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Economic feasibility study including business plan for the implementation of a deposit system in the context of waste and recycling management in Cape Verde

- Business Case Report -

Commissioned by the AHK Portugal

Written by **BlackForest Solutions GmbH**

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Abbreviation List

ANAS	Agência Nacional de Água e Saneamento
AHK	Auslandshandelskammer
BFS	BlackForest Solutions GmbH
BMCT	Business Model Calculation Tool
BPI	Beverage Producers and Importers
C	Consumer
CAPEX	Capital Expenditures
CERIS	Equatorial Coca-Cola Bottling Company
CNA	Conselho Nacional do Ambiente
CV	Cape Verde
DNA	Direcção Nacional do Ambiente
DGPOG	Direcção Geral de Planeamento, Orçamento e Gestão
DRS	Deposit Refund Scheme
ECOWAS	Economic Community of West African States
EU	European Union
EPR	Extended Producer Responsibility
FTE	Full-time equivalent
G	Government
GIZ	Gesellschaft für Internationale Zusammenarbeit
HoReCa	Hotels, Restaurants and Catering
HRA	Health Research Authority
INE	National Statistics Institute
INC	Intergovernmental Negotiating Committee
IRS	Informar Recycling Sector
IT	Information Technology
LBG	Landbell AG
MAA	Ministry of Environment and Agriculture
MD	Managing Director
MRFs	Material Recovery Facilities
NPO	Non- Profit Organization
OPEX	Operational Expenditures
OTC	Over-the-counter
PROs	Producer Responsibility Organizations
P	Public
PENGeR	Cape Verde National Strategic Plan for Waste Management
PET	Polyethylene terephthalate
POM	Placed on the market
PPP	Purchasing Power Parity
PPP	Polluter Pays Principle
R	Retailers
R&D	Cape Verde National Strategic Plan for Waste Management
RVM	Reverse Vending Machine
ToR	Terms of Reference
UN	United Nations
WMO	Waste Management Operators

Executive summary

Deposit refund scheme (DRS) is a surcharge on the price of potentially polluting products. When pollution is avoided by returning the products or their residuals, a surcharge refund is granted. Evidence from countries where **DRS** is implemented for single-use beverage containers indicates that they can deliver several benefits, including elevated recycling rates, higher purity in the collected material, and littering reduction.

According to the National Statistics Institute data, **Cape Verde´s waste production** reached 170 thousand tonnes in 2016 (Instituto Nacional de Estatística, 2016), which equals around **0,87 Kg of waste per inhabitant**. The country´s waste composition analysis indicates that **PET, aluminium cans and glass bottles** make up **2,1% 11,9% and 12%**, respectively.

Considering that these fractions are mainly found in urban areas and are largely attributed to tourism, and that **Cape Verde**, in 2016, developed its National Strategic Plan for Waste Management (PENGeR), issued to address the existing deficiencies in the waste management sector, in which **packaging waste was one of the prioritized fraction**, the **German-Portuguese Chamber of Commerce (AHK Portugal)** decided to assess the feasibility of an implementation of a deposit refund system for the country. For that, BlackForest Solutions GmbH, German company specialized in waste management, was hired to develop a feasibility study on the implementation of DRS in the country,

This report compiles a c**omprehensive study conducted in Cape Verde to understand how a potential DRS for beverage containers could be designed** in the country.

The **first phase** of the project consisted of **literature research** to identify main data related to beverage production and import, retailer spectrum (size, location), main hotel, restaurants and catering (HoReCa) activities and locations, existing legal framework tackling extended producer responsibility and previous regulatory frame on deposit refund scheme, identification of recycling paths and logistic possibilities, and all costs associated with those above-mentioned. Besides, the team contacted and conducted **interviews with some actors from public and private sector**s to have a better understanding of the status quo.

The **second phase** included the development of a **business model calculation tool (BMCT)**, in which data was inserted to start estimations on costs and operational factors. The team conducted one **presential workshop at Praia** for capacity building of public and private stakeholders, to confirm assumptions from the business model and gather missing data. The results from the capacity building sessions were evaluated via an initial and final questionnaires, filled in by the participants (Annex 9.1) and data and assumptions were incorporated into the BMCT.

A **wide-ranging glossary** with main specific terms from DRS are disclosed in the beginning of this report, followed by the **findings from phase one**. These findings include **main legislative acts** related to packaging waste, as well as explanations on the c**oncepts of extended producer responsibility** (EPR) and **deposit refund scheme**.

Following project objectives and scope are briefly described and they include the understanding the **status quo of beverage packaging waste management in Cape Verde, conduction of** a **beverage packaging data collection** study to achieve a business model that addresses the DRS system´s main costs, **strengthening government and the private sector capacities** in the DRS basics, p**rovision of support for the communication of the system´s financial implications** to institutional and private stakeholders and delineating the **next steps** required to start planning the DRS scheme in Cape Verde.

The core the feasibility study can be explained as a five-fold case, including: Strategic Case, Socio-Environmental Case, Commercial Case, Financial Case and Management Case.

The **Strategic Case** highlights the main benefits for the country when implementing such a system. These were divided into **political benefits**, considering that Cape Verde would be the first African country to implement DRS and could be seen as role-model leading and incentivizing the continent to shift towards circular economy actions, and that such a system supporting reaching internal recycling targets; **economical benefits**, since DRS applies the polluter´s pay principle and would contribute with new business opportunities for investment in the recycling industry; **social benefits**, encouraging behaviour changes and potentially integrating informal sector into the scheme; and **environmental benefits**, with litter reduction and optimized landfill space from diverted waste. This case also includes the risks associated with its implementation and potential mitigation measures.

The **Socio-Environmental Case** highlights the impacts of DRS implementation in different stakeholder groups. In general, **citizens/consumers** have a positive impression of DRS. They are expected to experience improved living conditions from litter reduction and indirectly receive education through awareness-raising campaigns. Impacts on the **National Government** refer mainly to efforts regarding the governmental stakeholders involved in the process are drafting specific legislation for DRS. Once the scheme is established and running, another duty from governmental stakeholders is to monitor the DRS operator. Besides, **public authorities** benefit from the generation of new direct and indirect jobs. Number of positions were also estimated within this case. For **recyclers and green investors**, positive outcome will be that packaging waste treatment will become an attractive investment market for waste handling facilities and recyclers. For the **informal sector**, DRS represents an improvement in working conditions, as well as employment within the system. **Producers and importers** will face a rise in costs from the fee to cover the expenses of the DRS Operator and will have to adapt their process flows. Depending on the operational setup (automated or manual), **retailers** may be obliged to invest in collection

infrastructure, resulting in extra costs. Yet, this can be seen as a business strategy to provide convenience to customers and potentially increase sales.

The **Commercial Case** includes the design parameters of the system and explains the main costs factors associated with the investment and operations. The **scope of DRS** includes all soft drinks, bottled water, and beer. The **deposit fee** was discussed during the workshop and compared to bottle prices in the local markets. First suggestions for the deposit fee were of 0,04EUR for containers smaller than 2L, and 0,10EUR for 5 and 10L containers. Considering return infrastructures, since Cape Verde has a small population and retail channels are mainly constituted by small shops and average wage is competitive, it was assumed that **no RVMs are installed in retail shops**. Besides, labelling and fraud control options were provided.

The **Financial Case** includes all cost elements related to the implementation and operations of DRS. For these calculations, two scenarios were modelled. **Scenario 1** describes the **manual over-the-counter returns at retail shops and redemption centers** equipped with reverse vending machines (RVMs), while **Scenario 2** assumes **full manual over-the-counter returns.** For the calculations, beverage-related data such as sales volumes and channels, beverage sales by material types, return flows, return rates, labor and space requirements were described. For each scenario, the collection infrastructure assumptions and calculations are detailed, and total costs were estimated. Although Scenario 2 did not count with investments in equipment, its **implementation was estimated 18% more expensive than scenario 1**.

The **Management Case** focusses on the scheme's structure, including different types of producer responsibility organization (PRO) setups, pros and cons, key institutional and private stakeholders in the country, their proposed roles and responsibilities. These are further refined in the Annex 9.2. Lastly, a general outline for the organigram of a PRO is shown, including description of main roles.

The **results from this business case were achieved by close cooperation with institutional and private stakeholders**. Private sector stakeholders have expressed their interest in supporting the project with information. Getting more information from these stakeholders will further improve the accuracy of this report's financial estimations and calculations, and the adaptability of the calculation model makes it possible. After carefully analyzing the potential implications and modelling the introduction of DRS in Cape Verde, conclusions regarding the island context, material volumes, market structure, consumer readiness, technical knowledge, data compilation and strategic development were detailed.

It is **strongly suggested** that, before moving to the implementation phase of DRS, a **one-year feasibility study is conducted**, with comprehensive market study to acquire accurate data and build capacities within the country. A **road map for establishing DRS in Cape Verde** is also described as result of this report.

Disclaimer

BlackForest Solutions GmbH has taken due care in preparing this report to ensure that all facts and analysis presented are as accurate as possible within the scope of the study.

This document was produced with the financial assistance of AHK Portugal. The views expressed herein cannot be taken to reflect the official opinion of AHK Portugal.

Glossary

Term	Definition	Source
Consumers	Citizens/customers who buy applicable beverage containers pay the deposit when buying the beverage and receive it back upon return of empty package.	(Spasova, Deposit-Refund Systems in Europe for one-way Beverage Packaging, 2019)
Counting line	Machine system for counting and sorting systems beverage containers such as aluminum cans, glass bottles and plastic bottles on an industrial scale.	(Ankerandersen, 2022)
Deposit	A fee that is charged at the point of purchase on beverage containers that are part of the scope of the DRS system. Retailers collect the deposit from consumers. Finally, the deposit is refunded when the consumer returns the empty container to an authorized redemption centre or retailer for recycling.	(CM Consulting Inc., 2018)
Deposit-refund system	Surcharge on the price of potentially polluting products. When pollution is avoided by returning the products or their residuals, a surcharge refund is granted.	(European Environment Agency, 2022)
Extended Producer Responsibility (EPR)	Environmental policy approach in which a producer's responsibility for a product is extended to the post-consumer stage of a product's life cycle.	(OECD, 2022)
Handling fee	Fee paid to redemption centers and retailers for receiving and paying out the deposit, sorting, and storing redeemed beverage containers. On a long-term basis, handling fees also cover investments in reverse vending machines, electricity costs, space requirements, and additional personnel required to handle the containers. The bottler or distributor often pays the fee but is paid by the DRS operator.	(CM Consulting Inc., 2018)
HoReCa (Hotels/Restaurants /Catering)	The food service industry sector that consists of establishments that prepare and serve food and beverages.	(Definitions, 2022)
Informal recycling sector (IRS)	Individuals or small and micro-enterprises that intervene in waste management without being registered and formally charged with providing waste management services.	(German Corporation for International Cooperation GmbH (GIZ), 2011)
One-way beverage packaging	Beverage packaging intended to be used only once by the consumer.	(Spasova, Deposit-Refund Systems in Europe for one-way

		Beverage Packaging, 2019)
Over the counter returns in retail stores	Businesses that accept small quantities (usually less than 100) of eligible containers over the counter in return for a cash refund.	(New South Wales Government)
Placed on market (POM)	The supply of a product for distribution, consumption or use on the market in the course of a commercial activity, against payment or free of charge.	(Official Journal of the European Union, 2016)
Producer Responsibility Organization (PRO)	Organization in charge of the operation of the deposit-refund system. Main responsibilities include contract management, reporting, administration of payments for deposits, handling fees and transportation fees. PRO can also be responsible for operating counting, consolidation, and redemption centers.	(BFS, 2022)
Producer fee	Fee paid for each container that is put on the market.	(Zero Waste Scotland, 2022)
Producers	Includes beverage manufacturers and importers. Companies that package, import, or sell beverage containers in their economic or professional activities.	(Spasova, Deposit-Refund Systems in Europe for one-way Beverage Packaging, 2019)
Redemption center	Facility where any person may, during normal business hours, redeem the amount of the deposit for any empty beverage container labeled. Although consumers can bring these bottles to retail stores, people or groups that collect large quantities of cans/bottles can bring their collected items to a redemption center.	(Law Insider, s.f.)
Retail channel	Store, establishment, or other distribution channel where the person(s) who purchase(s) the products do(es) so for immediate personal consumption.	(Law Insider, s.f.)
Retailers	Includes hypermarkets, supermarkets, small local shops and other stores (e.g. kiosks, gas stations) that sell beverage containers to consumers and accept the redeemed packaging on which the deposit is paid. Then, refunding the deposit back to the consumer.	(Spasova, Deposit-Refund Systems in Europe for one-way Beverage Packaging, 2019)
Reverse Vending Machine (RVM)	An automated device which accepts empty beverage containers and issues a refund for a deposit amount attached to the container that has been previously paid.	(Spasova, Deposit-Refund Systems in Europe for one-way Beverage Packaging, 2019)

Unredeemed deposits	The value of paid deposits on containers that have not been redeemed - possibly discarded in trash/as litter, recycled through other means, or lost.	(CM Consulting Inc., 2018)

1. Status Quo

The goal of the status quo is to provide a context to the system´s basics. It introduces Extended Producer Responsibility, describes the DRS in the context of beverage containers and ends by explaining the material and financial flows.

1.1. Cape Verde Context

According to the National Statistics Institute data, **Cape Verde´s waste production** reached 170 thousand tonnes in 2016 (Instituto Nacional de Estatística, 2016), which equals around **0,87 Kg of waste per inhabitant**. The country´s waste composition analysis indicates that **PET, aluminium cans and glass bottles** make up **2,1% 11,9% and 12%**, respectively. These fractions are mainly found in urban areas and are largely attributed to tourism. For example, **due to their high tourism demand, Boa Vista and Sal islands are large packaging waste producers**. Hence, in 2016, the Cape Verde National Strategic Plan for Waste Management (PENGeR) was issued to address the existing deficiencies in the waste management sector in which packaging waste was one of the prioritized fractions. PENGeR is meant to be implemented during 2015-2030 (Agência Nacional de Água e Saneamento, 2016).

The Cape Verde National Strategic Plan for Waste Management allowed identifying the existing problems and deficiencies and the definition of objectives attained to solve the recognized gaps. It has nine main objectives; one involves installing and expanding waste valorisation. This aim´s specific objective focuses on certain waste flows such as packaging, with the established target to reach 60% of this waste for recycling/recovery by 2030.

In this context, the **AHK Portugal proposed to contemplate and study the estimated financial feasibility of the Deposit Refund System (DRS)** as a scheme that helps meet country´s recycling targets. The system ensures high recovery rates, as the current global average of 84% shows (Reloop & Europe, 2020). The high rates help meet ambitious recycling targets, be it Cape Verde ones. Besides the elevated amount of (already separated) materials recovered, the high quality of the collected materials is ensured because segregation happens at the source. Therefore, the materials may remain at high-end uses with stringent qualities, such as the food industry level. This facilitates and supports the financial feasibility of the materials' recycling within a DRS model.

While a DRS system can be financially sustainable by applying the polluter-pays-principle (PPP), care must be taken for cost-effectiveness. Although high-quality materials recovery is essential for the system, the scheme's administrative setup and implementation are success factors. A DRS system's positive outcomes, such as awareness-raising and littering avoidance, are challenging to quantify in monetary terms for several reasons but are nonetheless perceivable side-effects.

1.2. Legislative Context

This subchapter aims to provide a general overview of the legal framework on waste context focused on packaging, and its status in Cape Verde.

1.2.1. Legislation in the Packaging Waste Context

In Cape Verde, waste management is regulated via the following laws:

- **Law No. 86/IV/93** establishes the environmental policies
- **Law No. 17/VIII/2012** establishes the legal and fiscal regime of the Ecological Tax
- **Decree-Law No. 12/2012** on waste disposal
- **Decree-Law No. 56/2015** establishes the general regime for prevention, generation, and waste management
- **Decree-Law No. 32/2016**, which approves the National Strategic Plan for Waste Management (PENGeR)
- **Decree-Law No. 26/2020**, which approves the legal framework for urban waste management services

As shown above, Cape Verde has already issued a regulation on waste management, particularly on packaging waste**. In 2010, an Ecological Tax on the production and import of plastic, glass, and metal packaging was introduced**. **In 2015, Decree-Law No. 56/2015 established the legal framework applicable to waste prevention, production, and management, including reusable and non-reusable packaging waste**. This Decree set forth the obligation of packagers and entities responsible for placing in the market products using reusable packages to create a deposit system for their recovery and reuse after being used by consumers.

In addition, in **2016 Cape Verde published its Roadmap Waste Project** ("Roadmap dos Resíduos em Cabo Verde") that aims to build a National Strategy for Waste Management. **As part of the Roadmap Waste Project**, the government of Cape Verde envisaged (i) the **development** of the PENGeR, and (ii) the operationalization of the National Strategy for Waste Management through the **design of Operational Plans for the municipalities** (Martins, 2016). Following, the 2016 Decree-Law No. 32/2016 approved the PENGeR for 2015-2030, which provided general waste management principles and strategic guidelines to ensure the waste prevention, production and management regime's implementation and effectiveness to the provisions of the Decree-Law No. 56/2015. Currently, the development of Operational Plans for the municipalities is envisaged, setting out the plans for the future management of municipal waste on the corresponding islands for 2018-2035. **This would make Cape Verde a pioneer on the African continent and a leader in the Economic Community of West African States (ECOWAS) region** and contribute significantly to environmental protection and sustainable resource use.

The following paragraphs describe the regulations governing packaging waste in Cape Verde. Of special focus is Article 146 from the Decree-Law No. 32/2016, which introduces DRS.

Law No. 17/VIII/2012: Ecological Tax

Law No. 17/VIII/2012 establishes the legal and fiscal regime of the Ecological Tax. The tax applies to products and fast-moving consumer goods packaging, such as rechargeable batteries; articles for transport or packaging of plastics, PET, and derivatives; bottles and other containers of glass; cans, boxes, and similar containers of metal; paper and cardboard; packing cases, boxes, and similar packings of wood; fireworks and pyrotechnic articles; electronic products; chewing gum, among others, and to certain products and packaging for industrial products made of plastic, PET and derivatives, glass and metal, among others. Any person or legal entity must pay this tax that imports or produces these products, and the amount of the tax will depend on the number of products imported or produced in Cape Verde.

In addition, this law set forth the duty for the taxpayer to return to the origin, recycle, and reuse at least 50% of the products and packaging. These include bottles and other glass containers suitable for carriage or packing; cans, boxes, and similar containers of metal; used tyres; boxes and similar packings of wood.

