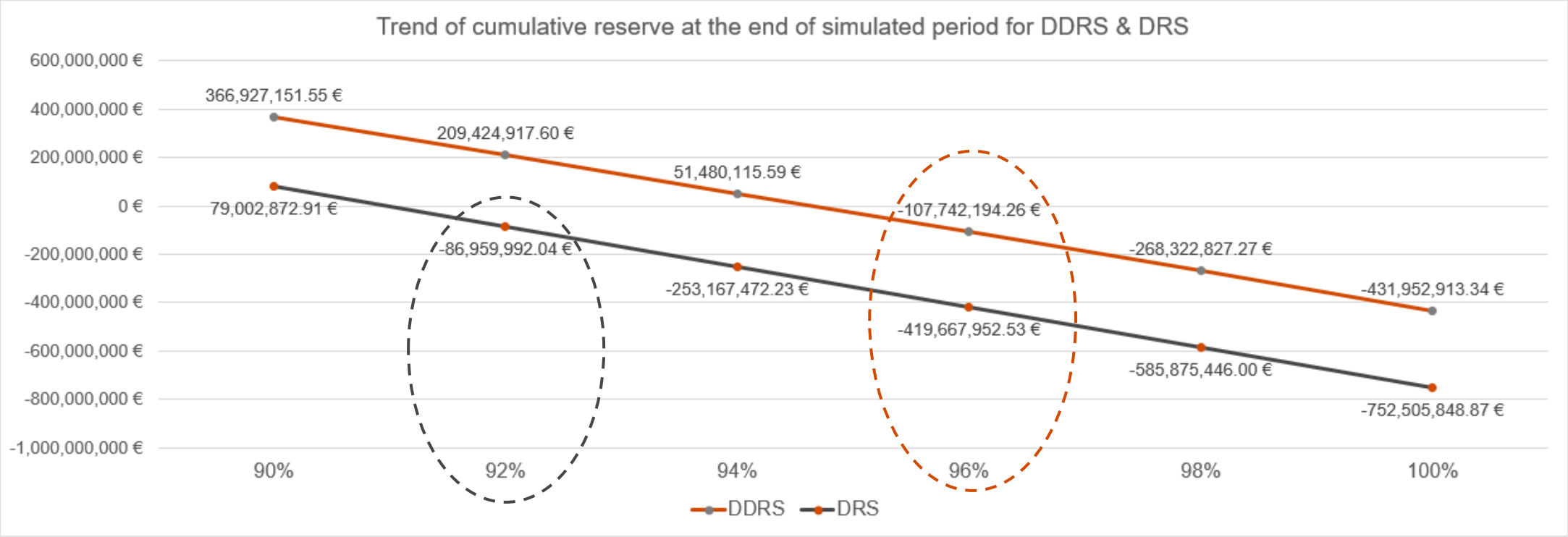
How does a “Digital DRS” compare to a “Classic DRS”?
From a financial perspective

	DDRS			DRS		
	PET	**Aluminium**	**Steel**	**PET**	**Aluminium**	**Steel**
Impact on operational cost	-880.72 €	-1,000.46 €	-605.37 €	-1,136.79 €	-1,437.87 €	-686.87 €
Impact on recycling revenue	+536.25 €	+992.02 €	+224.45 €	+536.25 €	+992.02 €	+35,686.78 €
Direct impact on operational cost per ton collected	**-344.47 €**	**-8.45 €**	**-380.93 €**	**-600.54 €**	**-445.86 €**	**-462.43 €**
Impact on operational cost of collecting + 1 ton for each fraction			**-733.84 €**			**-1,508.82 €**
Impact on litter cost	+3,210.11 €	+3,384.10 €	+3,388.35 €	+3,210.11 €	+3,384.10 €	+3,388.35 €
Impact on unredeemed deposits	-12,660.31 €	-16,013.45 €	-7,649.61 €	-12,660.31 €	-16,013.45 €	-7,649.61 €
Total impact on financial results per ton collected	**-9,794.67 €**	**-12,637.80 €**	**-4,642.18 €**	**-10,050.74 €**	**-13,075.21 €**	**-4,723.68 €**
Total impact on financial result + 1 ton for each fraction			**-27,074.65 €**			**-27,849.63 €**

DDRS is more cost effective compared to DRS in the short and long term running of the system

As there is currently no accurate basis to identify the collection rates of a DDRS or DRS, we have added a sensitivity analysis to show how the total cost evolves with higher collection rates (*see Financial Layer*). From this overview, we can conclude that the operational cost related to collecting one more ton for each fraction is two times higher for the DRS compared to DDRS, while revenues from recycling & unredeemed deposits increase and litter costs decrease at an equal rate between DDRS & DRS. This means that improving the performance of DRS will be more costly compared to DDRS.

How does a “Digital DRS” compare to a “Classic DRS”?
From a financial perspective



DDRS is more cost effective as the performance of the system increases, compared to DRS

The cumulative reserves presented reflect the final cumulative reserve at the end of the simulated period, showing the evolution if we have increased performance for the full period. Again, we conclude that the DDRS is more cost effective than DRS. A negative cumulative result at the end of the simulated period for DDRS only occurs if we collect 95% of all fractions during the complete simulated period. For the DRS, this tipping point already occurs at an overall collection rate of 91%. A DDRS will be more cost effective for achieving the objectives.

Please note: The financial result is also impacted by the unredeemed deposits. The results vary depending on the specific value assigned to each beverage packaging. This report only includes simulations with 20 cents as deposit.

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DDRS Blueprint

I. Technical layer

II. Technology layer

III. Financial layer

IV. Governance layer

V. Stakeholder layer

VI. Legal layer

Outcome of each layer, based on requested content

The DDRS Blueprint identifies…

Technical layer (operations & infrastructure)

- Collection options in 2 categories:
  - At home: blue bag
  - Out of home: Public blue bins, smart bins
- Needed adjustments to collection options to enable use for DDRS, as well as a proposed implementation strategy
- A logistical flow outlining the actors and their respective roles in DDRS
- The material flows in units and tonnages by fraction & destination in function of collection rates

Technology layer

- Most appropriate data carrier for beverage packaging and concluded uniques codes should be feasible for PET, with challenges to overcome for cans.
- Overall principles for DDRS, accompanied with specific criteria for the smartphone app, as well as the backend architecture.
- Conceptual design to enable overall functioning of the DDRS taking into account the security of the system
- The platform of the “Click” as a useful basis for the DDRS

Governance layer

- Fost plus as the most appropriate legal entity to manage the various activities related to beverage packaging

Stakeholder layer

- All stakeholders impacted by DDRS and/or with influence on DDRS, accompanied with a description of the potential impact of the introduction of DDRS.

Financial layer

- The investment costs for DDRS (IT infrastructure, collection points, home scanners, bin identifiers)
- Operational cost for DDRS over a period of 10 year in function of the collection rates

Legal layer

- The main GDPR aspects of the DDRS to be taken into account and proposed actions to ensure compliance
- The main VAT aspects to consider and actions to be taken

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DDRS Blueprint

I. Technical layer

II. Technology layer

III. Financial layer

IV. Governance layer

V. Stakeholder layer

VI. Legal layer

I. Technical layer

Table of contents

I. Technical layer

A. DDRS collection options - Overview

	Proposed combination of collection options in end state		
	Disposal at home	**Disposal on-the-go**	
	Blue bag	**Smart bin**	**Public blue bin**
Technology requirements (Hardware)	Bin identifier (Datamatix, sticker) [Alt: *NFC tag****]	Bin identifier (Datamatix, sticker) Access control (NFC)** Connection to internet Certificate based authentication	Bin identifier (Datamatix, sticker)
Technology requirements (reimbursement)	DDRS application/ Home scanner	DDRS application	DDRS application
Operations location strategy	Distribution through blue bag sales	*(See later)*	*(See later)*
Operations bin management	As-is	Through IC/ municipalities	Through IC/ municipalities
Finance - Investment (EUR)	0.01 - 0.15 per sticker [Alt. per NFC: *0.25 - 2.50****]	1,200 - 4,500** per smart bin	265 - 1,200 per bin

*Based on component cost (overestimation), not readily available
*** Option not included in simulations

**Not readily available in the market (potential underestimation);
Option not included in simulation

I. Technical layer

A. DDRS collection options - Blue bag

Blue bag

Comments

- Blue bag is the cornerstone for collection under DDRS
- Creates the option to redeem the deposit from the comfort of your home, using a smartphone or home scanner
- A bin identifier (sticker) is provided through blue bag sales to enable use for DDRS

Example

	Blue bag
Targets	Disposal at home & in semi-closed environments
Advantages	● Convenience for all “consumers/ buyers” (irrespective of smartphone possession) ● Proven performance of the blue bag system ● Can be expanded to other recyclable fractions ● Limited behavioural change ● No adjustment of logistics (waste streams) ● 100% accessible for all categories (24/7)
Disadvantages	● Extra effort of scanning

I. Technical layer

A. DDRS collection options - Public blue bin

Public blue bin

Comments

- DDRS blue bins are deployed in the public domain in collaboration with local authorities
- A bin identifier (sticker) is placed on each DDRS blue bin to enable use for DDRS
- Creates access and comfort for the consumer to redeem their deposit on-the-go using the smartphone application
- During the implementation of DDRS blue bins, public bins will be equipped with a bin identifier

	DDRS blue bin
Targets	Consumption out-of-home
Advantages	• Convenience for the digitally-enabled “consumer/ buyer” • Can be expanded to other recyclable fractions • 100% accessible for all digitally-enabled categories (24/7) • Low threshold for disposal (# of bins) • Visibility of the system in the public space (channel for marketing cfr. Click) • Enabling the creation of homogeneous flows in the public space • Perfectly fits with the growing on-the-go consumption market • Opening of the bins can be adjusted to the DDRS fractions • Low CAPEX
Disadvantages	• Requires cooperation from local authorities (placement of additional bins) • Potential contamination of waste streams

I. Technical layer

A. DDRS collection options - Public blue bin: market research

	Traflux - Pillar	Traflux - Mini Moloc	Bammens - Capitole series	Bammens - Citypole
				
Investment cost	€1100 - €1200	€600 - €900	€265 - €447	€793
Placement cost	€150 - €250	€150 - €250	/	/
Maintenance cost (per bin/ year)	€50 - €70	€50 - €70	/	/
Estimated lifespan	30 - 40 years	20 - 30 years	20 years	20 years
Volume (L)	50 - 200L	200 - 300L	55 - 70L	100L

Comment: Opening of the bins can be adjusted to the DDRS fractions
In the cost simulation, we have included a cost per public blue bin of 750.00€

I. Technical layer

A. DDRS collection options - Smart bin

Smart bin

Comments

- Smart bins are deployed in the public domain in collaboration with local authorities, supplementary to public blue bins to tackle ‘hotspots’ (areas with more concentrated volumes to collect)
- A bin identifier (sticker) is placed on each smart bin to enable use for DDRS
- Access control could be enabled, but will need to be investigated with suppliers
- Creates access and comfort for the consumer to redeem their deposit on-the-go using the smartphone application
- Smart bins are included because of their comparatively high capacity occupying the same space in the public domain. This reduces the operational cost for emptying or limits the need to place multiple bins in the same area.

	Smart bins
Targets	Consumption out-of-home
Advantages	● Convenience for the digitally-enabled “consumer/ buyer” ● Can be expanded to other recyclable fractions ● 100% accessible for all digitally-enabled categories (24/7) ● Low threshold for disposal (# of bins) ● Visibility of the system in the public space (channel for marketing cfr. Click) ● Enabling the creation of homogeneous flows in the public space ● Perfectly fits with the growing on-the-go consumption market ● Opening of the bins can be adjusted to the DDRS fractions
Disadvantages	● Requires cooperation from local authorities (placement of additional bins) ● Potential contamination of waste streams ● More expensive compared to public blue bin

I. Technical layer

A. DDRS collection options - Smart bin: Market research

	Big Belly	Mr Fill	Bin-e	Cycled	Alphatronics
					
Unit Cost	€1200 - €4500	TBC	€9500 - €13000	€3350 (average price)	Project based
Volume (L)	190L or 570L	120L or 240L	300L (800L compressed)	360L	Project based
Power consumption	Self-powered (solar)	Self-powered (solar)	Electric power supply 230V	Both plug-in or solar. 15W.	Project based
Compressor	Yes	Yes	Yes (paper and plastic)	No	No
Access Control	No	Yes	No	Yes	Yes
Display option	No	Yes (but limited)	Yes	Yes	Yes
Internet connection	Cellular connection. WIFI hub.	Cellular connection. GPRS.	No	Cellular connection.	No
Geo-localisation	Yes	TBC	No	Yes	No
Others	Optimal for hosting additional technologies (WIFI hotspot, Beacons, Urban sensors, small cell, first responder networks).	Lease model available at €150/month (incl. waste mgmt. system and others damage and maintenance costs).	AI-enabled sorting system into 4 waste streams (paper, plastic, metal and others).	AI-enabled sorting system into 2 waste streams (plastic and others).	Joint development of a smart bin between Alphatronics (an electronic devices company) and municipalities.

I. Technical layer

A. DDRS collection options - Implementation strategy (1/3)

Optimization to determine the number of collection points

The model uses an optimization technique to find the optimal points between investment cost, operational cost in function of the expected volumes to be collected. To illustrate, the model choses a smart bin, because it is more efficient over time to invest in an extra bin, compared to placing a public blue bin with a higher collection frequency.

In the first version of the DDRS blueprint report, we conducted the optimization with a constraint to ensure the same access for consumers (only geographic) using a minimum number of collection points based on kilometres of street per environment type.

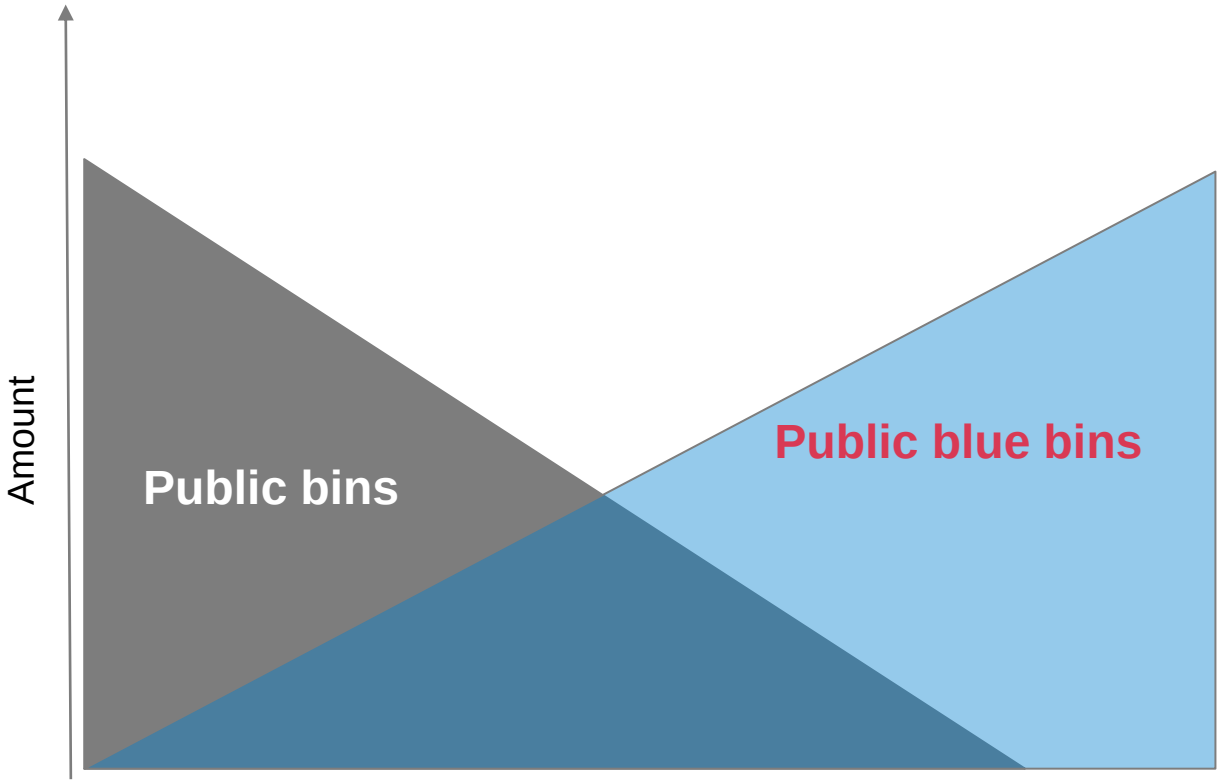
Based on the feedback, we have reworked the model to reflect scenario in which the collection points out-of-home are aligned with the estimated number of public bins currently available in municipalities.

Digital Deposit Return System (Sc.2)

	Public blue bin (simple)	Smart bin - Small	Smart bin - Big	Smart bin - Big compr.
Reference model	Traflux - Pillar	Big Belly	Big Belly	Big Belly
Investment cost	750.00 €	1,200.00 €	3,000.00 €	4,500.00 €
Capacity (liters)	100 L	190 L	570 L	570 L
Number allocated	**136,267**	**120**	**8**	**10**

I. Technical layer

A. DDRS collection options - Implementation strategy (2/3)



Public bins: possible solution for public blue bin transition

- A substantial amount of new public blue bins are foreseen in the model.
- To allow for a quick deployment of the DDRS, we propose to leverage existing infrastructure of public bins.
  - Stickers are placed on public bins to allow use for DDRS
  - +/- 135.000 public bins in BE
- Public bins are not physically removed from the public space. They still serve for collection of other waste streams. The transition only reflects the use of public bins to redeem deposits in the context of DDRS.

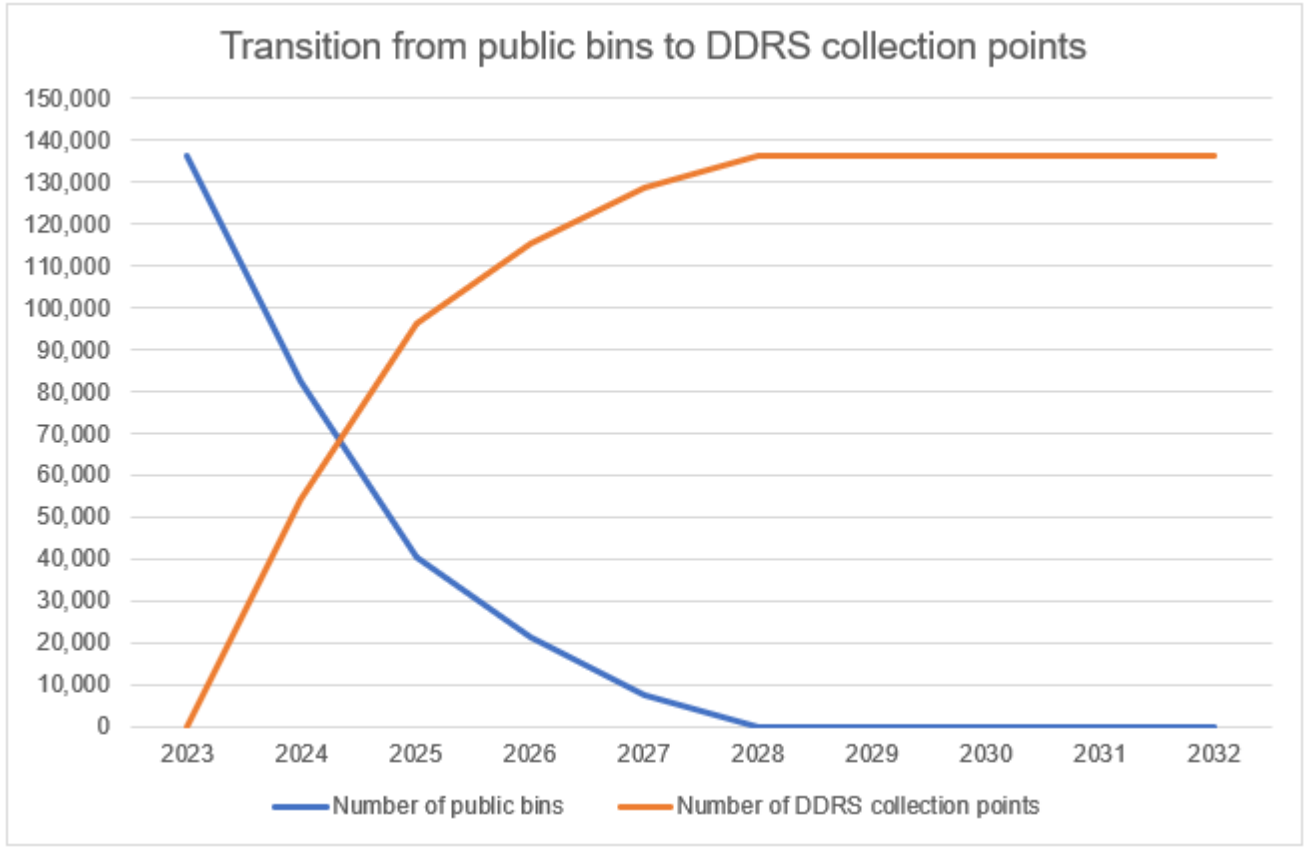
I. Technical layer

A. DDRS collection options - Implementation strategy (3/3)

Assumptions

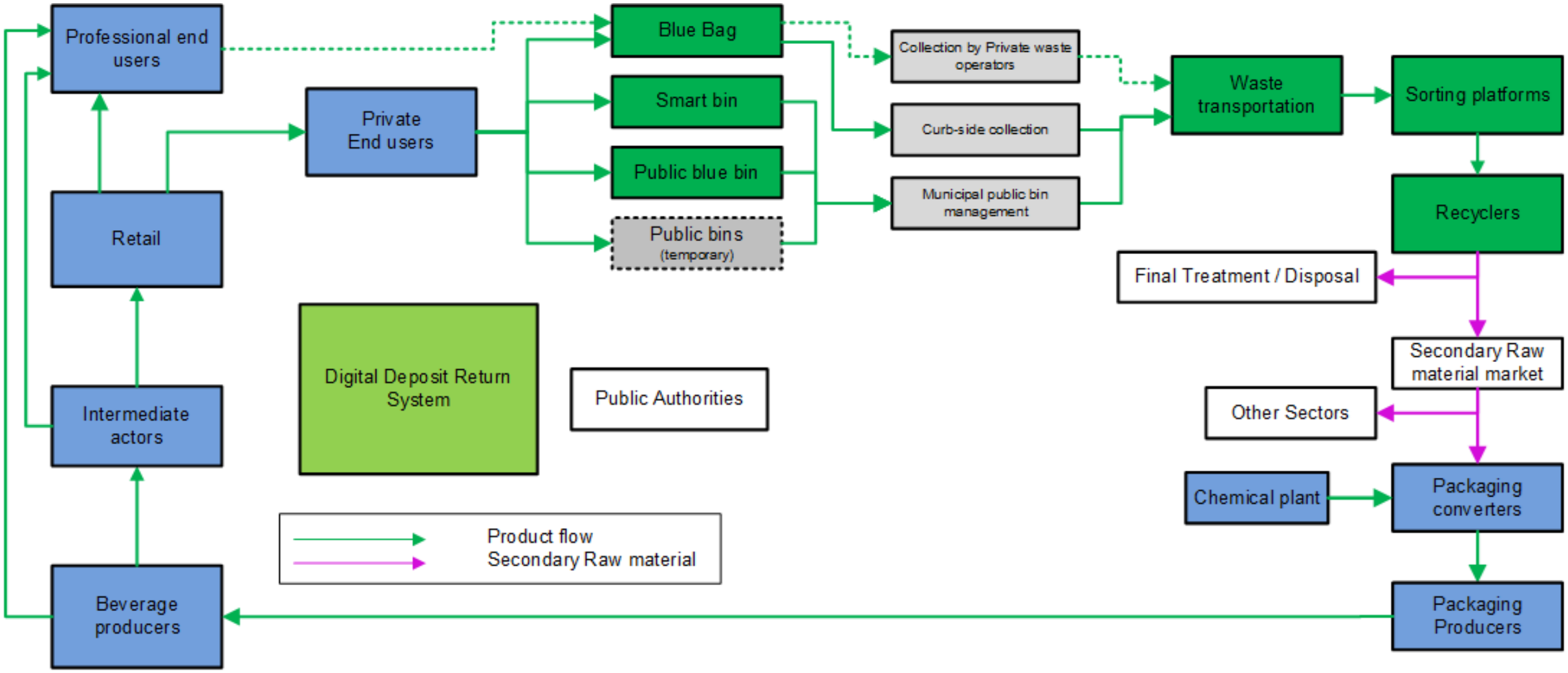
We aim to **complete the transition** from public bins to DDRS collection points **in 5 years** (20XX to 20XX+5). Within a municipality, there will be **no mixed use of public bins and waste bins deployed for DDRS**. This means that before the transition consumers will be able to use the normal public bin to dispose of their beverage packaging (and redeeming their deposit). After the transition, consumers will only be able to redeem their deposit by disposal their beverage packaging in the public blue bins. As mentioned before, the public bin does remain available for other waste streams.

There is a **non-linear switch between municipalities**, as there is a **dominant focus of transition in the first years** (i.e., 40% → 30% → 15% → 10% → 5%). The percentages reflect the portion of beverage packaging we estimated to be collected on the go.



I. Technical layer

B. DDRS logistical flow - Waste operations (1/2)



I. Technical layer

B. DDRS logistical flow - Waste operations (2/2)

Comments

- Partnerships will be needed for implementation of all collection options
- Reimbursement (“handling fee”) for waste operations will be foreseen for local authorities, in line with Fost plus system
- Public blue bins are strongly linked to obligations in the context of SUP Directive (EPR litter) and should be investigated further

	Collection options			
	Blue bag	**Public blue bin**	**Smart bin**	**Public bin (temporary)**
Existing waste operations to leverage for DDRS?	Yes, Fost plus system	TBD	TBD	Yes, public bin management by local authorities
Operations partner	Fost plus (existing agreements)	TBD	TBD	Public authorities
Separate collection route needed for DDRS flow?	No	Yes	Yes	No

I. Technical layer

C. DDRS Material flow - Expected collection rates (1/2)

DDRS deploys several collection options to allow consumers to redeem their deposit. For consumption at home DDRS utilizes the current blue bag system.

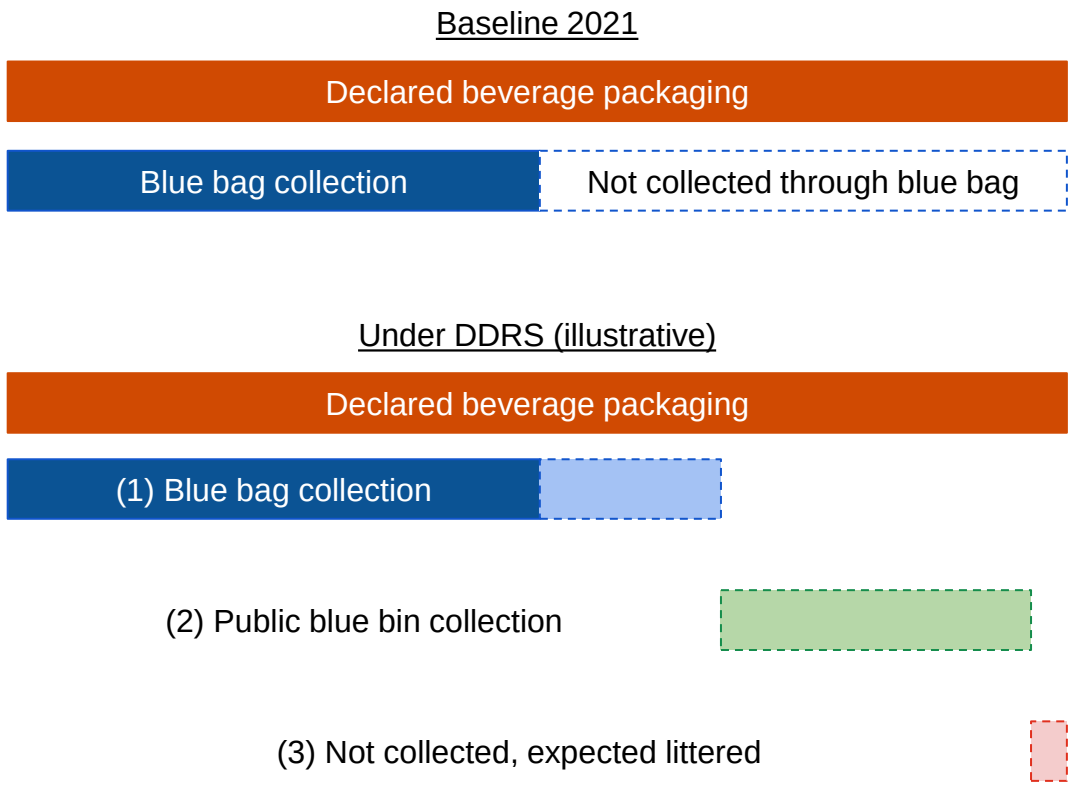
(1) In terms of collection rates for the blue bag, DDRS is expected to:

- Minimally retain current volumes disposed correctly by consumers (current collection rates)
- Incentivize the (more conscientious) use of the blue bag (40% of what is currently not collected)

(2) To capture those volumes which are currently not collected through the blue bag, DDRS deploys various types of public blue bins (see implementation strategy).

(3) What is not collected through the blue bag or through public blue bins is expected to be littered. In practice, the volume littered will be lower as it does not account for the volumes that are disposed, for example, outside of Belgium (holiday), at home in the general waste bin, etc. After implementation of DDRS, it is also possible consumers dispose of their beverage packaging, but chose to not redeem the paid deposit. However, there is no accurate basis to determine or simulate these “lost” volumes.

Please note: In this report, collection rates are calculated against the declared volumes of put on market beverage packaging.



I. Technical layer

C. DDRS Material flow - Expected collection rates (2/2)

For the DDRS, we include aim to achieve the collection rates presented on the right.

- As a starting point, we have included the rates communicated in the RfP documents.
- The endpoint is determined in reference to the collection rates of the DRS in Germany. The German DRS is considered as the most performant in the EU. In the context of DDRS, we aim to achieve the highest rates possible.

We progress linearly from the start to end in terms of performance.

Please note: In reality, collection rates are measured to indicate the performance of the system year by year. In the DDRS model, collection rates are an input variable to estimate the related costs. This means that the volumes presented on the right will change according to the collection rate.

We have included a sensitivity analysis (Financial layer) to illustrate the impact of incremental changes to collection rates on volumes collected and cost.

Input: Overall collection success rate			
	PET	**Steel**	**Alu**
2023	89.00%	95.00%	95.00%
…	…	…	…
2032	97.00%	99.00%	99.00%

Output: Tonnage collected (not collected) rounded			
	PET	**Steel**	**Alu**
2023	45,640 (5,642)	7,566 (398)	20,924 (1,101)
…	…	…	…
2032	49,742 (1,538)	7,884 (80)	21,805 (220)

I. Technical layer

C. DDRS Material flow - Allocation of scoped beverage packaging across DDRS collection options by year

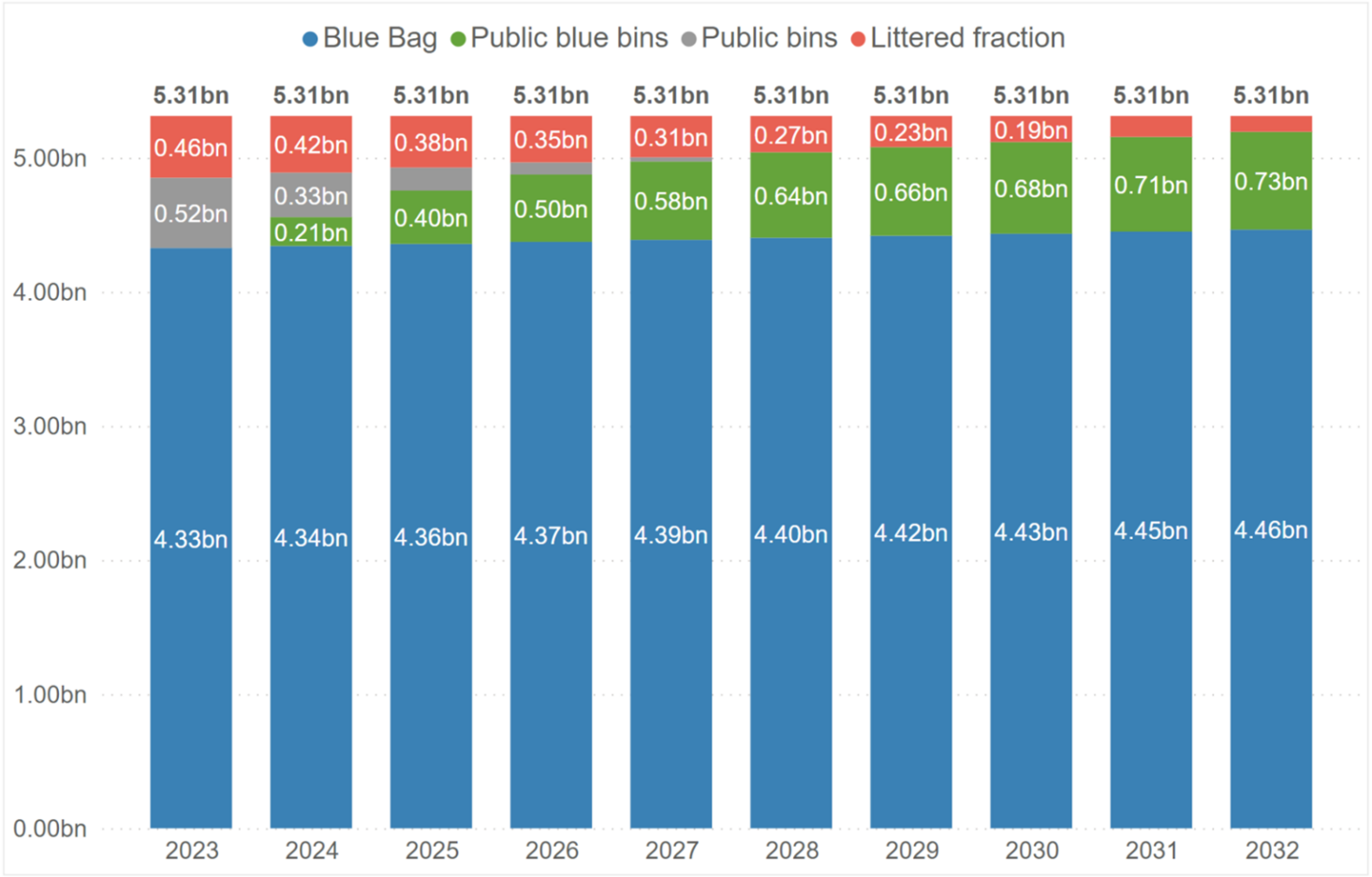
Key Observations - Output based on collection success

- The majority of beverage packaging units will be collected through the blue bag system. Over time we observe a slight increase in the number of units.
- The fraction collected through public infrastructure increases over time, as the littered fraction decreases.
- The beverage packaging units collected through the normal public waste bins decreases according to the implementation of the public blue bins.

Please note: The model uses conversion rates to estimate the number of units based on the declared weight of the identified fractions:

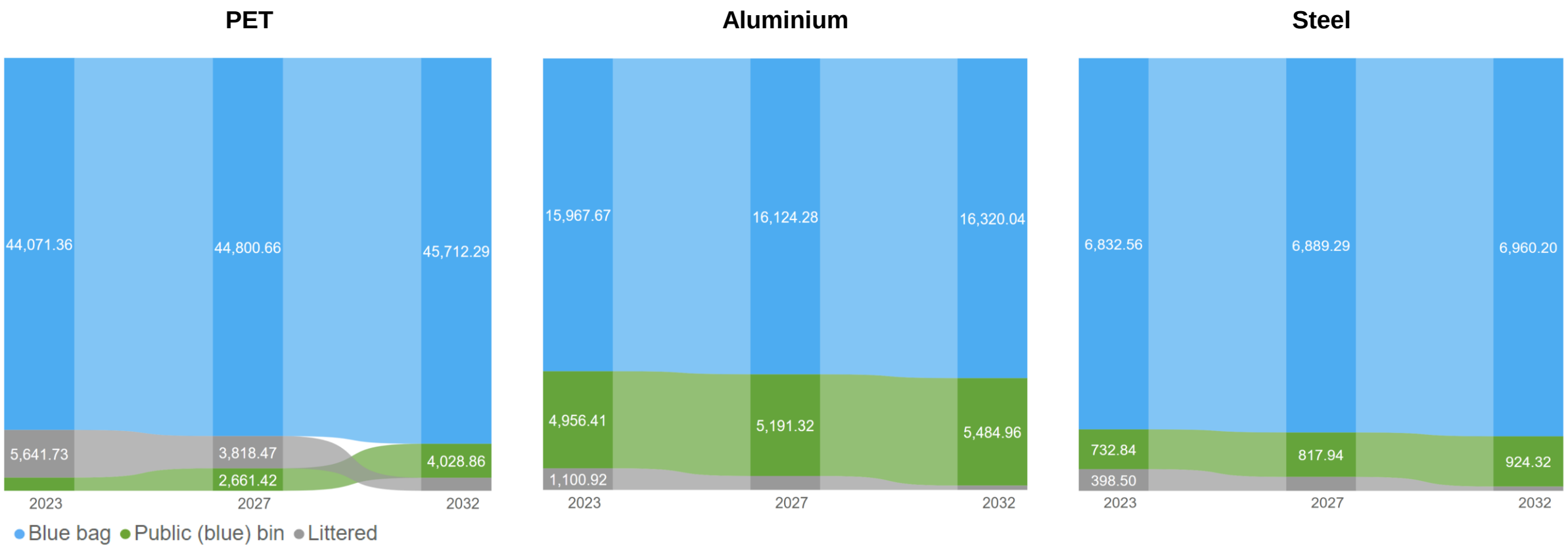
- PET (focus on <3L for conversion): 15.8 gr
- Aluminium: 12.5 gr
- Steel: 26.2 gr

Please see the next page for an overview of in weight for each fraction.



I. Technical layer

C. DDRS Material flow - Allocation of scoped beverage packaging in weight across DDRS collection options by year (simplified)



Please note: Figures presented in the visuals are the output created by the model based on the collection rates and expressed in tons.

I. Technical layer

D. Items to be further developed after blueprint phase (Go-decision for DDRS)

The blueprint identifies amongst other following technical-related items that require attention after decision on the DDRS solution.

Items	
Blue bag	● Placement of the bin identifier: on the bag, on the roll, separate, etc. ● Impact on costs & revenue for blue bag system from DDRS performance
Public bins	● Cost of additional sorting activities (pre- & post-sorting) ● Impact on costs to be borne under the obligations of the SUP Directive/ litter legislation
DDRS blue bin & smart bin	● Willingness of local authorities to allow placement of additional infrastructure ● Alternative in case there is no willingness of municipalities to collaborate in the context of DDRS ● Impact of separate “collection routes” to ensure segregation of waste streams ● Inclusion of other recyclable fractions beyond those selected for DDRS ● Impact on costs to be borne under the obligations of the SUP Directive/ litter legislation
Bin identifiers	● Proposed use of data matrix to ensure consistency for consumers. However, bin identifiers allow for more flexible choices of data carrier. ○ Potential benefit of using QR-code as bin identifier: Link can guide consumer to DDRS landing page in case they are new to the system/ have not installed the app ● Using a data matrix, decision to be taken to which extent bin IDs vary: ○ Replacement of all codes within specified timeframe ○ Codes to distinguish disposal at home vs disposal on the go ○ Codes to distinguish all collection options, by municipality (by using prefix numbers per municipality/ collection option)

2

DDRS Blueprint

I. Technical layer

II. Technology layer

III. Financial layer

IV. Governance layer

V. Stakeholder layer

VI. Legal layer

II. Technology layer

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II. Technology layer

A. Criteria for DDRS technology - Principles

The DDRS solution should follow these principles:

- Smartphone App should be user friendly
- Smartphone App needs to initiate a refund with as little clicks (process steps) as possible
- Smartphone App should be responsive at all times
- A refund can only be initiated from a verified location
- Backend infrastructure needs to handle very large amount of requests (1000 per second)
- Solution needs to be architected for change and growth
- Solution needs to be built in such a way that it is GDPR compliant
- Solution should be highly available at all times
- Product vending transactions should be real time

II. Technology layer

A. Criteria for DDRS technology - Application & Architecture

Criteria - Smartphone application

- Application is linked to a specific user
- Authentication based on Itsme
- Be able to scan DataMatrix 2D codes
- Use geolocation to determine the home address of the consumer
  - Allow scanning of a product for redemption within a radius of 50m around the home address*
  - If no geolocation is available, require to scan a bin code (data matrix) followed by the product codes to reclaim
- Have some basic information about the previous activities (amount scanned, products consumed,...)
- Display result of a scan (accepted, wrong location, product does not exist, product not activated yet, product already redeemed)

*This implies the consumer will not have to scan the bin identifier on the blue bag for disposal at home. If geolocation is allowed, the system will assume the consumer is disposing their beverage packaging correctly.

Criteria - Solution architecture

- Solution must be able to handle at the minimum 1000 requests per second
- All events pertaining to products must make use of REST API calls
- All events must contain only the minimal amount of data
- The entry point needs to be a web application firewall with application gateway capabilities, so that traffic can immediately be routed to the correct micro service (web application or API's)
- An API manager is used to enforce additional security and scalability
- A Load balancer is required for the API's to be able to scale horizontally and vertically
- The API's for producers, retailers and consumers must be hosted on segregated systems to guarantee they can only access the data they are entitled to access
- All data pertaining to users, producers or retailers must be hosted in a dedicated database.
- All event data must be hosted in a database system that is capable of handling at least 1000 requests per second
- The event database needs to be replicated in another region for disaster recovery reasons
- A Payment Initiator micro service that compiles a list of bank statements and runs scheduled once per day. It cannot have a user frontend. It cannot be accessible from the public internet
- A Janitor micro service that handles the data governance and enforces GDPR rules. It cannot have a user frontend. It cannot be accessible from the public internet

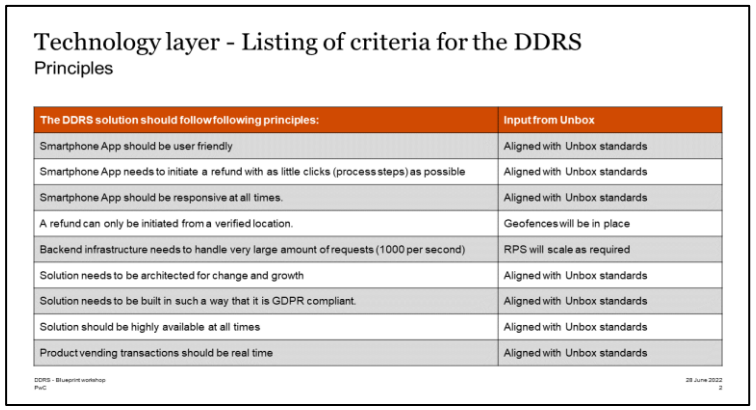
II. Technology layer

B. Weighing of the Click

In function of the weighing exercise, we have engaged with the developers of the Click (Unbox). We have asked them to review the defined criteria and to provide their input.

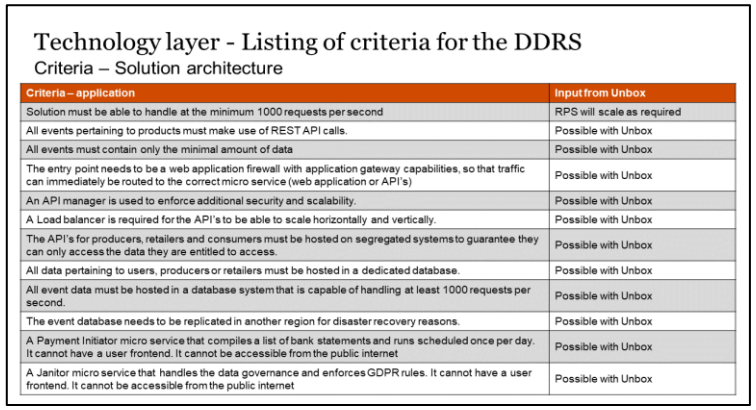
In summary, the **Unbox platform is able to provide the functionalities needed for the DDRS**:

- Defined principles for DDRS are aligned with the Unbox standards
- Unbox will be able to scale (handling of requests) as required
- All requirements for the DDRS application and solution architecture are possible with Unbox



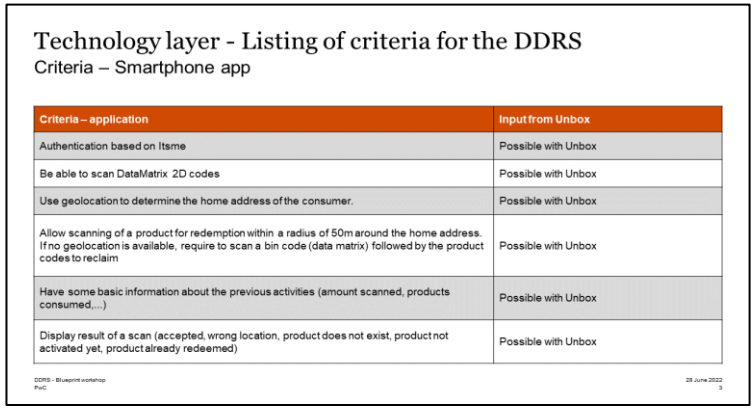
Technology layer - Listing of criteria for the DDRS
Principles

The DDRS solution should follow following principles:	Input from Unbox
Smartphone App should be user friendly	Aligned with Unbox standards
Smartphone App needs to initiate a refund with as little clicks (process steps) as possible	Aligned with Unbox standards
Smartphone App should be responsive at all times.	Aligned with Unbox standards
A refund can only be initiated from a verified location.	Geofences will be in place
Backend infrastructure needs to handle very large amount of requests (1000 per second)	RPS will scale as required
Solution needs to be architected for change and growth	Aligned with Unbox standards
Solution needs to be built in such a way that it is GDPR compliant.	Aligned with Unbox standards
Solution should be highly available at all times	Aligned with Unbox standards
Product vending transactions should be real time	Aligned with Unbox standards



Technology layer - Listing of criteria for the DDRS
Criteria – Solution architecture

Criteria – application	Input from Unbox
Solution must be able to handle at the minimum 1000 requests per second	RPS will scale as required
All events pertaining to products must make use of REST API calls.	Possible with Unbox
All events must contain only the minimal amount of data	Possible with Unbox
The entry point needs to be a web application firewall with application gateway capabilities, so that traffic can immediately be routed to the correct micro service (web application or API's)	Possible with Unbox
An API manager is used to enforce additional security and scalability.	Possible with Unbox
A Load balancer is required for the API's to be able to scale horizontally and vertically.	Possible with Unbox
The API's for producers, retailers and consumers must be hosted on segregated systems to guarantee they can only access the data they are entitled to access.	Possible with Unbox
All data pertaining to users, producers or retailers must be hosted in a dedicated database.	Possible with Unbox
All event data must be hosted in a database system that is capable of handling at least 1000 requests per second.	Possible with Unbox
The event database needs to be replicated in another region for disaster recovery reasons.	Possible with Unbox
A Payment Initiator micro service that compiles a list of bank statements and runs scheduled once per day. It cannot have a user frontend. It cannot be accessible from the public internet	Possible with Unbox
A Janitor micro service that handles the data governance and enforces GDPR rules. It cannot have a user frontend. It cannot be accessible from the public internet	Possible with Unbox



Technology layer - Listing of criteria for the DDRS
Criteria – Smartphone app

Criteria – application	Input from Unbox
Authentication based on Itsme	Possible with Unbox
Be able to scan DataMatrix 2D codes	Possible with Unbox
Use geolocation to determine the home address of the consumer.	Possible with Unbox
Allow scanning of a product for redemption within a radius of 50m around the home address. If no geolocation is available, require to scan a bin code (data matrix) followed by the product codes to reclaim	Possible with Unbox
Have some basic information about the previous activities (amount scanned, products consumed,...)	Possible with Unbox
Display result of a scan (accepted, wrong location, product does not exist, product not activated yet, product already redeemed)	Possible with Unbox

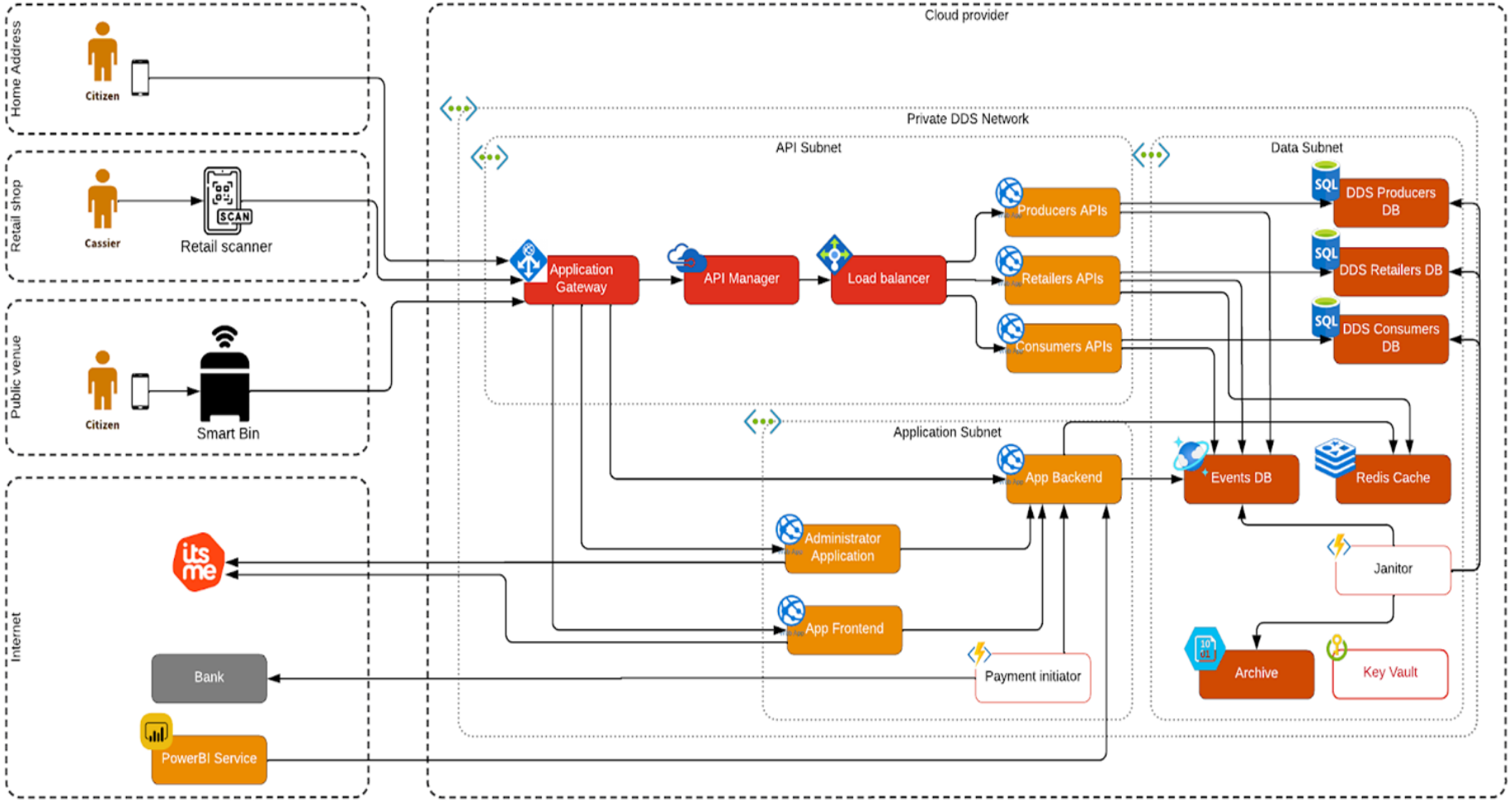
II. Technology layer

C. Architectural design - Introduction

1 Central system hosted in a public cloud holding all the intelligence and managing all components (i.e. app, scanners, smart bins).

2 Simple interface where producers can upload their unique codes into the Digital Deposit Return System (DDRS).

3 Data spread across different databases to ensure GDPR compliance (e.g. codes DB, event DB, citizen, retailer and producer DBs).



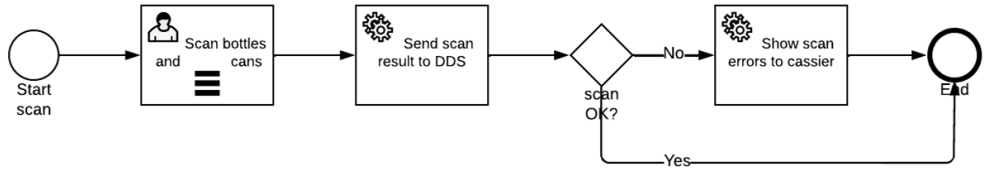
II. Technology layer

C. Architectural design - Components

Main Elements

Retail

Codes are activated at PoS during checkout so that the deposit can be reclaimed (adapted to cashier system or via separate retail scanner for DDRS).

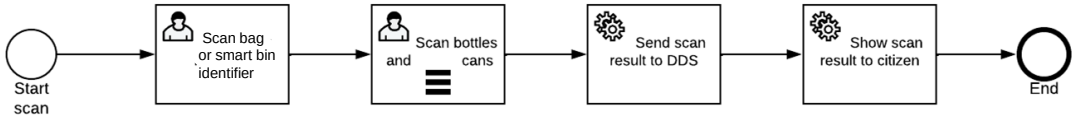


Citizen

Use of a smartphone app to reclaim deposit. Initiation includes providing some basic information (e.g. address and bank details) and authentication using ItsMe.

Public Venue/ public blue bins

Disposal at public blue bins is done using the DDRS app by scanning the bin unique identifier together with the bottle/ can unique identifier.



Secondary Elements

- Databases: Producers, Retailers, Consumers, Events
- APIs: Producers, Retailers, Consumers
- ItsMe, Banking apps, PowerBI, etc.
- Application Gateway
- API Manager
- Load Balancer
- Administrator Application
- App Frontend
- App Backend
- Payment initiator
- Janitor
- Redis Cache
- Archive
- Key Vault

II. Technology layer

C. Architectural design - Security of the system

The system is conceptually designed to minimise risks:

- Only a minimum of information is transmitted between the various components. This is often no more than a serial number and a scanner ID.
- The endpoints are as ‘dumb’ as possible, while all the intelligence is managed centrally.
- The central system should be set up at a well-known cloud provider that has already proven to be able to offer sufficient protection.
- Various security layers are used to counter attacks (Firewall, Web application firewall, API Manager).
- The system is modular so that the failure of one component cannot lead to a catastrophic break down.
- Different databases are used to be able to separate the information both logically and physically.
- The components responsible for the financial transactions are not accessible via a network. They are stand-alone and can only be manipulated by a Cloud Administrator.
- Serverless components are used, which are all kept up to date by the cloud provider.

Please note: The information uploaded to the system is not freely accessible by the parties involved (producers, retailers). Specifically, producers and retailers will not be able to access the data of others.

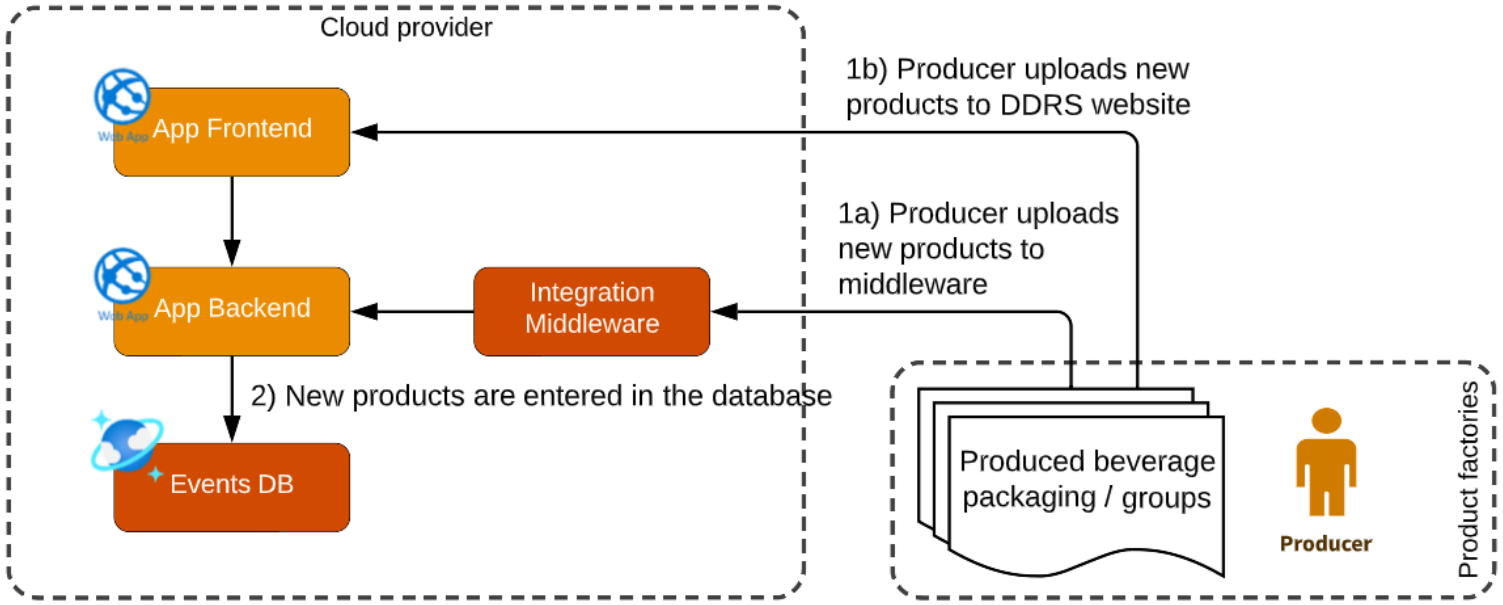
II. Technology layer

D. Design principles - Product registration process

Unique Product Coding

Every producer will need to print unique codes on the bottles or cans. No decision has been made on the entity that will manage these codes. This activity can be integrated in the DDRS organisation or outsourced (practical or cost considerations).

Producers of bottles and cans will need to register their products in the DDRS. They can do this either by uploading them automatically via an integration (API; 1a) or manually into DDRS using the website (1b).



Process description

A. Producer uploads a list of products into DDRS*. This can be done manually using the website or automatically using an integration

B. DDRS registers those products in the system and marks them as “Produced’. This means that at this moment they can be bought. Their location is presumed to be in a retail store.

*Minimally producers upload the product codes (numbers identifying a specific bottle or can). The meaning behind those number are subject to discussion or industry standards, as is currently the case for barcodes.

II. Technology layer

D. Design principles - Product registration process: Unique codes

Square

(01)07612345678900
(17)100503
(10)AC3453G3
(21)123

Rectangle

GS1 DataMatrix (preferred data carrier*)

GS1 DataMatrix is a matrix (2D or two-dimensional) barcode which may be printed as a square or rectangular symbol made up of individual dots or squares. This representation is an ordered grid of dark and light dots bordered by a finder pattern.

Considerations for DDRS

- Solution must follow GS1 standards
- Data structure: GS1 Serialized Global Trade Item Number (sGTIN)
- Replaces current barcode (!)
- Producers to specify and verify limits (e.g. cans)

*A data carrier is a graphical representation of data in a machine readable form, used to enable automatic reading of the Element Strings.

GS1 element strings		
AI	Data definition	Format (AI & data)*
01	GTIN	N2+N14
10	Batch or lot number	N2+X..20
11	Production date (YYMMDD)	N2+N6
15	Best before date (YYMMDD)	N2+N6
17	Expiration date (YYMMDD)	N2+N6
21	Serial number	N2+X..20

* Meaning of the format used	
Format	Meaning
N	Numeric digit
X	Alphanumeric characters
N2	Fixed length of two numeric digits
X…20	Variable length with a maximum of 20 alphanumeric char.

Adapted from GS1 DataMatrix Guidelines

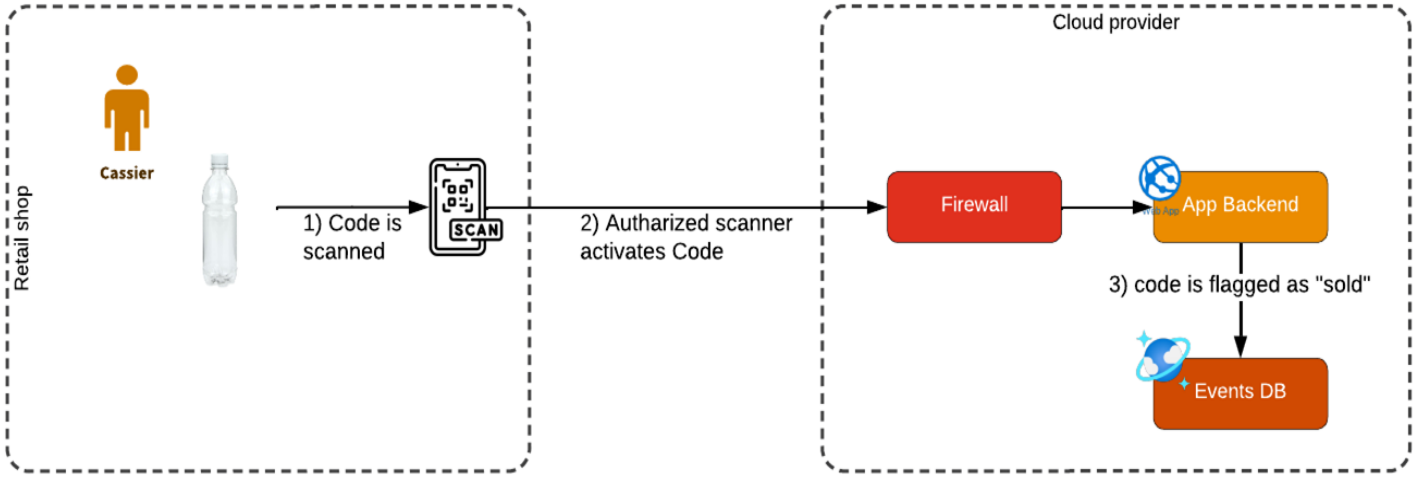
II. Technology layer

D. Design principles - Product vending process

Product Activation and Fraud Prevention

Once bottles/ cans are at PoS, they are ready to be purchased (i.e. to be activated). At time of purchase, a consumer has paid a deposit for their beverage packaging, so it is important that they are flagged as such. Once the bottles or cans are scanned by the retail scanner, they are marked as “Sold”. This means that they are ready for return/ refund.

This now leaves a door open for fraud: the frauder might buy bottles/cans and scan them all using the home scanner, triggering the refund process. But, instead of actually throwing them in the correct bin, he might try to return the products to get refunded the full price (including deposit) as well as the individual deposits reclaimed via the scanner. A failsafe will need to be designed to block this.



Process description

A. The cashier scans the products using the authorized retail scanner.

B. The scanner sends information that the product was purchased to DDRS

C. DDRS marks the individual bottles and cans as “Sold”

Fraud prevention

The retail scanner could also be used to scan returned products. If the deposits of the products would already have been reclaimed, the store could refuse to take them back.