Decree-Law No. 56/2015: Waste Prevention, Production, and Management

Decree-Law No. 56/2015 set forth the general framework for preventing, producing, and managing waste. This regime comprises (i) the principles for waste management and extended responsibilities of the producer; (ii) the regulation of waste prevention, planning and management, including the legal framework for the licensing and concession of waste management operations, the functioning of the Waste Information System, as well as provisions on the liability for packaging waste management; and (iii) the sanctions for illegal waste management activities. Articles 142 to 163 of this Decree-Law include the provisions relevant to the obligations for packaging waste management:

- Article 144: Obligations for packaging waste management

Economic operators in packaging are jointly responsible for managing packaging waste. Municipalities are accountable for collecting, sorting, stacking, and baling municipal waste and should benefit from the financial compensation applied in the integrated packaging management system. In turn, packagers and importers of packaged goods are obliged to grant financial compensation destined to support the increase in costs for municipalities to manage packaging waste. Producers or manufacturers of packages and packaging raw materials are responsible for the deposit system to ensure the packaging waste, either directly or through organizations created to recover recycled materials. Lastly, producers of urban and non-urban packaging waste have the duty to proceed to source segregation to promote the reuse or recovery of packaging waste.

- Article 145: Compliance with obligations

To comply with the obligations established in Article 144, economic operators may choose to manage their packaging waste under a deposit system or an integrated system model. Under the integrated system, the responsibility of the economic operators for the management of packaging waste may be transferred to a management body duly licensed for this activity by the national waste authority. In addition, the municipalities must plan and organize a packaging waste collection network; in the case of islands with more than one municipality, this network shall be divided between the different municipalities.

- Article 146: Deposit system for reusable packaging

Packagers and the entities responsible for the placement in the market of products using reusable packages must establish a deposit system for the recovery and reuse of their packages after being used by consumers. This system necessarily involves charging consumers a deposit at the time of purchase, which can only be refunded when the reusable packaging product is returned. The government's minimum deposit amount will be set in consultation with associations representing the sectors involved. The minimum value must be passed on throughout the distribution chain and is intended to encourage packaging return without exceeding its actual value. The distributors/retailers must collect and return the deposit and ensure the collection of used packaging at the point of sale and its storage under appropriate conditions. For packaging recovery, packagers and suppliers may agree on the terms for collecting used packaging. To ensure the consumer's right of choice, the distributors who place beverages on the market (e.g., soft drinks, beer, mineral water, etc.) packed in non-reusable packaging shall also pack the same category of products or similar products on the market in reusable beverage containers. Soft drinks, beers, natural waters, or other packaged beverages must be packed in reusable packages for immediate consumption on-site in hotels, restaurants, and similar establishments. Regardless of the location of the packagers and/or the entities responsible for the placement in the market of products using reusable packages, reusable packaging may not be placed in the municipal waste collection circuits.

- Article 147: Liability for the final destination

At the end of the return cycle, the responsibility for the final destination of the reusable packaging lies with the respective packagers and the entities that place reusable beverage containers on the market. There are exceptions for those companies or entities that have declared the assumption of liability.

- Article 149: Management plans for reusable packaging

The packagers and the entities responsible for the placement in the market of products using reusable packages must have a management plan for reusable packaging describing the deposit system and the applicable monitoring to measure the proportion of packaging collected for reuse with the volume of products placed on the market. In doing so, the management plans must ensure full compliance with the objectives of the applicable regulation.

- Article 159: Labelling of packaging and symbols

Packaging that is not reusable but is destined for recovery and subject to the deposit system must be marked with a specific symbol to be determined by the stakeholders. To facilitate collection, reuse, and recycling, the packaging materials used shall be indicated in all cases for identification and classification by the relevant industry according to the packaging materials labelling system contained in the applicable regulation. Reusable packaging may be marked with a specific symbol to be defined by a regulation of the corresponding authority. Non-reusable packaging covered by the integrated system shall be marked with a specific symbol in the applicable regulation. The distributors/retailers shall not commercialize any product whose packaging does not comply with this provision.

- Article 160: Essential packaging requirements

Packagers, and the entities responsible for the placement in the market of products using reusable packages shall ensure that the essential requirements for the manufacture and composition of packaging under this regulation are met. The environmental authority's regulation establishes the essential requirements regarding the composition, reusability, and recyclability of packaging. The conditions for exemption from applying the levels of concentration lead, cadmium, mercury and hexavalent chromium present in packaging cannot exceed 100 ppm for recycled materials.

- Article 163: Recovery and recycling targets

By resolution of the Council of Ministers, the recovery and recycling targets for packaging waste are set for a 10-year time horizon. Subsequently, new recovery and recycling targets will be set.

Decree-Law No. 32/2016: PENGeR

As discussed above, the PENGeR provides the general waste management principles and strategic guidelines to ensure the implementation of the waste prevention, production and management regimen established by Decree-Law No. 56/2015. The purpose of the PENGeR is to create an integrated and comprehensive strategy adapted to the national specificities and dispersion among islands that ensures the effectiveness of a sustainable and national waste management policy. The PENGeR is divided into the following parts: (i) characterization and assessment; (ii) prospective analysis; (iii) strategic guidelines; (iv) action program; and (v) review, monitoring and control.

The Council of Ministers approved the PENGeR on March 22, 2016. It has a national scope and includes all 22 municipalities in the country. The strategy presented in the PENGeR has a time horizon of 15 years (2015-2030) and can be updated or adapted to changing circumstances every 5 years (Agência Nacional de Água e Saneamento, 2016).

According to the PENGeR, the government's vision in Cape Verde is to create a waste sector by 2030, fully founded and with a complete infrastructure for the correct treatment and recovery of

all types of waste adapted to the specificities of each island and municipality. This strategy should be based on environmental, economic, and social pillars and be guided by the principles of prevention and reduction while contributing to improving public health and mitigating the effect of climate change.

1.3. Extended Producer Responsibility

The United Nations warned that in 2017 plastic production blew up to 384 million metric tons, up from 2 million metric tons in 1950 (Meredith, CNBC, 2022). Consequently, plastic waste is a pollutant found in every ecosystem globally and has been proven to cause significant damage to nature, humans, and wildlife. **In the recently issued first-ever plastic pollution treaty, plastic waste was recognized as a serious threat to our planet and addressed the need to solve this problem by 2040.** Low-and middle-income countries face a special challenge, given the commonly faced complication of not having sufficient budget to finance an integral and well-functioning waste management system.

Therefore, a system that places the burden for waste disposal on the producers is raised as a possible option that helps overcome the financial limitations challenge. **The Extended Producer Responsibility scheme (EPR) is an ecological strategy introduced in the 1990s**. According to Professor Thomas Lindhgvist, EPR involves making the **product's manufacturer responsible for the entire life cycle, especially for take-back, recycling, and final disposal**. Commonly, waste producers are obliged to pay a fee for every product placed on the market or take physical responsibility for the post-consumer phase of the product. After its implementation success in many European Countries, proving to improve the national waste context, EPR is being transmitted to low-and-middle-income countries.

Figure 1-1 shows the product and cash flow throughout the system.

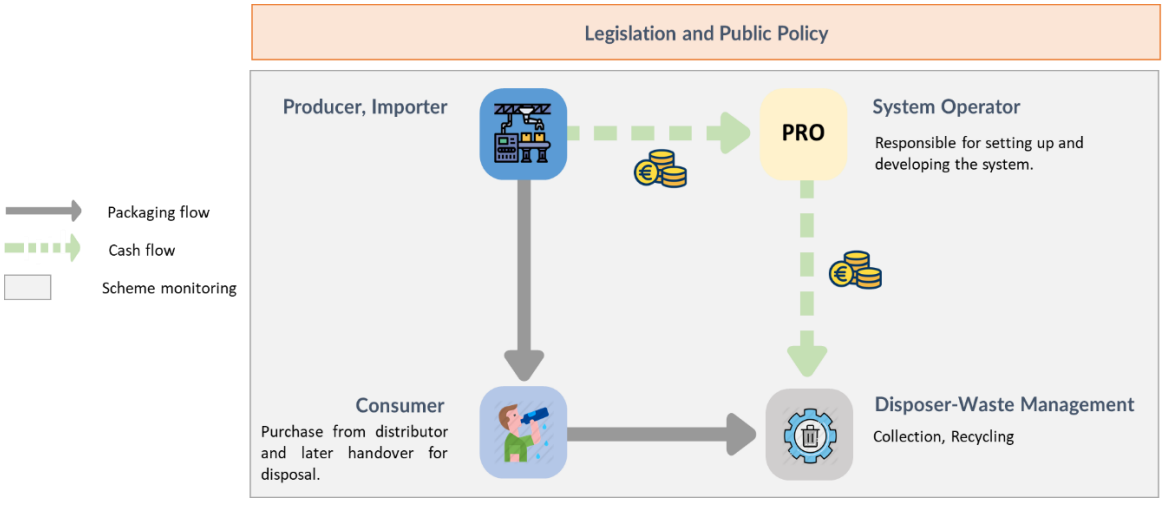


Figure 1-1 The general principle of an EPR system (BFS, 2021)

1.4. DRS for beverage containers

The **Deposit Refund System (DRS) falls under the Extended Producer Responsibility** umbrella as an example of an economic instrument. DRS application is **limited to some products** and was initially designed for the context of beverage containers. The **DRS principle gives a monetary value to each beverage packaging to increase recycling rates and reduce litter from the streets**. One of the system's main objectives is to change the mind of end consumers, so they perceive beverage containers as consumer items and not as waste.

DRS consists of adding a small extra deposit on top of the beverage price – such as those in plastic and glass bottles and aluminium cans – which is refunded to the consumer when they return the empty drink container for recycling (refer to Figure 1-2).

Figure 1-2 How does DRS function? (source: TOMRA, 2020)

Following the consolidation of the bottling industry around the '70s, the increase in transport costs and distances, the rise of consumerism, and customer convenience, the consumption of single-use beverage containers rose exponentially.

The deposit system started to appear as a countermeasure for this development. Iceland was the first country in 1989 to set up a DRS nationwide for a wide range of beverage containers. Sweden, in 1994, increased its scope from cans to plastic bottles. Resulting of this trend, countries such as Norway, Finland, Germany, Netherlands, Estonia, and Croatia implemented similar systems around the 2000s. The latest EU country to introduce DRS was Lithuania, to date.

Even though only the so-called “developed countries” have successfully implemented DRS, several nations have been developing studies and pilot projects to understand how such a system could be implemented.

1.4.1. Material and financial flows

While the consumers perceive the system's functioning as simple, the backend of the operation of an effective DRS is a complex process. Figure 1-3 shows a diagram explaining the material and financial flows.

The four flows that can be identified correspond to the material or product flow, the fees or costs required to run the system, the deposit, and data sharing:

- **Material flow:** Packaging from producers or importers is sold to consumers at retail shops. Consumers drink the products, and spent containers are returned at collection points. Then, the returned packaging is collected and transported to processing plants to be counted (if needed) and baled. Finally, the baled products are taken to a waste handling facility to be reprocessed or recycled and may return to the producers.
- **Producer or recycling fee:** Corresponds to the amount producers must pay for each container placed on the market. The rates of the fees may depend on the material type and size.
- **Handling fee:** Return points receive a handling fee from the DRS operator. The handling fee covers the costs for operational activities such as sorting, storage, cleaning of the return points, and paying the deposit fees back to the customers. These fares vary depending on the collection scheme (RVM or manual) and differ on container type.
- **Deposit fee:** The deposit or fee is charged at the point of purchase on beverage containers that are part of the scope of the DRS system, and retailers collect the deposit from consumers. Finally, the deposit is refunded when the consumer returns the empty container to an authorized return location. Producers or importers of beverages, which have previously paid a fee for each container, receive the deposit fee back from retailers when customers buy products.
- **Data sharing:** The DRS operator receives and manages data from the return locations (e.g., received bottles) and market data relevant to beverage sales.

Concerning the key players, the private sector is mainly represented by beverage producers or importers, retailers, recyclers, and the waste management sector by the collection operators. The informal and institutional sectors are not explicitly shown in the diagram below yet play a crucial role in the system (refer to chapter 7 for more details on the roles and responsibilities of all actors).

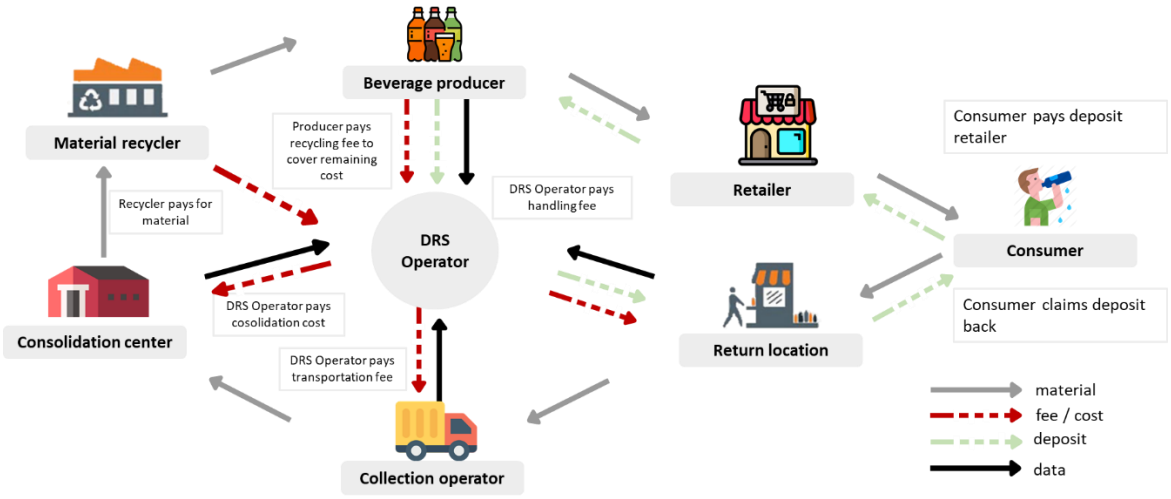


Figure 1-3 DRS scheme flows (LGB, 2021)

There are many doubts related to the introduction of the system; some of the main questions concern the ideal scheme, costs, rules of functioning, and the impact on the status quo. This study will address some of these.

2. Project Objectives and Scope

As part of the project, BlackForest Solutions GmbH (BFS) aimed at understanding how a deposit refund system could be tailored to Cape Verde by studying the beverage market and developing a business case that addresses the system´s main costs. For the task to develop a financial model, BFS worked with long term partner Landbell Consulting GmbH (Landbell).

Finally, the international experts delineated the next steps toward implementing DRS.

The **main objectives of the study** are:

- Understanding the **status quo of beverage packaging waste management in Cape Verde**. This includes conducting a literature review of previous studies and the legal framework, mapping the main stakeholders from the institutional and private sectors and achieving a general understanding of the beverage market in Cape Verde.
- Conducting a **beverage packaging data collection** study to achieve a business model that addresses the DRS system´s main costs. The beverage volume in the market was estimated using 2019 customs data of imported beverage products and empty beverage packages (PET-preforms and empty glass bottles). This volume was converted to package units using unit weight information and estimated shares of different packaging sizes.
- Aiding in **strengthening government and the private sector capacities** in the DRS basics
- **Providing support for the communication of the system´s financial implications** to institutional and private stakeholders.
- Delineate the **next steps** required to start planning the DRS scheme in Cape Verde.

3. Strategic Case

The Strategic Case introduces the main drivers for change, focusing on the Cape Verde policy and waste management plans.

3.1. Strategic Context

Plastic pollution is one of the bigger environmental issues society is currently facing. According to the Ellen MacArthur Foundation (The Ellen MacArthur Foundation, 2022), a circular economy approach for plastics, which addresses the full lifecycle of plastic and is based on three main principles, is required to solve plastic waste and pollution. The three main principles are:

- Eliminate all problematic and unnecessary plastic items we do not need.
- Innovate to ensure that the plastics we need are reusable, recyclable or compostable.
- Circulate all plastic items we use to keep them in the economy and out of the environment.

The United Nations (UN) has recently released a plan to create the first-ever global plastic pollution treaty, hailing the resolution as the most important multilateral climate deal since the landmark 2015 Paris accord. World leaders, ministers, and other representatives from nearly 200 countries at the UN environment agreed to develop a treaty to end the scourge of plastic pollution. The resolution, which addresses the full lifecycle of plastic, including production, design, and disposal, will be developed over the next two years (Meredith, CNBC, 2022).

The settlement establishes an Intergovernmental Negotiating Committee (INC), which is expected to start its work in 2022, aiming to complete a draft legally binding agreement by the end of 2024 (United Nations, 2022).

Following the consolidation of the bottling industry around the '70s, the increase in transport costs and distances, the rise of consumerism, and customer convenience, the consumption of single-use beverage containers rose exponentially. The deposit system started to appear as a countermeasure for this development. Iceland was the first country in 1989, setting up a DRS nationwide for a wide range of beverage containers. Sweden, in 1994, increased its scope from cans to plastic bottles. This trend resulted in countries such as Norway, Finland, Germany, Netherlands, Estonia, and Croatia implementing similar systems around the 2000s. The latest EU country to introduce DRS was Lithuania, to date.

Other countries are also actively addressing this topic, as shown in Figure 3-1. Data adapted from (Spasova, Deposit Refund Systems in Europe, 2019).

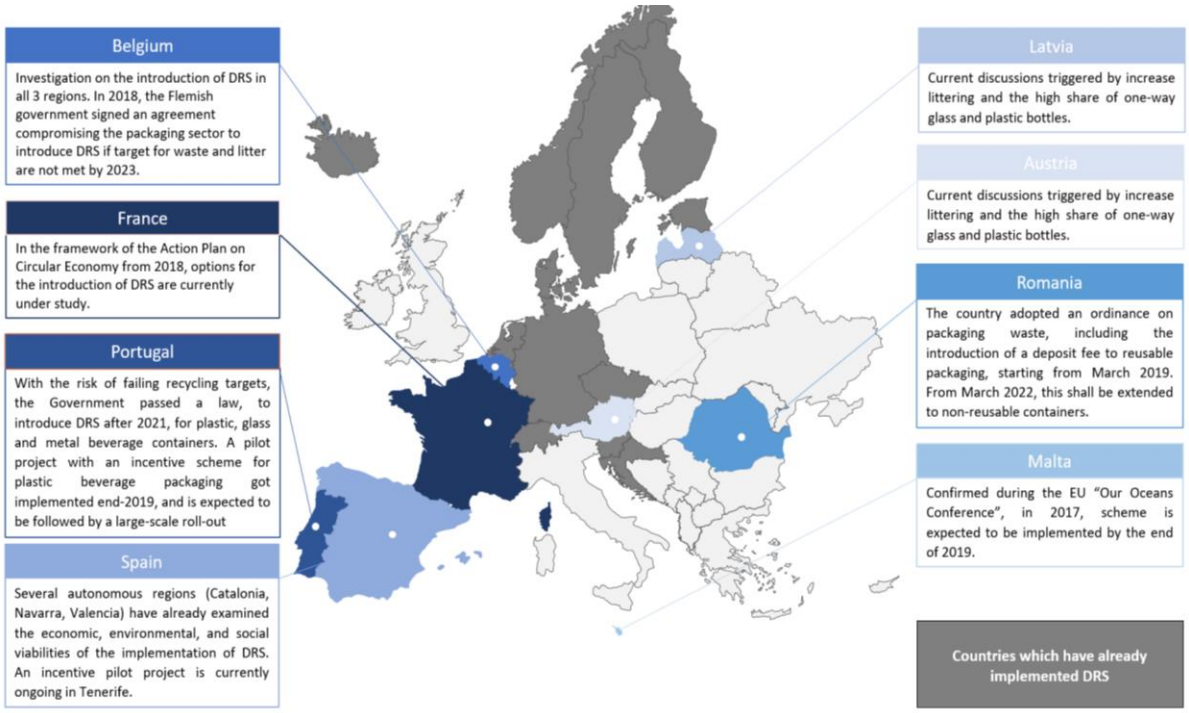


Figure 3-1 - Status quo of EU MS on the implementation of DRS (BFS, 2020)[1]

Considering the international panorama of a transition towards a circular economy, Cape Verde has also been working to tackle its plastic waste problem using the Roadmap Waste Project and National Strategic Plan for Waste Management (PENGeR) as a starting point.