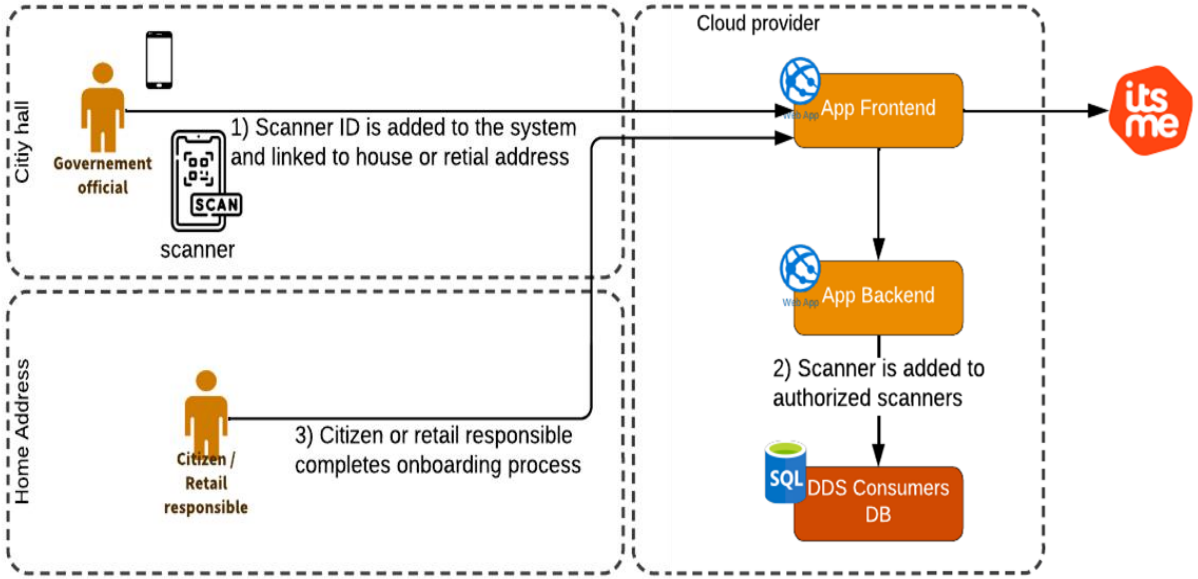
II. Technology layer

D. Design principles - Scanner initialization process

There will be 2 types of scanners

- **Retail scanners** will scan bottles and cans to activate the code in DDRS upon purchase. This includes retailers, shops and e-commerce.
- **Home scanners** will scan bottles and cans to trigger deposit refunds and to scan returned products (deactivation)

To make sure scanners are properly activated, an official instance will take care of it. This can be done by a government official, or the DDRS organisation. The reason for using municipal administrative functions (e.g. handling citizens moving house) is that it would leverage existing infrastructure known by the consumer. From that perspective, it could signal trust and be more efficient.



Process description

A. The government official takes a new scanner and registers it in the DDRS system using the DDRS Website. The scanner is attributed to an address and primary user.

B. The DDRS activates the scanner in the system. Calls coming from this scanner will as of now be accepted.

C. The citizen or retailer will complete their account in the DDRS by adding all missing information. Authentication can be accomplished using ItsMe, or an ID card reader. This can be done via the DDRS website or App. Once all information is filled in, the DDRS system can initialize refunds.

This process is valid for additional identification technologies, like an NFC token (Near Field Communication).

II. Technology layer

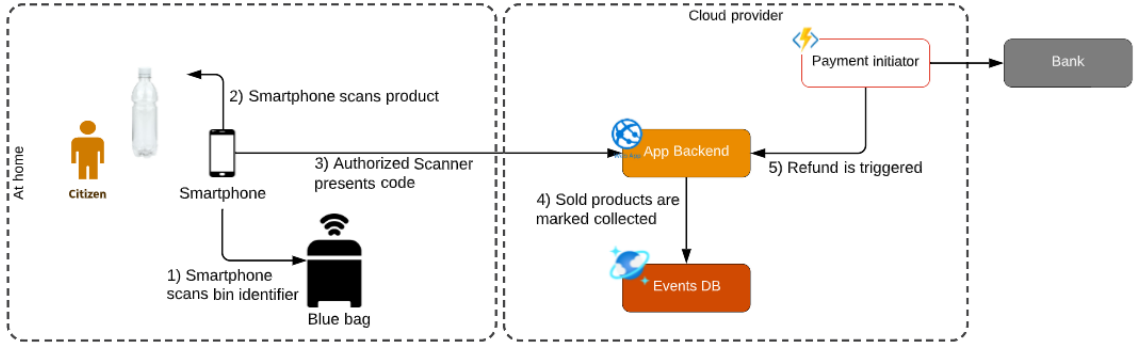
D. Design principles - Process for disposal at home

Post-purchase, post-consumption - At home

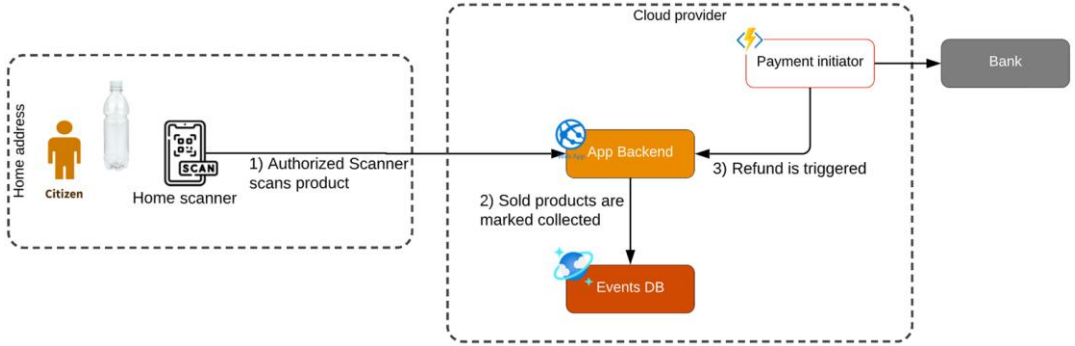
Now that bottles and cans have been bought and have been consumed, they can be returned. At home, products need to be scanned via the smartphone app or home scanner and deposited into the correct waste bin (blue bag).

In order to allow a grace period in which the products can be returned to the store, we will delay payment. For example, 1 month. By implementing this delay we make sure that products are not bought, scanned and immediately returned to the retail store.

Smartphone example



Home scanner example



Process description

A. Citizens scan the used bottle or can using the activated home scanner. The scanner sends the information to the DDRS system, which checks the status of the product.

B. If applicable the DDRS system marks the product as “Collected”

C. DDRS triggers a refund (in due time) towards the citizen.

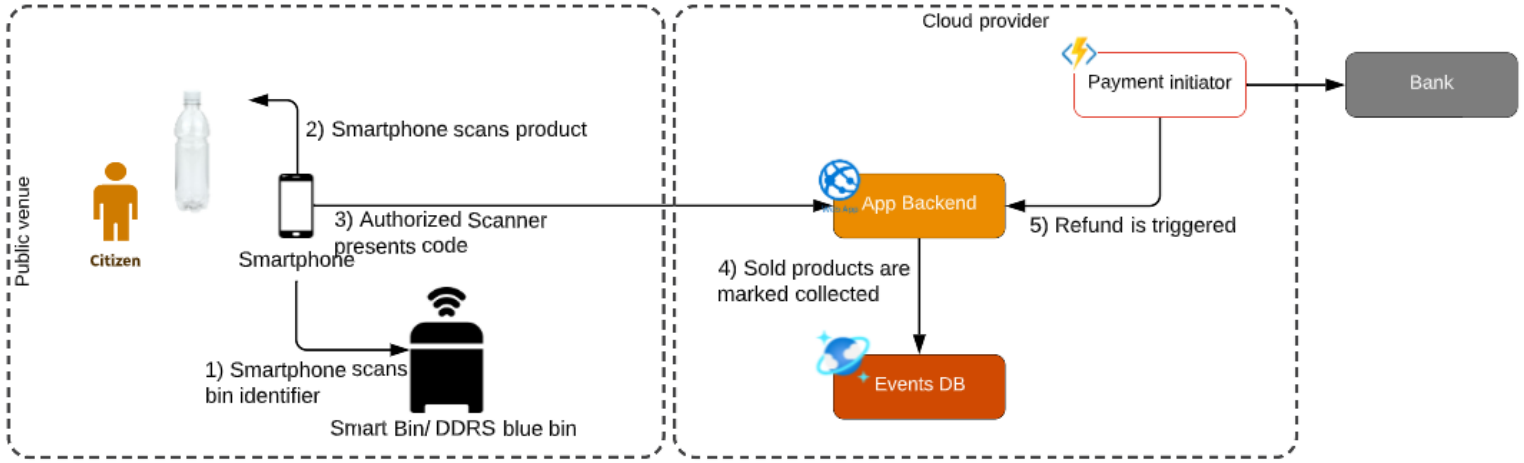
II. Technology layer

D. Design principles - Process for disposal on-the-go

Post-purchase, post-consumption - On the go

Bottles and cans that are consumed in public places or away from home also need to be collected. For this purpose, a number of public blue bins are placed in public places like parks and city halls.

Direct refunding using public blue bins is not possible. It would be too complex to have consumers identify themselves towards the smart bins. Therefore, the smartphone will be used to scan the product, and the refund will be triggered by the smartphone.



Process description

A. Consumer opens the smart bin using a smartphone

B. Consumer scans the product(s) that will be dropped in the smart bin

C. The smartphone sends the product codes to the DDRS system for verification

D. The (valid) products are marked as collected in the DDRS system

E. A refund is triggered in the DDRS system

II. Technology layer

E. Items to be further developed after blueprint phase (Go-decision for DDRS)

The blueprint identifies amongst other following technology-related items that require attention after decision on the DDRS solution.

Items	
Unique codes	● Industry-wide agreement is needed on data structure (“numbers behind the datamatrix”) ● Unique code management needs to be clarified, specifically who will be responsible for avoiding duplicates and timeframe in data retention policy
Registration of unique codes	● Clearly defined scope regarding the scoped beverage packaging ● The responsible party for the registration of unique codes is to be identified, specific challenges regarding: ○ Impact on producers without automatic integration (API)
Home scanner	● Identification of scanner manufacturer based on needed hardware (in annex) ● Practicalities regarding distribution of home scanners (partnerships, cost, etc.)
Retail scanner	● Identification of scanner manufacturer based on needed hardware (in annex) ● Practicalities regarding distribution of retail scanners (partnerships, cost, etc.)

2

DDRS Blueprint

I. Technical layer

II. Technology layer

III. Financial layer

IV. Governance layer

V. Stakeholder layer

VI. Legal layer

III. Financial layer

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III. Financial layer

A. DDRS Deposit flow

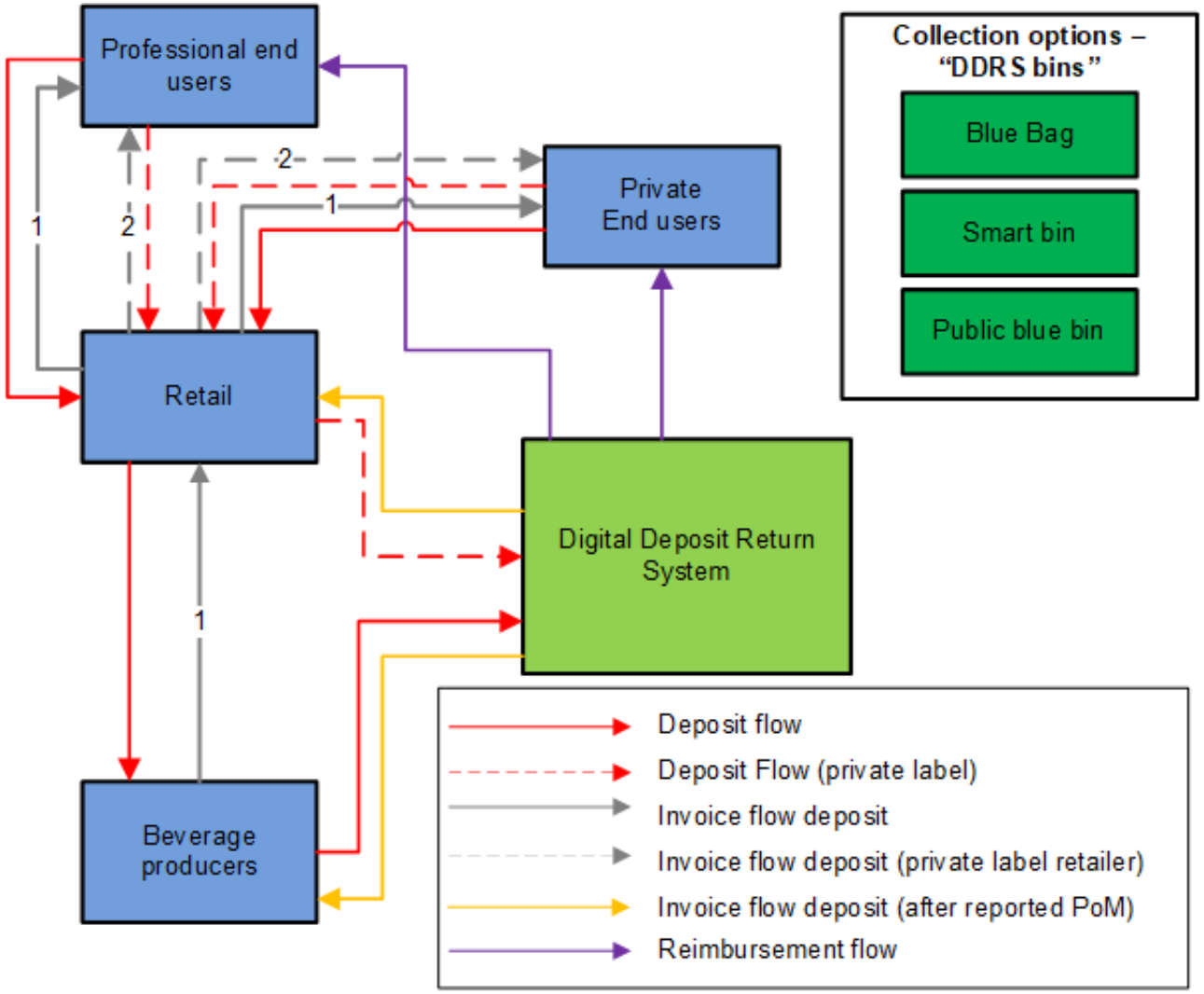
Deposit flow

1. Beverage producers invoice deposit (1)
2. Retailers forward deposit (1) in their invoice
3. Retailers invoice deposit (2) for private label
4. End-users pay deposit to seller
5. DDRS invoice deposit to retailers & beverage producers based on their respective PoM
6. Beverage producers & Retailers (for private label) pay deposit amount to DDRS organisation based on PoM
7. DDRS organisation reimburses deposit to consumers at time of correct disposal

Financing flow is managed centrally by the DDRS organisation. Producers and retailers (or sellers) do not refund consumers directly.

Intermediate actors were omitted from this visual to improve readability.

For a description of deposit flows of other deposit return systems, we like to refer to this report. It contains a visual for each country within the EU.



III. Financial layer

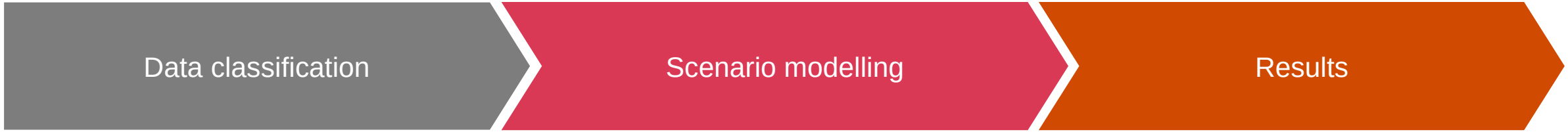
B. Cost simulation - Overview

Three objectives of the model

1. Develop the operational strategy at the optimal cost
2. Calculate the deposit (short/ long term)
3. Develop basis for financing strategy
   (the reserve – long/short term)

The model was applied to a **Digital DRS (DDRS)**, as well as a **Classic DRS (DRS)**. We will distinguish between both models throughout the next section.

Steps under this section



III. Financial layer

B. Cost simulation - Data classification & processing

Data received:

- Declared packaging for 2021 in weight & unit by material
- PMD - Collected: Collected tonnages of PMD (blue bag) by IC & municipality for 2021
- Production figures: Sorted PMD in weight (per IC, group)

Steps taken:

1. Consolidate the volumes collected and sorted on IC-level for the fractions of interest (PET, Alu, Steel)
   - Grouped sorting figures (volumes for multiple ICs) were allocated based on their contribution to the total PMD collected.
2. Allocate volumes per fraction to municipalities based on their share of collected PMD against the total PMD collected at IC-level
   - For NET Brussel, we had to allocate the volumes based on inhabitants.
3. Apply correction to reflect only beverage packaging (based on declared packaging)
4. Converge weight to units
5. Estimate “not collected” against declared packaging

Disclaimer - data restraints

- New blue bag was implemented for all citizens in Q4 2021 (Transition to P+MD). 2021 volumes of P+ well below current volumes.
- Combination of mainly old and only a few sorting plants, which has impact on cost and operational efficiency. Additionally, not all sorting plants sorted in 14 fractions.
- Allocation of sorting costs based on Business plans of the contracted sorting centers (not operational data), resulting in underestimations for some fractions (e.g. clear PET), and overestimations for others (e.g. metals)

III. Financial layer

B. Cost simulation - Scenario modelling: Allocation of collection points

In the original DDRS blueprint report, we included scenario 1.

Based on the feedback, we have created scenario 2 and adapted the model accordingly. In this scenario, the collection points out-of-home are aligned with the estimated number of public bins.

Additionally, a scenario was requested with a maximum number of RVMs (nl. 10,000 max.).

From a methodological point of view, the costs associated with a specific scenario can only compared to its counterpart with the same restrictions & criteria.

The group has decided to only compare DDRS-Sc.2 to DRS-Sc.3.

Model output: Total collection points & average distance			
Scenario		**DDRS**	**DRS**
Sc.1	**Calculation on the same access for consumers (only geographic):** Minimum number of collection points based on km street per TO	190,649 collection points 811 meters on average	190,370 collection points 812 meters on average
Sc.2	**Public bin restraint:** Collection points equal to est. number of public bins	136,405 collection points 1.13 km on average	136,405 collection points 1.13 km on average
Sc.3	**Request from blueprint feedback:** Max number of collection points is 10,000	N/A	9,464 collection points 16.33 km on average

III. Financial layer

B. Cost simulation - Scenario modelling: Allocation of collection points

Operational strategy: Find the optimal collection strategy for each municipality to collect the “not collected” at minimal cost

Basis: Total cost = OpEx (collection, logistics and treatment cost) + CapEx (investment cost)

Optimization technique will be used to guarantee the **minimal cost with respect to the defined constraints**

Optimization technique considers 3 elements:

1. **Objective** (goal) function – Total Cost
2. **Decision variables** – Number of bins of different collection equipment
3. **Constraints** – Total number of collection points per municipality

Our model has **multiple parameters**:

1. **Frequency** of collection (yearly)
2. **Access** to collection point (per km)
3. **CapEx** – Investment cost of equipment
4. **OpEx** – Cost of collection, transportation and treatment of waste

The outcome of the model will tell us: Given “X” frequency of collection, for each municipality, we would need “Y” number of “Z” collection option in order to collect all of the waste while minimizing the total cost.

Additional cost elements were added after allocation of collection points.

III. Financial layer

B. Cost simulation - Scenario modelling: Description of cost elements (1/2)

DDRS - Digital Deposit Return System	
Name	**Description**
Investment cost	
Public blue bin (all types)	Cost of acquiring and placement of various types of public blue bins (normal, smart bins). Cost is allocated to the year of implementation.
Bin stickers	Cost for bin identifiers (needed to redeem deposit), accounting periodic replacement. Cost is allocated to the year of implementation.
Scanners	Scanners to deploy as home- or retail-scanner (same investment cost), based on 27.50 € per scanner & estimated need for households (555K)
IT Development	Project cost to build and deploy the DDRS solution, estimated by PwC
Operational cost	
Blue bag collection & sorting	Cost related to blue bag operations of collection & sorting by fraction. Based on the total cost for collection & sorting in 2021 and applied to the volumes collected through the blue bag
“Public bin” collection cost	Cost for emptying public bins (Incl. personnel cost, TCO material, est. time for emptying & movement between bins), based on EPR litter simulation (corrected for other fractions). Applied to the frequency of collection.
“Public blue bin” collection cost	Cost for emptying public bins (Incl. personnel cost, TCO material, est. time for emptying & movement between bins), based on EPR litter simulation. Applied to the frequency of collection.
Maintenance cost	Yearly cost for maintenance of DDRS collection points (public blue bins), calculated per bin per year based on investment cost (10%).
Pre-sorting	Cost for sorting out non-PMD fractions, based on EPR litter simulation. Applied to volumes collected through public bins (transition)
Post-sorting	Cost for sorting PMD fractions, based on EPR litter simulation. Applied to volumes collected through public bins (transition) and “public blue bins”.
Outbound transport cost	Additional transport cost to cover transportation after consolidation point. Applied to volumes collected through public bins (transition) and “public blue bins”.
Litter cost	Estimated cost related to the not collected volumes, based on the total litter cost (EPR litter simulation)
Revenues	
Recycling revenue	The estimated net income from PET, aluminium and steel applied to volumes collected (public and blue bag).
Unredeemed deposits	Estimated income from not collected beverage packaging (20 euro cents per packaging unit)

Please note: Operational cost include those cost directly related to the execution of an activity. We have not included any form of overhead. To estimate the cost for overhead, 15% can be applied to the total cost as reference. We have also not included indirect costs or cost for adaptation at the side of the producers (e.g. printing operations) and retailers (e.g. update cashier solutions).

III. Financial layer

B. Cost simulation - Scenario modelling: Description of cost elements (2/2)

DRS - Deposit Return System	
Name	**Description**
Investment cost	
RVM investment	Cost of acquiring Reverse Vending Machines. Cost is allocated to the year of implementation (first year).
Operational cost	
Operational cost*	Cost per unit collected including ● Exploitation (building) cost ● Day2day emptying, cleaning, management,… ● Handling cost of "returning deposit" ● Transport cost ● Cost related to "retourcentra" (incl. reception, processing, storage, outgoing transport)
Maintenance cost	Yearly cost for maintenance of RVMs, calculated per RVM per year based on investment cost (10%).
Litter cost	Estimated cost related to the not collected volumes, based on the total litter cost (EPR litter simulation)
Revenues	
Recycling revenue	The estimated net income from PET, aluminium and steel applied to volumes collected (public and blue bag).
Unredeemed deposits	Estimated income from not collected beverage packaging (20 euro cents per packaging unit)

* Depending on the implementation strategy and organisation of take-back, it is possible there is an additional need for sorting and counting centres. This cost is currently not included.

Please note: Operational cost include those cost directly related to the execution of an activity. We have not included any form of overhead. To estimate the cost for overhead, 15% can be applied to the total cost as reference. We have also not included indirect costs or cost for adaptation at the side of the producers (e.g. printing operations) and retailers (e.g. rearrangements at PoS).

III. Financial layer

B. Cost simulation - Results: Investment cost (1/4)

Digital Deposit Return System (Sc.2)

	Public blue bin (simple)	Smart bin - Small	Smart bin - Big	Smart bin - Big compr.
Reference model	Traflux - Pillar	Big Belly	Big Belly	Big Belly
Investment cost	750.00 €	1,200.00 €	3,000.00 €	4,500.00 €
Capacity (liters)	100 L	190 L	570 L	570 L
Number allocated	**136,267**	**120**	**8**	**10**

Deposit Return System (Sc.3)

	RVM - Single	RVM - Double
Reference model	**Tomra - T70 Single**	**Tomra - T70 Dual**
Investment cost	14,500.00 €	23,000.00 €
Capacity (liters)	490 L	760 L
Number allocated (Sc.3)	**8,209**	**1,558**

III. Financial layer

B. Cost simulation - Results: Investment cost (2/4)

Digital Deposit Return System (Sc.2)

Region	Smart Bins - small	Smart Bins - Big	Smart Bins - Big compressed	Public blue bin (simple)
Vlaanderen	119	8	10	79,475
Wallonië	1	0	0	43,373
Brussel	0	0	0	13,419
Total	120	8	10	136,267

Year	Public blue bins (all types)	Bin stickers	Scanners	IT development	Total Investment
2023	0 €	0 €	15,260,712.69 €	€ 775,701.00	16,036,413.69 €
2024	40,597,050 €	14,614 €	0.00 €	€ 0.00	40,611,664.00 €
2025	31,617,750 €	11,363 €	0.00 €	€ 0.00	31,629,113.00 €
2026	14,273,400 €	5,132 €	0.00 €	€ 0.00	14,278,532.00 €
2027	10,320,450 €	3,705 €	0.00 €	€ 0.00	10,324,155.00 €
2028	5,604,600 €	2,013 €	0.00 €	€ 0.00	5,606,613.00 €
2029	0 €	0 €	0.00 €	€ 0.00	0.00 €
2030	0 €	0 €	0.00 €	€ 0.00	0.00 €
2031	0 €	0 €	0.00 €	€ 0.00	0.00 €
2032	0 €	0 €	0.00 €	€ 0.00	0.00 €
Total	102,413,250 €	36,827 €	15,260,712.69 €	€ 775,701.00	118,486,490.69 €

Q: How much would it cost to provide all households with a home scanner?
A: 138,183,402.50 €

Q: How much would it cost if you use NFC tags as well?
A: 147,317.40 €

Please note: these costs would replace what it currently included in the table, not in addition to the cost.

III. Financial layer

B. Cost simulation - Results: Investment cost (3/4)

Deposit Return System (Sc.3)

Year	RVM investment
2023	154,864,500 €
2024	0 €
2025	0 €
2026	0 €
2027	0 €
2028	0 €
2029	0 €
2030	0 €
2031	0 €
2032	0 €
Total	154,864,500 €

Region	RVM - double	RVM - single
Brussel	127	528
Vlaanderen	946	5,087
Wallonië	485	2,594
Total	1,558	8,209

Depending on the implementation strategy and organisation of take-back, it is possible there is an additional need for sorting and counting centres. Both the investment cost and operational costs related to these activities for DRS were not included in the calculation.

III. Financial layer

B. Cost simulation - Results: Investment cost (4/4)

DDRS vs. DRS - Conclusion

Assuming the cost is borne centrally, the total investment cost for DDRS (Sc.2) is lower compared to DRS (Sc.3).

Additionally, there are more collection points available for the consumer under DDRS, compared to DRS (considering the option of disposal at home). This means a consumer will have to travel a lower distance before encountering a collection points under DDRS compared to DRS (Sc.3).

DDRS provides more comfort and access to the consumer at a lower investment cost.

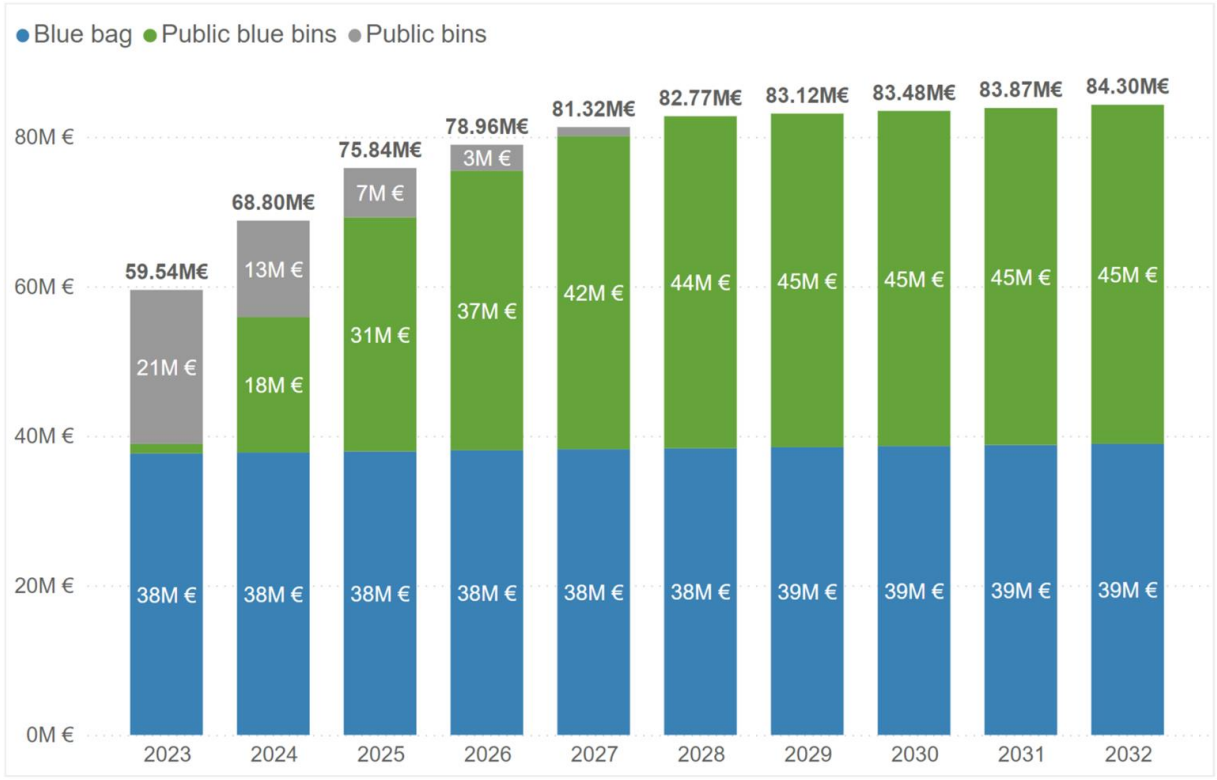
Model output: Total investment cost over simulated period			
Scenario		**DDRS**	**DRS**
Sc.2	**Public bin restraint:** Collection points equal to est. number of public bins	118,486,490.69 €	
Sc.3	**Request from blueprint feedback:** Max number of collection points is 10,000		154,864,500.00 €

III. Financial layer

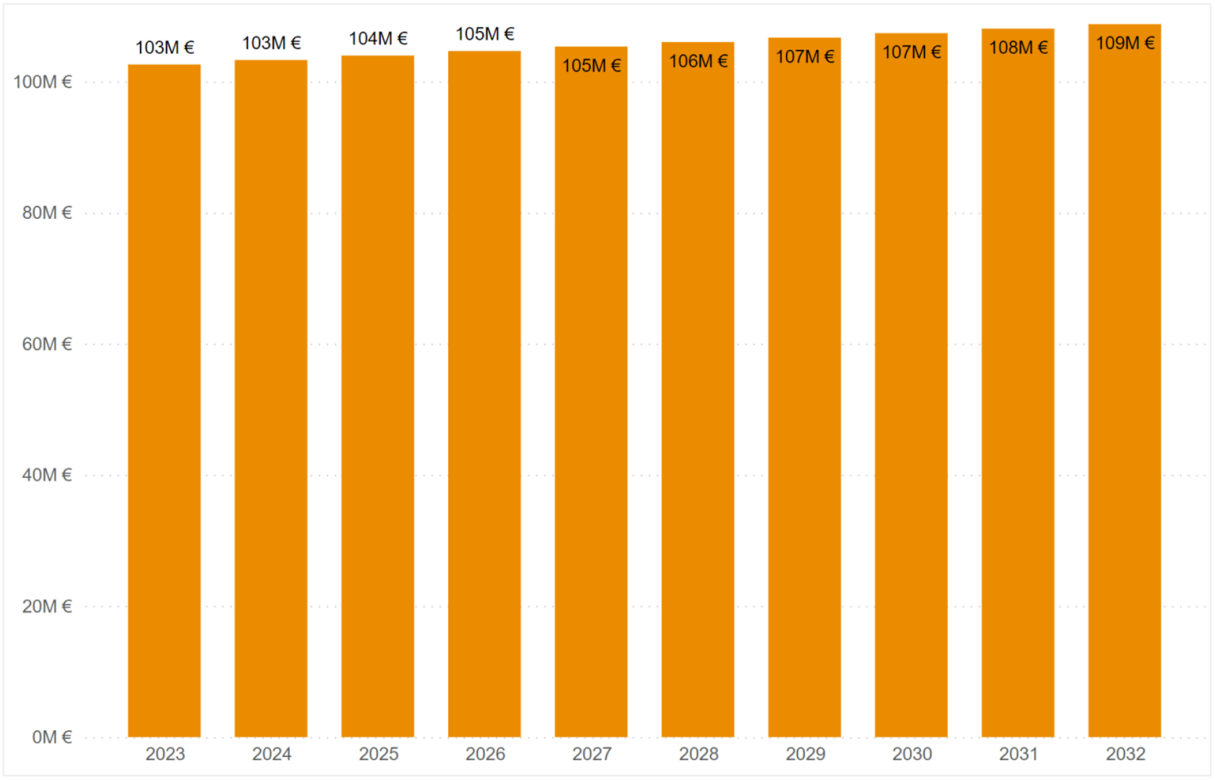
B. Cost simulation - Results: Operational cost (1/4)

As the operational cost is driven by collection rates, below reflects the outcome of both model with equal collection rates, as described in "I. Technical Layer"

Digital Deposit Return System (Sc.2)



Deposit Return System (Sc.3)



Please note: Operational cost include those cost directly related to the execution of an activity. We have not included any form of overhead. To estimate the cost for overhead, 15% can be applied to the total cost as reference. We have also not included indirect costs or cost for adaptation at the side of the producers (e.g. printing operations) and retailers (e.g. update cashier solutions).

III. Financial layer

B. Cost simulation - Results: Operational cost (2/4)

As the operational cost is driven by collection rates, below reflects the outcome of both model with equal collection rates, as described in "I. Technical Layer"

Digital Deposit Return System (Sc.2)

Year	Blue bag - Collection & Sorting	Public bins - collection cost	Pre-sorting	Public blue bins - collection cost	Maintenance cost	Post-sorting	Outbound transport cost	IT recurrent	Yearly Operational cost	Recycling revenue	Net OpEx
2023	37,653,407.35 €	13,506,428.95 €	5,633,486.06 €	0 €	0 €	1,219,941.12 €	233,109.77 €	1,292,760.00 €	59,539,133.25 €	46,903,918.60 €	12,635,214.65 €
2024	37,796,209.65 €	8,394,872.07 €	3,569,416.98 €	12,175,272 €	4,059,705 €	1,273,099.72 €	243,267.46 €	1,292,760.00 €	68,804,602.88 €	47,253,268.79 €	21,551,334.09 €
2025	37,939,011.94 €	4,256,510.86 €	1,853,006.75 €	21,695,452 €	7,221,480 €	1,326,258.32 €	253,425.16 €	1,292,760.00 €	75,837,905.04 €	47,602,618.98 €	28,235,286.05 €
2026	38,081,814.24 €	2,234,310.89 €	969,406.50 €	26,086,941 €	8,648,820 €	1,379,416.95 €	263,582.86 €	1,292,760.00 €	78,957,052.43 €	47,951,969.17 €	31,005,083.26 €
2027	38,224,616.54 €	781,458.46 €	337,880.14 €	29,293,009 €	9,680,865 €	1,432,575.59 €	273,740.56 €	1,292,760.00 €	81,316,905.29 €	48,301,319.36 €	33,015,585.93 €
2028	38,367,418.84 €	0.00 €	0.00 €	31,098,493 €	10,241,325 €	1,485,734.22 €	283,898.26 €	1,292,760.00 €	82,769,629.31 €	48,650,669.55 €	34,118,959.76 €
2029	38,510,221.14 €	0.00 €	0.00 €	31,239,937 €	10,241,325 €	1,538,892.83 €	294,055.95 €	1,292,760.00 €	83,117,191.92 €	49,000,019.74 €	34,117,172.18 €
2030	38,653,023.44 €	0.00 €	0.00 €	31,399,510 €	10,241,325 €	1,592,051.44 €	304,213.65 €	1,292,760.00 €	83,482,883.53 €	49,349,369.93 €	34,133,513.60 €
2031	38,795,825.74 €	0.00 €	0.00 €	31,578,853 €	10,241,325 €	1,645,210.05 €	314,371.35 €	1,292,760.00 €	83,868,345.13 €	49,698,720.12 €	34,169,625.01 €
2032	38,938,628.03 €	0.00 €	0.00 €	31,806,660 €	10,241,325 €	1,698,368.65 €	324,529.04 €	1,292,760.00 €	84,302,270.72 €	50,048,070.31 €	34,254,200.41 €
Total	382,960,176.91 €	29,173,581.23 €	12,363,196.43 €	246,374,127 €	80,817,495 €	14,591,548.89 €	2,788,194.05 €	12,927,600.00 €	781,995,919.50 €	484,759,944.57 €	297,235,974.94 €

Please note: Operational cost include those cost directly related to the execution of an activity. We have not included any form of overhead. To estimate the cost for overhead, 15% can be applied to the total cost as reference. We have also not included indirect costs or cost for adaptation at the side of the producers (e.g. printing operations) and retailers (e.g. update cashier solutions).

III. Financial layer

B. Cost simulation - Results: Operational cost (3/4)

As the operational cost is driven by collection rates, below reflects the outcome of both model with equal collection rates, as described in "I. Technical Layer"

Deposit Return System (Sc.3)

Year	Operational cost	Maintenance cost	Yearly OpEx	Recycling revenue	Net OpEx
2023	87,119,748.66 €	15,486,450 €	102,606,198.66 €	46,903,918.60 €	55,702,280.05 €
2024	87,802,754.72 €	15,486,450 €	103,289,204.72 €	47,253,268.79 €	56,035,935.93 €
2025	88,485,760.59 €	15,486,450 €	103,972,210.59 €	47,602,618.98 €	56,369,591.61 €
2026	89,168,766.14 €	15,486,450 €	104,655,216.14 €	47,951,969.17 €	56,703,246.97 €
2027	89,851,772.30 €	15,486,450 €	105,338,222.30 €	48,301,319.36 €	57,036,902.94 €
2028	90,534,778.15 €	15,486,450 €	106,021,228.15 €	48,650,669.55 €	57,370,558.60 €
2029	91,217,784.08 €	15,486,450 €	106,704,234.08 €	49,000,019.74 €	57,704,214.33 €
2030	91,900,789.77 €	15,486,450 €	107,387,239.77 €	49,349,369.93 €	58,037,869.84 €
2031	92,583,795.62 €	15,486,450 €	108,070,245.62 €	49,698,720.12 €	58,371,525.50 €
2032	93,266,801.33 €	15,486,450 €	108,753,251.33 €	50,048,070.31 €	58,705,181.02 €
Total	901,932,751.36 €	154,864,500 €	1,056,797,251.36 €	484,759,944.57 €	572,037,306.79 €

* Depending on the implementation strategy and organisation of take-back, it is possible there is an additional need for sorting and counting centres. Based on the cost for sorting from a previous study, this additional operational cost is estimated at 20,5 mio euros per year.

Please note: Operational cost include those cost directly related to the execution of an activity. We have not included any form of overhead. To estimate the cost for overhead, 15% can be applied to the total cost as reference. We have also not included indirect costs or cost for adaptation at the side of the producers (e.g. printing operations) and retailers (e.g. update cashier solutions).

III. Financial layer

B. Cost simulation - Results: Operational cost (4/4)

As the operational cost is driven by collection rates, below reflects the outcome of both model with equal collection rates, as described in "I. Technical Layer"

DDRS vs. DRS - Conclusion

The total net operational cost over the simulated period for DDRS (Sc.2) is lower compared to DRS (Sc.2) & DRS (Sc.3).

Additionally, DDRS shows potential for cost reductions, as the overall cost will reduce if more is collected through the blue bag or efficiency is achieved in the management of public bins.

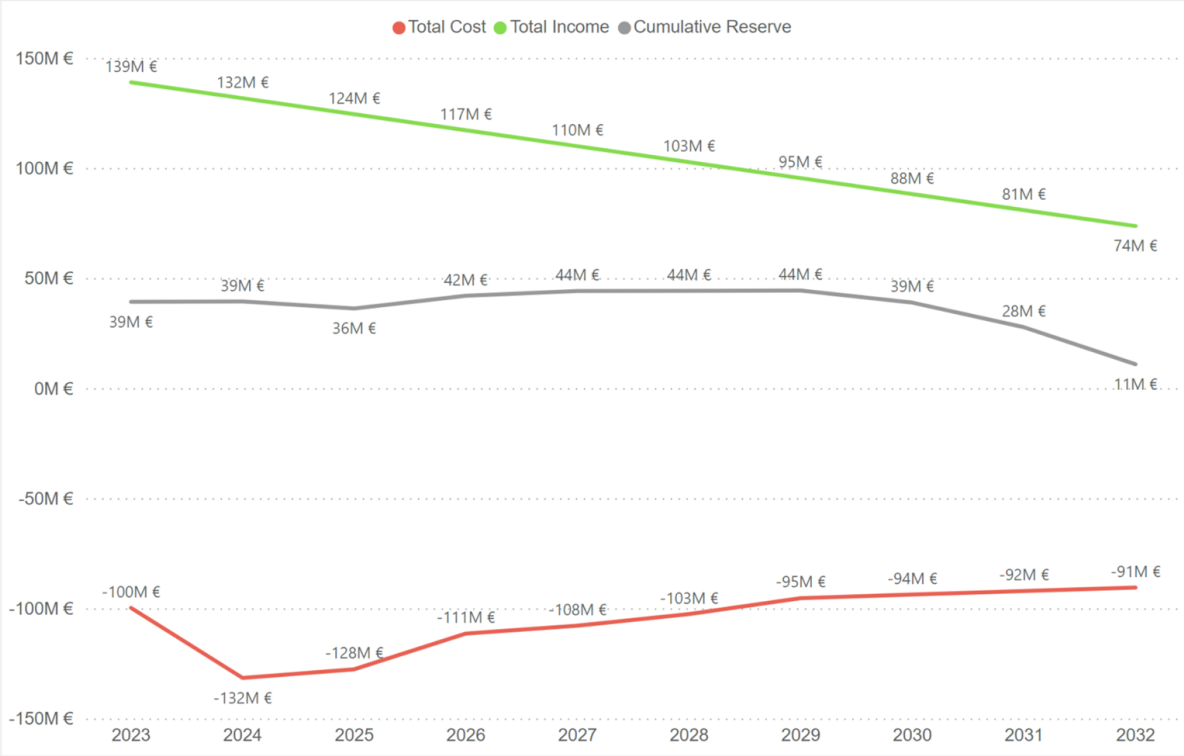
Model output: Total net OpEx over the simulated period (= total operational cost - total revenue from recycling)			
Scenario		**DDRS**	**DRS**
Sc.2	**Public bin restraint:** Collection points equal to est. number of public bins	297,235,974.94 €	
Sc.3	**Request from blueprint feedback:** Max number of collection points is 10,000		572,037,306.79 €

III. Financial layer

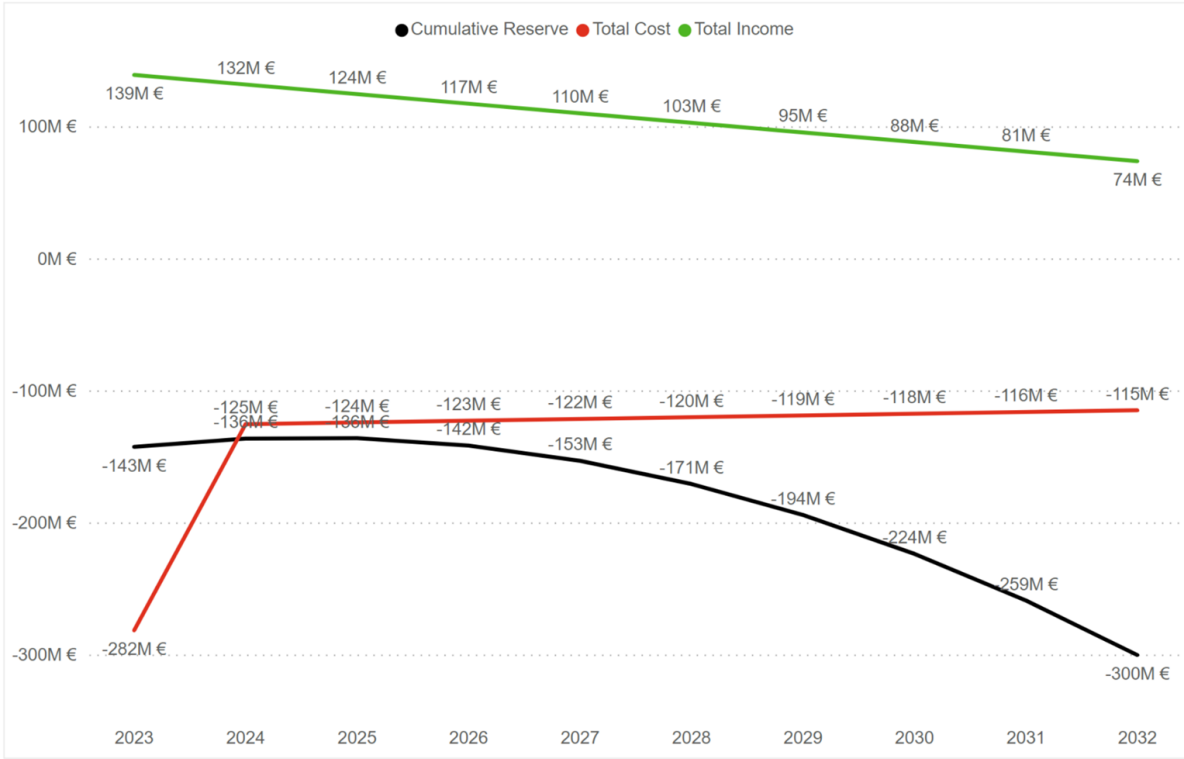
B. Cost simulation - Results: Financial results with 20 cent deposit (1/4)

As the financial results are driven by collection rates, below reflects the outcome of both model with equal collection rates, as described in "I. Technical Layer"

Digital Deposit Return System (Sc.2)



Deposit Return System (Sc.3)



III. Financial layer

B. Cost simulation - Results: Financial results with 20 cent deposit (2/4)

As the financial results are driven by collection rates, below reflects the outcome of both model with equal collection rates, as described in "I. Technical Layer"

Digital Deposit Return System (Sc.2)

Year	Investment cost	Operational cost	Litter cost	Total cost	Unredeemed deposits	Recycling revenue	Total income	Yearly result	Cumulative reserve
2023	-16,036,413.69 €	-59,539,133.25 €	-24,146,044.59 €	-99,721,591.53 €	92,071,054.40 €	46,903,918.60 €	138,974,973.00 €	39,253,381.47 €	39,253,381.47 €
2024	-40,611,664.00 €	-68,804,602.88 €	-22,153,969.85 €	-131,570,236.73 €	84,464,495.20 €	47,253,268.79 €	131,717,763.99 €	147,527.26 €	39,400,913.05 €
2025	-31,629,113.00 €	-75,837,905.04 €	-20,161,895.11 €	-127,628,913.15 €	76,857,931.80 €	47,602,618.98 €	124,460,550.78 €	-3,168,362.37 €	36,232,556.65 €
2026	-14,278,532.00 €	-78,957,052.43 €	-18,169,820.38 €	-111,405,404.81 €	69,251,368.60 €	47,951,969.17 €	117,203,337.77 €	5,797,932.97 €	42,030,481.81 €
2027	-10,324,155.00 €	-81,316,905.29 €	-16,177,745.64 €	-107,818,805.93 €	61,644,813.80 €	48,301,319.36 €	109,946,133.16 €	2,127,327.24 €	44,157,813.06 €
2028	-5,606,613.00 €	-82,769,629.31 €	-14,185,670.90 €	-102,561,913.22 €	54,038,249.60 €	48,650,669.55 €	102,688,919.15 €	127,005.94 €	44,284,820.79 €
2029	0.00 €	-83,117,191.92 €	-12,193,596.16 €	-95,310,788.08 €	46,431,694.20 €	49,000,019.74 €	95,431,713.94 €	120,925.86 €	44,405,747.53 €
2030	0.00 €	-83,482,883.53 €	-10,201,521.42 €	-93,684,404.95 €	38,825,126.60 €	49,349,369.93 €	88,174,496.53 €	-5,509,908.42 €	38,895,835.35 €
2031	0.00 €	-83,868,345.13 €	-8,209,446.69 €	-92,077,791.82 €	31,218,569.40 €	49,698,720.12 €	80,917,289.52 €	-11,160,502.30 €	27,735,341.25 €
2032	0.00 €	-84,302,270.72 €	-6,217,371.95 €	-90,519,642.67 €	23,612,008.80 €	50,048,070.31 €	73,660,079.11 €	-16,859,563.56 €	10,875,787.30 €
Total	-118,486,490.69 €	-781,995,919.50 €	-151,817,082.70 €	-1,052,299,492.89 €	578,415,312.40 €	484,759,944.57 €	1,063,175,256.97 €	10,875,764.08 €	10,875,787.30 €

We observe no negative cumulative reserve for DDRS for the simulated period. The cumulative reserve reaches the highest point in 2029. At this point, we achieve a collection rate for PET of 94.33% and 97.67% for aluminium and steel.

At the end of the simulated period, the cumulative reserve is positive: 10,875,787.30 €

Please note: Operational cost include those cost directly related to the execution of an activity. We have not included any form of overhead. To estimate the cost for overhead, 15% can be applied to the total cost as reference. We have also not included indirect costs or cost for adaptation at the side of the producers (e.g. printing operations) and retailers (e.g. update cashier solutions).
Litter cost reflects an estimation based on the litter-related costs. This remains the most suitable approach until there is clarity on the levies from the Regions.

III. Financial layer

B. Cost simulation - Results: Financial results with 20 cent deposit (3/4)

As the financial results are driven by collection rates, below reflects the outcome of both model with equal collection rates, as described in "I. Technical Layer"

Deposit Return System (Sc.3)

Year	Investment cost	Operational cost	Litter cost	Total cost	Unredeemed deposits	Recycling revenue	Total income	Yearly result	Cumulative reserve
2023	-154,864,500 €	-102,606,198.66 €	-24,146,044.59	-281,616,743.25 €	92,071,054.40 €	46,903,918.60 €	138,974,973.00 €	-142,641,770.24	-142,641,770.24 €
2024	0 €	-103,289,204.72 €	-22,153,969.85	-125,443,174.58 €	84,464,495.20 €	47,253,268.79 €	131,717,763.99 €	6,274,589.42	-136,367,180.83 €
2025	0 €	-103,972,210.59 €	-20,161,895.11	-124,134,105.71 €	76,857,931.80 €	47,602,618.98 €	124,460,550.78 €	326,445.07	-136,040,735.76 €
2026	0 €	-104,655,216.14 €	-18,169,820.38	-122,825,036.52 €	69,251,368.60 €	47,951,969.17 €	117,203,337.77 €	-5,621,698.75	-141,662,434.50 €
2027	0 €	-105,338,222.30 €	-16,177,745.64	-121,515,967.94 €	61,644,813.80 €	48,301,319.36 €	109,946,133.16 €	-11,569,834.78	-153,232,269.28 €
2028	0 €	-106,021,228.15 €	-14,185,670.90	-120,206,899.05 €	54,038,249.60 €	48,650,669.55 €	102,688,919.15 €	-17,517,979.90	-170,750,249.18 €
2029	0 €	-106,704,234.08 €	-12,193,596.16	-118,897,830.24 €	46,431,694.20 €	49,000,019.74 €	95,431,713.94 €	-23,466,116.30	-194,216,365.48 €
2030	0 €	-107,387,239.77 €	-10,201,521.42	-117,588,761.19 €	38,825,126.60 €	49,349,369.93 €	88,174,496.53 €	-29,414,264.66	-223,630,630.14 €
2031	0 €	-108,070,245.62 €	-8,209,446.69	-116,279,692.31 €	31,218,569.40 €	49,698,720.12 €	80,917,289.52 €	-35,362,402.78	-258,993,032.92 €
2032	0 €	-108,753,251.33 €	-6,217,371.95	-114,970,623.28 €	23,612,008.80 €	50,048,070.31 €	73,660,079.11 €	-41,310,544.17	-300,303,577.09 €
Total	-154,864,500 €	-1,056,797,251.36 €	-151,817,082.70	-1,363,478,834.06 €	578,415,312.40 €	484,759,944.57 €	1,063,175,256.97 €	-300,303,577.09	-300,303,577.09 €

We observe only negative cumulative reserves for DRS for the simulated period. The negative cumulative reserve reaches its lowest point at the end of the simulated period. As collection rates increase, the cumulative reserve worsens.

At the end of the simulated period, the cumulative reserve is positive: -300,303,577.09 €

Please note: Operational cost include those cost directly related to the execution of an activity. We have not included any form of overhead. To estimate the cost for overhead, 15% can be applied to the total cost as reference. We have also not included indirect costs or cost for adaptation at the side of the producers (e.g. printing operations) and retailers (e.g. update cashier solutions).
Litter cost reflects an estimation based on the litter-related costs. This remains the most suitable approach until there is clarity on the levies from the Regions.

III. Financial layer

B. Cost simulation - Results: Financial results with 20 cent deposit (4/4)

As the financial results are driven by collection rates, below reflects the outcome of both model with equal collection rates, as described in "I. Technical Layer"

DDRS vs. DRS - Financial results

At the end of the simulated period, we observe a positive cumulative reserve for DDRS and a negative for DRS.

The alignment of collection success between DDRS & DRS shows DDRS to be more cost effective than DRS.

In practice, we expect lower collection rates for DRS. However, including a simulation for DRS with lower performance creates a methodologically inconsistent comparison between the 2 systems.

Model output: Cumulative reserve at the end of the simulated period (Y2032)			
Scenario		**DDRS**	**DRS**
Sc.2	**Public bin restraint:** Collection points equal to est. number of public bins	10,875,787.30 €	
Sc.3	**Request from blueprint feedback:** Max number of collection points is 10,000		-300,303,577.09 €

III. Financial layer

B. Cost simulation - Results: Comparison of average yearly cost & revenues for DDRS & DRS

Average yearly cost (calculated based on simulated period)								
	Investment cost	**Operational cost**	**Litter cost**	**Total cost**	**Unredeemed deposit**	**Recycling revenue**	**Total income**	**Net income (income-cost)**
DDRS	-11,848,649.07 €	-78,199,591.95 €	-15,181,708.27 €	**-105,229,949.29 €**	57,841,531.24 €	48,475,994.46 €	**106,317,525.70 €**	1,087,576.41 €
DRS	-15,486,450.00 €	-105,679,725.14 €	-15,181,708.27 €	**-136,347,883.41 €**	57,841,531.24 €	48,475,994.46 €	**106,317,525.70 €**	-30,030,357.71 €
Delta (DDRS - DRS)	3,637,800.93 €	27,480,133.19 €	0.00 €	**31,117,934.12 €**	0.00 €	0.00 €	0.00 €	

Overall DDRS creates more ease and comfort for the consumer at a lower cost while achieving the same performance

When we compare each category of cost and income using the average per year (calculated based on the simulated period) between DDRS & DRS, we observe an overall lower costs at the side of DDRS for the same performance (namely collection success).

Although DDRS requires additional IT infrastructure and significantly more collection points, the investment cost is lower. However, we do need to mention that DDRS will require producer-specific adaptations to their production lines, as they will be required to print unique codes on all beverage packaging. This cost is not included in the simulation.

DDRS is also more efficient in terms of operational costs, mainly as a result of the blue bag collection. Under a DRS, the operational burden lies with the retailers. We do need to mention that the current model does not include adaptation cost (training, etc.) at the side of the retailer.

Please note: Operational cost include those cost directly related to the execution of an activity. We have not included any form of overhead. To estimate the cost for overhead, 15% can be applied to the total cost as reference. We have also not included indirect costs or cost for adaptation at the side of the producers (e.g. printing operations) and retailers (e.g. update cashier solutions).
Litter cost reflects an estimation based on the litter-related costs. This remains the most suitable approach until there is clarity on the levies from the Regions.

III. Financial layer

C. Sensitivity analysis - Introduction

We ran the model for DDRS & DRS multiple times with changing collection rates for only 1 fraction, while keeping the other stable at 100%. We applied increments of 2% to the collection rates starting at 90% to 100%.

After, we created waterfall charts showing only the differences between, for example, 90% and 92% for only PET. From this, we can derive the changing in volumes (tonnage) as well as the cost and revenue it entails.

Illustrative for input data

Collection rate	90%	Year	Investment cost	Operational cost	Litter cost	Total cost	Unredeemed deposits	Recycling revenue	Total income	Yearly result	Cumulative reserve
Reported	512,806	2023	-16,036,413.69	-62,231,262.96	-17,331,780.42	-95,599,457	64,884,103	48,360,988.96	113,245,091.76	17,645,634.66	17,645,634.66
Blue bag	442,777	2024	-40,611,664.00	-70,170,011.43	-17,331,780.42	-128,113,456	64,884,103	48,360,988.96	113,245,091.76	-14,868,364.09	2,777,272.05
Public blue bins	18,770	2025	-31,629,113.00	-76,361,602.01	-17,331,780.42	-125,322,495	64,884,103	48,360,988.96	113,245,091.76	-12,077,403.67	-9,300,130.42
Litter	51,258	2026	-14,278,532.00	-78,996,710.07	-17,331,780.42	-110,607,022	64,884,103	48,360,988.96	113,245,091.76	2,638,069.26	-6,662,063.71
		2027	-10,324,155.00	-80,994,338.99	-17,331,780.42	-108,650,274	64,884,103	48,360,988.96	113,245,091.76	4,594,817.34	-2,067,241.52
		2028	-5,606,613.00	-82,133,638.75	-17,331,780.42	-105,072,032	64,884,103	48,360,988.96	113,245,091.76	8,173,059.59	6,105,820.21
		2029	0.00	-82,133,638.75	-17,331,780.42	-99,465,419	64,884,103	48,360,988.96	113,245,091.76	13,779,672.59	19,885,496.96
		2030	0.00	-82,133,638.75	-17,331,780.42	-99,465,419	64,884,103	48,360,988.96	113,245,091.76	13,779,672.59	33,665,173.71
		2031	0.00	-82,133,638.75	-17,331,780.42	-99,465,419	64,884,103	48,360,988.96	113,245,091.76	13,779,672.59	47,444,850.46
		2032	0.00	-82,133,638.75	-17,331,780.42	-99,465,419	64,884,103	48,360,988.96	113,245,091.76	13,779,672.59	61,224,527.21
		TOTAL	**-118,486,490.69**	**-779,422,119.23**	**-173,317,804.20**	**-1,071,226,414.13**	**648,841,028.00**	**483,609,889.60**	**1,132,450,917.60**	**61,224,503.45**	**170,719,339.61**

Collection rate	92%	Year	Investment cost	Operational cost	Litter cost	Total cost	Unredeemed deposits	Recycling revenue	Total income	Yearly result	Cumulative reserve
Reported	512805.57	2023	-16,036,413.69	-63,654,405.44	-13,871,006.23	-93,561,825.36	51,928,179.80	48,909,761.71	100,837,941.51	7,276,116.15	7,276,116.15
Blue bag	446871.2024	2024	-40,611,664.00	-71,250,567.69	-13,871,006.23	-125,733,237.92	51,928,179.80	48,909,761.71	100,837,941.51	-24,895,296.41	-17,619,178.16
Public blue bins	24911.10684	2025	-31,629,113.00	-77,193,086.77	-13,871,006.23	-122,693,206.00	51,928,179.80	48,909,761.71	100,837,941.51	-21,855,264.49	-39,474,442.99
Litter	41023.26077	2026	-14,278,532.00	-79,716,134.83	-13,871,006.23	-107,865,673.06	51,928,179.80	48,909,761.71	100,837,941.51	-7,027,731.54	-46,502,174.69
		2027	-10,324,155.00	-81,631,242.99	-13,871,006.23	-105,826,404.22	51,928,179.80	48,909,761.71	100,837,941.51	-4,988,462.71	-51,490,639.22
		2028	-5,606,613.00	-82,726,709.88	-13,871,006.23	-102,204,329.11	51,928,179.80	48,909,761.71	100,837,941.51	-1,366,387.60	-52,857,034.63
		2029	0.00	-82,726,709.88	-13,871,006.23	-96,597,716.11	51,928,179.80	48,909,761.71	100,837,941.51	4,240,225.40	-48,616,815.04
		2030	0.00	-82,726,709.88	-13,871,006.23	-96,597,716.11	51,928,179.80	48,909,761.71	100,837,941.51	4,240,225.40	-44,376,595.44
		2031	0.00	-82,726,709.88	-13,871,006.23	-96,597,716.11	51,928,179.80	48,909,761.71	100,837,941.51	4,240,225.40	-40,136,375.84
		2032	0.00	-82,726,709.88	-13,871,006.23	-96,597,716.11	51,928,179.80	48,909,761.71	100,837,941.51	4,240,225.40	-35,896,156.25
		TOTAL	**-118,486,490.69**	**-787,078,987.12**	**-138,710,062.30**	**-1,044,275,540.11**	**519,281,798.00**	**489,097,617.10**	**1,008,379,415.10**	**-35,896,125.00**	**-369,693,296.11**

Collection rate	94%	Year	Investment cost	Operational cost	Litter cost	Total cost	Unredeemed deposits	Recycling revenue	Total income	Yearly result	Cumulative reserve
Reported	512,806	2023	-16,036,413.69	-65,086,342.32	-10,410,232.04	-91,532,988.05	38,972,254.00	49,458,534.47	88,430,788.47	-3,102,199.57	-3,102,199.57
Blue bag	450,965	2024	-40,611,664.00	-72,354,055.58	-10,410,232.04	-123,375,951.62	38,972,254.00	49,458,534.47	88,430,788.47	-34,945,163.15	-38,047,358.85
Public blue bins	31,052	2025	-31,629,113.00	-78,059,344.00	-10,410,232.04	-120,098,289.04	38,972,254.00	49,458,534.47	88,430,788.47	-31,667,500.57	-69,714,862.93
Litter	30,788	2026	-14,278,532.00	-80,484,654.49	-10,410,232.04	-105,173,418.53	38,972,254.00	49,458,534.47	88,430,788.47	-16,742,630.06	-86,457,502.28
		2027	-10,324,155.00	-82,322,405.76	-10,410,232.04	-103,056,792.80	38,972,254.00	49,458,534.47	88,430,788.47	-14,626,004.33	-101,083,513.95
		2028	-5,606,613.00	-83,374,450.97	-10,410,232.04	-99,391,296.02	38,972,254.00	49,458,534.47	88,430,788.47	-10,960,507.54	-112,044,029.70
		2029	0.00	-83,374,450.97	-10,410,232.04	-93,784,683.02	38,972,254.00	49,458,534.47	88,430,788.47	-5,353,894.54	-117,397,930.44
		2030	0.00	-83,374,450.97	-10,410,232.04	-93,784,683.02	38,972,254.00	49,458,534.47	88,430,788.47	-5,353,894.54	-122,751,831.17
		2031	0.00	-83,374,450.97	-10,410,232.04	-93,784,683.02	38,972,254.00	49,458,534.47	88,430,788.47	-5,353,894.54	-128,105,731.91
		2032	0.00	-83,374,450.97	-10,410,232.04	-93,784,683.02	38,972,254.00	49,458,534.47	88,430,788.47	-5,353,894.54	-133,459,632.65
		TOTAL	**-118,486,490.69**	**-795,178,657.00**	**-104,102,320.40**	**-1,017,767,468.14**	**389,722,540.00**	**494,585,344.70**	**884,307,884.70**	**-133,459,583.38**	**-912,164,593.45**

Collection rate	96%	Year	Investment cost	Operational cost	Litter cost	Total cost	Unredeemed deposits	Recycling revenue	Total income	Yearly result	Cumulative reserve
Reported	512,806	2023	-16,036,413.69	-66,538,150.97	-6,935,503.12	-89,510,067.77	25,964,089.00	50,009,520.02	75,973,609.02	-13,536,458.75	-13,536,458.75
Blue bag	455,076	2024	-40,611,664.00	-73,498,750.09	-6,935,503.12	-121,045,917.20	25,964,089.00	50,009,520.02	75,973,609.02	-45,072,308.18	-58,608,766.87
Public blue bins	37,218	2025	-31,629,113.00	-78,980,693.92	-6,935,503.12	-117,545,310.04	25,964,089.00	50,009,520.02	75,973,609.02	-41,571,701.02	-100,180,466.49
Litter	20,512	2026	-14,278,532.00	-81,330,233.03	-6,935,503.12	-102,544,268.15	25,964,089.00	50,009,520.02	75,973,609.02	-26,570,659.13	-126,751,124.65
		2027	-10,324,155.00	-83,096,665.79	-6,935,503.12	-100,356,323.91	25,964,089.00	50,009,520.02	75,973,609.02	-24,382,714.88	-151,133,839.15
		2028	-5,606,613.00	-84,106,733.78	-6,935,503.12	-96,648,849.89	25,964,089.00	50,009,520.02	75,973,609.02	-20,675,240.87	-171,809,074.23
		2029	0.00	-84,106,733.78	-6,935,503.12	-91,042,236.89	25,964,089.00	50,009,520.02	75,973,609.02	-15,068,627.87	-186,877,697.30
		2030	0.00	-84,106,733.78	-6,935,503.12	-91,042,236.89	25,964,089.00	50,009,520.02	75,973,609.02	-15,068,627.87	-201,946,320.37
		2031	0.00	-84,106,733.78	-6,935,503.12	-91,042,236.89	25,964,089.00	50,009,520.02	75,973,609.02	-15,068,627.87	-217,014,943.44
		2032	0.00	-84,106,733.78	-6,935,503.12	-91,042,236.89	25,964,089.00	50,009,520.02	75,973,609.02	-15,068,627.87	-232,083,566.51
		TOTAL	**-118,486,490.69**	**-803,978,162.70**	**-69,355,031.20**	**-991,819,684.52**	**259,640,890.00**	**500,095,200.20**	**759,736,090.20**	**-232,083,594.31**	**-1,459,942,252.76**