General EPR objectives are shown in Figure 3-2.

[1] Based on data from (Spasova, Deposit Refund Systems in Europe, 2019). Status of 2019.

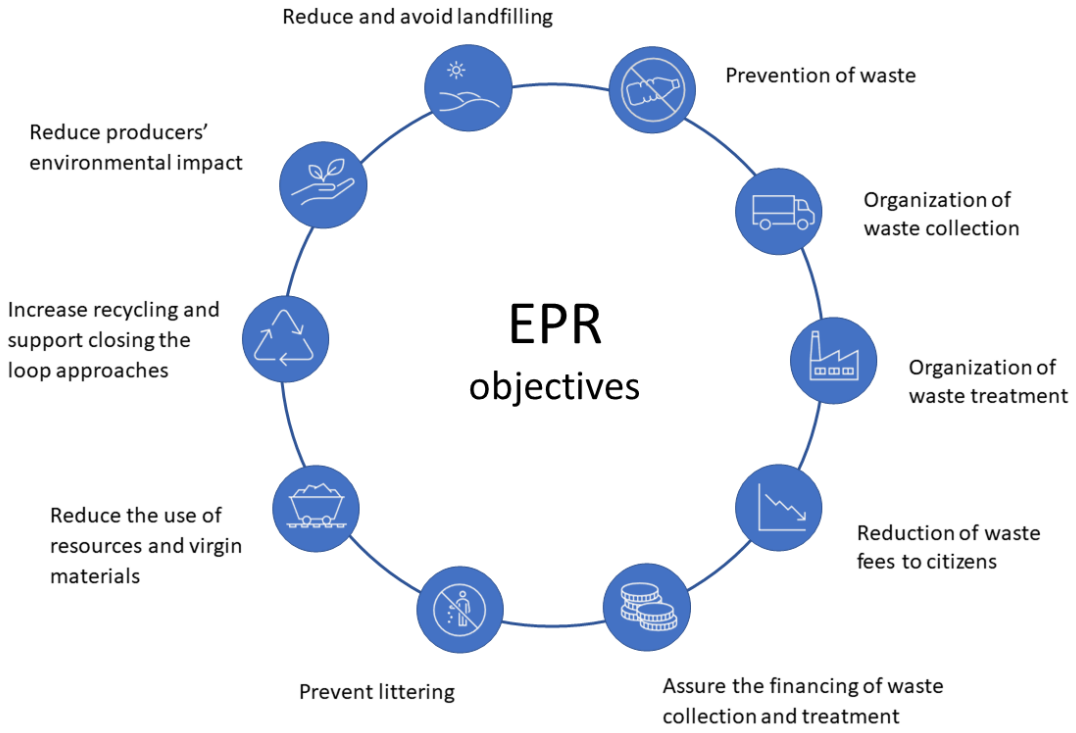


Figure 3-2 EPR general objectives (BFS, 2020)

A Deposit Refund System (DRS) for beverage containers was proposed as a suitable scheme that fits and will enable Cape Verde to meet its waste management objectives strategically. For instance, as mentioned in chapter 1, the DRS system ensures high recovery rates, as the current global average of 84% (Reloop & Europe, 2020).

3.2. Cape Verde Specific Strategic Objectives

Cape Verde's status quo is at its initial steps in taking action for recycling. It has identified packaging as a waste fraction that should be prioritized yet the country still lacks local formal recycling infrastructure. Additionally, the country has not yet implemented source segregation. These reasons reaffirm the need for action.

Figure 3-3 highlights the main strategic factors endorsing the establishment of a DRS in Cape Verde.

Figure 3-3 Strategic factors for establishing DRS in Cape Verde (BFS, 2022)

In **May 2022**, **a workshop in Cape Verde took place** with the following objectives:

1. Meet with institutional and private stakeholders to **introduce the project**.
2. **Start to build capacities** on the deposit refund scheme basics.
3. **Present the initial results of the Business Case** to the participating stakeholders and receive their feedback.
4. In parallel, **highlight and request the missing data** required to complete the business model calculation tool (BMCT).

Note: During the visit to Cape Verde, an initial and final questionnaire was applied to stakeholders. Its intention was to understand whether the workshop sessions helped expand their technical knowledge on the DRS and which topics remained unclear. Details on the results of the survey´s can be found in Annex 9.1.

3.3. Strategic risks

This subchapter presents the **main risks associated with DRS implementation** and potential mitigation measures (refer to Table 3-1).

Table 3-1 Risks and Mitigation Measures when Implementing DRS

Risks	Description	Mitigation Measures
Governance & Operational Setup	Definition of roles and responsibilities among public and private stakeholders	Intensify exchange tables and working groups to define clear responsibilities. These should be well-described in the new DRS legislative framework.
Restricted recycling	The lack of recycling infrastructure leads to the export	It is expected that, with the implementation of DRS, new business

capacity in the country	of recyclables. Even though this practice is highly spread worldwide, it could bring less credibility to the system.	opportunities will arise due to higher quantities and quality of collected materials.
Potential reluctance of producers, importers, and retailers in participating in the system	Typically, producers, importers, and retailers hinder DRS development in some countries since the system represents higher costs for them.	This obstacle may be overcome by engaging with the beverage manufacturers in the system's design from the initial phase. Constant communication and consultations with producers, importers and retailers is crucial. Gathering their feedback to tailor the system to meet their needs. Finally, producers and importers also face a growing demand for sustainability from consumers and other stakeholders.
Risks of fraudulent activities (e.g., double redeemed containers)	Return of beverage containers that do not belong to the scope of DRS or return the same containers several times. Producers or importers not reporting or underreporting their products placed on the market (POM).	There are strategies to limit fraudulent activity, but they should not create unnecessary costs for consumers and businesses. This issue is usually addressed by applying DRS-specific bar codes and a centralized system controlling the POM, redeemed and collected container quantities on item and return location level. Monitoring and auditing companies are critical for the success of DRS.
Poor Performance of DRS	Established collection targets are not met.	Addressed via ongoing monitoring of DRS Operator activities, the establishment of penalties for not complying with targets, and higher investment in awareness-raising campaigns
Island logistics	Consolidating minimum volumes that enable the establishment of recycling plants or export.	This challenge may be overcome by developing one to two main interim storages for the valorization of DRS scope fractions.

	In DRS, each package has to be identified before compacting the package. Interisland logistics increases complexity and cost of collection logistics of empty packages.	This challenge can be partly overcome by setting up RVM-equipped redemption centers in islands. Using RVMs will allow early compaction of the packages and increase the efficiency of collection logistics.

4. Socio-Environmental Case

The socio-environmental case highlights the potential consequences of DRS implementation on socio- and environmental factors.

4.1. Data Acquisition

The main sources of information used to complete the expected social impacts per stakeholder group were desktop and market research on the country´s beverage packaging and waste context, the outcomes of visit to Cape Verde in May 2022, and the financial calculation tool.

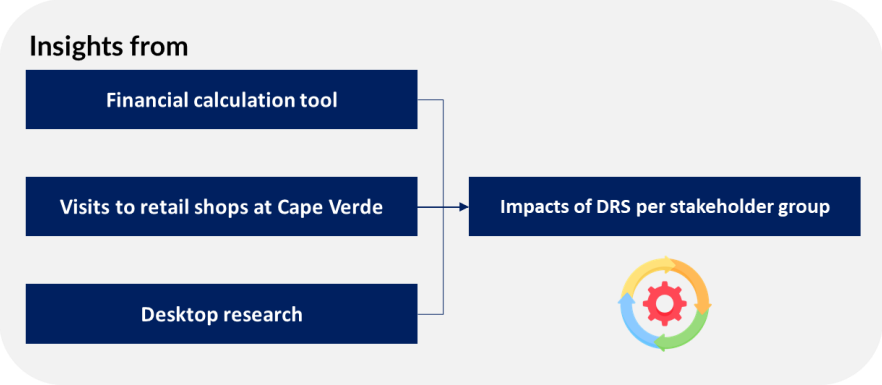


Figure 4-1 Data sources to define the impacts of DRS on stakeholders (BFS, 2022)

Relevant to the impacts on consumers, retail shop visits to consult beverage container prices and feedback on the perception of the deposit level during the presential workshop were considered. Impacts on the governmental stakeholders were developed based on their responsibility to draft a clear and precise law and their leadership role as system drivers.

Data collected from the private sector, customs and National Statistics Institute (INE) on the share of containers sold by bottle size and the volumes of imported packages were used to estimate the impact on waste managers and the informal sector. In other words, the amount of beverage bottles placed on the market was calculated, thus, with the proposed return rate (80%) the amount of material collected ready to be recycled.

Finally, the **main arguments used to name the private sector impacts were the business model calculation tool results and their role as waste producers and managers of the system**.

Additionally, studies on DRS in Scotland, Slovakia, and Spain (Government, 2020) (Dráb & Slučiaková, 2018) (i Palmer, 2017) were consulted to analyse the expected impacts on the social processes of the introduction of DRS in Cape Verde.

Finally, a **qualitative assessment was included to designate each impact as significant, moderate, or minor**.

4.2. Impacts on the citizens

Firstly, the public will be one of the main actors who will notice the beneficial impacts of DRS to a large extent. **Cape Verde citizens are expected to experience improved living conditions from litter reduction in public spaces and indirectly receive waste management education through awareness-raising campaigns**.

Considering that the DRS design is based on consumer convenience, citizens will perceive the system as simple. It is not expected that consumers face challenges when returning containers.

Initially, consumers might perceive that the prices increased from the deposit fee (refer to section 5.1.2) placed on the beverage containers. **However, as the financial calculations will consider local parameters, it can be said that the deposit level is in line with Cape Verde´s economic context**. The scale of this impact is expected to be minor. Besides, consumers will also perceive a sense of participation in recycling processes, raising awareness among citizens about this topic.

On the other hand, the negative impact citizens will be exposed to is potentially reduced comfort and added complications in the shopping process. People will have to allocate time and space for household waste separation and beverage return to collection points. Also, there will be a waiting time at return locations, especially during high traffic shopping hours in retail stores.

Generally, the public tends to **have a positive impression of DRS**. To confirm this hypothesis and understand the desired scheme design, citizen consultation sessions shall be conducted (e.g. consumer behavioral survey).

4.3. Impacts on Governmental Stakeholders

4.3.1. Impact at National Level

The **main efforts regarding the governmental stakeholders involved in the process are drafting specific legislation for DRS**. This mandated framework shall ensure clarity in all roles and responsibilities, monitoring and enforcement procedures, and be dedicated to specific stakeholders. **Once the scheme is established and running, another duty from governmental stakeholders is to monitor the DRS operator** to assure that targets are being met and the entity is running compliant with the established legislative framework. As drivers of the system, governmental stakeholders must be involved in all phases and activities related to its design and implementation.

It can be expected that citizens perceive the implementation of DRS as positive and responsible actors will be accounted for boosting the country towards a green economy.

4.3.2. Impact on municipalities

The impacts from a DRS implementation on the local authorities will differ depending on the context of the region. For instance, the different ways staff interact with the waste based on the collection approach and its destination after it is collected will impact the costs. Whether the local authority operates the collection of containers, or the services are contracted out to a private sector waste company will also lead to different distributions of costs and benefits. Local governance structures (e.g., single, or two-tier local government administration) will also influence the impacts of DRS. If part of the collection locations are separated from the retail store network to so called redemption centers, these redemption centers will need spaces and have impact on urban planning.

Usually, **the main concern on behalf of local authorities is the potential loss of material revenue**. Currently, **there are not yet official Material Recovery Facilities (MRFs) in place in Cape Verde**; **the informal sector mainly leads the valorisation of recyclables**.

Additionally, implementing DRS would represent lower costs associated with street sweeping and landfilling since littering is expected to decrease.

Local authorities' specific roles and responsibilities within the DRS setup are yet to be defined. In any case, recognizing the expected impacts will allow decision-makers to develop strategies that enhance the positive effects and establish suitable countermeasures to minimize the negative impacts.

4.3.3. Required workforce

It is foreseen that the introduction of DRS in Cape Verde will impact employment. **Operational and administrative activities will demand a workforce to fulfil the relevant DRS tasks. Four main activities are considered in the estimation of FTE (full-time equivalent) jobs** required to execute the operational front of DRS; these include:

a. **Reception of beverage containers at the return locations**.
b. **Collection and transport** of the packed beverage containers.
c. **Manual counting** of the returned bottles.
d. **Consolidating, sorting, and baling** (PET and Alu cans) of beverage containers

It is important to mention that magnitude of the labour force required depends on the volume of material and the beverage return approach.

Table 4-1 shows the results of the FTE jobs per operational activity in Scenario 1 – a combination of over-the-counter returns and set up of redemption centers. Calculations show that **210 people will be required to operate scenario 1**:

- From the 210-workforce needed, 166 people will be hired at the retail shops or redemption centers to manage operational activities relevant to the reception of beverage containers.
- Out of the 166 jobs created for operational activities at return locations, 62% or 103 people will be assigned to flow 1 (over the counter returns) for the individual handling of beverage containers.
- The number of personnel required to perform the collection and transportation activities is 5.
- Beverage counting and validation at flows 1 and 2, over the counter returns and HoReCa, will require 28 staff members.
- Baling of beverage containers is expected to necessitate 11 people.

Table 4-1 Estimated operational jobs generated from the introduction of DRS – Scenario 1 (LBG, 2022)

SCENARIO 1

	Operational activities at return locations	Logistics activities	Beverage counting activities (Flows 1 and 2)	Bailing of beverage containers	
	Total FTE	*Total* FTE	*Total* FTE	*Total* FTE	*Total* ***FTE***
Flow 1: Retail manual OTC					
SUM	**103,5**	**2,8**	**3,8**	**0,9**	***111,0***
Flow 2: Manual HoReCa					
SUM	**0,0**	**1,1**	**24,1**	**9,8**	***35,0***
Flow 3: Redemption centers					
SUM	**62,8**	**0,9**	**0,0**	**0,6**	***64,2***
Total (FTE)	***166,3***	***4,8***	***27,9***	***11,2***	***210***

For Scenario 2, given its 100% manual approach, a larger workforce will be needed. It was estimated that **220 people will be required to operate scenario 2**. The key messages for scenario 2 are:

- 78% of the workforce or 173 staff will be allocated to perform operational activities at the return locations.
- A team of 6 people shall be hired to conduct transportation and logistics activities.
- For flows 1 and 2, counting centers will demand 30 job positions to meet beverage counting activities.
- Baling of beverage containers is expected to necessitate 11 people.

Figure 4-2 Estimated operational jobs generated from the introduction of DRS – Scenario 2 (LBG, 2022)

SCENARIO 2

	Operational activities at return locations	Logistics activities	Beverage counting activities (Flows 1 and 2)	Bailing of beverage containers	
	Total FTE	*Total* FTE	*Total* FTE	*Total* FTE	*Total* ***FTE***
Flow 1: Retail manual OTC					
SUM	**172,6**	**4,7**	**6,3**	**1,5**	***185,0***
Flow 2: Manual HoReCa					
SUM	**0,0**	**1,1**	**24,1**	**9,8**	***35,0***
Total (FTE)	***172,6***	***5,8***	***30,4***	***11,2***	***220***

It is important to mention that the estimation of the personnel needed by introducing DRS only considers the operational tasks of running a DRS scheme operation. Therefore, **additional 7-9 FTE** positions will be created for:

- Management of PRO, return points, counting centers and recycling facilities (2-3 FTE).
- Administration of deposit payments and reporting activities (1-3 FTE).
- Provide customer service and IT support (2-3 FTE).
- Manufacturing and distribution of transport packages and labels (1 FTE).
- Planning and executing awareness-raising campaigns and consumer communication (1 FTE).

4.4. Impacts on Waste Managers

Waste managers will benefit from optimized operational costs as packaging containers will not be mixed with other waste streams. Furthermore, higher quality material will enable better selling prices and boost the recycling market. Finally, dumpsites and landfills will experience reduced amounts of waste. Currently, Cape Verde´s waste is disposed of mainly in the country´s 18 official dumpsites that serve the 22 municipalities and one landfill in Santiago (Agência Nacional de Água e Saneamento, 2016).

A **positive outcome will be that packaging waste treatment will become an attractive investment market for waste handling facilities and recyclers**. Cape Verde has no formal recycling facilities; it is an industry under development. So, DRS implementation would enhance the sector's growth by motivating waste managers to expand their activities or attract investment opportunities.

Although revenues might decrease with fewer waste inputs for landfill operators, the main impact will be **land optimization from a reduction in received volumes of spent beverage containers**. A total of 17.500 tons of packaging waste in Cape Verde will be diverted from landfills if DRS implemented.

Table 4-2 Total diverted waste from landfills from the introduction of DRS in Cape Verde (BFS, 2022)

Baseline information	Aluminium cans	Glass bottles	Plastic bottles
Units placed on the market (million units)	15.000.000	107.000.000	55.000.000
Collection target – with DRS	83,6%	83,6%	83,6%
Weight per unit (kg/package)	0,0111	0,1768	0,0331
Total diverted waste (million units)	**12.540.000**	**89.452.000**	**45.980.000**
Total diverted waste (tons)	**139**	**15.815**	**1.522**

4.5. Impacts on the Informal Sector

The informal recycling sector (IRS) plays an important role in collecting beverage containers in most cities worldwide. Aluminium cans are usually highly collected in low- and mid-income countries due to their natural value. In contrast, the value of PET and glass bottles can differ strongly based on the secondary raw material markets.

A **positive impact on the IRS is the significant improvement in working conditions**. There are opportunities for increased collection rates from the citizens who separate bottles but do not return them and instead leave these at visible places/allocated places for collection. For example, in German cities like Berlin, a common practice in the informal sector is the collection of beverage containers lying in parks or next to waste containers.

The informal sector will also have a broader range of container types to pick from. **The collected material will be more valuable because the deposit value exceeds the material value of the package**. Also, the quality of collected material is improved when beverage packages will not mix with other waste. Therefore, more monetary compensation will be earned by IRS. A negative impact might be the reduction of available containers in the “free market”.

Another possibility is to integrate the informal sector into the deposit system, e.g. working in coordination with redemption centers by bringing in their collected bottles during non-peak hours of the operation. Also, the IRS can cooperate with consolidation and counting centers, bringing the collected packages directly to where the counting is done, thus offering savings in collection logistics. This would create additional jobs. The inclusion and involvement of the informal sector will play a key role in the system's success.

According to PENGeR, Cape Verde´s informal recycling sector can be found at dumpsites carrying out activities such as sorting and collecting valuable materials. PENGeR also indicates that this activity represents their main source of income, and some might be dedicated to it full time. Additionally, nine out of the fourteen interviewed municipalities mentioned the regular presence of the informal sector at the dumpsites. Those are Ribeira Grande/Paul, São Vicente, Ribeira Brava, Sal Brava, Sal, Boa Vista, Santa Cruz, Praia, Mosteiros and São Filipe. Lastly, the number of

average waste pickers present at the municipality's dumpsites are the following (Agência Nacional de Água e Saneamento, 2016):

- Praia: 79 waste pickers
- Boa Vista: 30 waste pickers
- Sal: 20 waste pickers
- São Vicente: 18 waste pickers

  Porto Novo, Santa Catarina de Santiago and Brava: Municipalities that manage dumpsites but do not hold a record on the waste pickers, although some acknowledge their presence.

4.6. Impacts on the Private Sector

The private sector will come across different impacts.

Producers and importers will face a rise in beverage packaging/production costs from the fee to cover the expenses of the DRS Operator. This cost increase is estimated in section 6.3.3 of this report. Furthermore, the producers, importers and retailers **will have to adapt their process flows to meet the requirements of DRS established by the law**. Beverage producers and importers will be required to **adapt their product labels to comply with the marking instructions of the DRS**. This process usually covers the visual deposit logo for the consumer and manual return channel and a barcode readable by the reverse vending machines (RVMs) and counting lines, which indicates the item belongs in the DRS and confirms the identity of returned package or stock keeping unit (SKU). So, the introduction of DRS might also require changing the labelling requirements for some or all of imported products.

Producers and importers will also have to report their item-level POM information and pay the deposits based on their POM to the DRS Operator.

On the other hand, within the DRS scope, **brands' image will be improved towards clients and consumers, resulting from adapting the business to a circular economy**. These companies will be able to share information on high recycling quotas in their sustainability reports. **Besides, high-quality collected material, e.g., food-grade, may enable popular processes like bottle-to-bottle recycling**.

The contemplated **impacts of retailers include converting commercial space to set up beverage packaging return points for customers**. Depending on the operational setup (automated or manual), **retailers may be obliged to invest in collection infrastructure, resulting in extra costs**. Yet, **this can be seen as a business strategy to provide convenience to customers and potentially increase sales**. A well-established collection network within retail areas can attract further customers, who would come to return containers and shop. Returning the packages will become

a widely adopted activity; the convenience of the return will impact consumer shopping location selection.

Retailer personnel will handle the returns and pay out the deposits to the consumers. Returned packages have to be packed in durable transportation packages and stored in safe location in the backroom area. These labor-, packaging material- and space costs are typically compensated to retailers with handling fees paid by the producer responsibility organization.

A major implication of DRS on producers, importers and retailers will be a significant increase in administrative efforts from running the DRS managing organization. Companies will need to gather and disclose production data and, most likely, be part of the operations of the DRS Operator.

Finally, **Cape Verde´s industry will experience increased operational efficiencies due to the granular data reporting and management**.

During the onsite mission to Cape Verde in May 2022, visits to four retail shops in Praia took place. Outcomes of the observations on space availability to set up return locations within the visited shops are shown below.

Table 4-3 Findings on space availability in retail shops for the set up of beverage packaging return locations (BFS, 2021)

Parameter/ Retail shop	Retail shop Fenicia	Supermarket Calú e Ángela	Supermarket Monteiro	Supermarket Calú e Ángela
Size	• Small	• Medium	• Medium	• Large
Collection options	• **Manual return.**	• **Manual return.**	• **Manual return.**	• **RVM installation.** • **Manual return.**
Space availability	• **No** available **space** to place RVMs inside the store.	• **No** available **space** to place RVMs inside the store.	• **No** available **space** to place RVMs inside the store.	• **Available space** to place RVM inside the store.
Implications	• Allocate storage space to place collected beverage containers.	• Allocate storage space to place collected beverage containers.	• Allocate storage space to place collected beverage containers.	• Adapt commercial space to place RVM or return location. • Electric installation and place RVM.

In general, it can be said that only the larger-sized retail shops, such as supermarkets, will receive enough material to leverage the investment needed to set up an reverse vending machine. As labour costs are competitive in Cape Verde, the small and medium-sized stores will likely collect beverage containers manually.

In summary, through literature review (Government, 2020) (Dráb & Slučiaková, 2018) (i Palmer, 2017), business model outcomes and onsite visits to retail shops, the next implications of DRS in different stakeholder groups were identified:

Stakeholder group	Implications
Beverage producers and importers (BPI) 	– Adaptation of operational activities (e.g. new label design and or re-labelling) – Improved operational efficiency (e.g. data governance) – Increased beverage drink packaging costs (e.g. producer fee to cover the costs of the DRS Operator) – Increased administrative efforts (e.g. DRS Operator management) – Increased products´ recycling rates and shift towards circular economy and green global trends
Retailers (R) 	– Reduced comercial space (e.g. set up return points within the comercial premises) – Increased administrative efforts (e.g. DRS Operator management) – Increased capital costs (e.g. hosting return points) – Potential increase of sales from offering customer convenience (e.g. placing RVMs)
Waste management operators (WMO) 	– Improved material quality (e.g. clean and segregated beverage containers ready to be recycled) – Enhanced potential for recycling sector development (e.g. material quality will make recyling an attractive market) – Optimized operational costs (e.g less efforts in waste segregation) – Decreased amounts of disposed waste at dumpsites and landfill (e.g. recovery of PET, glass and aluminium bottles)
Government (G) 	– Reduced waste management services costs (e.g. street and roads cleaning) – Adaptation of legislation (e.g. development of waste law for DRS in beverage containers) – Increased incentives to maximize business contribution (e.g. tax on products which are outside of the scope)
Consumer (C) 	– Potential price increase perception (e.g. deposit fee in beverage containers) – Sense of contribution in the recycling processes (e.g. returning beverage containers) – Positive image towards beverage / retailer brand from supporting DRS implementation
Public (P) 	– Improved waste management literacy (e.g. awareness raising campaigns) – Improved living conditions (e.g. litter reduction from public spaces) – Reduced comfort of the population (e.g. return beverage packaging, space for temporary storage) – Integration of the informal sector (e.g. increase collection rates)

Figure 4-3 Expected implications of implementing a DRS scheme per stakeholder group (BFS, 2022)

Expected effort \ Scale of impact	MINOR	MODERATE	HIGH
HIGH	(BPI) : Increased beverage drink packaging costs (BPI) : Increased administrative efforts	(C): Positive image towards beverage / retailer brand due to changes in current mindset ("green products")	(BPI) : Adaptation of operational activities (BPI) : Improved operational efficiency (G) : Adaptation of legislation
MODERATE	(C): Sense of contribuiton in the recycling processes	(R) : Reduced comercial space (P) : Reduced comfort of the population (G) : Increased incentives to maximize business contribution	(R) : Increased administrative efforts (R) : Increased capital costs
MINOR	(G) : Reduced waste management services costs (C) : Price increase perception (P) : Increased employment opportunities	(WMO) : Optimized operational costs (WMO) : Decreased amounts of landfilled waste (P) : Improved living conditions	(WMO) : Improved material Quality (BPI) : Increased products recycling rates (R): Potential increase of sales (P) : Improved waste management literacy (P) : Integration of the informal sector

Figure 4-4 Qualitative assessment of the implications of introducing DRS (BFS, 2022)

Finally, a **qualitative assessment matrix was developed to identify the activities that would generate a high impact through low efforts and those that would require the highest**

commitment from the stakeholder groups. Some key points to highlight from the qualitative assessment shown in Figure 4-4 are:

- Beverage producers and the government are the stakeholders who will have to commit the most to the project.
- Activities such as adapting the legislation (government) and beverage industry process flows (producers and importers) will significantly impact DRS effectiveness. Substantial effort and time will have to be invested.
- Retailers, however, will also be accountable for the system's success by converting part of their commercial spaces as return points and placing great efforts in adjusting their process flows to fit DRS requirements.
- Cape Verde citizens will come across high-impact results while making minor efforts. The public will notice improved living conditions and an indirect increase in knowledge of waste segregation.
- The reception of high-quality material will positively impact the recycling industry without investing efforts.
- The price increase from placing a deposit fee on beverage bottles is not expected to cause a high impact on consumers' perceptions.

5. Commercial Case

The commercial case encompasses the scheme structure and funding solution analysis, including the main design parameters and basic assumptions used in the financial case.

5.1. Design Parameters

5.1.1. Scope of DRS

The scope of DRS correlates to the range of bottles/cans included within the scheme, both in container material type and beverage category. DRS schemes in Europe are usually comprehensive, covering three main types of one-way packaging materials: plastics, glass, and metal.

Historically, deposit systems were developed for beverage containers because they are more likely than other types of food-based containers to be consumed away from home and thus end up as litter. Some standard **exceptions within European DRSs are made for wines and spirits**. Besides, **bottle shapes with non-cylindrical cross-sections (such as Tetra Pak containers) mean more expensive take-back**, considering that the usage of RVM requires a higher investment in machinery. The DRS return network must handle hundreds of millions of individual items efficiently. Carton packages have caused challenges due to wedging, causing, for example, conveyer belt jams and machine damage in handling systems. Including carton packages stream in DRS would require significant stream-specific investments that are not in use in other countries. Therefore, carton packages are not advised to be included in the scope.

Furthermore, **hygiene issues, particularly in association with plastic milk bottles and other food-based containers, are raised in most DRS schemes across Europe**. These matters associated with milk bottles have been stated to not include in existing DRSs.

Assumptions for Cape Verde

Bearing this in mind and considering the visits to retail shops and the discussions with private and public stakeholders during the workshop in Cape Verde, the materials within scope for DRS are expected to include PET, aluminum cans and glass packages.

The beverage categories suggested to be included in the system´s scope are all soft drinks, bottled water, and beer.

It is proposed that strong alcoholic beverages and dairy products, are excluded from the system´s scope. Tetra Pak shall not take part of the DRS.

5.1.2. Deposit and Fees

Two of the key design features of a DRS are the division and or the level of the deposits. **Some systems break down the fees into different categories such as 'container material type' and 'container volume', combined with 'beverage type' or 'alcohol content %'**. This means that some countries determine their deposit fees by differentiating between sizes and material types, while others have one rate for all container types, facilitating society's comprehension.

While setting a fee based on the beverage size may be perceived as customers getting a higher award for larger items, including guaranteeing to recycle these bigger containers is beneficial, ensuring all containers are recycled independently of their size is crucial.

'Container material type' is a category used by most EU member states to differentiate deposits. One important factor regarding this category, which shall be considered, is that beverage producers might change their packaging type depending on the fee. If there are much higher fees for cans than glass bottles, producers might switch to the glass option. Containers differ in their collection costs and material value despite the deposit value. Therefore, recycling fees typically differ between material types.

Previous studies have shown that return rates correlate to the deposit rate. Figure 5-1 shows the relation between return rates and deposit values regarding the purchasing power parity (PPP). As it can be seen, a higher deposit level favours the return rate. It is crucial to highlight that deposit values must be adjusted to PPP to normalize the relative differences in wealth between the countries concerned and make the figures more comparable (Eunomia, A Scottish Deposit Refund System, 2015).

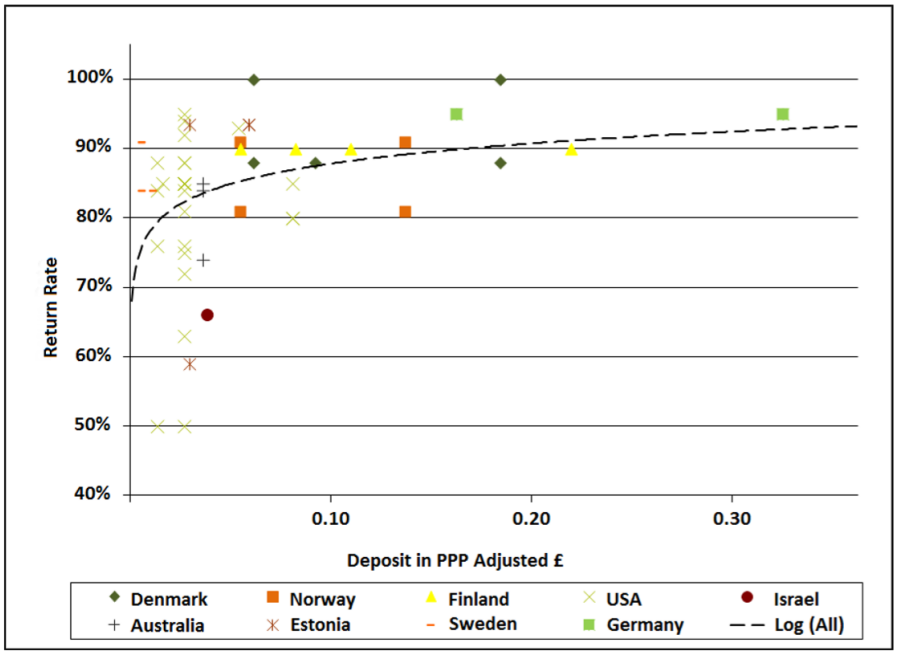


Figure 5-1 Return rates as a function of deposits in PPP - Adjusted £ (Eunomia, A Scottish Deposit Refund System, 2015)

Another important financial aspect is the handling fee. Systems that include redemption centers may also pay handling fees, depending on who operates the centers. A handling fee would not be necessary if the central system operator manages these centers (Eunomia, A Deposit Refund System for the Czech Republic, 2019). In this case, the DRS Operator directly pays the costs to operate the redemption center.

Table 5-1 provides a general overview of European countries' deposit and handling fees.

Table 5-1 Deposit and handling fees for different one-way containers in EU member states - adapted from (CM Consulting, 2018) and (Spasova, 2019)

Country	Container Category	Deposit Fee (€/Cont.)	Handling Operation	Handling Fee* (€/Cont.)
Croatia	All containers	0.06	Manual	0.01
			RVM	0.02
Denmark	Metal, glass <1L	0.13	Manual	0.008 - 0.019
	Plastic <1L	0.20	RVM with compactation	0.0019 - 0.0095
	Metal, glass, plastic >1L	0.40		
Estonia	All containers	0.10	Manual	0.0105 - 0.0120
			RVM without compactation	0.0215 - 0.234
			RVM with compactation	0.031
Finland	Plastic <0.5L	0.10	Manual or RVM without compactation	0.027
	Plastic 0.5L-1L	0.20		
	Plastic >1L	0.40		

	Metal	0.15	RVM with compactation	0.03
	Glass	0.10		
Germany	All containers	0.25	**	
Lithuania	All containers	0.10	Manual	0.028
			RVM without compactation	0.015
			RVM with compactation	0.028
Norway	Plastic, metal < 0.5L	0.20	Manual/RVM without compactation	0.005 - 0.01
Sweden	Metal	0.10	Manual	0.00 - 0.023
	Plastic <1L	0.10	RVM without compactation	0.023
	Plastic >1L	0.20	RVM with compaction	0.017 - 0.048

* Handling fee ranges correspond to different container types.

** Germany has a particular system in which there are no handling fees. Instead, the retailer owns the material and sells it to the recycling plants. This practice is an exception considering the European praxis. Therefore, it is not considered for this study as a benchmark.

The handling fee is intended to reflect retailers' operational costs such as overhead, space, electricity, and usually higher for retailers that install RVMs (with compaction) to promote more efficient options and, consequently, reduce overall system costs.

The main fees surrounding the central system operator are highlighted in Figure 5-2.

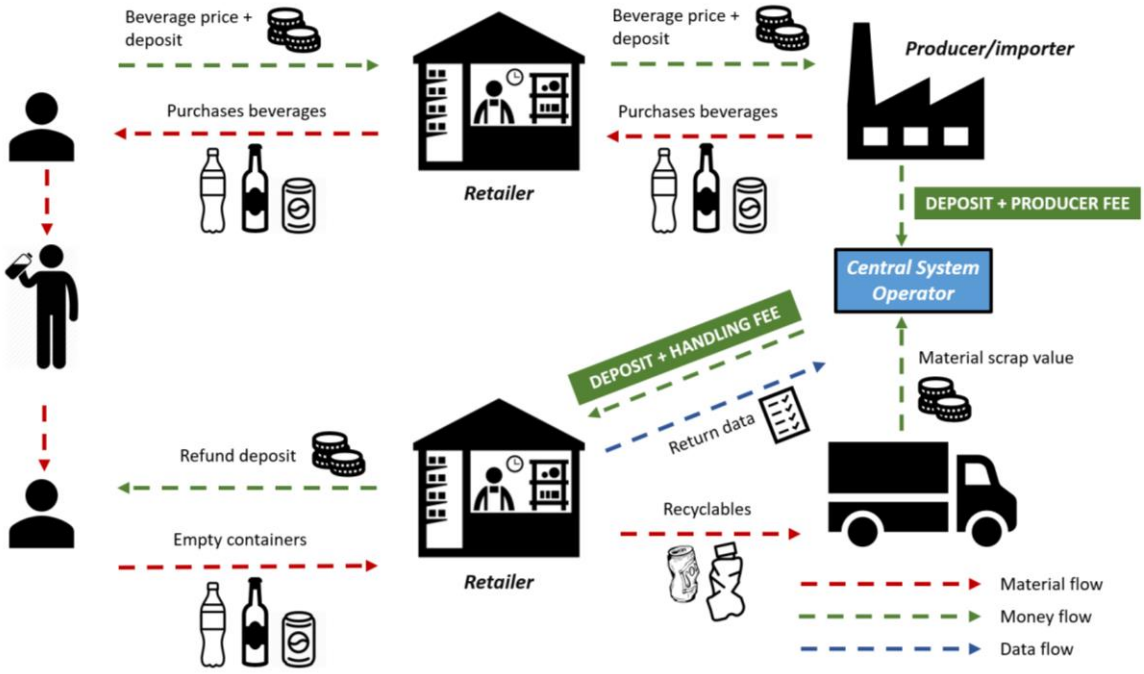


Figure 5-2 Deposit and handling fees flow (BFS, 2020)

Assumptions for Cape Verde

Considering that Cape Verde has ongoing efforts to increase environmental awareness and sensitization of citizens towards sustainability, it is recommended to keep the deposit system as simple as possible. In this case, it is suggested that the country either adopts a flat rate for all containers or sets two rates based on the size of the beverage containers. For example, decide on a deposit level for containers smaller than 2 L and a higher deposit level for 5 and 10 L containers.