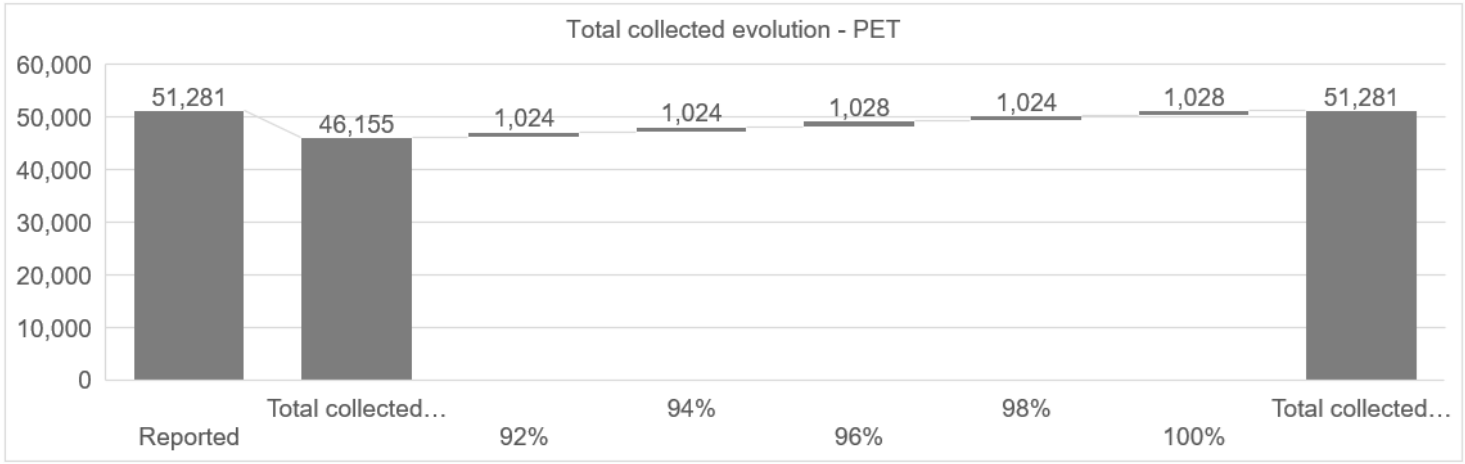
Collection rate	98%	Year	Investment cost	Operational cost	Litter cost	Total cost	Unredeemed deposits	Recycling revenue	Total income	Yearly result	Cumulative reserve
Reported	512,806	2023	-16,036,413.69	-68,007,088.45	-3,474,728.93	-87,518,231.06	13,008,163.80	50,558,292.78	63,566,456.58	-23,951,774.48	-23,951,774.48
Blue bag	459,170	2024	-40,611,664.00	-74,731,029.18	-3,474,728.93	-118,817,422.11	13,008,163.80	50,558,292.78	63,566,456.58	-55,250,965.53	-79,202,737.23
Public blue bins	43,359	2025	-31,629,113.00	-80,012,532.80	-3,474,728.93	-115,116,374.73	13,008,163.80	50,558,292.78	63,566,456.58	-51,549,918.15	-130,752,645.35
Litter	10,276	2026	-14,278,532.00	-82,291,721.47	-3,474,728.93	-100,044,982.39	13,008,163.80	50,558,292.78	63,566,456.58	-36,478,525.81	-167,231,163.56
		2027	-10,324,155.00	-84,000,801.38	-3,474,728.93	-97,799,685.31	13,008,163.80	50,558,292.78	63,566,456.58	-34,233,228.73	-201,464,379.77
		2028	-5,606,613.00	-84,976,256.88	-3,474,728.93	-94,057,598.81	13,008,163.80	50,558,292.78	63,566,456.58	-30,491,142.23	-231,955,510.13
		2029	0.00	-84,976,256.88	-3,474,728.93	-88,450,985.81	13,008,163.80	50,558,292.78	63,566,456.58	-24,884,529.23	-256,840,026.47
		2030	0.00	-84,976,256.88	-3,474,728.93	-88,450,985.81	13,008,163.80	50,558,292.78	63,566,456.58	-24,884,529.23	-281,724,542.81
		2031	0.00	-84,976,256.88	-3,474,728.93	-88,450,985.81	13,008,163.80	50,558,292.78	63,566,456.58	-24,884,529.23	-306,609,059.16
		2032	0.00	-84,976,256.88	-3,474,728.93	-88,450,985.81	13,008,163.80	50,558,292.78	63,566,456.58	-24,884,529.23	-331,493,575.50
		TOTAL	**-118,486,490.69**	**-813,924,457.68**	**-34,747,289.30**	**-967,158,237.65**	**130,081,638.00**	**505,582,927.80**	**635,664,565.80**	**-331,493,671.85**	**-2,011,225,413.46**

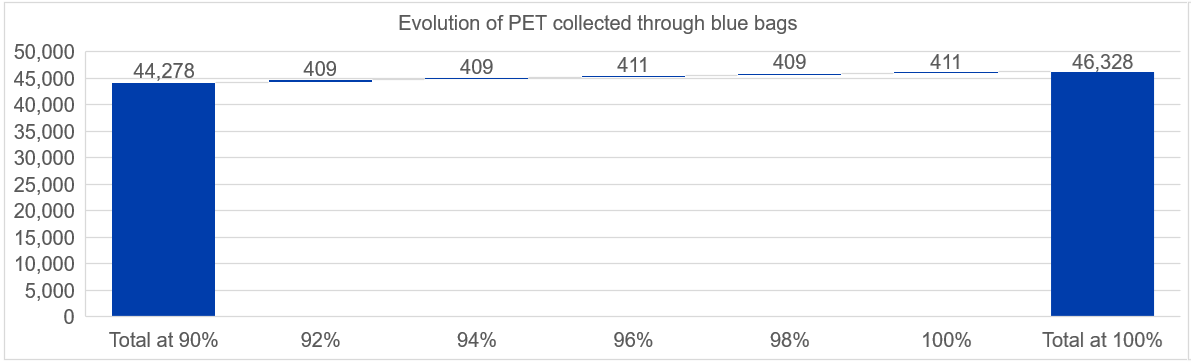
Collection rate	100%	Year	Investment cost	Operational cost	Litter cost	Total cost	Unredeemed deposits	Recycling revenue	Total income	Yearly result	Cumulative reserve
Reported	512,806	2023	-16,036,413.69	-69,497,659.90	0.00	-85,534,072.59	0.00	51,109,278.33	51,109,278.33	-34,424,794.25	-34,424,794.25
Blue bag	463,281	2024	-40,611,664.00	-75,999,404.21	0.00	-116,611,068.21	0.00	51,109,278.33	51,109,278.33	-65,501,789.88	-99,926,584.21
Public blue bins	49,525	2025	-31,629,113.00	-81,095,920.49	0.00	-112,725,033.49	0.00	51,109,278.33	51,109,278.33	-61,615,755.16	-161,542,342.52
Litter	-	2026	-14,278,532.00	-83,317,059.77	0.00	-97,595,591.77	0.00	51,109,278.33	51,109,278.33	-46,486,313.43	-208,028,665.46
		2027	-10,324,155.00	-84,983,724.19	0.00	-95,307,879.19	0.00	51,109,278.33	51,109,278.33	-44,198,600.86	-252,227,272.73
		2028	-5,606,613.00	-85,933,079.73	0.00	-91,539,692.73	0.00	51,109,278.33	51,109,278.33	-40,430,414.40	-292,657,692.86
		2029	0.00	-85,933,079.73	0.00	-85,933,079.73	0.00	51,109,278.33	51,109,278.33	-34,823,801.40	-327,481,497.98
		2030	0.00	-85,933,079.73	0.00	-85,933,079.73	0.00	51,109,278.33	51,109,278.33	-34,823,801.40	-362,305,303.10
		2031	0.00	-85,933,079.73	0.00	-85,933,079.73	0.00	51,109,278.33	51,109,278.33	-34,823,801.40	-397,129,108.22
		2032	0.00	-85,933,079.73	0.00	-85,933,079.73	0.00	51,109,278.33	51,109,278.33	-34,823,801.40	-431,952,913.34
		TOTAL	**-118,486,490.69**	**-824,559,166.21**	**0.00**	**-943,045,656.90**	**0.00**	**511,092,783.30**	**511,092,783.30**	**-431,952,873.58**	**-2,567,676,174.67**

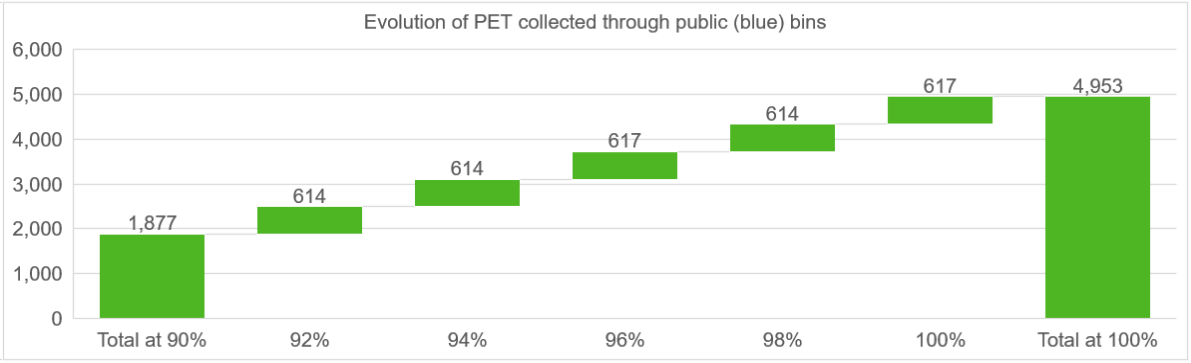
III. Financial layer

C. Sensitivity analysis - What is the impact of 2% increases in collection on collected volumes for PET under DDRS?

- The majority of PET is collected through blue bags (+/- 90% at 100% collection rate)
- With each increase of collection rate, on average an additional 1,025 tons of PET will be collected, of which
  - 40% is allocated to the blue bags
  - 60% will be collected through public (blue) bins



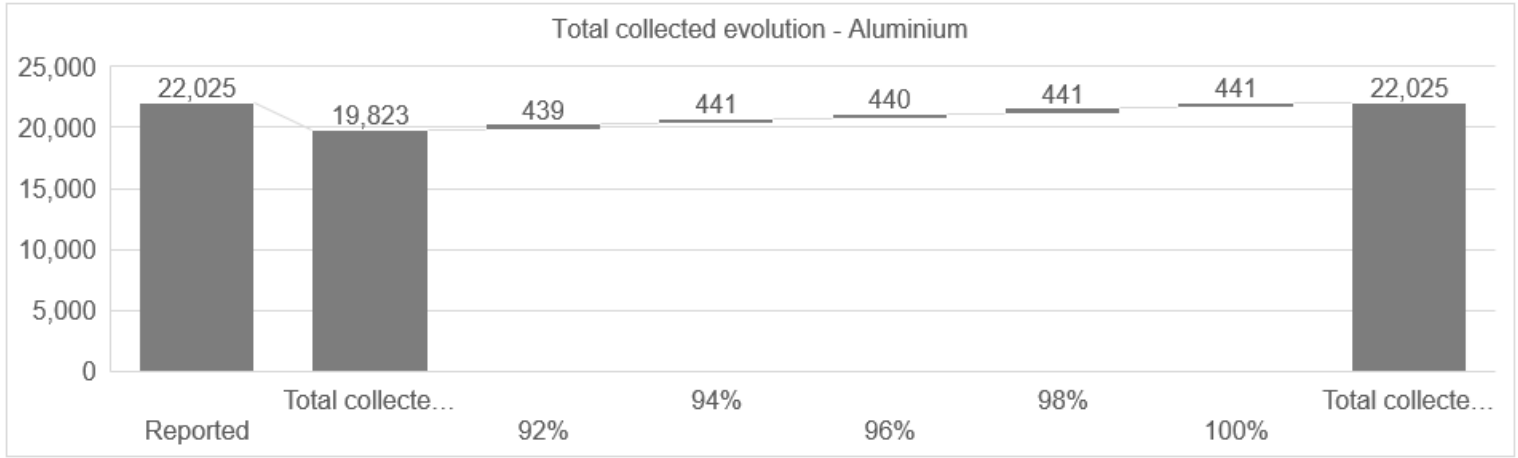


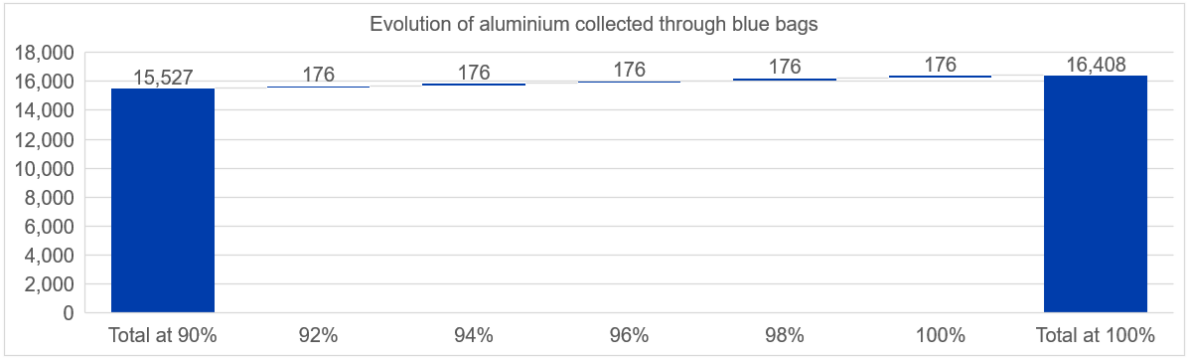


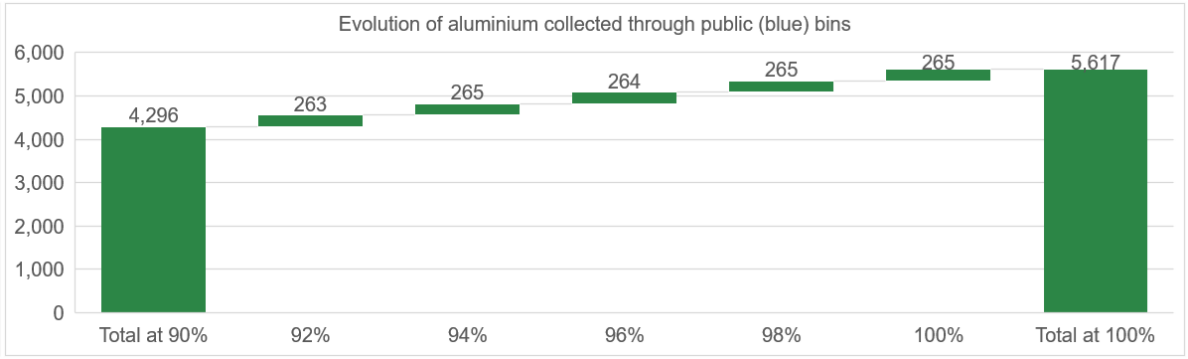
III. Financial layer

C. Sensitivity analysis - What is the impact of 2% increases in collection on collected volumes for Aluminium under DDRS?

- The majority of aluminium is collected through blue bags (+/- 74% at 100% collection rate)
- With each increase of collection rate, on average an additional 440 tons of aluminium will be collected, of which
  - 40% is allocated to the blue bags
  - 60% will be collected through public (blue) bins



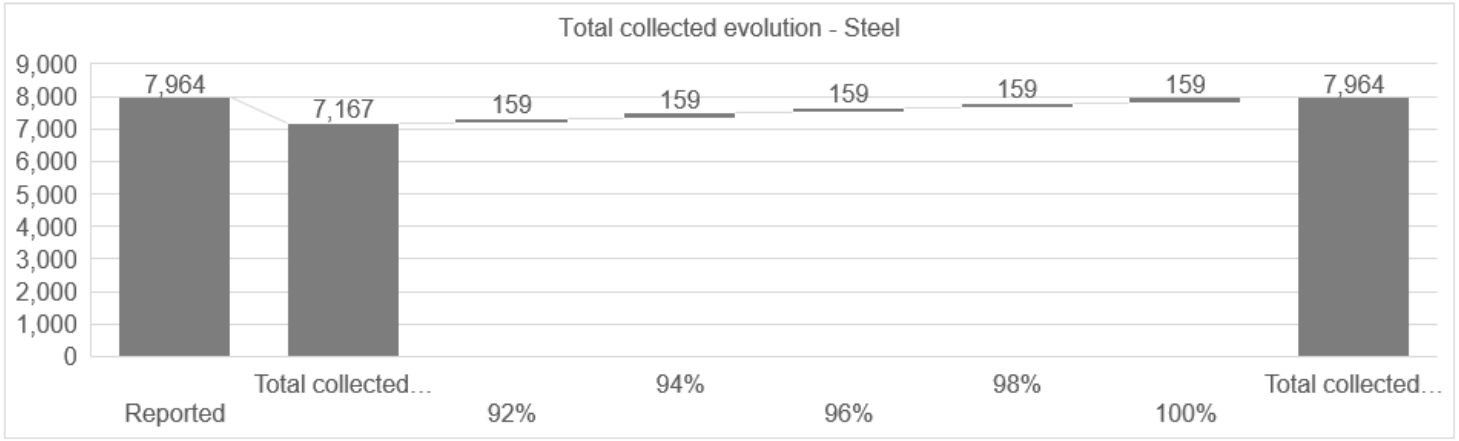


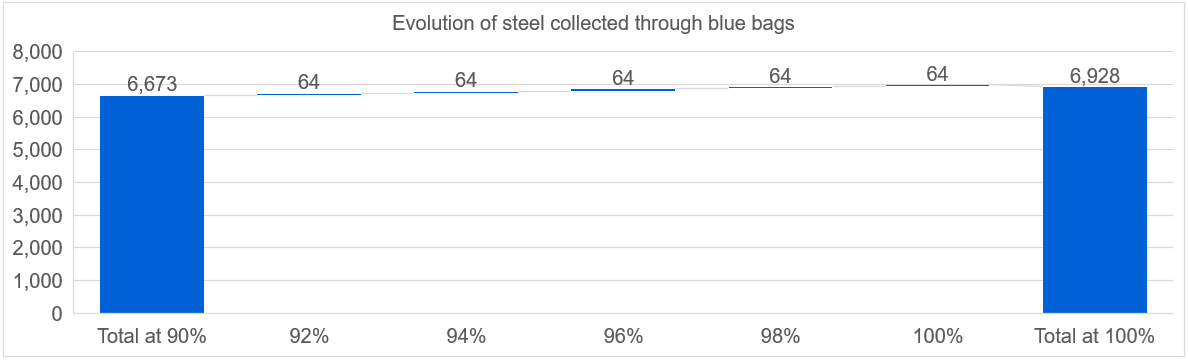


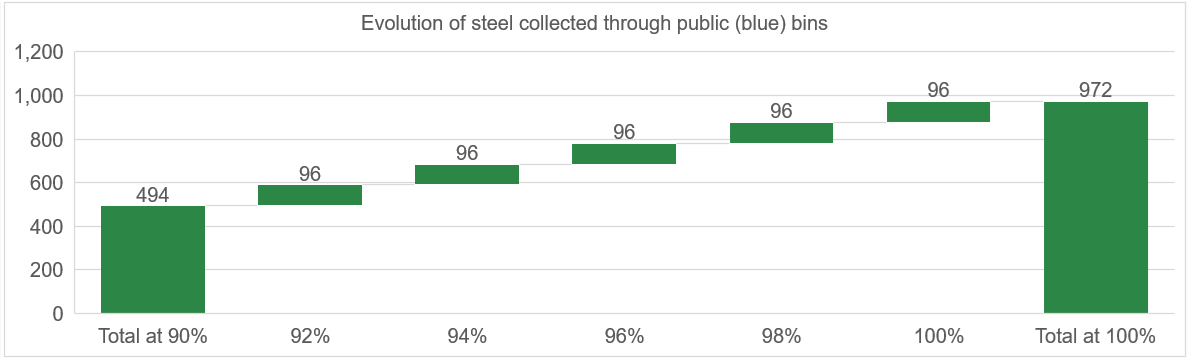
III. Financial layer

C. Sensitivity analysis - What is the impact of 2% increases in collection on collected volumes for Steel under DDRS?

- The majority of steel is collected through blue bags (+/- 84% at 100% collection rate)
- With each increase of collection rate, on average an additional 159 tons of steel will be collected, of which
  - 40% is allocated to the blue bags
  - 60% will be collected through public (blue) bins





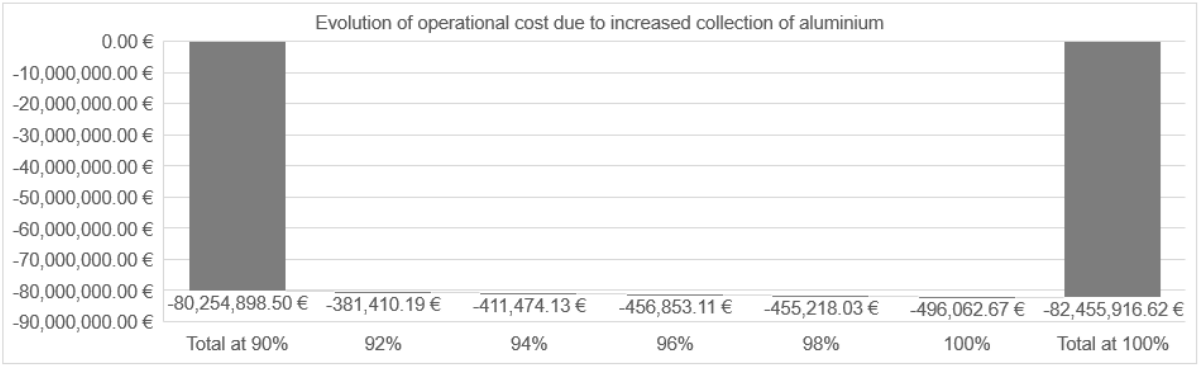


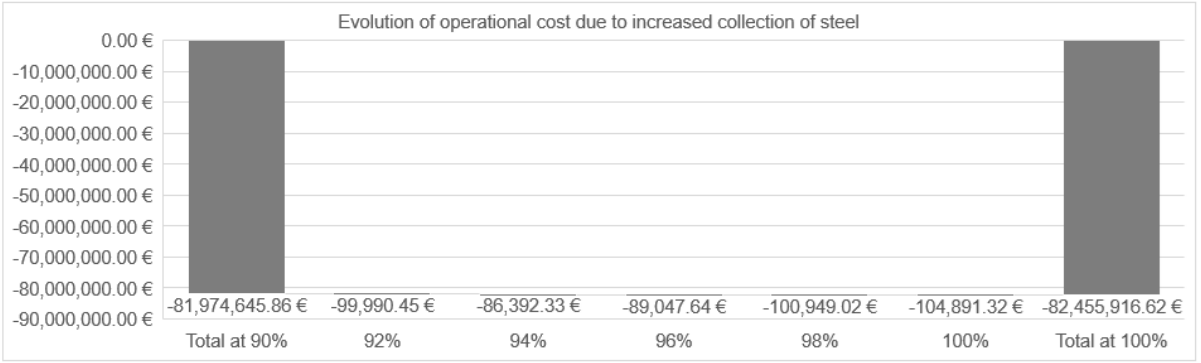
III. Financial layer

C. Sensitivity analysis - What is the impact of 2% increases in collection on operational cost for DDRS?

An overall increase in collection rate of 2% for all fractions, translates on average to an additional operational cost of 1,439,198.71 €

	PET	Aluminium	Steel
+2 % in volume	1,025 tons	440 tons	159 tons
Impact on cost	902,740.94 €	440,203.62 €	96,254.15 €
Additional cost per ton collected	880.72 €	1,000.46 €	605.37 €





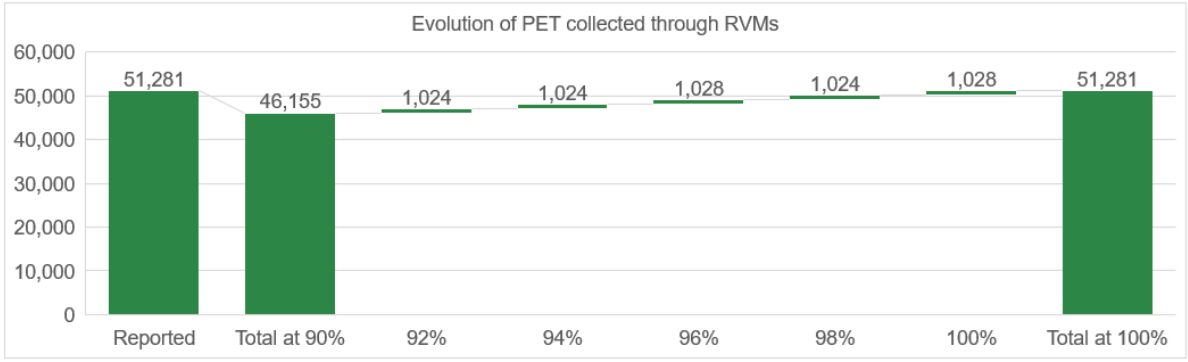
III. Financial layer

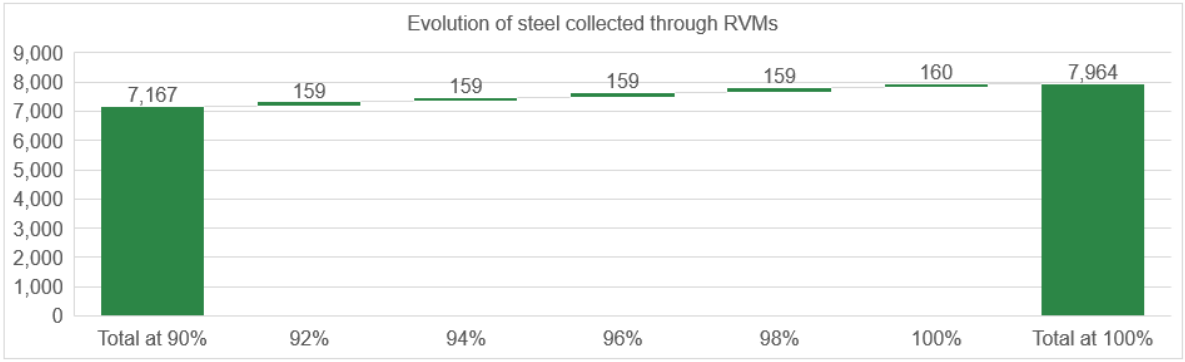
C. Sensitivity analysis - What is the impact of 2% increases in collection on collected volumes under DRS?

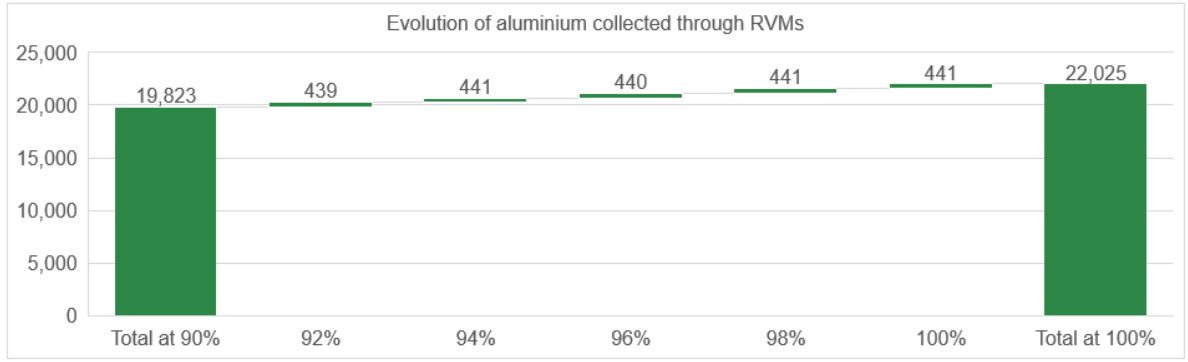
In the DRS, there is only one collection option, the RVMs. In terms of volumes, we observe the same pattern as with DDRS:

Across the various collection options, an increase of 2% in collection rate translates to (on average) an additional collection of:

- 1,025 tons of PET
- 440 tons of aluminium
- 159 tons of steel





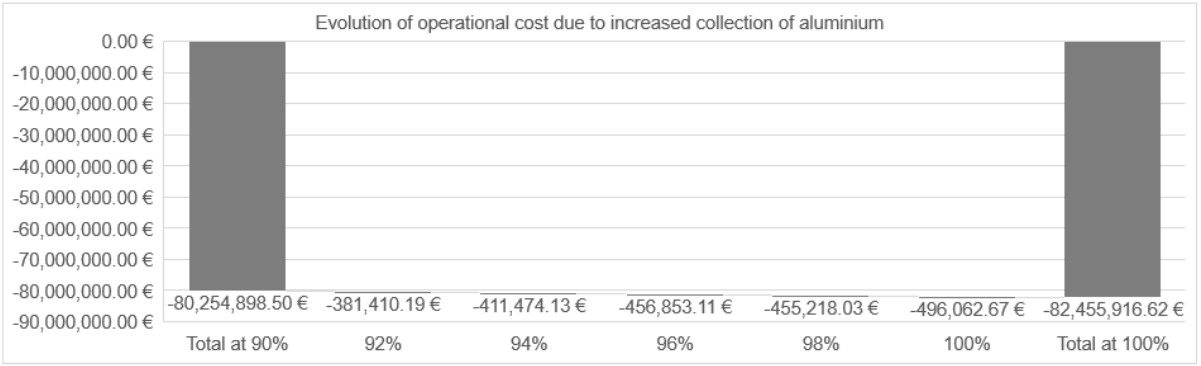


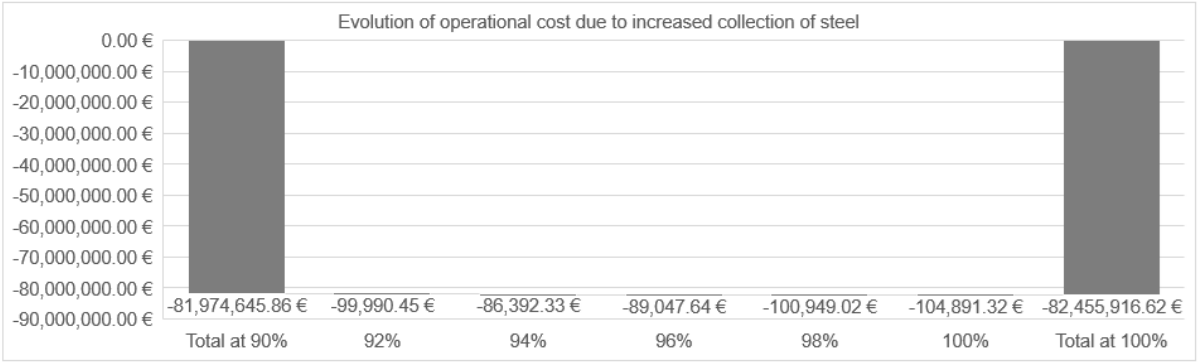
III. Financial layer

C. Sensitivity analysis - What is the impact of 2% increases in collection on operational cost for DRS?

An overall increase in collection rate of 2% for all fractions, translates on average to an additional operational cost of 1,907,087.77 €. This is 467,889.06 € more compared to the increased operational for DDRS.