The deposit should be high enough to motivate citizens to return the containers, but not as high as it would hinder consumers from purchasing the item and as per incentivizing fraudulent schemes. It is also essential to highlight that it is more feasible to increase the deposit level than to reduce it.

Considering Cape Verde´s context in terms of minimum wage, beverage prices, as well as the commonly found beverage container sizes and their share, it is proposed to divide the deposit level in two:

- PET, glass and aluminum can containers smaller than 2 L shall have a deposit of 4 escudos (0,04 €) per package.
- PET beverage containers of 5 and 10 L shall have a deposit of 10 escudos (around 0,10 €) per package.

Direct costs to operate return locations were calculated in the model and are shown in the Financial Case.

5.1.3. Infrastructure and Logistics

Typically, empty bottles and cans are returned to retail or a specific storage station (or a combination of the two). As further described in the Management Case, retailers are usually obliged to participate in the system. In some countries, “redemption centers” are explicitly created to take back used containers and refund deposits. The redemption centers are return locations not connected to retail store. They can be equipped with reverse vending machines and compaction solutions, that allow receiving high volume returns and increase logistics efficiency of returned packages. Redemption centers can be run directly by the system operator or by private individuals and companies and can be staffed or enable consumers to drop off their spent containers.

5.1.3.1. Types of collection

Collection of single-use beverage containers usually involves either:

- **Reverse vending machines** (RVMs); and/or
- **Over the counter** (OTC) collection: retailers manually collecting and storing containers.

RVMs are automated machines where customers insert their used beverage containers to obtain their refund. RVMs can identify the container and beverage type, confirm the deposit to be refunded and, in some cases, compact the containers to reduce storage space and prevent multiple redemptions. Compacting also increases the capacity of transport units and the efficiency of logistics.

RVMs are connected online to the system operator, enabling the update of new products, identifying redemption patterns, determining the optimal time for collection, and reimbursing retailers more swiftly. Additionally, some RVMs enable retailers to advertise products or offer promotions to potential customers and can allow consumers to donate their deposits to charity.

There are **different types of machines** that can be purchased or leased, depending on the requirements and size of retailers. Table 5-2 shows three examples of RVMs that may be suitable for Cape Verde´s context, in the case that retail shop owners decide to install these. The examples were selected based on the observations from the visits to retail shops, where it was seen that the share of supermarkets is low when compared to the number of small local shops and space within the shops is limited.

Table 5-2 Reverse vending machines examples (BFS, 2022)

	Stand Alone RVM	RVM with slim design	Bulk collection RVM
RVM	 Source: TOMRA	 Source: RVM systems	 Source: RVM systems
Key features	• Small and convenient	• Separate or combined (MIX) storage	• High speed bulk feed and a single feed in the same machine
Material types	• Cans • Plastic bottles • Glass bottles	• Cans • Plastic bottles • Glass bottles	• Cans • Plastic bottles • Glass bottles
Space	• 0,76 m2	• For medium to large retail stores.	• For large stores or redemption centers
Speed	• 15 containers per minute	• 60 containers per minute	• Up to 100 containers per minute

In countries where labour cost is competitive, such as Cape Verde, establishing a network with manual operations (e.g., over-the-counter collection) may be favoured over a more automized approach through setting up RVMs. This means that retail shop owners assign space for the temporary storage of the received material and train their labour force to:

- Receive the deposit for the purchase of beverage containers.
- Pay the deposit back when a beverage container is returned.
- Keep the system´s integrity (e.g., inspect container´s quality and prevent fraud).

Assumptions for Cape Verde

Considering that Cape Verde has a small population, retail channels are mainly constituted by small shops and average wage is competitive, it was assumed that no RVMs are installed in retail shops. This means that beverage containers will be returned over-the-counter and handling operations will be manual.

However, RVM installation final decision is left to the retail shop owner. RVM placement is advantageous when retail shops collect at least 1000 packages per day (considering average wage in Cape Verde).

5.1.3.2. Return locations

As shown above, containers are returned in either a manual or automated manner, varying labour and logistics costs. This is mainly related to the automated machines compacting materials to make them denser, leading to more efficient logistics. Consumer convenience is also a result of opting for an automated return approach.

Estimating the number of take-back locations is essential, as is the type of collection (manual or automatic) the retailers would likely operate.

It is vital to understand the country's retail landscape, to calculate the number of collection points in the system and whether containers would likely be returned to retailers via RVMs or manually over the counter. Once the country's context is clear and the number of collection points established, optimal logistics routes can be selected.

Return locations might include:

- Supermarkets;
- Food/convenience stores;
- Gas stations;
- Cafes (for packages consumed on site); and
- Hotels, bars and pubs(for packages consumed on site).

5.1.3.3. Counting centers

Counting centers receive the manually collected material and non-compacted containers from OTC return schemes and HoReCa sector, count and bale them. These centers also prevent fraud since containers not compacted might be taken after counting and put back into the system to redeem the deposit twice. Counting centers are employed to guarantee that the retailer who pays out the deposits receives the correct amount.

The plastic and aluminium packages from OTC and HoReCa return channels cannot be compacted before they are counted. Thus, manual returns' collection logistics of intact packages is less efficient than RVM returns where packages are often compacted after identification.

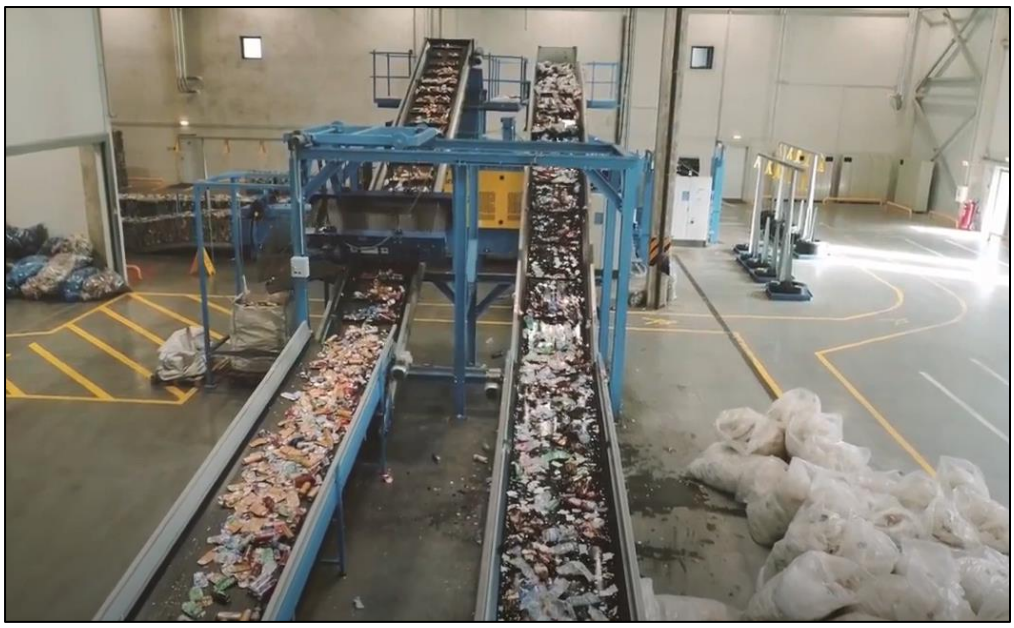


Figure 5-3 Beverage container counting lines in a counting center (Grąžinti Verta, s.f.)

5.1.3.4. Redemption centers

The return of used beverage containers needs to be as convenient as possible for consumers; therefore, European systems commonly rely on the return to the retail model. This enables customers to return their containers while shopping or if they are consuming their beverage on the way. Return rates will decrease if consumers change their routes to return containers.

Even though redemption centers might decrease consumer convenience , they are helpful in locations with less density of retailers or more informal retailers lacking adequate return and storage space (e.g., markets, kiosks, very small stores). Besides improving logistics, redemption centers are also acting as an awareness-raising tool. Figure 5-4 exemplifies redemption centers.

Figure 5-4 Redemption centers for beverage containers (The Orange County Register, s.f.) (theleader.au, 2018)

Assumptions for Cape Verde

Bearing in mind high investment costs with RVMs, the Financial Case does not consider that RVMs are placed in retail shops. Instead, it follows manual operations for the handling of beverage containers. However, retail shops owners may decide to set-up RVMs at their shops and allow for customer convenience.

The decision on the ratio between the shops that will set up over the counter (OTC) returns Vs the number of redemption centers to be established was made based on the analysis of the island's context. For practical terms, the islands were divided into three:

- Highly touristic islands: Boa Vista, Sal
- Densely populated or urban predominant islands: Santiago, São Vicente
- Lower population density islands: Brava, Fogo, Maio, Santo Antão, São Nicolau, Santa Luzia

With a system design based on manual operations, retail shops within the scope shall offer OTC collection. Additionally, it was estimated that 12 redemption centers, fully equipped with RVMs, distributed at the islands of Santiago (x8), São Vicente (x2), Fogo (x1) and Santo Antão (x1) are set up. However, this number can be adapted based on the final desired design of the scheme. Redemption centers would receive bulk volumes of containers from citizens, informal sector, HoReCa and small local shops (informal retail).

Considering the information received from the National Statistics Institute (INE) and the municipalities, the sales channels of different packaging types have been divided into:

- Retail shops including supermarkets, small local shops (organized and informal retail), and gas stations, kiosks, etc
- HoReCa including bars, cafes, restaurants, and hotels

1 counting center equipped with 2-3 counting lines is estimated to receive the volumes deriving from OTC collection and from HoReCa sector. It is likely that the counting center is set up in Praia in Santiago Island.

Further details in the Financial Case.

5.1.4. Labelling and Fraud Control

To operate a DRS, it is important to distinguish between "visual information logos" (which enable consumers to identify items that can be returned), machine-readable identifiers (which enable RVMs and counting lines to identify package) and "security logos" (whose primary purpose is preventing fraud).

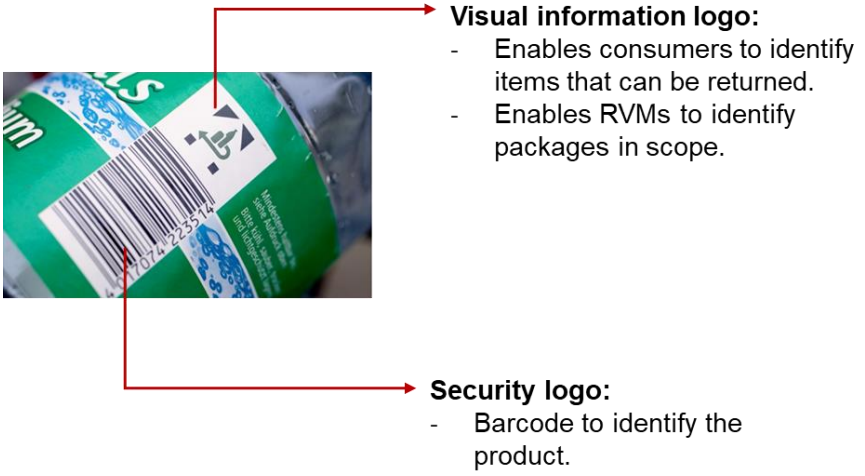


Figure 5-5 DRS labelling approach generally includes a visual information logo and a security logo (BFS, 2021)

Deposit fraud can occur anywhere throughout the system, particularly at the back-end, when a refund is claimed on a deposit that was never paid. This is the case when containers are imported or excluded from the DRS scope and are returned. This fraud type is more frequent when substantial cross-border travel and trade occur, and is significantly easier managed risk in distant island country. The risk for this type of fraud also rises if there is a wide availability of similar non-deposit packages that consumers or informal organisations can easily convert to having markings of deposit system.

Double redemption of containers and receipts is another possibility; in this case, the deposit only paid once is refunded multiple times (Eunomia, A Deposit Refund System for the Czech Republic, 2019).

At the front-end of the process, there is the potential for producers or distributors to under-report their sales data, meaning not enough deposits are initiated, and fees are avoided.

In **addition to the container label bringing information to retailers and consumers, the label provides the primary means of detecting and preventing fraud if the barcode is registered with the system operator and scanned by the RVM or at the counting centre**.

The RVMs can also include anti-fraud features to help maintain the integrity of the recycling system. For example, RVM technology can compare each barcode to the registered database and reject those containers that are not part of the scheme.

Security elements like image and data sensors and barcode recognition can verify that the shape and dimensions of the package are consistent with package product identification and aid in detecting inconsistencies. Additionally, RVMs can connect stakeholders to send real-time alerts.

Fraud can be more difficult to monitor with manual over the counter returns. At OTC return, inspection of the packages happens in two ways:

- A package is recognized to be within the scope of the system via its information logo and validated visually.
- In parallel, a scanner can be used in unclear situations to verify the identity of the package and whether it is in scope of DRS.

Assumptions for Cape Verde

Considering that a high share of beverages is imported (and have different bar codes), there are three main strategies to mitigate fraud:

- Request producers and importers to adopt a national barcode for Cape Verde.
- Offer producers and importers the option of adopting an open barcode that allows containers to be sold in any country while paying a higher fee to countermeasure the greater risk of fraud.
- Offer producers the option to use a barcode add-on (additional smaller barcode printed or manually fixed) that the RVM or bulk counting technology can scan. 33% imports (national bar code or add-on)

The strategy 1 is feasible for all the products produced in Cape Verde, also for the products produced regionally and imported to Cape Verde in high volumes.

Strategies 2 and 3 are feasible for products with small sales volume and products in which the Cape Verde imports does not play important role in their production.

Strategy 3 supports the consumer and manual return locations better and is advised to be chosen for all products with significant volume.

5.2. Financing

The detailed costing and funding of the scheme are set out in the Financial Case, but the following section gives an overview of the costs (capital and operating) incurred and how these may be funded.

5.2.1. Funding the Costs of the Scheme

In general, DRS scheme's main costs can be divided into two parts:

- **Costs of setting up the DRS scheme**, also known as Capital Expenditures (CAPEX) such as:

  - Building necessary infrastructure.
  - Purchasing and installing equipment used to handle and validate the returned packages.
  - Setting up the organization to manage the DRS, including the IT system to monitor payments and control it.
- **Costs of operating the DRS scheme**, also known as Operational Expenditures (OPEX) such as:
  - Main cost elements from managing collection points.
  - The collection logistics and export of collected material.
  - Beverage containers handling operations at counting centers such as counting and baling.
  - The general administration of the system.

Producers, importers, and retailers usually bear both setup and operational costs. Based on the main expenses of the DRS, the costs to the retailer on the required space and resources for the DRS (e.g., acquirement of RVMs) are by far the most significant component of the total implementation costs.

Table 5-3 explains the main financial features while implementing a DRS.

Table 5-3 Main DRS Costs (BFS, 2022)

Financial Feature	Details
RVM costs	Include the purchasing of equipment (installation and operating) and the bring points for consumers to return the materials and collect their deposits. These expenses vary depending on the number and type of machines (with compaction, material separation), and the type of purchase agreement (by the tenderer, retailer, leasing, etc.).
Operating costs in return locations	Include space, personnel and packaging material costs in return locations. In return, locations equipped with RVM also include the cleaning and maintenance costs of the RVMs.
Collection costs	Refer to the collection of beverage containers from retailers. These expenses rely on the investment of purchasing or leasing new vehicles. In most cases, the collection from retail can be done as backhauling operation of beverage distribution, but the option to use DRS specific capacity is also possible. The collection logistics from high volume redemption centers can be done by third party waste collection operators that can use their normal capacities for the collection.
Labelling	Labelling is a cost for those imported/produced products without Cape Verde specific labels. Refer to the national harmonization requirements for products participating in the system.
Central system setup	Refer to the establishment of the DRS Operator. It includes hiring personnel, preparing system bylaws and agreements with different

	stakeholders, preparing guidelines and instructions for stakeholders, and setting up an IT system for reporting and managing operational and financial transactions.
Total setup costs	Include the equipment (RVMs, vehicles, equipment required at counting centers), redemption center locations, labelling, and setup of the central system (IT, communication, etc.).
Counting centers	Comprise the central counting centers where the manually collected material and non-compacted containers from RVMs are counted and baled. It doesn't account for the initial investment for the equipment, and these costs involve potential rental of the building/space, utility costs, handling operational costs, and labour.
Transportation and logistics costs	Include the number of routings to transfer collected material from retailers to the counting centers or recycling plants, fuel consumption, and labour.
Administrative costs	Considered ongoing and are associated with the staff required to run the central system, including administrative and customer services, marketing, communication and monitoring. In some cases, awareness-raising campaign costs are also included.
Producers' costs	Include the total annual fee paid in the system by the liable producers. These represent the net cost producers must pay into the system. The producers' fee is part of the system's revenue, including the unclaimed deposits and the revenues from the collected materials sales to recycling facilities.
Handling Fee	A fee paid to redemption centers and retailers to receive and pay out the deposit, sort, and store redeemed beverage containers.
Awareness-raising costs	Include the communication and campaigns to be conducted by the operator to spread and promote the scheme to the consumers. In some countries, the minimum amount of the revenues to be allocated for this feature depends on the operator. In others, such as Lithuania, it is determined by law (minimum of 1%).
Total operational costs	Include the retailer's costs, the collection, central counting costs, transportation and logistics, and administrative costs. In some studies, the operational cost account for the losses from fraudulently claimed deposits (e.g., Czech Republic). The system's revenues partially cover these.

The scheme will require upfront capital investment and ongoing operational costs. **If the scheme is implemented as a non-profit entity** (see Management Case – Chapter 7), **the key principle is**

that ongoing operational costs will be funded by revenue from unredeemed deposits and the sales of high-quality materials recycling. The balance of costs would then be charged to the producers through the producers' fee. The handling fee could be set as a single amount per container or allocated as an alternative figure for different material types to trigger eco-design practices within producers.

Producers would provide a report to the Scheme Administrator detailing the number of containers sold to the wholesalers. The Scheme Administrator would then invoice the producers based on the quantity at the appropriate deposit rate per container.