	PET	Aluminium	Steel
+2 % in volume	1,025 tons	440 tons	159 tons
Impact on cost	1,165,210.52 €	632,664.70 €	109,212.55 €
Additional cost per ton collected	1,136.79 €	1,437.87 €	686.87 €



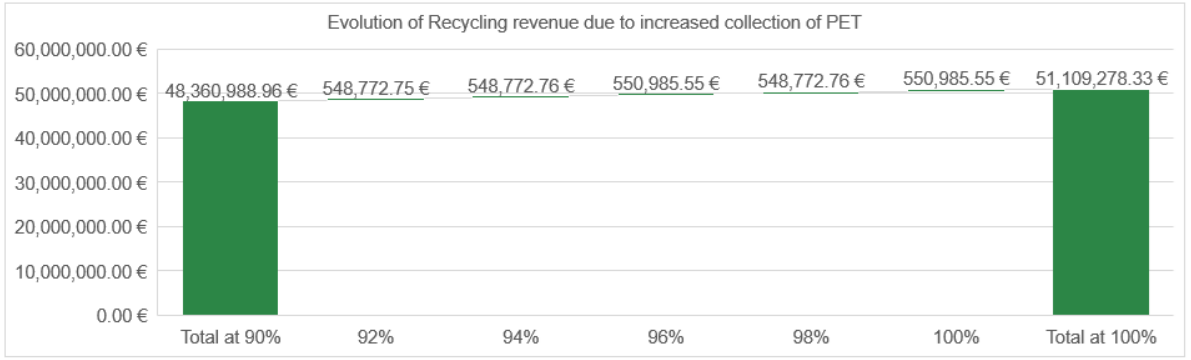


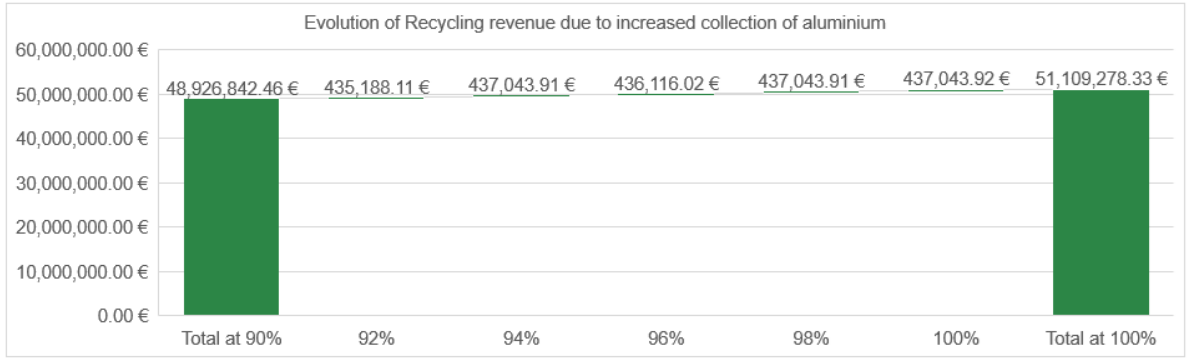
III. Financial layer

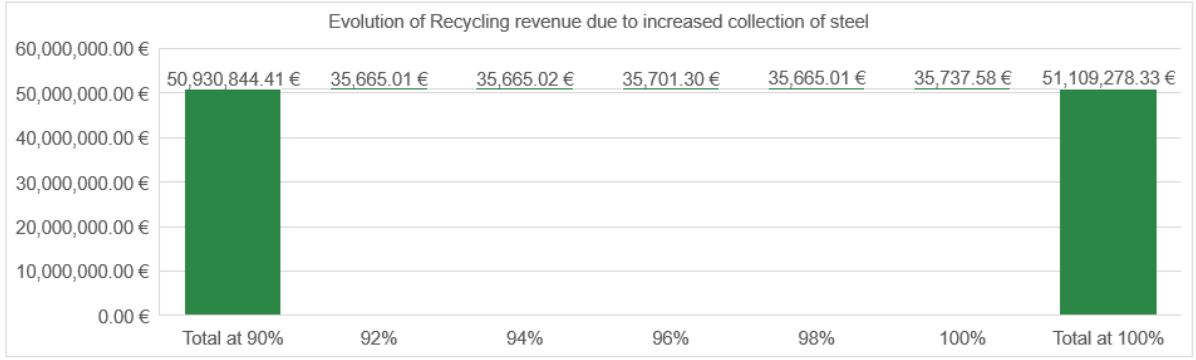
C. Sensitivity analysis - What is the impact of 2% increases in collection on recycling revenues for DDRS & DRS?

An overall increase in collection rate of 2% for all fractions, translates on average to an additional recycling revenue of 1,021,831.82 €. This is identical for DDRS & DRS.

	PET	Aluminium	Steel
+2 % in volume	1,025 tons	440 tons	159 tons
Impact on revenue	549,657.87 €	436,487.17 €	35,686.78 €
Additional revenue per ton collected	536.25 €	992.02 €	224.45 €





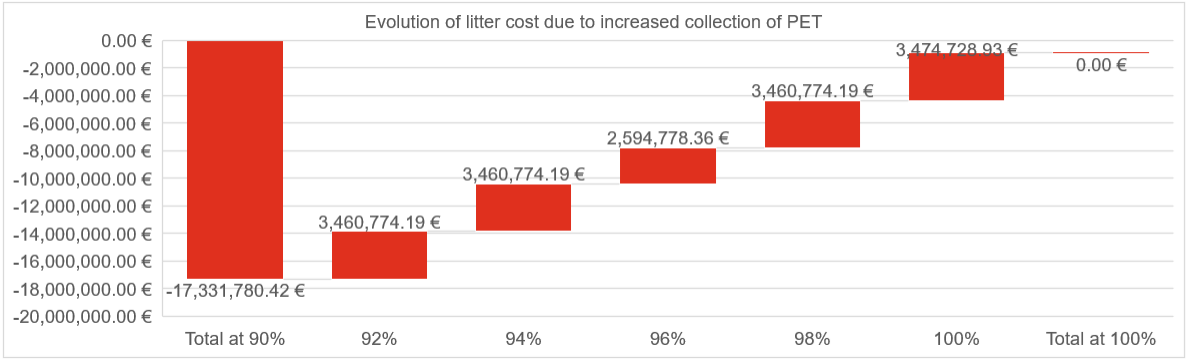


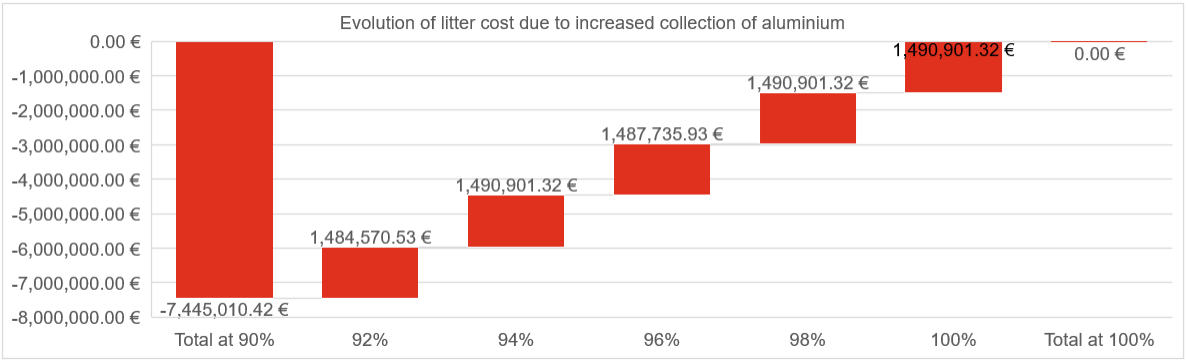
III. Financial layer

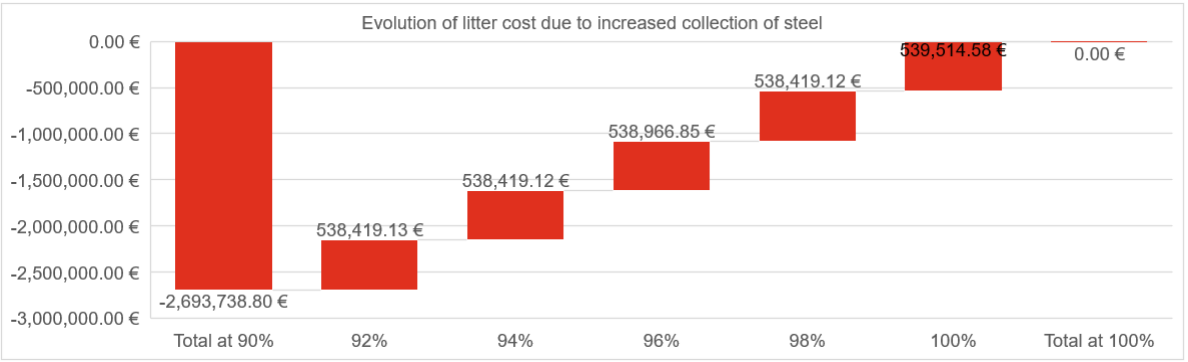
C. Sensitivity analysis - What is the impact of 2% increases in collection on litter cost for DDRS & DRS?

An overall increase in collection rate of 2% for all fractions, translates on average to a decrease in litter cost of 5,318,115.81 €. This is identical for DDRS & DRS.

	PET	Aluminium	Steel
+2 % in volume	-1,025 tons	-440 tons	-159 tons
Impact on litter cost	3,290,365.97 €	1,489,002.08 €	538,747.76 €
Additional revenue per ton collected	3,210.11 €	3,384.10 €	3,388.35 €





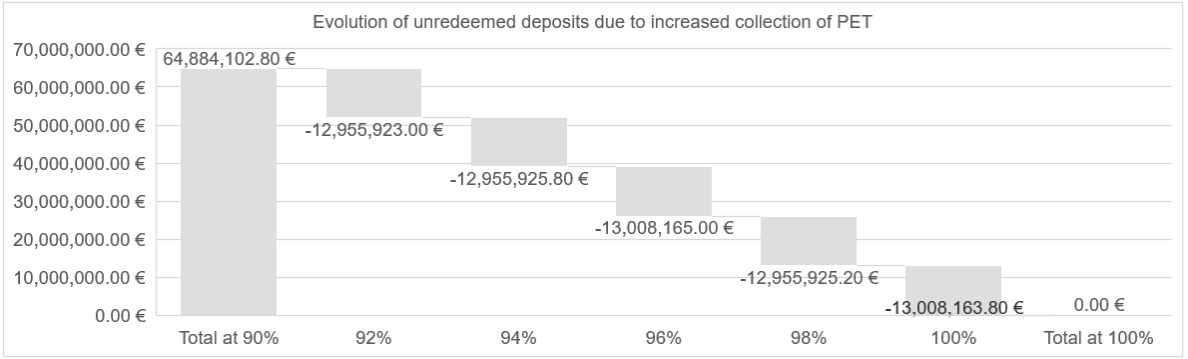


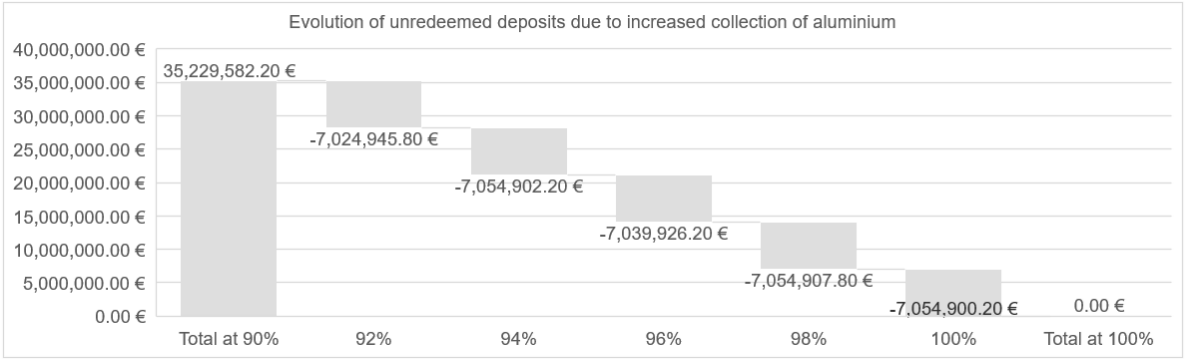
III. Financial layer

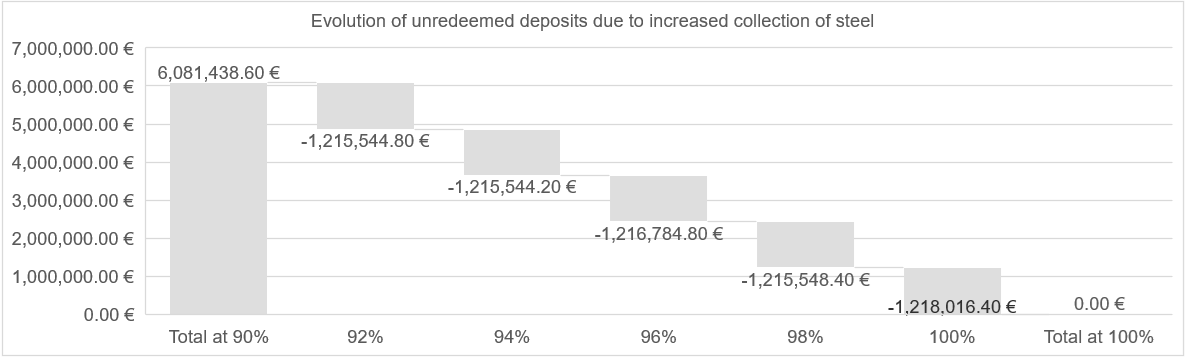
C. Sensitivity analysis - What is the impact of 2% increases in collection on unredeemed deposits for DDRS & DRS?

An overall increase in collection rate of 2% for all fractions, translates on average to a decrease in unredeemed deposits of 21,239,024.72 €. This is identical for DDRS & DRS.

	PET	Aluminium	Steel
+2 % in volume	-1,025 tons	-440 tons	-159 tons
Impact on unredeemed	-12,976,820.56 €	-7,045,916.44 €	-1,216,287.72 €
Reduced revenue per ton collected	-12,660.31 €	-16,013.45 €	-7,649.61 €







III. Financial layer

C. Sensitivity analysis - Conclusion DDRS vs DRS - Impact on operational cost under increased collection*

DDRS			
	PET	Aluminium	Steel
+2 % in volume	1,025 tons	440 tons	159 tons
Impact on cost	902,740.94 €	440,203.62 €	96,254.15 €
Additional cost per ton collected	880.72 €	1,000.46 €	605.37 €

DRS			
	PET	Aluminium	Steel
+2 % in volume	1,025 tons	440 tons	159 tons
Impact on cost	1,165,210.52 €	632,664.70 €	109,212.55 €
Additional cost per ton collected	1,136.79 €	1,437.87 €	686.87 €

With every 2% increase in collection rate, the operational cost of DRS increase more rapidly compared to DDRS, while revenues from recycling & unredeemed deposits increase and litter costs decrease at an equal rate between DDRS & DRS.

This means that improving the performance of DRS will be more costly compared to DDRS.

**Collection= the same collection rates (result) are used for DDRS and DRS. However the likelihood of this to happen primarily depends on the willingness and ability off the consumer to bring it back to the points of collection. This is primarily influenced by other cost sensitive dimensions (accessibility in location, in time and # of collection points). Those are downplayed in the current DRS mode at the side of the producers which implies that there are no similar conditions created for the end use (cost goes up). At the same time it limits the easiness of capturing on the go consumption.*

III. Financial layer

D. Impact of (D)DRS on the cost for other household packaging collected through the blue bag

Under a DRS, a significant volume will disappear from the blue bag

	Declared beverage packaging	% of category	% of total declared
PET - Colorless	39,019	85%	12.94%
PET - Blue	8,995	94%	2.98%
PET - Green	3,266	93%	1.08%
Alu	22,025	72%	7.30%
Steel	7,964	21%	2.64%
			26.95%

If we redistribute the current total cost based on the remaining volumes after implementation of DRS, there could a an **increase of cost for the other fractions of +37% in addition to the contribution today.**

Over time, the cost for the other fractions could reduce again, depending on the consumer's behaviour and the organisation of collection.

III. Financial layer

E. Items to be further developed after blueprint phase (Go-decision for DDRS)

The blueprint identifies amongst other following finance-related items that require attention after decision on the DDRS solution.

Items	
Financing strategy	● Analysis of the need for an “industry fee” (e.g. to cover the difference between costs & revenue) ● Analysis of the need for an “handling fee” for local authorities (bin management) ● Impact on/ of Green Dot contribution (blue bag) and other (e.g. SUP), including alignment ● Cash flow impact management in function of deposit payments ● Integrated financing strategy for all different obligations
Deposit value	● Decision on the amount paid by the consumer (deposit) ○ Variable deposit over time or stable ○ Differentiated deposit for different beverage packaging based on size or other characteristics ● Incentive for consumers to return beverage packaging not in the DDRS scope (e.g. scrap value, cross-border shopping)
Deposit transactions	● Engagement with transaction service providers or banks to establish agreement ● Estimation of cost related to transaction unders DDRS (grouped or individual transactions)

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V. Stakeholder layer

A. Impact matrix of the DDRS

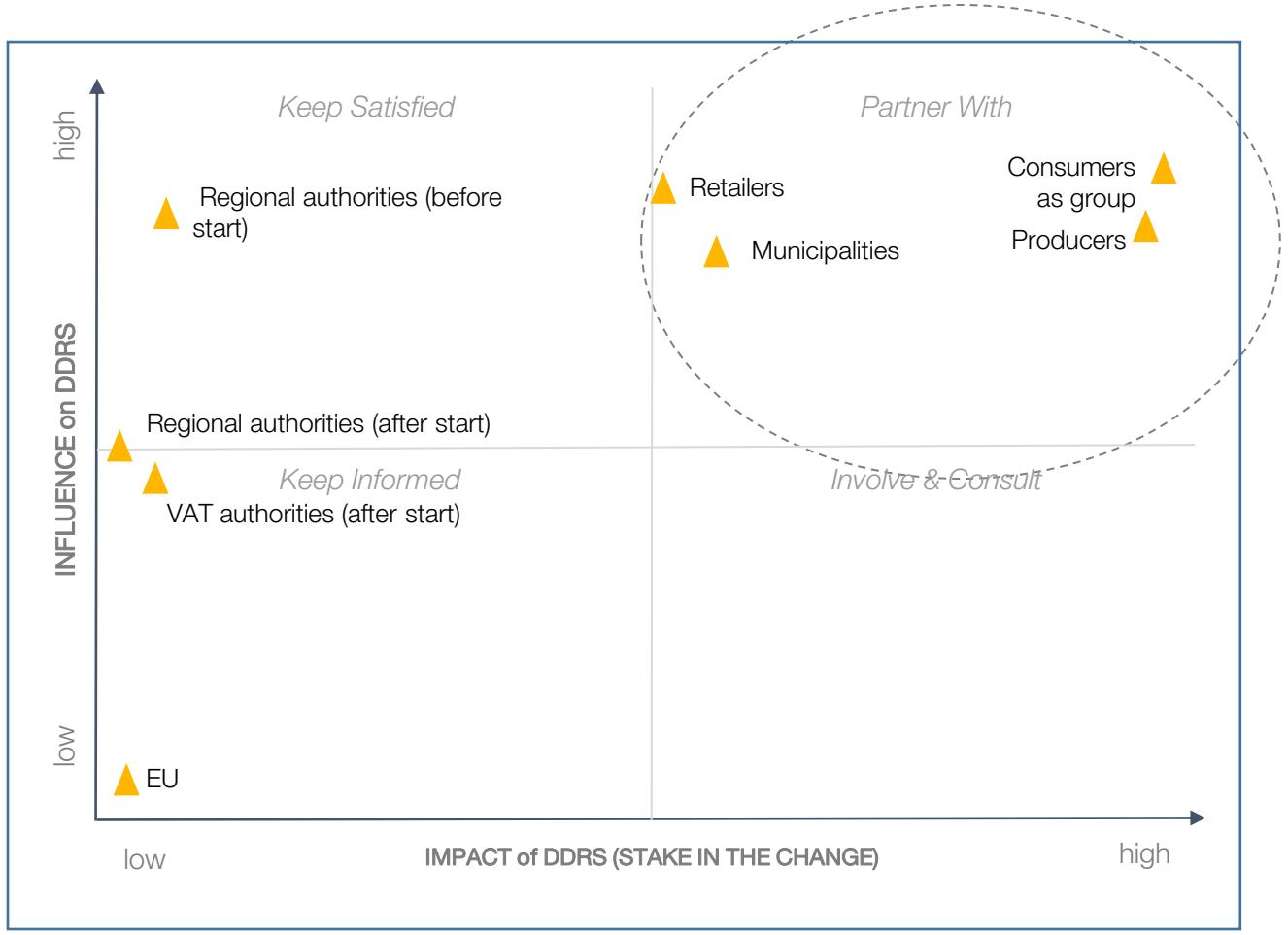
Comment: The overview does not contain all subgroups within stakeholder groups (e.g. consumers/ retailers). They have been identified in the various sub-chapters of the blueprint study, wherever relevant.

Stakeholder Group	Impact of DDRS	Influence on DDRS	Comments
Beverage producers and retailers (private label) or importers	High	High	Additional step during production/ packaging of the product because of printing/ stickering of the unique code on the packaging; reporting to DDRS system of PoM. Adaptation cost varies from low to high (depending on various parameters which are different from company to company) in relation to a.o. set-up and technology status)
Retailers as PoS	Medium	High	Required for the activation of the deposit code; Adaptation effort is minimal to medium for all PoS.
Consumers as group	High	High	Prefinances the deposit/ Structural change in behaviour required; effort depends on the collection mean (current blue bag system v. on the go disposal). Access, easiness and comfort are key requirements
Regional authorities	Low	High	Required to develop legislative framework to ensure level playing field and various stakeholder commitments for the DDRS
Municipalities/ IC	Medium	High	Important role for an efficient roll-out of the DDRS (e.g. permits and/ or localisation/ placement of public blue bins, distribution of home scanners to digitally impaired); depending on the finale operational set up a role in the operations (bin handling/ management)
Central VAT authorities	Low	Medium	Agreement needed for DDRS to be treated as as classic deposit (outside scope of VAT)
EU/ Regulatory Bodies	Low	Low	Indirect impact through upcoming/current legislative frameworks

V. Stakeholder layer

A. Impact matrix of the DDRS

Stakeholder Group	Impact of DDRS	Influence on DDRS
Beverage producers and retailers (private label) or importers	High	High
Retailers as PoS	Medium	High
Consumers as group	High	High
Regional authorities	Low	High
Municipalities/ IC	Medium	High
Central VAT authorities	Low	Medium
EU/ Regulatory Bodies	Low	Low



V. Stakeholder layer

B. Items to be further developed after blueprint phase (Go-decision for DDRS)

Generic: Structural development of an integrated outreach strategy is required to create consistent, effective and efficient implementation of DDRS

Stakeholders	Sample of topics to further developed/ co-created
Beverage producers and retailers (private label) or importers	• Detailed impact assessment for small-medium sized beverage producers is needed • Industry-wide agreement on data structure, printing standards, label information
Retailers/ Commercial PoS	• Detailed impact assessment for small-medium sized retailers/ commercial PoS is needed • Will need to be involved in discussions on unique codes
Consumers as group	• Structural engagement is needed with the consumers, as they will be the end-user of the DDRS • Impact assessment of decisions on ease of use, access and comfort for the consumer
Regional authorities	• Engage with regional authorities to obtain insight in their expectations of the DDRS & obtain their buy-in for implementation
Municipalities/ IC	• Agreement is needed for placement of public blue bins and subsequent operational management
Central VAT authorities	• Need for an agreement with the central VAT authorities on VAT treatment
EU/ Regulatory bodies	• Analysis on potential infringement on “free movement of goods” as a result of mandatory unique codes for the Belgian market. • Analysis of opportunities to receive EU funding (subsidies) to develop the DDRS

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VI. Legal layer

A. GDPR considerations for DDRS – Applicability

Is the GDPR legislation applicable for the implementation and use of a DDRS ?

GDPR comes into place when processing happens – "Processing means any operation or set of operations performed upon personal data or sets of personal data (...)" [(1)].

Data Processing for DDRS

- Data will be collected via/ in collaboration with public and administrative entities for the digitally impaired users (i.e. home scanner)
- Data will be used in order to allow DDRS NPO to perform contractual obligations towards customers, but also towards producers
- DDRS NPO will process data linked to customer habits, as well as other data such as bank account details, geo-localisation, etc.

- Should DDRS not be GDPR compliant or should the data be inaccurate/… DDRS NPO risks to face:
  - Administrative or criminal fines imposed by a Supervisory Authority
  - Order to cease the processing activities underlying the system (and to terminate the DDRS as such)
  - Contractual liability towards and claims from consumers, other partners
- If the conditions outlined in this section are fulfilled, DDRS can be fully GDPR compliant.

[(1)] See appendix for detailed characterization of personal data

VI. Legal layer

A. GDPR considerations for DDRS – Type of processing activities that will apply to DDRS

Non-limitative and illustrative list of processing activities falling under the scope of the DDRS NPO:

- Creation, maintenance and deletion of a customer account (online or via app)*
- Creation, maintenance and deletion of a customer account (via municipalities)
- Registration of the user activity (scan of tags) on the account*
- Payment services*

Additional processing activities that might take place in relation to DDRS:

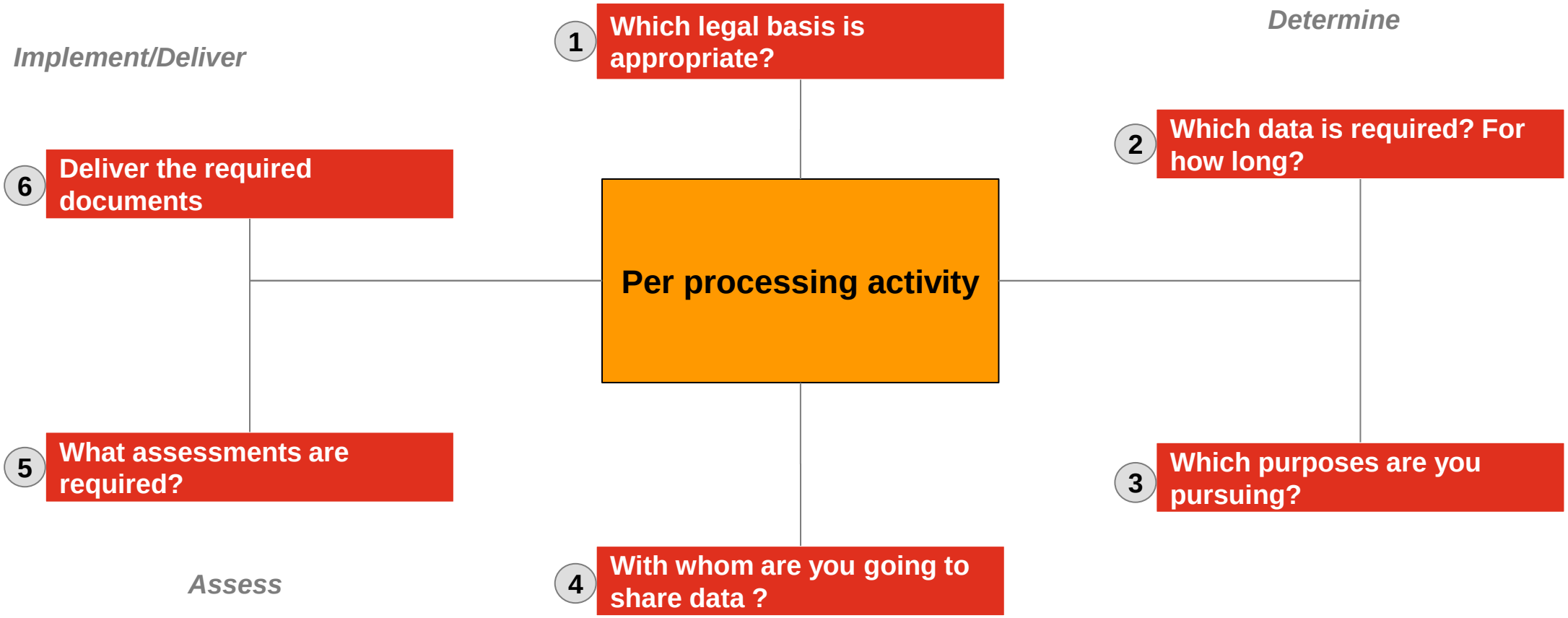
- Monitoring of performance of DDRS
- Fraud detection
- Claims and litigation
- Reuse of data for commercial purposes
- ….

Based on the current DDRS blueprint, we have determined that the above listed processing activities may occur throughout the DDRS operations. This non-exhaustive list might however be expanded during the course of our further analysis / the development of the project.
For example : the creation of a CRM, the storage of data for accountability purposes,…

VI. Legal layer

A. GDPR considerations for DDRS – GDPR Compliance Framework

Determination and assessment consists of…



VI. Legal layer

A. GDPR considerations for DDRS – GDPR Compliance Framework

For each processing activity DDRS NPO should…

1. **Determine the correct legal basis to collect personal data**

Without legal basis, your processing activity is not lawful, meaning that DDRS NPO could face fines or an injunction to cease the activity.

Option 1: Consent — For non-necessary optional features

Processing activities are allowed insofar the data subject has freely, specifically and unambiguously consented to them.

Question at stake: Is consent freely given in the framework of DDRS?

Risk: What to do when Data Subject retracts consent?

Option 2: Performance of a contract — For the core features

Processing activities are allowed insofar they are strictly necessary for the performance of a contract concluded between the data controller (DDRS) and the Data Subject

Question at stake: There must be a contractual relationship between DDRS NPO and the data subject?

Option 3: Legitimate interest — For additional features

Processing activities are allowed insofar the DDRS NPO has a legitimate interest to process such data (not overruled by a contradictory legitimate interest of Data Subject)

Deliverable: Perform a legitimate interest assessment

VI. Legal layer

A. GDPR considerations for DDRS – GDPR Compliance Framework

For each processing activity DDRS NPO should…

2. Determine the data transfers

When sharing/acquiring/making data available to third parties → DDRS has a specific responsibility of making sure this happens in a GDPR compliant manner

1. Determine the data flows with external parties

Question: In which situations will data be accessed from/ via third parties?
E.g., App developers, app providers, service providers supplying specific software applications

→ Manufacturer of cans, packaging company, organism which will be in charge of verification of the app/ refund to end user, specific financial payment service, …

2. Determine the GDPR role of those parties

- Data controller: determines purpose + way of processing
- Data processor: processes on behalf of data controller
- Joint data controller
- Separate data controller

→ Once the GDPR roles have been settled, appropriate data processing / sharing agreements should be established (implementation phase)

3. Determine when data is shared, stored or transmitted outside EEA

VI. Legal layer

A. GDPR considerations for DDRS – GDPR Compliance Framework

For each processing activity DDRS NPO should…

3. Undertake compulsory assessments under GDPR

When sharing/acquiring/making data available to third parties → DDRS has a specific responsibility of making sure this happens in a GDPR compliant manner

1. Data protection impact assessment (DPIA)

- Required in case of "high risk processing operations"
  - E.g. DDRS NPO ("innovative technology")
- To be conducted before the processing of data
- To be considered as a living tool, not merely as a one-off exercise
- DPO should be involved

2. Legitimate interest assessment (LIA)

- Required in case "legitimate interest" is being invoked as lawful base to process data
  - E.g. longer retention of data for fraud prevention
- Used to identify what the exact legitimate interest is at stake + identity whether the processing is necessary for that legitimate interest

3. Transfer Impact Assessment (TIA)

- Concerns international transfer of personal data
  - E.g. cooperation with a cloud provider located outside the EU
- Used to clarify data privacy risks in case of transferring EU residents' data to countries without adequacy under the GDPR.
- Elaboration of a questionnaire to be completed by data importer or data exporter.

VI. Legal layer

A. GDPR considerations for DDRS – GDPR Compliance Framework

For each processing activity DDRS NPO should…

4. Collect data in a legal way (incl. Purpose and storage limitation)

→ Determine what data will be archived (and for how long) and what will be deleted

→ personal data may not be kept longer than is necessary for the purposes of the processing

1. Was the data subject properly informed ?

2. Has the collected data been minimalized in proportion to what is needed for the outpointed purpose? How will the data be collected ?