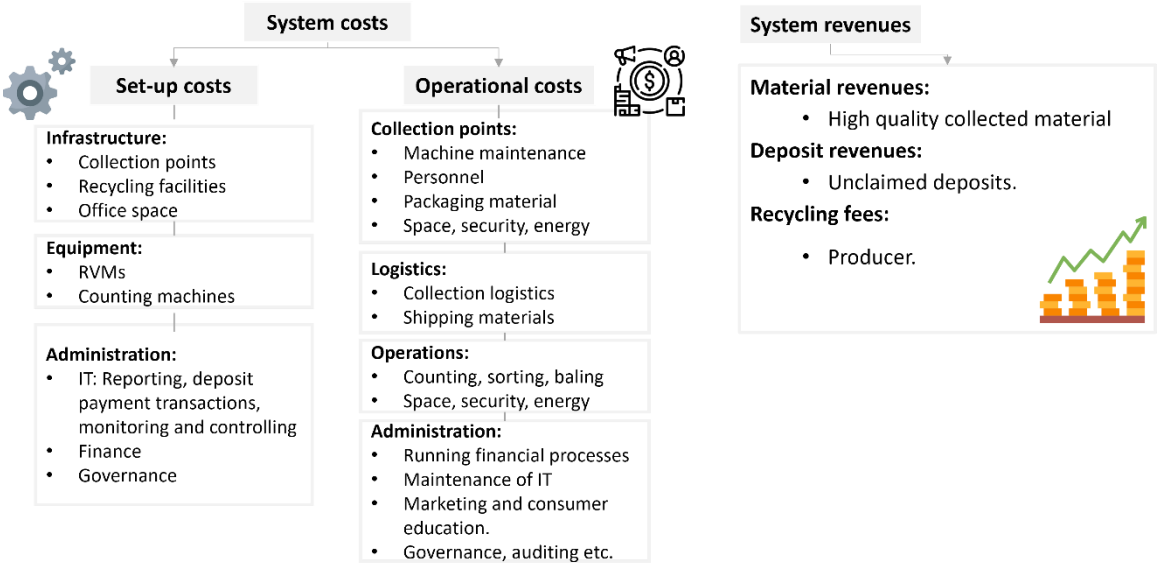


Figure 5-6 Summary of DRS Operational Costs and Revenues (LB, 2021)

Details on financial estimations and calculations are shown in the following chapter.

6. Financial case

This chapter aims to forecast the financial implications for implementing the deposit refund scheme in Cape Verde.

In DRSs operated in other countries, **direct financial responsibility for the costs effectively falls mostly on beverage producers, packers, fillers and importers**. **Retailers typically face additional costs, notably those linked to receiving and storing containers and operating a deposit account** (to settle deposit claims from customers and reconcile any difference between sales and returns from the central system). Generally, **handling fees are paid to retailers for their services in receiving these containers and paying the deposits to the consumers**.

The financial case outlines the main cost drivers in the system, which design parameters are taken into account, which estimations have been considered for the calculations, the revenues and the final cash flow analysis.

All collected data was inserted in a business model calculation tool (BMCT), developed by the international experts, and the expected costs and revenues of the system were derived.

In each subchapter, detailed explanations of each part of the BMCT and its considerations are shown.

6.1. Data Acquisition Methodology

A **two-phase methodology** was followed to obtain a DRS financial model tailored to the Cape Verde context of the beverage industry. The first phase involved **literature review and completing a directory with contact points from the institutional and private sectors**. Tailored emails were sent to the targeted stakeholders requesting specific information relevant to their background. During this phase, data were received from primary sources such as the National Water and Sanitation Agency (ANAS), Cape Verde´s municipalities, and the National Statistics Institute (INE). Besides, individual stakeholder consultations were conducted, with private stakeholders, to collect market data.

The second phase concerned the d**evelopment of a calculation tool to model a DRS scheme fed with the data collected** in phase one.

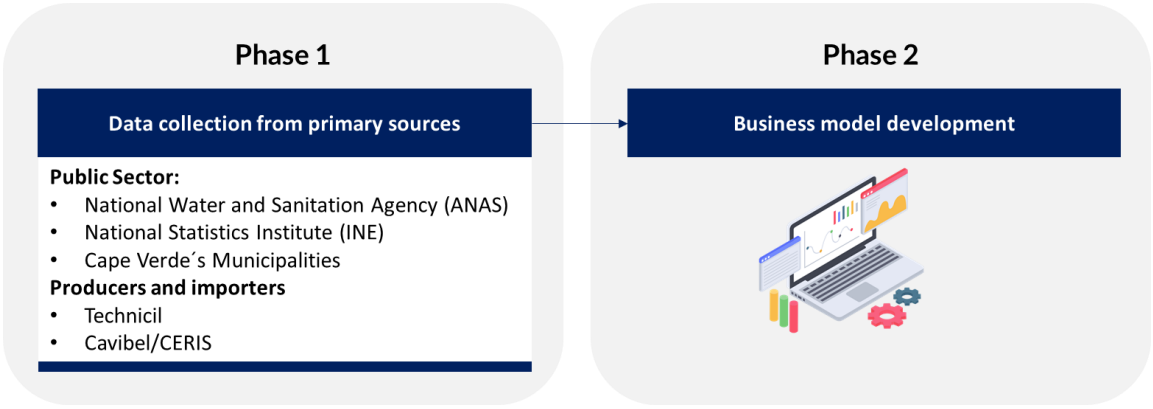


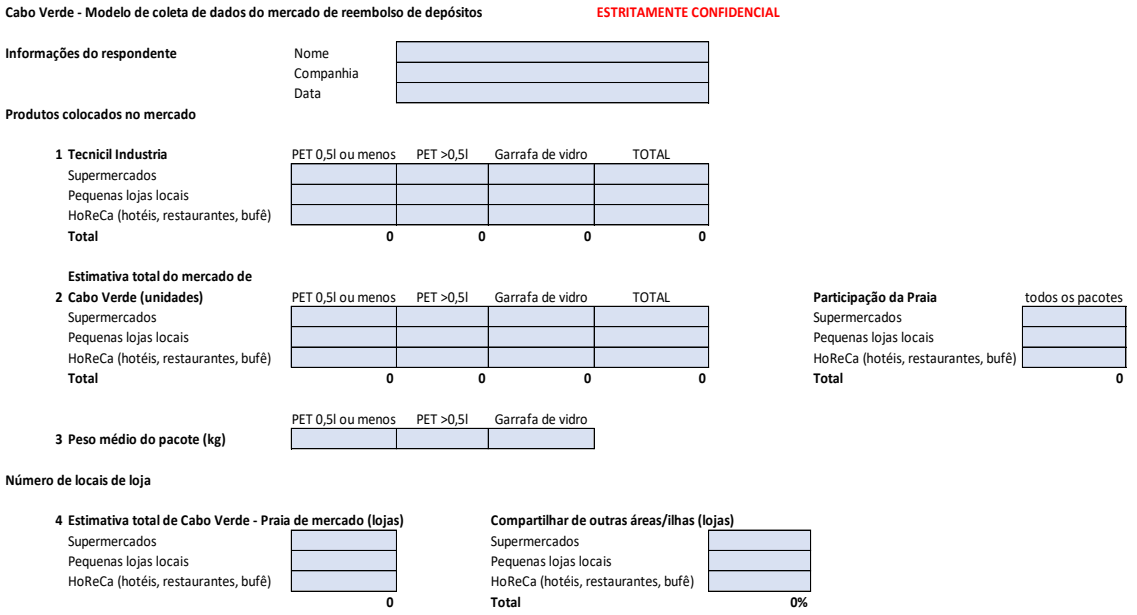
Figure 6-1 Summary of the financial methodology approach (BFS, 2022)

The first insights into market data were obtained from literature provided by AHK Portugal[2], mainly the review of PENGeR, and imports data share by INE.

The next step was to **validate the initial assumptions by consulting stakeholders from the private and public sectors**. Actors were engaged through email exchanges, 1:1 virtual meetings and a presential workshop. Concerning the private sector, the strategy was to:

- Initiate communication via e-mail to briefly introduce the project and request a 1:1 virtual discussion.
- Schedule individual meetings with actors to explain the business case approach and request market data.
- Develop and share a standard data collection survey (see Figure 6-2) to gather data such as units placed in the market, market share per type of product, main retail channels, etc.
- Invite key stakeholders to participate in the presential workshop to explain further the project, the initial findings and missing information necessary to complete the business case.
- Continue follow-up via e-mail correspondence after the workshop to request the missing data. The received information was kept strictly confidential.

[2] Voranalyse 2021. Abfall- und Kreislaufwirtschaft in Kap Verde Implementierung eines Pfandsystems



Cabo Verde - Modelo de coleta de dados do mercado de reembolso de depósitos ESTRITAMENTE CONFIDENCIAL

Informações do respondente

Nome	
Companhia	
Data	

Produtos colocados no mercado

1 Tecnicil Industria

	PET 0,5l ou menos	PET >0,5l	Garrafa de vidro	TOTAL
Supermercados				
Pequenas lojas locais				
HoReCa (hotéis, restaurantes, bufê)				
Total	**0**	**0**	**0**	**0**

2 Estimativa total do mercado de Cabo Verde (unidades)

	PET 0,5l ou menos	PET >0,5l	Garrafa de vidro	TOTAL
Supermercados				
Pequenas lojas locais				
HoReCa (hotéis, restaurantes, bufê)				
Total	**0**	**0**	**0**	**0**

Participação da Praia

	todos os pacotes
Supermercados	
Pequenas lojas locais	
HoReCa (hotéis, restaurantes, bufê)	
Total	**0**

3 Peso médio do pacote (kg)

PET 0,5l ou menos	PET >0,5l	Garrafa de vidro

Número de locais de loja

4 Estimativa total de Cabo Verde - Praia de mercado (lojas)

Supermercados	
Pequenas lojas locais	
HoReCa (hotéis, restaurantes, bufê)	
	0

Compartilhar de outras áreas/ilhas (lojas)

Supermercados	
Pequenas lojas locais	
HoReCa (hotéis, restaurantes, bufê)	
Total	**0%**

Figure 6-2 Data collection survey (Local consultant, 2021)

The main activities in the second phase involved the analysis of the collected information and the development of a comprehensive calculation tool that could simulate scenarios for the scheme design.

The **market data that was used to feed the calculation tool** were the following:

- **Customs data of 2019 imports of beverage products and beverage packaging materials used by local production** (glass for bottles, PET preforms for bottles, PP for bottle caps).
- **Import data was converted to beverage sales estimate per packaging type and converted to packaging units** using the information of shares of different packaging sizes and unit weights of different packaging sizes.
- **HoReCa shares using the tourism statistics and waste generation statistics**
- **Retail sales** and **HoReCa consumption estimates** using population and tourism statistics.
- **Estimates on labour, space, and logistics costs**.

6.2. Beverage-related Data

According to the stakeholders' insights at the presential workshop, Cape Verde has no domestic beverage package production (within the assumed DRS scope – see section 5.1.1).

There are two types of empty packages imported into the country: preforms (usually PET) and empty bottles (glass). Besides, many beverages are directly imported from countries, such as Portugal.

The filled beverage containers are reported in liters, while the empty packages are in units.

Table 6-1 Data on imported beverages, in liters (source: INE, 2019)

Beverage Imports (2019)		
Beverage type	**Quantity (L)**	**HS Code**
Soft Drink	4.874.947	2202990000 - Other non-alcoholic beverages, not including fruit or vegetable juices of heading No 2009 2202100000 - Waters, including mineral waters and aerated waters, containing added sugar or other sweetening matter or flavoured 2202900000 - Other waters
Bottled Water	2.821.368	2201100000 - Water, including natural or artificial mineral water and aerated water, not containing added sugar or flavored or edible water
Beer	10.921.570	2203001000 - Beer made from malt, in containers holding <= 50 cl 2203009000 - Other beer made of malt 2202910000 - Beer, non-alcoholic
Wine	3.578.989	2204210010 - Wines n.e.c. in containers holding <= 2 L 2204100000 - Sparkling wine
SUM	**22.196.874**	

Table 6-2 Data on imported packages, in units (source: INE, 2019)

Packages imported (2019)		
Packaging material	**Quantity (units)**	**HS Code**
PET	44.810.934	3923300000 - Jugs, bottles, flasks and similar articles of plastics
Glass	73.901.674	7010900000 - Jugs, bottles, flasks and other glass containers for transport or packaging
SUM	**118.712.608**	

The customs statistics give a full picture of the total beverage market, as shown in Table 6-1 and Table 6-2. In 2019, around 22 million liters of beverages and 119 million packages were imported into the country. As mentioned in section 5.1.1, strong alcoholic beverages, dairy products and beverages in Tetra Pak are proposed to be excluded from the system´s scope and were therefore not considered in the calculations.

Two main operations **were made to convert all the import data from liters to packages within the BMCT. The operations followed consisted of multiplying and dividing the imported beverages by the bottle material and size they can be found in. For example, of the 3 million liters of water that were imported, 20% of the volume was sold in 0,33 L PET bottles.**

Table 6-3 Summary of beverage packages placed on the market, in units (LB, 2022)

Market data	PET	Glass	Alu Cans	Total
Imported beverages	10.412.947	33.300.934	14.947.023	58.660.904
Domestic production	44.810.934	73.901.674	0	118.712.608
Total packages POM (units)	**55.223.881**	**107.202.608**	**14.947.023**	**177.373.512**

Based on the received information and the conversion into packages, around 177 million packages were placed in the Cape Verde market in 2019.

6.2.1. Sales volumes

The mass of packages placed in the market in kilogram per package was estimated as the weighted average of different package size weights. The following considerations were assumed:

- Cans: 0,0110 kg/package;
- Glass: 0,1768 kg/package;
- Plastic: 0,0331 kg/package.

The number of products placed in the market is shown in Table 6-4, where the total mass of packaging placed on the market (POM) was calculated.

Considering the total numbers, it is possible to estimate the share of POM per beverage container type in the Cape Verde market (see Table 6-4):

- Cans: 8% of POM
- Glass: 60% of POM
- Plastic: 31% of POM

Table 6-4 Estimated packaging mix placed on the market (POM) (LBG, 2022)

	Cans	Glass	Plastic	SUM	Unit
MARKET					
Mass of packages placed in the market	166	18.918	1.820	**20.904**	POM tons
Number of products placed in the market	15.000.000	107.000.000	55.000.000	**177.000.000**	POM units
Mass per package	0,0111	0,1768	0,0331		kg/package
Share of POM	8%	60%	31%		%

6.2.2. Sales channels

According to information from the National Statistics Institute, the municipalities and the visual considerations made during store visits, beverages are mainly sold in supermarkets, small local shops, restaurants, bars and hotels. Hence, the different packaging types were divided into the following retail channels:

- Retail shops including supermarkets, small local shops (organized and informal retail), and gas stations, kiosks, etc.
- HoReCa including bars, cafes, restaurants, and hotels.

The estimated number of retail shops in the country is shown in Table 6-5.

Table 6-5 Estimated number of retail shops (INE, 2019)

Municipality	Island	Retail shops	Restaurants	Bars	Hotels
Ribeira Grande Santo Antão	Sao Antao	71	22	47	27
Paul	Sao Antao	40	11	12	18
Porto Novo	Sao Antao	140	6	5	16
São Vicente	Sao Vicente	575	141	87	10
Ribeira Brava	Sao Nicolau	12	2	95	2
Tarrafal de São Nicolau	Sao Nicolau	7	0	0	2
Sal	Sal	290	91	60	10
Boa Vista	Boa Vista	40	73	6	3
Maio	Maio	5	3	19	5
Tarrafal de Santiago	Santiago	26	34	141	2
Santa Catarina Santiago	Santiago	289	9	2	3
Santa Cruz	Santiago	12	1	155	1
Praia	Santiago	739	127	41	12
São Domingos	Santiago	3	2	0	0
São Miguel	Santiago	5	0	221	0
São Salvador do Mundo	Santiago	0	0	0	0
São Lourenço dos Orgãos	Santiago	35	0	0	0
Ribeira Grande Santiago	Santiago	48	21	0	2
Mosteiros	Fogo	32	0	2	2
São Filipe	Fogo	158	2	0	4
Santa Catarina do Fogo	Fogo	50	0	40	2
Brava		8	1	149	3
	Total	**2.585**	**547**	**1.080**	**124**

6.2.3. Beverage sales by material type and channels

The shares of sales by packaging material type and retail channel represent the volume in which beverage containers are sold in retail locations. The figures found in Table 6-6 are based on assumptions made from information obtained from the National Strategic Plan for Waste Management report. The resulting share of beverage sales per channel considers the following logic:

- For practical terms, **Cape Verde was divided into three island groups**, the **highly touristic islands** (Boa Vista, Sal), the **most populated islands** (Santiago, São Vicente) and the **lower populated islands** (Brava, Fogo, Maio, Santo Antão, São Nicolau and Santa Luzia)
- Based on PENGeR data:
    - Santiago and Sao Vicente produce 7 times more waste than Boa Vista and Sal (130.266 tons Vs 18.205 tons).
    - At the densely populated islands, PET waste generation is only 2 times larger than in Boa Vista and Sal (1.510 tons Vs 788 tons). This means that the consumption per capita is higher in islands with more HoReCa consumption and that HoReCa

sector plays an important role in waste generation (significant in PET, less significant in glass).

- Additionally, estimations showed that the consumption of PET bottles at Boa Vista and Sal is highly driven by tourists (estimated to be 82%).

Therefore, after calculations, the average share of beverage containers consumed by the HoReCa sector in the country represents 18% while the remaining 82% of the packages are purchased at the retail shops (see Table 6-6). In the BMCT this share is assumed to be same for all packaging types.

Table 6-6 Shares of sales channels per packaging type (LBG, 2022)

SALES CHANNELS (percentage)	Cans	Glass	Plastic
Retail all	82%	82%	82%
HoReCa	18%	18%	18%
SUM	100%	100%	100%

6.2.4. Return channel flows

Typically, the consumer returns the beverage container within the retail shop or takes bigger volumes of packages to a redemption center (depending on distances and return location possibilities). These retail shops can be equipped with reverse vending machines (RVMs) or receive the containers manually, over the counter. However, **in the BMCT no retail stores are assumed to be equipped with RVMs**.

The **redemption centers are usually equipped with RVMs**, since higher volumes tend to be returned in such locations. The system must have the required infrastructure for returning such containers to be functional. **Redemption centers typically receive the beverage containers directly from HoReCa and smaller shops**.

In the Business Model Calculation Tool (BMCT), the options for consumers to return packages was divided into three different return flows:

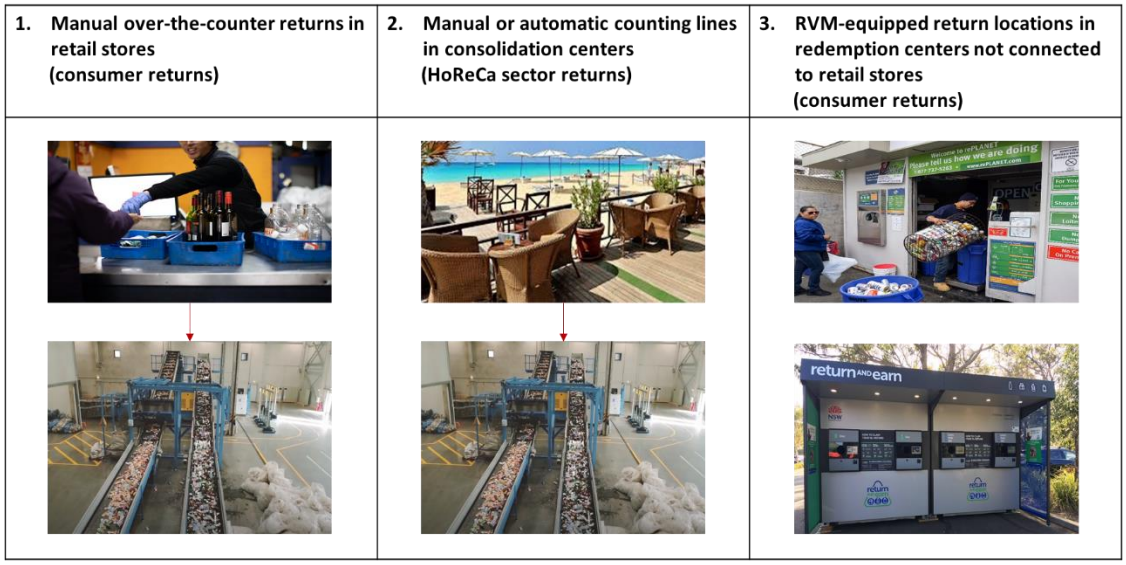


Figure 6-3 Potential return channel flows (BFS,2022)

Additionally, **two scenarios on collection approach magnitude were modelled to account for different (initial) investment options** while establishing DRS in Cape Verde:

- **Scenario 1: Manual over-the-counter returns at retail shops and redemption centers**.
  - 50% of retail shops volume collected by retail shops manually receiving the beverage containers.
  - The remaining 50% of the retail volume is destined for redemption centers
  - HoReCa actors return the empty package to their beverage distributor through reverse logistics.
- **Scenario 2: Manual over-the-counter returns**
  - 100% of retail shops volume collected by retail shops manually receivingthe beverage containers.
  - HoReCa actors return the empty package to their beverage distributor through reverse logistics.

Table 6-7 Return channel flows per scenario (BFS, 2022)

Return channel flows	Scenario 1	Scenario 2
1. **Manual over-the-counter returns in retail stores (retail manual OTC)**	X	X
2. Manual operations at **counting centers (HoReCa sector)**	X	X
3. **RVM-equipped returns in redemption centers not connected to retail stores**	X	

Section 6.3.3 shows the main findings on the financial impact of setting up RVMs at redemption centers.

Finally, each of the return flows has a different logic and cost parameters. Details are shown in Table 6-8.

Table 6-8 Return flows logic and parameters (BFS, 2022)

	Flow 1	Flow 2	Flow 3
Collection	Manual return over the counter	Manual return of packages consumed in HoReCa location	Based on automatic return with RVMs
Location	Within retail store area	HoReCa distributors and wholesalers	Specific locations in larger cities. Independent from the retail shop network
Return	Consumers return to store personnel over the counter. Personnel manually verify for correct labelling and count the returned packages	Returned by the HoReCa sector. Personnel manually verify for correct labelling and count the returned packages	Consumers return to the self-service model, assisted by personnel working in redemption centers
Operation	Returns operated by the retail personnel. Logistics operated by distributors or third party providers, counting operated by the PRO	Returns operated by HoReCa personnel and HoReCa distributor, counting operated by the PRO	Returns operated by the DRS Operator or third party service provider
Investment	Lower investment in equipment	Lower investment in equipment	Require investments in equipment and installation in return location
Efficiency	Slower operation than RVM. Low efficiency in collection logistics. Packages not compacted.	Operation in HoReCa location efficient deposits not paid. Low efficiency in collection logistics. Packages not compacted.	If RVMs are installed: Higher efficiency in the operation of the location, High efficiency in collection logistics- Packages compacted.
Space Availability	Storage capacity might be limited	HoReCa handles empty packages even	More space availability, allowing higher efficiency

	depending on the size of retail	without DRS introduction	

It is important to mention that **automatic returns at retail shops, via RVMs, presents some operational advantages**:

- Higher capacity to receive large volumes of returned packages.
- Shorter waiting time for consumers and better convenience.
- Higher efficiency in logistics and handling units, since packages are recognized, compacted, and sorted in the return location.

The **number of RVMs in the retail stores is ultimately a decision by retail operators**, which can make independent investing decisions based on their commercial evaluation. It will affect transportation efficiency, counting line investments, and the need for a redemption center network to be built by the DRS Operator. **In BMCT it has been assumed that no RVMs are installed in retail shops**, at least for the first operational years.

6.2.5. Estimated return rate of consumer and HoReCa

In most DRS designs, the consumer has the freedom to decide when the return of packages is made, and to which return location. The return of the packages is not always conducted in the same store or location where the consumer purchased the beverage product.

Based on the experiences of consumer behaviour from countries that operate DRS, the return of the packages is often made within 1-2 weeks after the purchase was made. Consumers normally return the packages in their preferred weekly or monthly grocery shopping retail store.

Individual beverage purchases, consumed on the go, are typically not returned one at a time. Hence, larger retail stores like supermarkets tend to receive a higher share of returns than their sales share.

Similarly, the small markets, kiosks and other retail channels tend to collect fewer returned containers compared to their sales.

Therefore, **the BMCT has used the return index to describe how the need for return capacity varies per channel. In this case, the return index varies from 80% to 100%, depending on the sales channel**. Table 6-9 discloses the expected returns per sales channel.

Table 6-9 Return Index per Sales Channel

Sales Channel	Return index (%)
Retail shops	80
HoReCa	100

When simulating the consumer behaviour, **it was assumed that 80% of the beverage containers were returned at the return locations inside the retail shops or redemption centers**. In this case, and based on several DRS experiences in other countries, it would be possible to expect higher return quantities returned by the informal sector to such redemption centers. **Since redemption centers are equipped with RVMs and provide higher return convenience, it is expected that the informal sector will collect containers and return them in this channel**.

In the HoReCa sector, the return index contemplated was 100% since the larger shops get their return service from their beverage distributor, who takes the empty packages back (reverse logistics). Since smaller shops don't have access to this service, they are expected to return their packages to redemption centers. A share of the returns may also be conveyed in cash and carry locations (if equipped with an RVM) and redemption centers.

6.2.6. Labor, space, and packaging material

As described in chapter 6.2.4, **different return flows account for labour, space and packaging material requirements**.

The **manual processes with human handling of each package are the most labour-intensive part of return operations**. **In manual operations, the packages are not compacted before counting, resulting in higher storage space required per returned package**.

For any RVM-equipped return location, space is needed to store and load packages for transportation. The storage space required is lower per returned unit since packages are typically compacted at the site, and volume is reduced.

The level of transported packages depends on the unit's weight, compaction level, and material type. Manually received, non-compacted packages are usually loaded in smaller transportation units. RVM returns, with compacted PET bottles and cans, can be transported in higher capacity transportation units. Glass is always transported in bins.

To account for material needs and logistics estimations within the model, Flow 1, storage capacity is restricted since the material is not compacted. Within this flow, it was considered that 1 small bag could store 300 can units, 1 bin can store 500 glass bottles, and 1 small bag could store 85 plastic bottles.

On Flow 2, the storage capacity is similar to Flow 1, except for plastic bottles. The difference in plastic bottle storage capacity is associated with the smaller-sized bottles found in the HoReCa sector. In contrast, bigger bottles would also be returned on the OTC return.

Regarding bulk returns in redemption centers (Flow 3), compacted cans are stored in carton boxes, PET bottles in big bags and glass in bins.

Table 6-10 describes the number of packaging units per return channel flow.

Table 6-10 Number of units required to fill the corresponding package type per return channel flow (LGB, 2022)

SPACE & TIME REQUIREMENTS	Cans	Glass	Plastic
FLOW 1 - Manual OTC returns			
Pack type	Small bag	Bin	Small bag
Pack capacity units	300	500	85
Work s/unit	2	4	3
Space_storage (m^2)	0,3	1	4
FLOW 2 - Manual HoReCa			
Pack type	Small bag	Bin	Small bag
Pack capacity units	300	300	120
FLOW 3 - Redemption centers			
Pack type	Carton	Bin	Big bag
Pack capacity units	4000	500	600
Work s/unit	0,5	1,5	1,2
Space_RVM (m^2)	3,4	24,2	12,4
Space_storage (m^2)	5	10	15
Space_consumer (m^2)	5	10	25

6.3. Collection Infrastructure

6.3.1. Collection Infrastructure Assumptions

The **DRS workflow** – reception of all the returns from consumers and HoReCa sector, process the returned bottles and reimburse deposits – **must happen without delays**. **It is crucial to provide enough infrastructure capacities to suffice**.

Therefore, when developing the financial model for implementing the system, it is imperative to base the calculation on capacity sufficiency to handle returns and validate deposit payments. These factors were considered when establishing the system's potential design and estimating the number of return locations, redemption centers, counting centers and logistics costs.

In the calculations, **all the investments in DRS-specific equipment such as counting lines and RVMs at redemption centers were converted to annual depreciation and maintenance costs and are, therefore visible under operating costs**.

The rental costs used for calculations were obtained from desktop research on Cape Verde´s commercial space rent. The figures need to be validated by local stakeholders.

The collection logistics prices have been estimated based on the distribution cost of standard pallet space and space requirements for different DRS transportation packages.

To dimension the size of the counting center, the volumes of packages generated in Flows 1 and 2 were considered. Investment costs are based on European equipment provider. The number of working days was stipulated to be 330 days per year, with 15h working hours per day. This is an

average between summer peaks, in which working hours vary between 20h-21h/day, and winter season, in which working hours may vary from 7h-14h/day. Besides, depreciation costs, space and labour required were also considered. Since counting lines are heavily used, they require higher maintenance than RVMs.

Typically, a counting center has several counting lines. Calculations for both scenarios are shown in the following section.

Figure 6-4 shows the main assumptions used in the BMCT to estimate the costs of implementing the deposit-refund system in Cape Verde. The comments column aims to provide additional details such as the source of the information or an explanation of the data enclosed.

Business Case Report BFS2022/CAV004	**Cape Verde** Economic feasibility for the implementation of DRS in Cape Verde

BLACKFOREST SOLUTIONS

RETURN REQUIREMENTS			Comments
RVM cost redemption center			
Machines	30.000,00	EUR	Price-estimate for single RVM. Assumption that Redemption center has multi-RVM installation of 4 RVMs
Yearly depreciation	5.184,59	EUR	Calculated with 5% interest rate and 7 year payback period.
Maintenance	3.000,00	EUR	10% of RVM cost, repairs and replacement of worn parts
Rental cost			
Retail	10	EUR /m2 /month	Adapted from information based on desktop research. Data needs to be validated.
Redemption center	6	EUR /m2 /month	Adapted from information based on desktop research. Data needs to be validated.
Pack materials			
Big bag	2	EUR	Unit prices are estimates that are based on similar DRS specific packaging materials on other markets.
Carton	3	EUR	Big bag is not feasible transportation unit for cans due to high compression and weight of the transportation package.
Small bag	0,7	EUR	PE/PP bags
Bin	2,4	EUR	Calculation base: 12500 bins, 90€ each, depreciated in 7 years, 5% interest, emptied 82.000 times -> 2,37 €/bin.
Transportation cost (Intra island / Santiago)			
Big bag	3	EUR/ unit	Based on results to set up a counting center in Praia, Santiago.
Carton	3	EUR/ unit	Transportation costs are based on private sector query made in other market with comparable cost (per pallet place) and conversion to transportation unit space n
Small bag	1,5	EUR/ unit	
Bin	4	EUR/ unit	
Transportation cost (Intra + interisland / other islands)			
Big bag	6	EUR/ unit	Based on results to set up a counting center in Praia, Santiago.
Carton	6	EUR/ unit	Collection cost same as in Santiag. Inter-island transportation cost estimate added
Small bag	3	EUR/ unit	
Bin	8	EUR/ unit	
Collection in Intra island (Santiago)			
Flow 1	49%		49% of OTC volume returned in Santiago
Flow 2	5%		5% of HoReCa volume returned in Santiago
Flow 3	65%		65% of Redemption center volume returned in Santiago
Collection share Other islands			
Flow 1	51%		51% of OTC volume returned in remaining islands
Flow 2	95%		95% of HoReCa volume returned in remaining islands
Flow 3	35%		35% of Redemption center volume returned in remaining islands

Labor cost (CV minimum wage)			
Hourly cost	0,73	EUR/h	Desktop research, CV minimum wage in private sector = 13.000 esc appr 117 €/m. Data needs to be validates.
Working hours	4950	h	330 days, 15h per day
Labor	3620	EUR /y	Working hours * Labour costs
Labor cost (Other areas)			
Hourly cost	0,73	EUR/h	Desktop research, CV minimum wage in private sector = 13.000 esc appr 117 €/m. Data needs to be validates.
Working hours	4950	h	330 days, 15h per day
Labor	3620	EUR /y	Working hours * Labour costs
Counting cost			
Counting line	250.000,00	EUR	Based on European equipment price.
Yearly depreciation	43204,95	EUR	
Maintenance	20%	%	Based on experience. Due to heavy use (15h per day) 20%.
Maintenance	50.000	EUR	
Space needed	150	m2	Space requirement 150 m2 for 1 counting line including the line footprint, operating space and work in progress bag storage space per line
Space cost	10.800,00	EUR/y	
Capacity	228.462	bags/year	Counting line can be operated 330 days / year. 35 days reserved for maintenance breaks downtime.
Counting line, cost per bag	0,19	EUR/bag	330 days/year, 15 h/day, 46 bag/hour
Maintenance, cost per bag	0,22	EUR/bag	Average counting operation 15 hours/day. 3 shifts (20-21h) in summer time, 1-2 shifts (7-14h) in other times. Cleaning 1h/shift.
Labour cost, cost per bag	0,02	EUR/bag	
Space, cost per bag	0,05	EUR/bag	
Total counting cost per bag	0,47	EUR/bag	

Figure 6-4 Assumptions for BMCT on return infrastructure and logistics (LBG, 2022)

6.3.2. Collection Infrastructure Calculations

The calculations shown in the following subchapters are based on the data acquired via the market study, onsite visit, and information received by private and public stakeholders.

An average return rate of 84% was assumed for both scenarios for year 1.

6.3.2.1. Scenario 1

As mentioned in section 6.2.4, the main characteristic of scenario 1 is that **beverage containers are returned at retail shops with manual over-the-counter returns and at redemption centers**.

Considering the return flows for scenario 1, Table 6-11 shows the beverage units collected per flow. The figures relate to the number of products placed in the market multiplied times the expected collection rate and share of bottles returned per retail channel.

For example, out of the 15 million cans sold in Cape Verde, 6 million will be returned in Flow 1 – retail shops with the over-the-counter collection, and 20.6 thousand small bags will be needed to pack this volume of materials. The 6 million cans represent 8% of the total amount of beverage containers that will be returned in Flow 1.

Table 6-11 Destined units per return flow in scenario 1 (LBG, 2022)

Destined units per flow (COLLECTION RATE 84%)				
	Units	**Units/package**	**Packages**	**Units share (%)**
Flow 1: Retail manual OTC				
Cans	6.169.680	300	20.566	8%
Glass	44.010.384	500	88.021	60%
Plastic	22.622.160	85	266.143	31%
SUM	**72.802.224**		**374.729**	
Flow 2: Manual HoReCa				
Cans	2.257.200	300	7.524	8%
Glass	16.101.360	300	53.671	60%
Plastic	8.276.400	120	68.970	31%
SUM	**26.634.960**		**130.165**	
Flow 3: Redemption centers				
Cans	4.113.120	4000	1.028	8%
Glass	29.340.256	500	58.681	60%
Plastic	15.081.440	600	25.136	31%
SUM	**48.534.816**		**84.845**	
TOTAL SUM	**147.972.000**			

As shown in Figure 6-5, 73 million units or 50% of returns are expected to occur at retail shops with the over-the-counter collection.

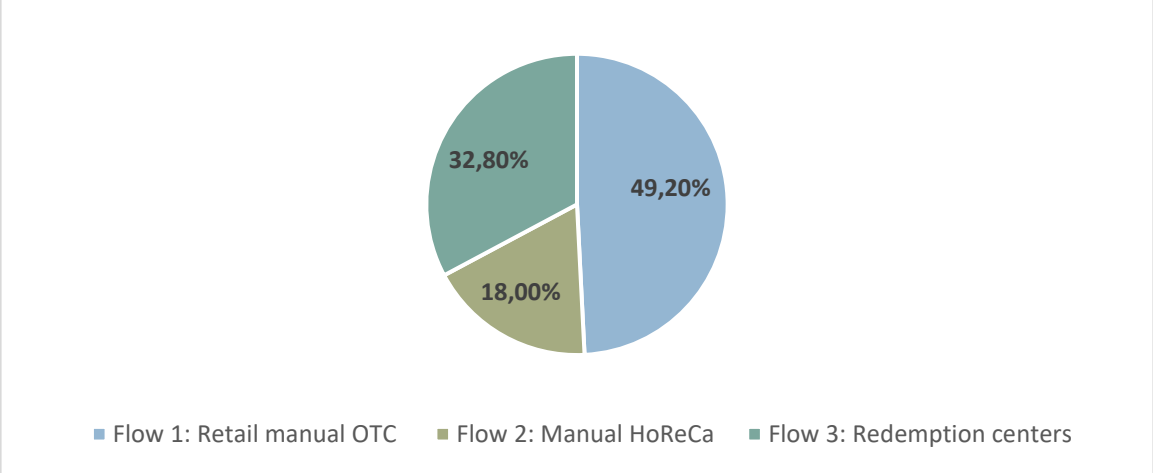


Figure 6-5 Percentage of returned units per flow in Scenario 1 (LBG, 2022)

To estimate the required number of counting lines installed at the counting center, parameters such as the total amount of packaging bags from flows 1 and 2, labour costs, and working hours per year were considered.

As shown in Table 6-12, the maximum capacity per counting line is 228.462 bags in one year. Since counting lines are applicable for flows 1 and 2, the total amount of packages of 363.203 was used to estimate the number of required counting lines. So, 363.203 packages were divided over the maximum capacity per line, resulting in 1,6 or 2. Therefore, the infrastructure required would account for 1 counting center, with 2 counting lines.

Glass is counted manually and by bins (300 to 500 units per bin, depending on the type).

Table 6-12 Estimated counting lines and redemption centers needed (LBG, 2022)

Counting and Redemption Centers needed (COLLECTION RATE 84%)			
Flow 1: Retail manual OTC	**Counted packages**	**Capacity (bags/line)**	**Counting lines needed**
Cans	20.566	228462	
Plastic	266.143	228462	
Flow 2: Manual HoReCa			
Cans	7.524	228462	
Plastic	68.970	228462	
SUM	**363.203**		2
Flow 3: Redemption centers	**Units per RVM**	**RVM capacity (units)**	**Redemption centers needed**
Cans	4.113.120	50.000	
Glass	29.340.256	150.000	
Plastic	15.081.440	800.000	
SUM	**48.534.816**	**1.000.000**	12

To calculate the number of redemption centers to be established, the total number of expected containers in flow 3 of 48.5 million units (see Table 6-12) was divided into the number of units a redemption center can process or four million. Based on experience, each RVM has the maximum return capacity of 1 million units within 1 year, and each redemption center is designed to include 4 RVMs. The required number of redemption centers for this scenario is 12, equipped with 4 RVMs each.