→ **verify whether data has been collected for specified, explicit, and legitimate purposes**

- E.g.: bank details can only be collected for effectuating the deposit reimbursement
- E.g.: a standard user account registration form often includes the question to provide birthplace and/or personal address → not necessary for purpose of processing

3. Determine retention policies

VI. Legal layer

A. GDPR considerations for DDRS – GDPR Compliance Framework

Main Deliverables

- **DDRS NPO is required to properly document and demonstrate the compliance of DDRS NPO with the GDPR key principles and requirements**
  - DPIA
  - RoPA (Record of Processing Activities)
  - Retention policy
  - Data breach notification scheme
- **DDRS NPO needs to inform the data subjects and handle their requests**
  - Privacy policy
  - DSR procedure (Data Subject Request)
- **In margin of the GDPR requirements, DDRS NPO needs to clearly delineate the rights and responsibilities of the users of the apps**

VI. Legal layer

B. High-level input VAT aspects - Legislative framework

STARTING POINT = European VAT Directive

TRANSPOSED into Belgian legislation

DEROGATES from EU Directive

DEPOSIT = outside scope VAT

Conditions deposit

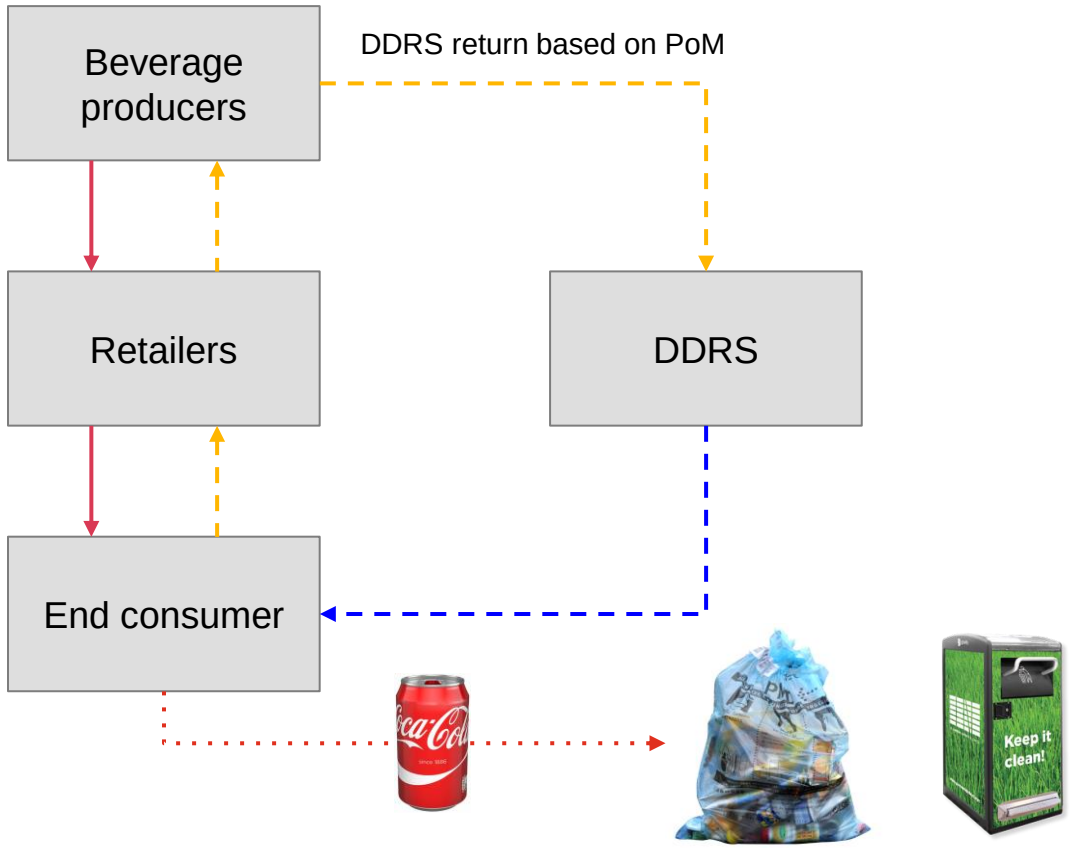
(A) It must be ordinary and customary packaging materials;

(B) It must be agreed that these packaging materials must or may be returned and the customer is entitled to a refund if he/she returns them.

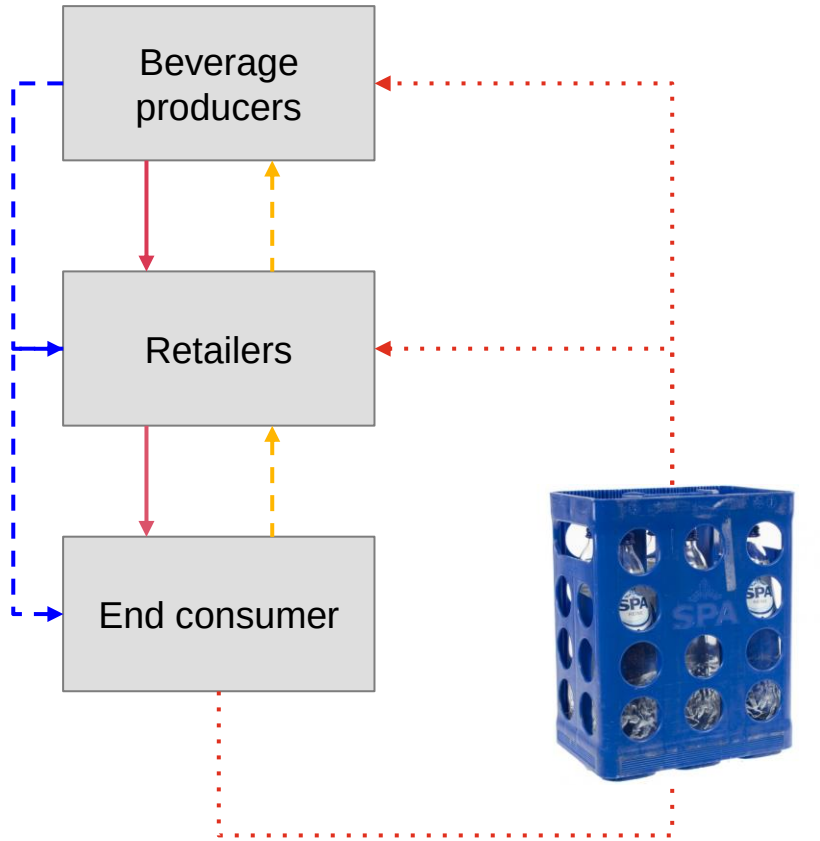
VI. Legal layer

B. High-level input VAT aspects

Simplified visualization of the proposed model



Traditional deposit model

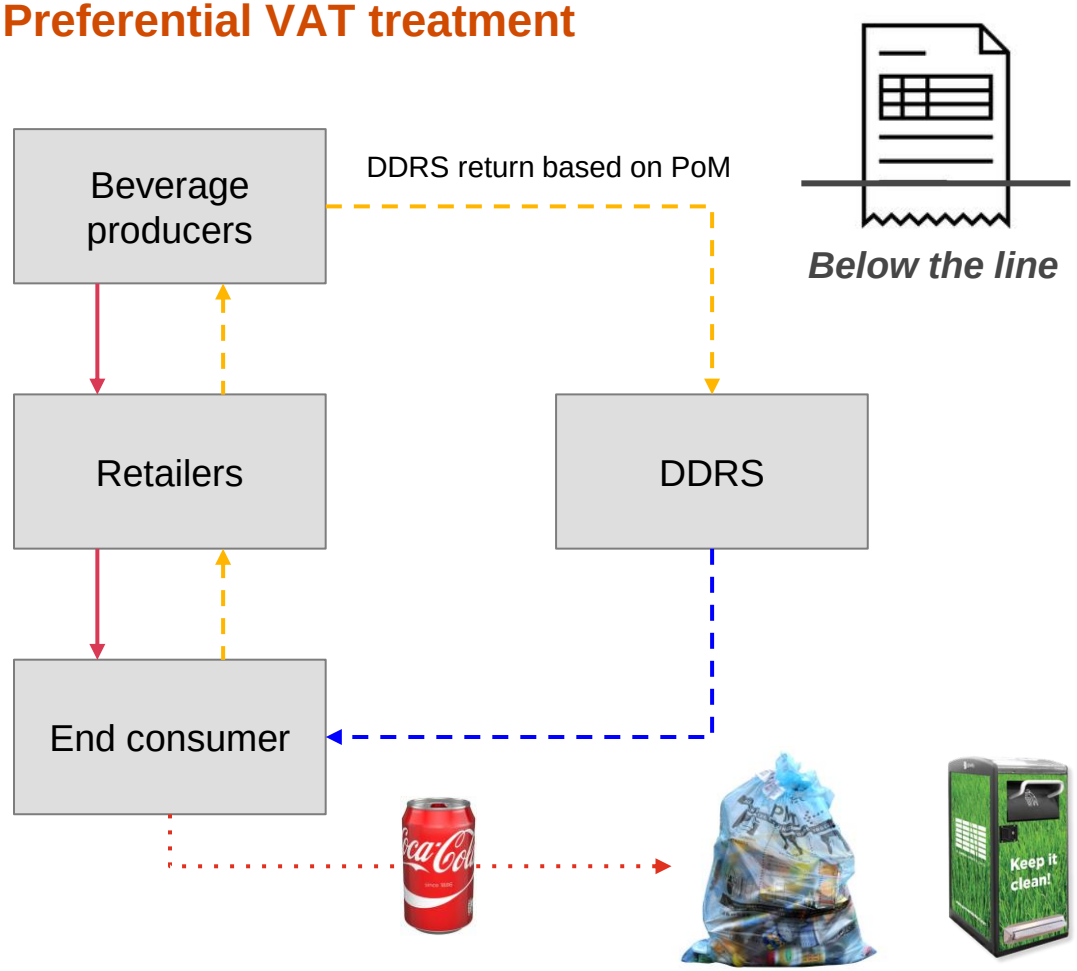


Sales flow
Deposit flow payment
Return package flow
Deposit flow refund

VI. Legal layer

B. High-level input VAT aspects

Preferential VAT treatment



DDRS as classic deposit outside scope of VAT

NEED for an agreement with the central VAT authorities

Parallel can be made to traditional system, where DDRS has taken the role of the producers

- Producers pay service fee to DDRS
- No VAT impact in B2B relation
- No distortion of competition (low value) (especially if mandatory)

Customer is guaranteed repayment upon return of the packaging materials

- Producers pay deposit to DDRS based on PoM declaration
- DDRS pays deposit to customer upon 'return'

Technical system set-up should prevent fraud

- Producers communicate the codes of products put on market
- Codes can only be activated at PoS upon sale at which time cross check is done against the codes communicated by producers
- Deposit can only be claimed back once per code
- 'Proof' of return will be captured in the system

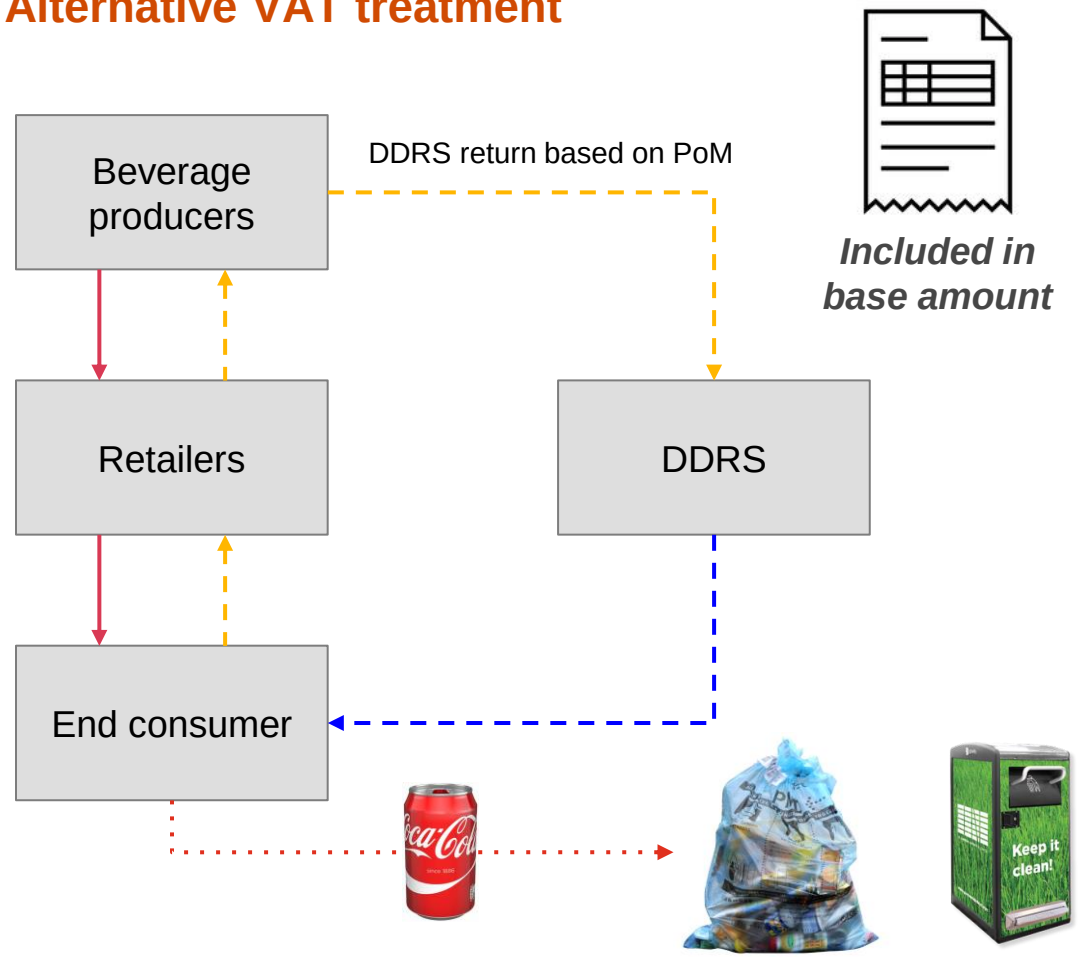
Recommendation to add value of deposit on ALU/PET to support the VAT treatment as a 'deposit'

Sales flow | Deposit flow payment | Return package flow | Deposit flow refund

VI. Legal layer

B. High-level input VAT aspects

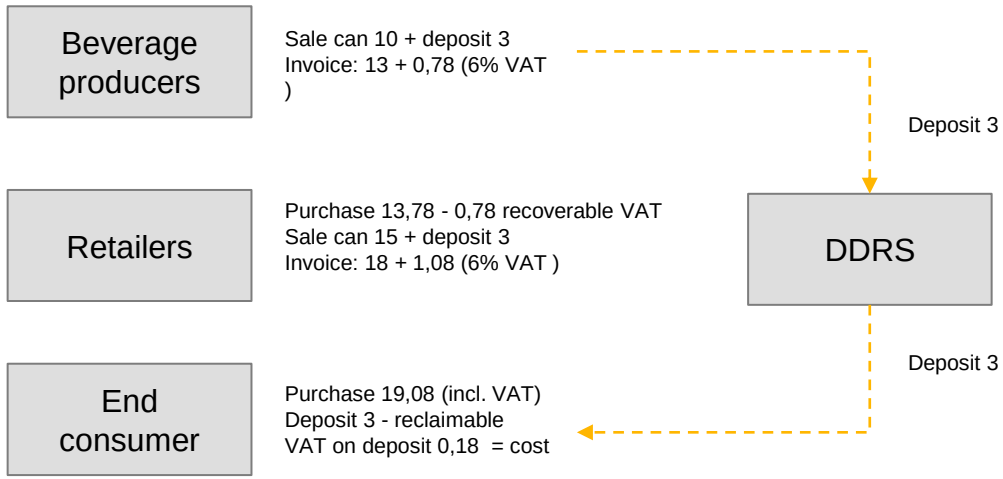
Alternative VAT treatment



DDRS as lost packaging cost

In case no positive agreement is reached with the TA

- DDRS is viewed upon as usual cost of packaging to be included in the base amount subject to Belgian VAT
- Additional cost end consumers: VAT on deposit



Sales flow
Deposit flow payment
Return package flow
Deposit flow refund

3

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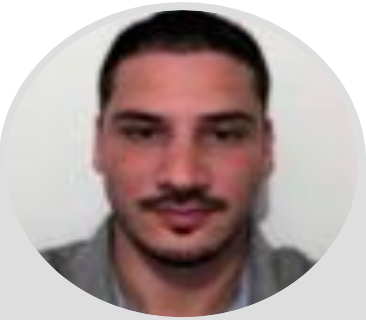

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4

Glossary

4. Glossary

DDRS	Digital Deposit Return Scheme
DRS	“Classic” Deposit Return Scheme
PoS	Point of Sale
RVM	Reverse Vending Machine
PoM	Put on Market
NFC	Near Field Communication
SUP	Single Use Plastics (Directive)
GS1	GS1 is a neutral, global collaboration platform that brings industry leaders, government, regulators, academia, and associations together to develop standards-based solutions to address the challenges of data exchange
DataMatrix	A DataMatrix is a two-dimensional code consisting of black and white "cells" or dots arranged in either a square or rectangular pattern
sGTIN	Serialized Global Trade Item Number
SSCC	Serial Shipping Container Code (SSCC) is an 18-digit number used to identify logistics units
MES	Manufacturing Execution System
UPC	Universal Product Code
API	Application Programming Interface
SME	Small-to-medium enterprise
IC	Intercommunale

Thank you!

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Annex

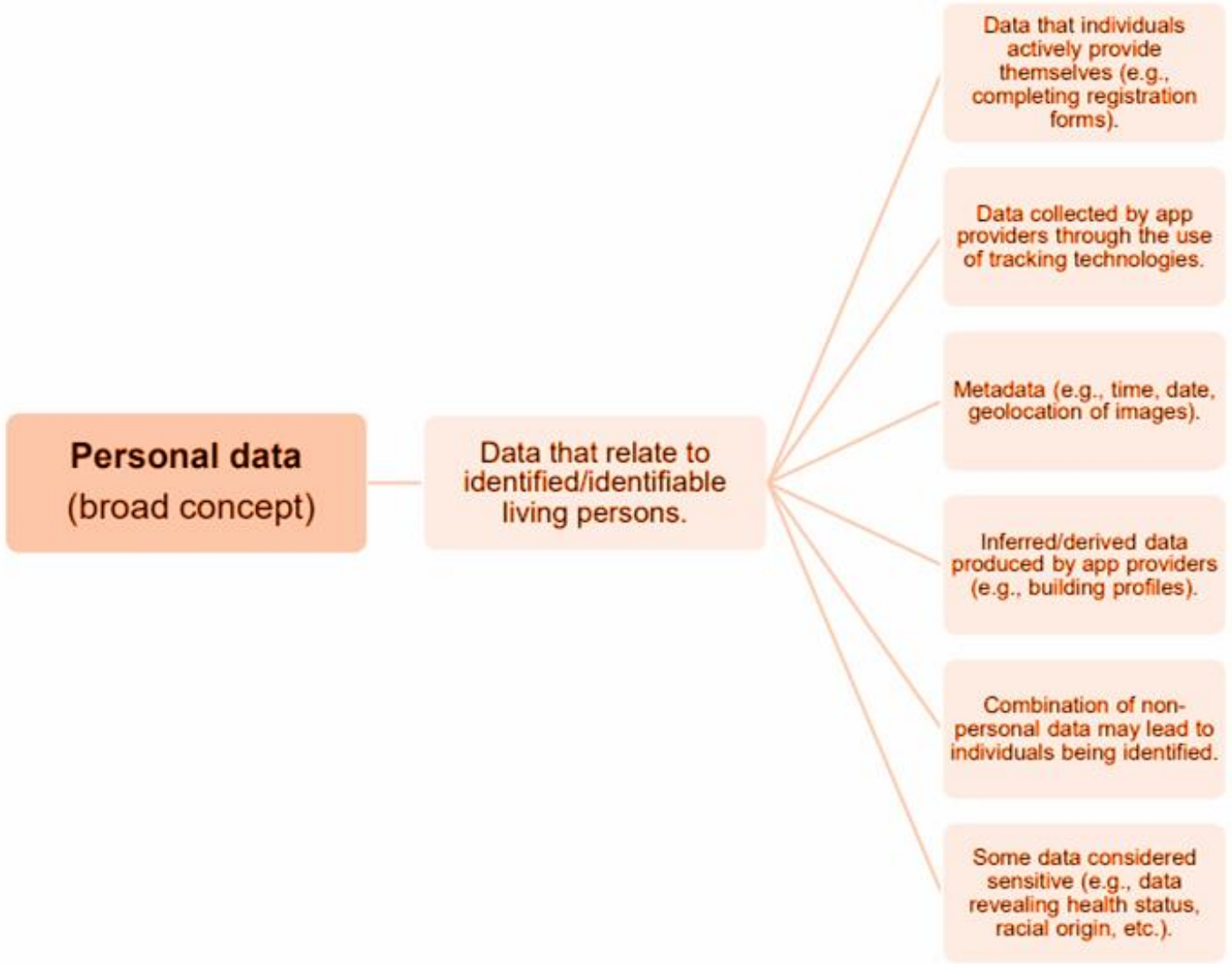
1

Additional information Legal

General: DDRS NPO entails processing of Personal Data

***Personally identifiable information (PII)**, which is any data that can be used to identify a specific individual such as:*

- *Basic identity information – name, address and ID numbers, email addresses, banking details*
- *Web data – location, IP address, cookie data, tags, login IDs, social media posts, or digital images*
- *Geolocation*
- *…*



Account creation, management & deletion

Data Collection

Data is collected directly from the user via App or registration form

- Determine legal basis
- Determine purpose
- Determine required data
- Privacy Policy

Creation of the account

After verification, an account is created within the DDRS

- Use of third parties?

Data transfer & storage

The information is stored at rest internally or via an external partner

- Determine third party transfers
- Data processing agreements

Account management

Account is used by the customer to update or modify his data.

- Data access management
- Data subject requests

Account deletion & data retention

Upon request of the user/absence of use, the account can be deleted. Data can be kept longer according to retention policy

- Retention policies
- Anonymisation of data
- Reuse of data

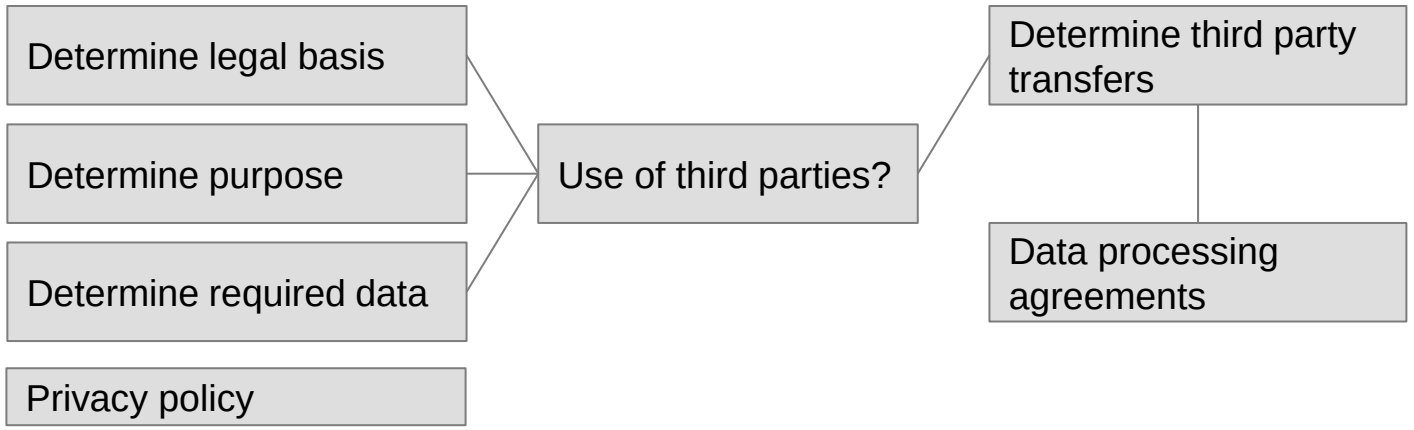
E-Deposit & Payment service

Activation of the Tag	Scan of the Tag	Credit of the account	Payment	Account deletion & data retention
Tag is activated at the PoS	Depending on the method of disposal, this information might come via various channels	Information on the account are updated	DDRS give instruction to the Payment Service Provider to proceed to payment.	Upon request of the user/absence of use, the account can be deleted. Data can be kept longer according to retention policy

- Data Minimisation
- Legal basis : performance of a contract
- Determine third party transfers
- If geolocalisation is collected: DPIA is needed
- Maximal data retention should be aligned with :
  - Legal obligations for accountability
  - DDRS NPO liability

Payment of the deposit

Deposit credit on specific account	Recovery of bank account	Instruction to payment service	Proof of payment	Account deletion & data retention
Data is collected directly from the user via App or registration form	Bank account number is retrieved	Instruction to payment to external service provider	Proof of payment is provided and stored in a specific place. It will be used in the framework of accountability/ claims.	Upon request of the user/absence of use, the account can be deleted. Data can be kept longer according to retention policy



- Data access management
- Data subject requests

- Retention policies
- Anonymisation of data
- Reuse of data

Claim of tag on a user account

Data collection	A.o. recovery of geolocation	Data transfer & storage	Proof of scanning	Account deletion & data retention
Data is collected directly from the user via App or registration form after scanning tag on bin	Geolocation is retrieved in case user scans QR code on bin	The information is stored at rest internally or via an external partner	Proof of scanning is provided and stored in a specific place. It will be used in the framework of accountability/ claims.	Upon request of the user/absence of use, the account can be deleted. Data can be kept longer according to retention policy

- Retention policies
- Anonymisation of data
- Reuse of data

2

Additional information Tax

VI. Legal layer

B. High-level input VAT aspects - Legislative framework: relevant jurisprudence

Article 92 EU VAT Directive 2006/112/EC

As regards the costs of returnable packaging material, Member States may take one of the following measures:

(a) exclude them from the taxable amount and take the measures necessary to ensure that this amount is adjusted if the packing material is not returned;
(b) include them in the taxable amount and take the measures necessary to ensure that this amount is adjusted if the packing material is in fact returned**.**

Transposed into article 28, 4° of the Belgian VAT code

The taxable base amount does not include

[…]

4° the costs of usual packaging materials if the supplier agrees to their reimbursement in the event of return of those packaging materials.

VI. Legal layer

B. High-level input VAT aspects - Legislative framework: relevant jurisprudence

Decision E.T. 12114 (nr 483) dd. 30.04.1974 (excerpt)

In order for the costs of packaging materials not to be included in the taxable amount, the following conditions are required:

1° it must be ordinary and customary packaging materials;
2° it must be agreed that these packaging materials must or may be returned and the customer is entitled to a refund if he returns them.

Conditions are assumed to be met if the statement “deposit” or a similar statement is mentioned on the invoice, insofar as this is in accordance with the parties’ understanding.

Parliamentary question nr. 326 De Clippele dd. 02.10.1991 (excerpt)

The Honorable Member will find below the list of the different groups of simplification measures in force in Belgium under Article 27 of the Sixth VAT Directive of 17 May 1977 (77/388/EEC) Z. Revue nr. 30, p. 266.
[...]
- Regulations in which the taxable amount is not revised:
[...]
b) Taxable amount does not need to be revised if the ordinary and customary packaging materials, of which the costs were not originally included, are not returned by the customer

VI. Legal layer

B. High-level input VAT aspects - Legislative framework: relevant jurisprudence

Article 27 of the Sixth Directive transposed into article 394 of EU Directive 2006/112/EC

Member States which, at 1 January 1977, applied special measures to simplify the procedure for collecting VAT or to prevent certain forms of tax evasion or avoidance may retain them provided that they have notified the Commission accordingly before 1 January 1978 and that such simplification measures comply with the criterion laid down in the second subparagraph of Article 395(1).

Explanatory Memorandum (extraordinary session - 1968 - 15 October 1968) (excerpt)

Article 28, 1° to 4°, does not introduce any novelty. Also in the current system of the transfer tax [edit: currently known as value added tax] are excluded from the taxable amount:

[...]

4° the sums of which the contract permits deduction for any return of packaging used for transport, whether or not such return takes place.

[continued on the next page]

VI. Legal layer

B. High-level input VAT aspects - Legislative framework: relevant jurisprudence

Explanatory Memorandum (extraordinary session - 1968 - 15 October 1968) (excerpt) (continued)

With regard to packaging materials, it should be noted that their taxation between taxable persons is without any interest in a VAT system. Indeed, if the costs of packaging materials were included in the taxable amount of the tax due on the delivery of the packaged goods, the return of those packaging materials would have to be refunded for the tax calculated on the price or its value value, which can only entail complications in the area of accounting and administration.

It is true that the ordinary and customary packaging materials referred to in 4° will not be taxed with regard to the supply of goods to a non-taxable person, in particular a private individual. But that objection is not such as to create distortions in competition.

It should also be noted that the envisaged regulation does not apply to packaging materials other than ordinary and customary. Those packaging materials must be regarded as separate goods for the purposes of the tax, regardless of how they are invoiced.

[...].

3

Use-cases for unique coding

Understanding the background of the serialisation techniques of other industries and integrating it into existing processes

Case studies from the pharma, tobacco and food & beverage industry

Pharmaceutical industry

The pharmaceutical industry is facing the **risk of counterfeiting** which endangers the health of consumers. To fight against counterfeit medicines the industry has the obligation to implement the principle of serialisation which allows **tracing** each individual product via a unique serial number from the manufacturer to the end user, and to **give quality information** such as origin, expiry date etc.

Tobacco industry

The tobacco industry is a victim of **counterfeit and illicit tobacco sales**, which has led to the revision of the Tobacco Products Directive (the directive responsible for the quality and health of tobacco consumers) and the implementation of mandatory serialisation and security features. This allows them to **trace products** and **verify their authenticity** throughout the supply chain.

Food & beverage industry

The food and beverage market has long used batch serialisation, which is essential to ensure product **tracking and enables the recall of certain batches** in the event of a quality problem. These markets are now evolving towards the need to trace the single product (beyond the production batch) to optimise quality tracing. Some products such as milk powder in China or spirits are already obliged to implement the unique code in order to **guarantee safety and authenticity** of the product.

(1) The pharma industry - unique serial numbers to prevent counterfeit medicines

In order to improve the safety of medicines, the EU has put in place a Directive on Falsified Medicines which introduces several measures to fight medicine falsifications and ensure monitoring.

Measures of the Falsified Medicines Directive

1. Mandatory safety features on packaging (from 2019)
   - **unique code**
   - anti-tampering device
2. A common, EU-wide logo to identify legal online pharmacies
3. Stricter rules on import of active pharmaceutical ingredients
4. Strengthened record-keeping requirements for wholesale distributors.

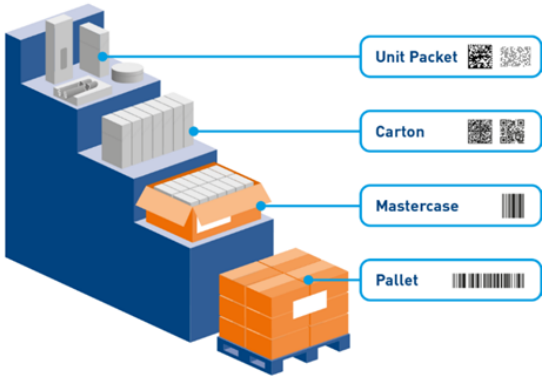
Serialisation

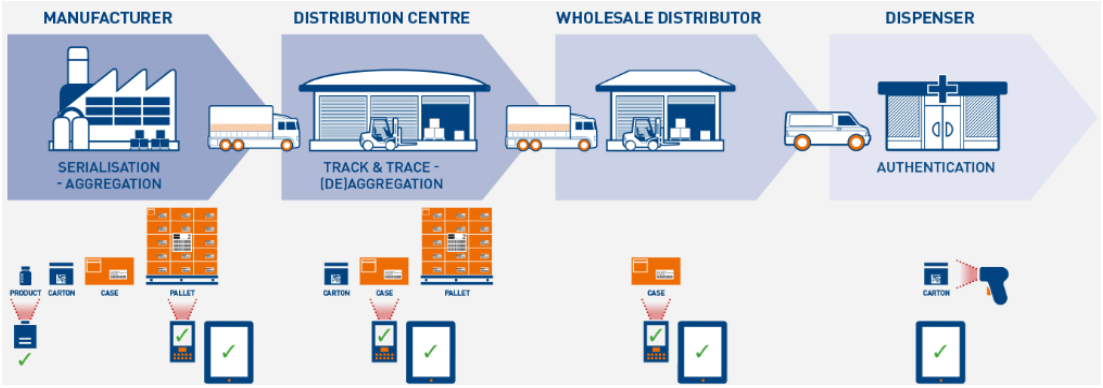
- Process of a**ssigning a unique serial code** to each marketable unit of each prescription product.
- The pharmaceutical industry relies on **labelling and coding technologies** to serialise products.

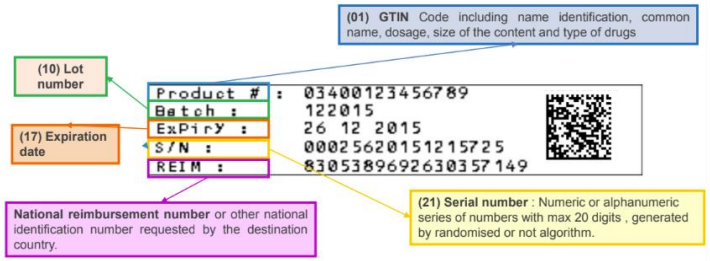
Aggregation

Establishing **parent-child relationships** between **all pharmaceutical packaging**:

- From the primary packaging, serial number and medicine to the tertiary packaging such as the bundle, case, or pallet







Case (1/2): Artesan

Modern Serialisation solution for contract manufacturer

What?	Modern serialisation solution for Artesan with unique data matrix code and individual serial number provided by METTLER TOLEDO PCE
Why?	Securpharm requirement: initiative protecting German pharmaceutical distribution system from counterfeit medicines
How?	Datamatrix code and individual serial number are stored in central database so each pack can be easily identified at any point in time. The Datamatrix Station XMV by Mettler Toledo PCE is used to mark and verify boxes.
Impact	N/A

About

Artisan is a German **contract manufacturer** in the **pharma industry** supplying various international markets. The company offers services from product development and project management to **serialisation services**, packaging and distribution.

Case

The **Track & Trace solution** marks packaging for purely prescription medicines, in line with the securPharm requirement, with a data matrix code and a serial number in plain text.
Integrated camera checks whether data content is correct and legible immediately after the printing process.
The acquired data is stored in a **database** during the labelling and verification process

Production

- Located on the production line **between the cartoner and checkweigher**
- Throughput of up to **350 packs per minute**
- Can be **easily integrated** into every production line because of adjustable height and belt speed
- Can be deployed in a flexible manner to several production lines

Case (2/2): Alliance Healthcare

Turnkey FMD compliance solution for pharmaceutical wholesaler

What?	*Zetes* solution for serialisation and packaging identification
Why?	Falsified Medicines Directive compliance requirement (came into force on February 2019)
How?	The combination of a logistics execution solution and an advanced supply chain traceability software enables the company to streamline event handling, reporting and communication with national hubs.
Impact	Full visibility of the product pathway, eliminating the risk of non-compliance

About

Alliance Healthcare is the **wholesale and healthcare services** business of Walgreens Boots Alliance, supplying medicines, other healthcare products and related services to pharmacies, doctors, health centers and hospitals.

Case

The *Zetes* FMD solution was **implemented across 100+ sites** throughout Europe. The solution was **integrated with existing internal warehouse management systems** to enable the verification and/or decommissioning of products. It also allows Alliance Healthcare to communicate with third-party systems enhancing **supply chain collaboration and communication**.

Production

- Operators **scan** medicines with handheld or desktop terminals
- Data is then captured and **verified** real-time
- Captured data is automatically checked against the **National Medicines Verification System (NMVS*)** and **stored**

*NMVS serves as a **verification platform** that pharmacies, wholesalers, doctors etc. can use to check the **authenticity** of a product

(2) The tobacco industry: unique identifier codes to combat illegal production and trade

Europe has put in place a Tobacco Products Directive which sets the framework for the tracking and tracing of the movements of tobacco products on the EU market.

Tobacco Products Directive

- **EU-wide track and trace system** for the legal supply chain of tobacco products & system of security features to help **detect illicit products**
- Each tobacco product should be marked with a **unique code** and the introduction of **security features** to prove authenticity.
- The unique code will be registered in a **European database** in order to track each product throughout its life cycle.
- **Manufacturers** should conclude **data storage** contracts with independent third parties and copy all information into an EU-wide database

Set up of traceability system

ID issuer

Member states appoint ID issuer that **generates and issues unique identifier codes** to be applied to unit packets

Independent from tobacco industry

Code generation

ID issuer generates **unique code** for unit packets or aggregated packaging

Data storage

Manufacturers and importers contract with a **data storage provider** to **host the traceability data** related to their products

Traceability

Commission select a provider of a "**secondary" repository** that will store a copy of **all traceability data** which will provide authorities with an overview of all product movements

Movement is scanned and recorded throughout the supply chain

Case (1/2): CTS Santelé

Serialisation and traceability for tobacco products

What?	*Zetes* solution for serialisation and packaging identification
Why?	Tobacco Products Directive compliance requirement
How?	Implementation of unit coding (& retrofit the existing production lines with serialisation capabilities) to achieve full traceability and to track all logistical events in the life of a product, from production to delivery
Impact	Overview of all the logistics activities and transport throughout the entire supply chain

About

CTS is an **SME tobacco producer**, specialising in the cutting and manufacturing of fine cut tobacco. They are now established internationally with teams based in Belgium, France and Spain.

Case

Zetes implemented serialisation capabilities on the production lines of CTS Tobacco. CTS **serialises and aggregates** all packaging with a unique code, which purchases from Incert*. Then, *Zetes* takes care of the packaging and product identification that the TPD requires.

*The government organization that provides the unique Belgian identifiers.

Production

- At the end of production, the **unique code is assigned** to the package along with the necessary data (TPD identification)
- The code is then **verified** by a machine (Anti Tampering Device Reading Verification) before the packages are boxed and tracked (scanned).
- Each time the box/package is scanned along the chain (on average ten times), the **data is sent** in real time

Case (2/2): Anonymous company

Traceability for tobacco products with Sewtec automation solution

What?	Sewtec automation solution solution for packaging identification and traceability
Why?	Tobacco Products Directive compliance requirement and improve track and trace systems
How?	Implementation of automated tracking machines within the existing supply chain
Impact	Better tracking of products throughout the entire supply chain and compliance with Tobacco Products Directive

About

N/A - Anonymous company

Case

Implementation of **automated machines** integrated with existing systems to form a highly efficient tracking and tracing system for 24/7 production lines. The machines use a laser coding system and can be integrated at various points on your packaging line. These machines will **read the unique product codes** at the different tracking points and send the information back to the system in real time.

Production

- The unique code is assigned to the products
- When the product passes through the tracking points, the unique code is read and the information is automatically sent to the system

(3) Unique codes are applied regularly in the food and beverage industry, for a variety of reasons

Unique codes in Food & beverage

All participants in modern supply chains are expected to have effective practices in place for **rapid identification, location, and withdrawal of food lots** when problems are suspected or confirmed. This requires the adoption of business practices that **enable trading partners in the food industry to track and trace** a product throughout the **entire supply chain**

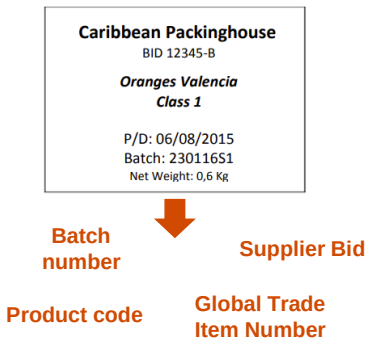
Several reasons for application

- Control food hazards
- Provide reliable product information
- Guarantee product authenticity
- Quality assurance
- Process and order management
- Provide traceability in case of recalls
- Regulatory requirements

Example of traceability process for packinghouses (relates to filling facilities)

Harvesting	Receiving	Packing	Delivery
Product is harvested and place in bins which serve as the **traceable unit** between farm and packing house. A **field tag** is applied to the bins used for transport.	Packing house checks if all products are **properly identified.** Then the products are moved to a holding area until it is to be packed. **Received products are recorded**	Products are placed on packing line and a **batch/lot number is assigned** to the production run. After processing and packing a label is applied to the packaging.	Upon delivery, info is recorded again

Info recorded during processing



Case (1/2): Aguas Misioneras

Providing consumers with bottled and traceable Argentinian water

AGUAS MISIONERAS

What?	Traceability system for bottled water throughout the supply chain - from well to supermarket
Why?	Recall - Ability to track water to its well of origin
How?	Implementation of GS1 barcodes with Global trade item number (GTIN) and serial shipping container codes (SSCC)
Impact	Enabled the standardised identification of products, documented all traceability information and procedures, conducted an accurate and updated production circuit analysis, achieved an easier and more efficient stock management system.

About

Aguas Misioneras is an Argentinian state company **packaging and distributing quality drinking water**. The company works to generate resources through rational, profitable and sustainable water management.

Case

The company has a focus on consumer safety and satisfaction, and wanted to develop a t**raceability system to track the production, packing, storage and distribution** of its bottled water, and if needed, trace delivered water back to the well where it originated. As a first step, AM assigned each of its products a unique code which was encoded in the **barcode** together with a **batch number** and **expiration date**.

Production

- A global trade item number (GTIN) is **encoded into the barcode** with other information
- **Pallets** of goods are identified by **serial shipping container codes (SSCC)**
- A register of how lots were used can be generated and in case of a recall aguas misioneras knows which supermarkets received the recalled bottled water based on each pallets SSCC, identified by the GTIN

Case (2/2): Alfajores El Molle

Enabling digitalisation and traceability with serialisation

What?	Unique code and traceability system (via serialisation with GS1 standards) for sweet treats throughout the supply chain
Why?	To comply with food safety regulations, attain certifications and better manage its broad stock of alfajores
How?	Implementation of GS1 barcodes with Global trade item number (GTIN) and serial shipping container codes (SSCC) & a traceability system via the GS1 TrazAR platform to capture data and track products
Impact	Enables data digitalisation and process automation, Provides for improved management in terms of suppliers and available stock, Centralises data, Promotes work culture with a focus on food safety

About

Alfajores El Molle is a small, family-owned business located in Argentina. The company **produces handmade** alfajores, a popular **confection** in Argentina, in a variety of flavours.

Case

Alfajores El Molle wanted to better manage its stock by uniquely identifying the flavours of alfajores in its extensive product line. Furthermore, the company needed to create a traceability system to comply with regulations and achieve specific certifications. They implemented **GS1 barcodes** encoded with GS1 **identifiers** and a **traceability system** (GS1 TrazAR platform) to collect digitised data and track product.

Production

- To lay the foundation of the traceability system, Alfajores El Molle implemented GS1 identifiers (GTIN & SSCC) encoded in **GS1 barcodes to uniquely and accurately identify product flavours and dispatched units**
- They implemented the GS1 TrazAR platform to digitalise the collection of data associated with their procedures, and it helps them to **solve problem of stock handling**

Main challenges to overcome when introducing serialisation

Data Management & efficient technology

- Serial numbers, master data and event information need to be **exchanged among supply chain parties** and also **reported** in a compliant way. Data must also be **protected** from hackers and other cyber criminals.
- **Inefficient technology** can lead to coding errors, unplanned downtime, high consumables cost, complex multi-supplier integration, and issues with laser operator

Productivity

If there is a risk of **OEE* reduction** when introducing serialisation:

- the introduction of a completely new packaging line is considered preferable;
- as well as the use of a centrally configurable process management software

Imported products & international requirements

During export, companies have to adapt to the **different regulations** of the countries in terms of necessary information and serialisation.

- For example, for **medicines**, there is a European serialisation system that lays the foundations for serialisation and mandatory information.

Capabilities & outsourcing

The choice to outsource filling will also depend on the company's ability to offer compliant serialisation.

- Many companies choose to **outsource packing** to companies that already have the ca**pabilities and expertise to do serialisation** for them in order to reduce costs.

* Overall Equipment Efficiency

Datasystems used to manage unique identifiers

Benchmark of suppliers

Supplier	About	Country	Size	Integration	Software	Functionalities		
						Unique code	Printing	Traceability system
Adents	Supply chain solutions, serialisation and tracking	FR/US	Big - international	Integration with ERP and MES systems	**Adents supervisor** to configure all your packaging lines and serialisation parameters + drives serialisation and aggregation	X		
					Adents pilot manages the marking and control of unit-level codes on the production line and ensures accurate transmission of information		X	
					Adents Prodigi Serialisation and traceability solution to generate, manage, exchange, enhance and analyze serialisation data			X
GS1	Solutions for identification, EPC/RFID barcodes & labels, and supply chain standards system	BE	Big - international	Integration with ERP and MES systems	**GS1 standards** provides the global framework and local implementation services to ensure that traceability systems are interoperable and scalable	X		
Zetes	Supply chain solutions and technology	BE	Big - international in EMEA	Integration with existing WMS or ERP systems	**ZetesZeus** is a product traceability software and track & trace platform			X
					ZetesAtlas is a packaging execution system that provides quick and easy identification, serialisation, aggregation and traceability	X	X	

Suppliers of digital deposit return system

Benchmark of suppliers

Supplier	About	Solution	Functionalities	Country	Size
Polytag	Mobile application for the DDRS	Polytag DDRS	• Provides a **phone application** that allows digital deposit return system (scan the container and receive the deposit on their app wallet). • Solution uses serialisation to capture in-scope drinks containers	UK	small
Reward4-waste	Mobile application for the DDRS	Reward4waste	Can generate unique codes or work with other code providers. • Provides a phone application that allows digital deposit return system (scan the container and receive the deposit on their app wallet). • Solution uses serialisation to capture in-scope drinks containers	UK	small
Recyclever	Reverse vending machine for DDRS	Recyclever	• They **manufacture Reverse Vending Machines** used with DDRS for PET bottles, cans, and glass bottles. • Consumers use Reverse Vending Machines (RVM) to return empty drinks containers and obtain a reward. RVM's are installed in supermarkets and premises like council collection points, workplaces and many others.	UK	small

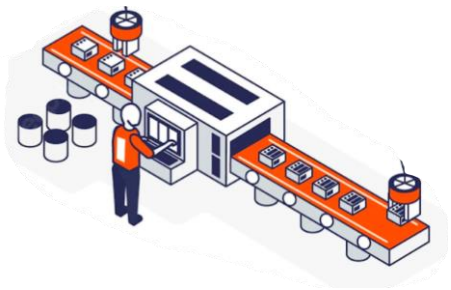
Which technologies are on the market ?

The optimal printing and marking technology for a given application depends on factors including the packaging substrate, equipment integration, production speeds and code requirements.

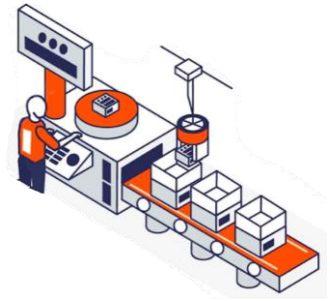
	Operation	Specificities	Type of surface
Inkjet	An inkjet printer prints by spraying tiny drops of ink on the surface.	High coding accuracy even on concave surface of a can Production speeds **540** cans/min Non permanent print Most frequently chosen coding solutions	Type of surface: **metal, plastics,** and flexible packaging Concave surface like **cans: YES**
Thermal Inkjet	Uses a drop ejection process that fires very small droplets of ink, resulting in a high printing resolution. The system works by applying a voltage and heating the ink rapidly and ejecting the ink from the nozzle because of expansion.	Production speeds max **300**cans/min Low-cost Non permanent print	Type of surface: **metal, plastics,** and flexible packaging Concave surface like **cans: NO**
CO2 laser	CO2 machines usually produce the laser beam in a sealed glass tube which is filled with gas, usually carbon dioxide. A high voltage flows through the tube and reacts with the gas particles, increasing their energy, in turn producing light.	High coding accuracy (not on concave surface) Is more compact Production speeds **1,200** cans/min Permanent print Almost no downtime	Type of surface: **metal, plastics,** and flexible packaging Concave surface like **cans: NO**
Fiber laser	Fiber lasers use pump light from what is called laser diodes. These diodes emit light that is sent into the fiber-optic cable. Optical components located in the cable are then used to generate a specific wavelength and amplify it. Finally, the resulting laser beam is shaped and released.	High coding accuracy even on concave surface of a can Is more compact Ability to more effectively penetrate and code reflective Materials, such as aluminium cans Production speeds **1,500** cans/min Permanent print Almost no downtime **The most innovative solution that does not reduce the speed of can production**	Type of surface: **metal, plastics,** and flexible packaging Concave surface like **cans: YES**

What is the process fostered for serialisation, aggregation and DDRS?

Manufacturing phase



Packing phase



Distribution phase

Point of sale

Serialisation: Application of unique code during manufacturing process

The unique codes are generated and put on the packaged products:
Plastic: feasible at production speed
Cans: faisible at production speed on top of the can, not feasible at production speed on side of the can

Unique codes and the deposit can be activated/linked at different times. It is recommended to activate the code with the deposit later at the time of sale (avoid fraud)

Aggregation during Packing process

Unique codes are **verified** after application

A code (associated with the serial numbers of its containers) is **put on the packets** so that data can be aggregated and tracked throughout the supply chain. This phase is not mandatory for goods and beverages.

Tracking of packets

The movement of the products from distributors to retailers is **tracked** all the way out to the intended retail store which has the following **advantages**:

- Improved inventory management
- Real-time information
- Identification of bottlenecks
- Identification of fake products entering the supply chain

Activation of digital deposit at point of sale

By **activating** the **unique code with the deposit** at the **point of sale,** possibilities for **fraud** can be **reduced** drastically

- The **deposit is not claimable** until the item has been purchased so **fraud pre-sale is impossible**
- The **amount and currency are determined at point of sale** allowing goods to move freely from one country to another without deposit complications

How to manage products imported from abroad?

Use cases from other industries applying serialisation

Falsified Medicines Directive

- Safety feature rules (unique code & anti-tampering device) **don't apply to medicinal products imported** into member states
- Member states can use **national legislation to regulate** which provisions apply to imported products
  - Example: **mandatory verification**/ decommissioning of products

Tobacco Products Directive

Importers of tobacco products have to comply to the directive by taking the following steps:

- **Prior to goods arrival in Europe**: serial numbers need to be acquired from different countries in Europe, dispatched to the manufacturer and then commissioned once they have been applied to the product
- **Upon arrival in Europe**: logistics and administrative transactions must be generated

European Medicines Verification System

- As part of the directive on falsified medicines, the European medicines verification system (EMVS) was set up
- This is a European hub that **collects and ensures medicines authenticity** by an **end-to-end verification**
- Manufacturers apply unique serialisation with random numbers to their products and **upload it into EMVS**
- At each point in the supply chain codes are scanned and verified with using EMVS

Options

1. **Don't apply to imported products**
2. **Repackage or relabel upon arrival**
3. **Foreign manufacturers request and apply issued unique codes**
4. **Upload existing unique codes into national repository**

Small producers: Outsourcing case

For small producers who package their production themselves, the cost of implementing a serialisation system might be too high for them and the question of **outsourcing** arises. For the small producers who do not pack and label their products themselves the situation does not change and they will continue to outsource the packing and labelling to a company that will also offer serialisation.

We then have two possibilities for outsourcing:

Outsourcing packaging, labelling & serialisation

The producer sends the containers to be packed, labelled and serialised to the outsourcing company

Outsourcing serialisation only

The producer sends the products already packed and labelled and the outsourcing company only serialise them

Pros & Cons of outsourcing serialisation:

Pros

- The cost of implementing serialisation is borne by the external packaging and labelling company, which can **divide the costs among its clients.**
- There is **no need to finance a serialisation solution** adapted to the current supply chain or to hire competent resources in this area

Cons

- Cost associated with **loss of speed** (time to send products to be serialised) and delays (OEE impact)
- **Cost of transport** of products to the serialisation site
- **Cost of outsourcing** and extra fees that the organisation may impose in case of code changes etc

Process overview as conclusion

The implementation of a DDRS implies the serialisation of all PET bottles and cans sold in the Belgian market, a serialisation already implemented for example by the tobacco and pharmaceutical sectors. Based on the explained research a **final process from serialization to return for recycling of a DDRS system** has been proposed.

1. Serialisation

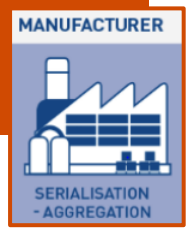
Application of the unique code at the end of the manufacturing phase (packaging filler) once the product has been bottled/canned.

Different printer solutions have been proposed and solutions exist that do not affect production speed or marking quality for both cans and plastics bottles.

The unique code may be subject to national regulation in order to be complementary to the adopted DDRS solution.

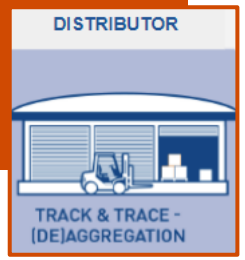
2. Aggregation (not mandatory for DDRS, only needed for multi-packs)

Application of a code on the packets containing the single products in order to be able to track them



3.Tracking (not required for DDRS)

Tracking of the products throughout the supply chain



4. Activation of the code

Association/activation of a deposit to the code at the point of sale in order to minimise the risk of fraud (fraudulent codes for unsold bottles)

5. Return for recycling

Once consumed, the container is returned for recycling according to the solutions offered by the DDRS:

Return to collection point | Return to retail | At home | Smartbin

4

Expected collection- & recycling rates

Introduction

Deposit Return Scheme

In a *Deposit Return Scheme (DRS)* a small value is assigned to an **item of packaging** which is refunded to a customer when the item is returned via a **dedicated collection points**. This 'deposit' acts as an incentive for consumers to return the empty container, subsequently supporting reuse or recycling.

The means to return the items:

Return to collection point

Return to retail

Digital Deposit Return Scheme

A *digital deposit return scheme (DDRS)* builds on the classic deposit return system by **assigning a unique code to the product and a second code to collection points**, so that consumers can return the product (thus claiming their refund) at home or on the go using a smartphone app.

The means to return the items:

Return to collection point

Return to retail

At home

Smartbin

Return & recycle rate for DRS - EU

5 countries in Europe with a DRS in place *(selection based on n° of inhabitants or located near Belgium)*

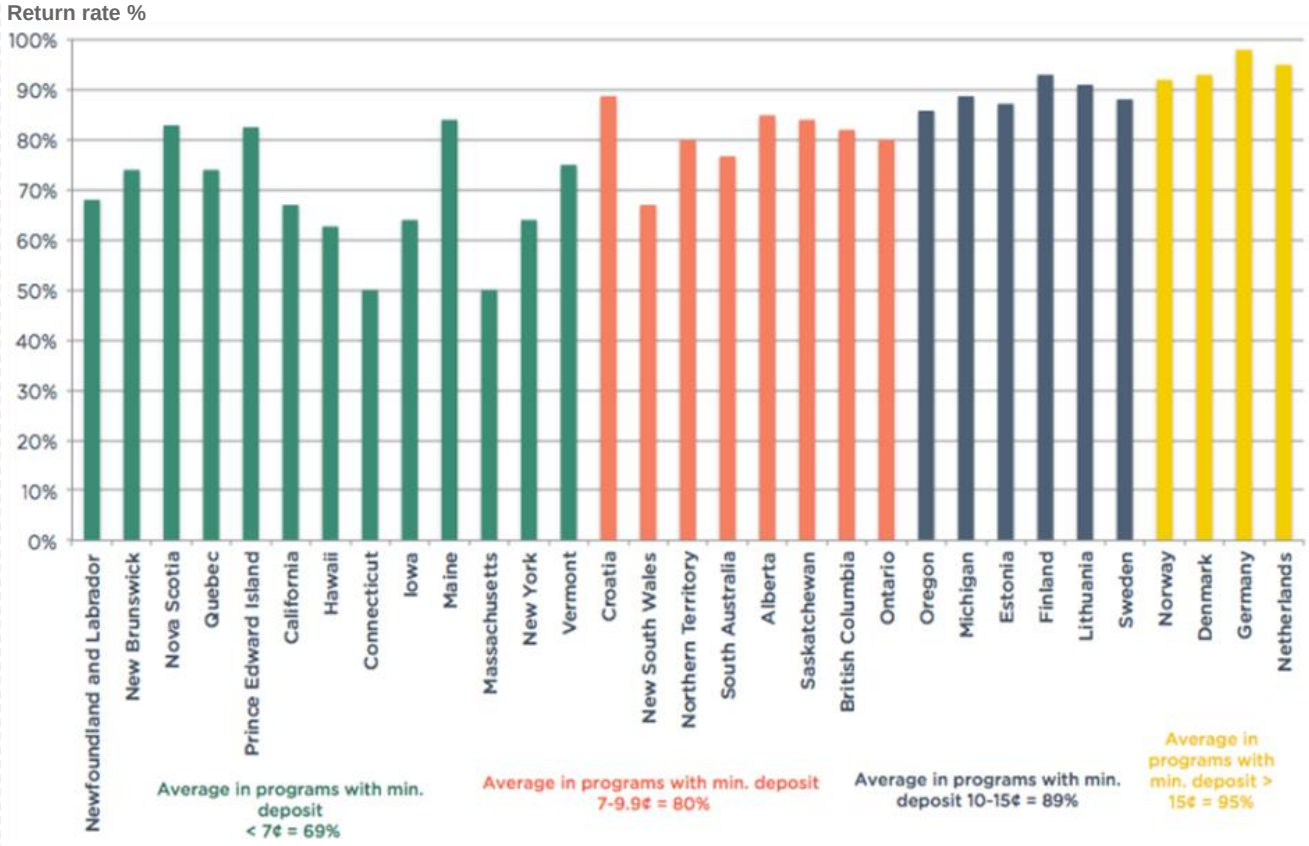
Countries	Type of DRS	Start of DRS	Scope	Deposit	Return Rate*	Recycling Rate**
Germany 	Return to retail	2003	Plastic (predominantly PET), metal (aluminum), glass	PET bottle 0,25€ Cans 0,25€	97% PET bottles 99% Cans	Plastics total 104% Cans 107%
The Netherlands 	Return to retail	2005	Plastic (predominantly PET)	PET bottle 0,10€ to 0,25€	95% PET bottles Cans (to implement in 2023)	Close to 100%
Sweden 	Return-to-retail & collection point	1984 cans 1994 PET	PET, HDPE, aluminium, steel	Cans 0.11€ PET bottle<0,5L 0.11€ PET bottle>0,5L 0,22€	84% PET bottles 85,8% Cans	Close to 100%
Norway 	Return to retail	1999	Plastic (predominantly PET, HDPE), metal (aluminum/tinplate)	PET bottle, Cans<0,5L 0,16€ PET bottle, Cans>0,5L 0,25€	89% PET bottles 89% Cans	97%- 100%
Croatia 	Return to retail	2006	Plastic (predominantly PET), metal (aluminum and tinplate), glass	PET bottle 0.06€ Cans 0.06€	89% PET bottles 79% Cans	Close to 100%

➔ All the 10 countries in the European continent that have a DRS system in place have a **return rate above ~80%**.

*Return rate represents the amount of beverage containers collected (by weight or unit) expressed as a percentage of the amount of beverage container material placed on the market, excluding exports.
**Rates above 100% are more likely to be linked to the return of bottles and cans from other neighbouring countries to access the deposit.

Return & recycle rate for DRS - Worldwide

Latest return rates in Deposit Return Systems by minimum deposit value (USD)



Fact Sheet Deposit Return Systems - System Performance. Reloop, 2021.

It can be concluded that **the higher the value of the deposit the higher the return rate -** All countries with a deposit value above **0,15 €** have a return rate above **90%**.

Scientific research has also been able to highlight other elements that impact on people's behaviour (e.g. sorting) and therefore on the return rate:

- **Dirtiness**: A dirty or dilapidated state of collection point
- **Distance**: Distance to travel to the collection point
- **Weekly collection:** Frequency of collection
- **Visibility of sorting (normative)**: Sorting is a normative behaviour and social visibility (e.g. door-to-door collection) leads to more sorting
- **Information**: Level of information about recycling to the population
- **Perceived constraints:** The perceived constraint (physical effort, time and space requirements) leads to less sorting
- **Belief in effectiveness:** The more people believe that recycling is efficient and environmentally friendly, the more they sort

Move towards digitisation and kerbside collection for DRS

Norway

The **largest online grocery shop, Kolonial** (rebranded Oda), delivers groceries to individuals and businesses and then had the idea to offer to collect customer returns on deliveries for its customers. They **collect empty waste from customer houses**, the waste is collected in plastic bags, which are scanned by Kolonial at the time of collection. This saves the customer having to travel to a collection point. **The money is then credited to the customer's account**. Kolonial is associated with one of the deposit return organisations to bring the waste to be recycled to them. This service exists from 2016 and in 2020 Kolonial collected nearly 3.3 million bottles and cans.

- ➔ https://infinitum.no/media/twqha5rg/infinitum_aarsrapport_2020_en_web_spreads.pdf
- ➔ https://www.acrplus.org/images/technical-reports/2019_ACR_Deposit-refund_systems_in_Europe_Report.pdf

Czech Republic

Mattoni and online grocery shopping site Košík.cz have created the first circular, deposited bottle. It is made out of 80% recycled plastic, and will get a new lease of life when returned. They provide the same service as Kolonial.

- ➔ https://www.mattoni1873.cz/en/our-responsibility/

DDRS - pilot projects (1/2)

There are currently no examples of a DDRS implemented on a national scale, but various pilot projects have been carried out. Here are 3 cases of DDRS pilot projects:

	Polytag - 2021 *Conwy (UK)*	**Reward4waste - 2021** *Dublin (IRL)*	**Reward4waste - 2020** *Whitehead (IRL)*
Duration	4 weeks	4 weeks	4 months*
Target population	325 households	200 households	2000 households
Sample size	83% (271 households)	72% registered (145 households)	25% of households
Product scope	A set of plastic water bottles	Milk bottles	Drinks containers (plastic bottles, milk bottles, glass bottles and cans) from a specific shop
Deposit	YES 0,2€	YES 0,2€	NO (only reward for voucher)
Unique product code	YES	YES	YES
Collection point code	YES (QR code sticker on their own bin + tagged bin collection point)	YES (code on their own bin)	YES (unique code on box at home/ bin collection)
Type of collection/ return by consumer	Kerbside collection. At home by scanning their bin & their bottle with an app. For households without smartphone, register on a 'vendor app' and placed the empty bottles in a uniquely tagged bin at a collection point.	Kerbside collection. At home by scanning their bin & their bottle with an app.	Kerbside bins or collection points.
Results**	97% engagement rate (263 registered households scanned at least one bottle)	94% of return rate (655 returned/ 700 delivered)	The trial objective did not include testing the deposit/return function but only the motivation of people for DDRS and the use of the app. Survey were conducted.

*Trial carried out during the covid period which led to delays in the implementation of the codes on the products and therefore delayed in the trial
**To counterbalance the number of participants and the willingness to participate

DDRS - pilot projects (2/2)

Outcome

There is **no national implementation** of DDRS.

Therefore a precise comparison in the field can not be done with DRS.

The result of these pilot show promising results in terms of engagement, adoption by consumers and collection rates.

Several studies claim that there could be an **increase in the return rate with a DDRS solution** compared to DRS as the convenience of engaging with a DDRS at the kerbside could attract greater container return rate from consumers.

Comparison summary

Deposit Return Scheme	Digital Deposit Return Scheme
Pros	
• Positive impact on the litter (compared to no incentive) • Positive impact on the return and recycling rate (compared to no incentive) • Limited change for producers (requires one-time change in label)	• Positive impact on the litter (compared to no incentive) • Positive impact on the return and recycling rate (compared to no incentive) • Flexibility in the means of collection (at home & on the go) • Builds on existing success of blue bag system • Minimal change for consumers in relation to the disposal • Optimal access and availability of collection points to capture maximum amount of identified fractions • Implementation of unique code provides data on traceability, consumption and consumer habits • Creates additional communication channels towards consumers in relation to litter (app) • Adaptable system to access other fractions • Minimal risk of fraud (no cash returns, no import)
Cons	
• End of blue bag collection for identified fractions • End of door-to-door collection for identified fractions • Shift in waste transportation from intercommunales to private waste operators, potentially lowering the negotiation power to reduce cost for collection & transportation • Significant change in waste management for households and private consumers • Significant cost for consumers to return identified fraction • Constraint in access and availability to sufficient collection points to allow for consumption on the go and beyond opening hours of collection points with RVMs • Impact of implementing a deposit system for retailers (machine for returning waste infrastructure) • Risk of fraud (Import, multiple reimbursements for same unit [tbc], cash reimbursement)	• Significant change for producers in setup phase (serialisation) • Digitally impaired have no access for reimbursement on the go • Implementation requires support from local authorities • Risk of fraud (duplication of codes, hacking of the system) • Risk that the redeemer does not dispose the fraction in the appropriate collection point

Quid carbon footprint of both systems?

THE END

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