In summary, **the collection network and logistics initial approach for scenario 1 would be as follows**:

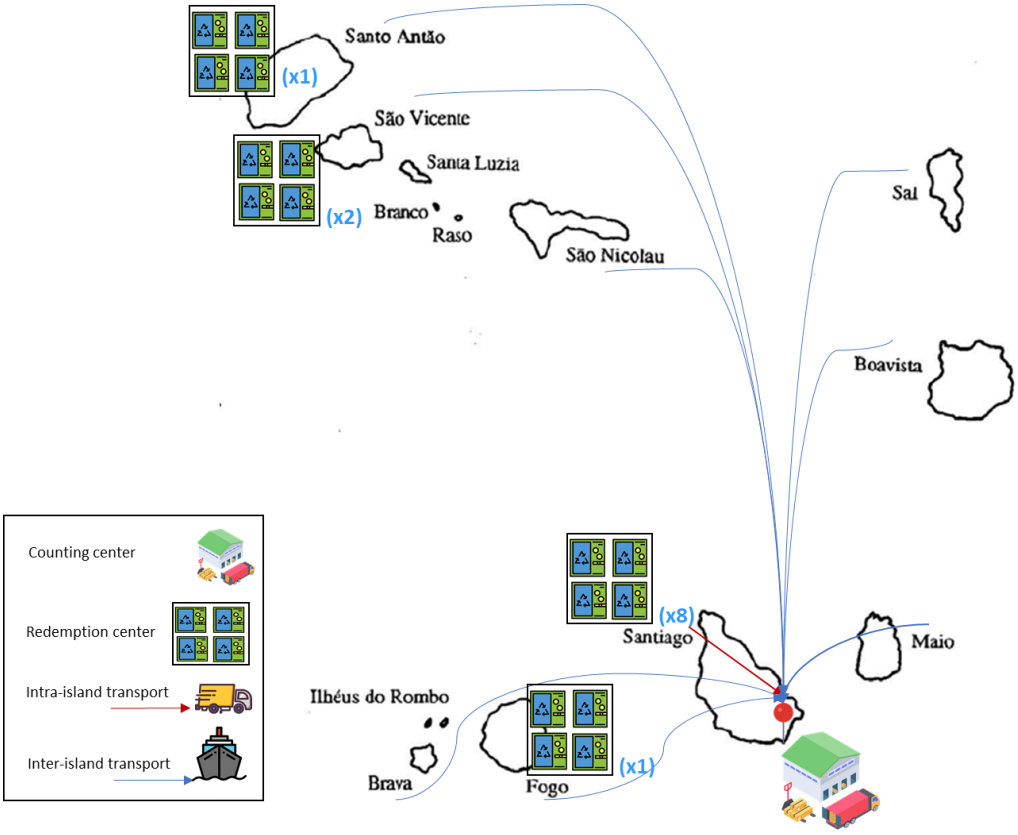


Figure 6-6 Initial approach to the collection infrastructure and logistics for scenario 1 (BFS, 2022)

As mentioned in section 5.1.3, each island´s context in terms of population, touristic activities, waste management generation and retail channels were considered to select where to place the infrastructure required to collect packages produced.

It is important to mention that:

- **Enough retail shops in the islands shall set up return points within their premises to suffice the collection of around 73 million units**.

- **All beverage containers collected in retail shops will be sent to the counting center at Praia** in Santiago Island via ocean freight.
- **Empty containers returned to retail shops within Santiago Island will be delivered to the counting center via inland transport**.
- **Logistics route planning and the best connection between the islands in Cape Verde were not considered**, and this remains to be contemplated.

6.3.2.2. Scenario 2

The main difference between scenarios 1 and 2 is that in the second, **consumers return the empty packages only at retail shops with manual over-the-counter returns**. The **scenario 2 was built to present the impact that setup with 12 redemption centers would have to the investment and operating cost of the DRS**. On top of these financial impacts, the **redemption centers have other positive impacts, such as creating awareness of DRS and helping the informal sector to take part in collection activities**.

Considering the return approach for scenario 2, Table 6-13 shows the beverage units collected per flow. As described in Scenario 1, estimations relate to the number of products placed in the market multiplied by the expected collection rate and share of bottles returned per retail channel.

In this case, out of the 15 million cans sold in Cape Verde, around 10.3 million will be returned in Flow 1 –retail shops with the over-the-counter collection, and 34 thousand small bags will be needed to pack this volume of materials.

Table 6-13 Destined units per return flow in scenario 2 (LBG, 2022)

Destined units per flow (COLLECTION RATE 84%)				
	Units	**Units/package**	**Packages**	**Units share (%)**
Flow 1: Retail manual OTC				
Cans	10.282.800	300	34.276	8%
Glass	73.350.640	500	146.701	60%
Plastic	37.703.600	85	443.572	31%
SUM	**121.337.040**		**624.549**	
Flow 2: Manual HoReCa				
Cans	2.257.200	300	7.524	8%
Glass	16.101.360	300	53.671	60%
Plastic	8.276.400	120	68.970	31%
SUM	**26.634.960**		**130.165**	
TOTAL SUM	**147.972.000**			

Considering that Scenario 2 contemplates 100% of consumers returning empty packages at retail shops, it is expected that around 121 million containers are returned in flow 2 over the counter. As brought up in section 6.2.3, the average share of beverage containers consumed by the HoReCa sector in the country represents 18%.

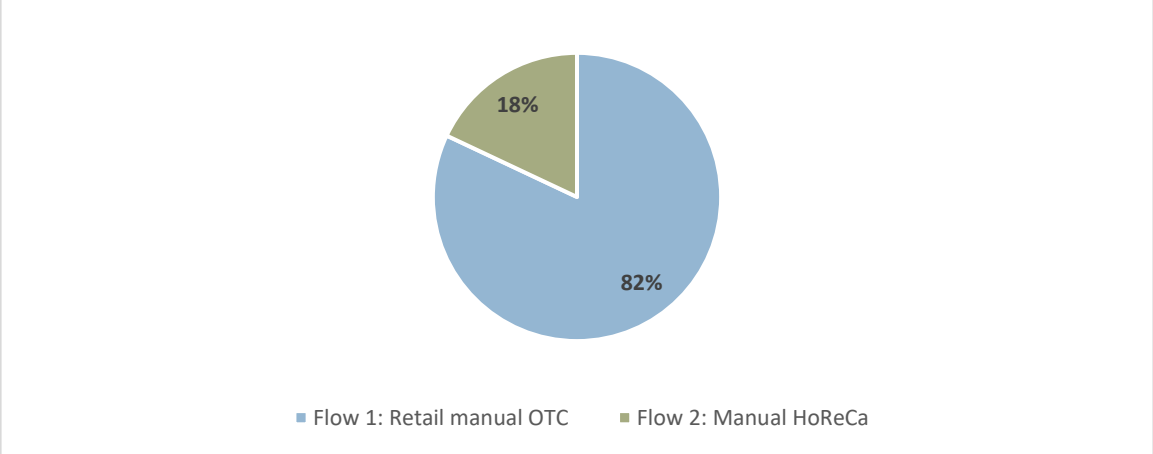


Figure 6-7 Percentage of beverage containers returned per flow for Scenario 2 (LBG, 2022)

Calculating the required number of counting lines needed follows the same principles detailed for Scenario 1.

As shown in Table 6-14 the maximum capacity per line was 228.462 bags in one year. Since counting lines are applicable for flows 1 and 2, the total amount of packages of 554.342 was used to estimate the number of required counting lines. So, total sum of empty packages was divided over the maximum capacity per line, resulting in 2,4 or 3. Therefore, the infrastructure required would account for 1 counting center, with 3 counting lines.

Glass is counted manually and by bins (300 to 500 units per bin, depending on the type).

Table 6-14 Estimated counting lines needed (LBG, 2022)

Counting lines needed (COLLECTION RATE 84%)			
Flow 1: Retail manual OTC	**Counted packages**	**Capacity (bags/line)**	**Counting lines needed**
Cans	34.276	228462	
Plastic	443.572	228462	
SUM	**477.848**		
Flow 2: Manual HoReCa			
Cans	7.524	228462	
Plastic	68.970	228462	
SUM	**76.494**		
TOTAL SUM	**554.342**		3,0

In summary, the **collection network and logistics initial approach for scenario 2 would be as follows**:

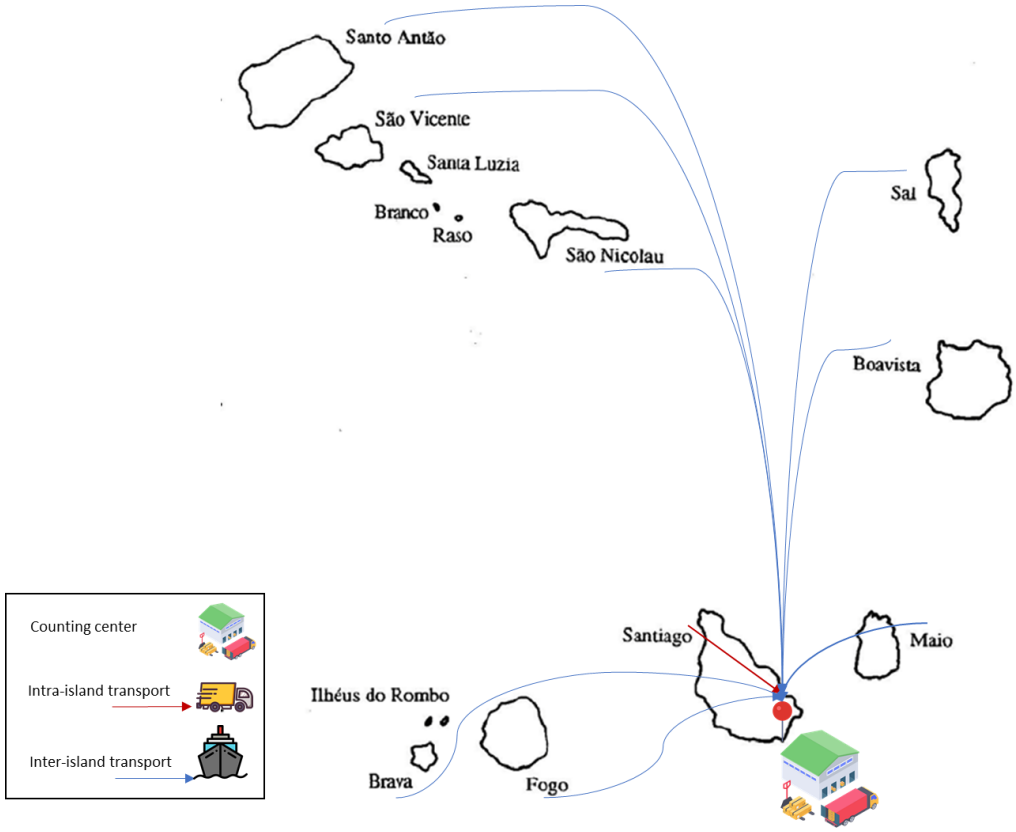


Figure 6-8 Initial approach to the collection infrastructure and logistics for scenario 2 (BFS, 2022)

It is important to mention that:

- **100% of retail shops in the islands** (included in the scope of the system) **shall set up return points within their premises** to suffice the collection of around 121 million units.
- **All beverage containers collected in retail shops will be sent to the counting center at Praia,** in Santiago Island via ocean freight.
- **Empty containers returned to retail shops within Santiago Island will be delivered to the counting center via inland transport**.
- **Logistics route planning and the best connection between the islands in Cape Verde were not considered**, and this remains to be contemplated.

6.3.3. Financial Calculations

6.3.3.1. Scenario 1

After obtaining the required infrastructure, costs and revenues for the planned setup were calculated.

Counting centers building and general infrastructure costs were not specifically included, other than cost of industrial space.

Since HoReCa typically use logistic return schemes for its containers, there are no infrastructure investments. Besides, this sector does not account for handling fees since they do not pay a deposit to the consumer. Only logistics costs are considered in calculation costs for HoReCa.

The cost per collected package was calculated by dividing the total sum per collection flow by the total units per material type (see Table 6-11). These costs were added to logistic costs to reach the handling fee required to cover such expenses (see Table 6-15Table 6-15).

Table 6-15 Collection infrastructure - Investment & Operation per year (LBG, 2022)

	TOTAL COST				COST PER COLLECTED PACKAGE		
	PET	Can	Glass	Total	PET	Can	Glass
1. Manual OTC							
Personnel	13.785,38 €	3.759,65 €	26.818,83 €	44.363,86 €	0,001 €	0,001 €	0,001 €
Packaging material	186.300,14 €	14.395,92 €	211.249,84 €	411.945,90 €	0,008 €	0,002 €	0,005 €
Space	434.448,00 €	32.583,60 €	108.612,00 €	575.643,60 €	0,019 €	0,005 €	0,002 €
Total	**634.533,52 €**	**50.739,17 €**	**346.680,67 €**	**1.031.953,36 €**	**0,028 €**	**0,008 €**	**0,008 €**
2. Manual HoReCa							
Personnel	-	-	-	-	-	-	-
Packaging material	-	-	-	-	-	-	-
Total	-	-	-	-	-	-	-
3. Redemption center							
RVM	77.329,55 €	21.089,88 €	150.441,12 €	248.860,54 €	0,005 €	0,005 €	0,005 €
RVM maintenance	44.745,76 €	12.203,39 €	87.050,85 €	144.000,00 €	0,003 €	0,003 €	0,003 €
Personnel	20.941,02 €	40.739,80 €	5.711,19 €	67.392,00 €	0,001 €	0,010 €	0,000 €
Space	45.298,98 €	11.568,81 €	38.172,20 €	95.040,00 €	0,003 €	0,003 €	0,001 €
Total	**110.985,76 €**	**64.512,00 €**	**130.934,24 €**	**306.432,00 €**	**0,012 €**	**0,021 €**	**0,009 €**

Note: It was assumed that RVMs are not purchased but leased. If RVMs are purchased, flow 4 would have a cost impact of 1.440.000€ in RVM costs (30.000 EUR/RVM and 48 RVMs are planned for the 12 redemption centers).

The logistic costs were also calculated considering the handling fee of different materials and return flows, as shown in Table 6-16.

Table 6-16 Logistic Costs per year (LBG, 2022)

	TOTAL COST				COST PER COLLECTED PACKAGE		
	PET	Can	Glass	Total	PET	Can	Glass
Collection transport							
1. Manual OTC	602.814,03 €	46.581,08 €	531.645,44 €	1.181.040,55 €	0,027 €	0,008 €	0,012 €
2. Manual HoReCa	201.737,25 €	33.858,00 €	418.635,36 €	654.230,61 €	0,024 €	0,015 €	0,026 €
3. Redemption center	101.799,72 €	4.164,53 €	237.656,07 €	343.620,33 €	0,007 €	0,001 €	0,008 €
Total	**906.351,00 €**	**84.603,62 €**	**1.187.936,87 €**	**2.178.891,49 €**	**0,058 €**	**0,024 €**	**0,046 €**

These costs account for the assumptions on the total number of units collected, packaging types and their costs, and transportation shares per flow in Santiago and the rest of the islands.

For the cost estimations of the counting center, only flows 1 and 2 were considered. Glass is counted in bins, and therefore working efforts are not included within the costs described in Table 6-17.

Table 6-17 Counting line costs estimations (LBG, 2022)

	TOTAL COST				COST PER COLLECTED PACKAGE		
	PET	Can	Glass	Total	PET	Can	Glass
Counting Centers							
Counting cost	157.866,50 €	13.232,57 €	-	171.099,07 €	0,005 €	0,002 €	- €
Consolidation, sorting, baling	76.076,00 €	6.938,80 €	200.372,48 €	283.387,28 €	0,002 €	0,001 €	0,003 €
Total	**233.942,50 €**	**20.171,37 €**	**200.372,48 €**	**454.486,35 €**	**0,008 €**	**0,002 €**	**0,003 €**

Note: It was assumed that counting lines are not purchased but leased. In case counting lines are purchased, there would be an impact of 500.000 € in the counting costs.

Table 6-18 Table 6-18 shows the total costs of exporting PET, aluminium cans and glass bottles. Revenues are shown in Table 6-22.

Table 6-18 Costs associated with the export of materials (LBG, 2022)

	TOTAL COST			
	PET	Can	Glass	Total
Material transport (bale containers to export)	91.291,20 €	8.326,56 €	1.581.544,80 €	**1.681.162,56 €**

Other costs associated with setting up the PRO, administrative and marketing and labelling and fraud prevention costs were assumed to consider the total sum of costs.

Table 6-19 Cost assumptions for PRO setup, administrative and fraud prevention (LBG, 2022)

Setup costs for PRO	7	%	of the total sum
Administration, IT and marketing	7	%	per year of operation cost
Labelling & fraud prevention	10	%	of total DRS cost

The **PRO setup costs main costs factors** are:

- **Legal costs**: Preparing system bylaws, registrations, agreements.
- **Costs of hiring**: management and employees.
- **Administrative work for operational activities**:
  - Preparing instructions, running tenders, managing registrations (return locations, producers, packages), building capacities for stakeholders;
  - IT system setup.

Summing up all the costs described above, **approximately 7 million euros would be required to set up the DRS in Cape Verde under stipulated conditions**.

Table 6-20 DRS in Cape Verde Total Costs (LBG, 2022)

	TOTAL COST			
	PET	Can	Glass	Total
Return location costs				
1. Manual OTC	634.533,52 €	50.739,17 €	346.680,67 €	1.031.953,36 €
2. Manual HoReCa	-	-	-	-
3. Redemption center	110.985,76 €	64.512,00 €	130.934,24 €	306.432,00 €
Collection transport	906.351,00 €	84.603,62 €	1.187.936,87 €	2.178.891,49 €
Counting Centers	233.942,50 €	20.171,37 €	200.372,48 €	454.486,35 €
Material transport	91.291,20 €	8.326,56 €	1.581.544,80 €	1.681.162,56 €
Set up PRO	138.397,28 €	15.984,69 €	241.322,83 €	395.704,80 €
Administration, IT and marketing	138.397,28 €	15.984,69 €	241.322,83 €	395.704,80 €
Labelling and fraud prevention	197.710,40 €	22.835,27 €	344.746,91 €	565.292,58 €
Costs of DRS operations & administration				
(used for Producers Fee - Revenues)	***2.451.608,93 €***	***283.157,37 €***	***4.274.861,64 €***	**7.009.627,94 €**

The major cost drivers are shown in Figure 6-9.

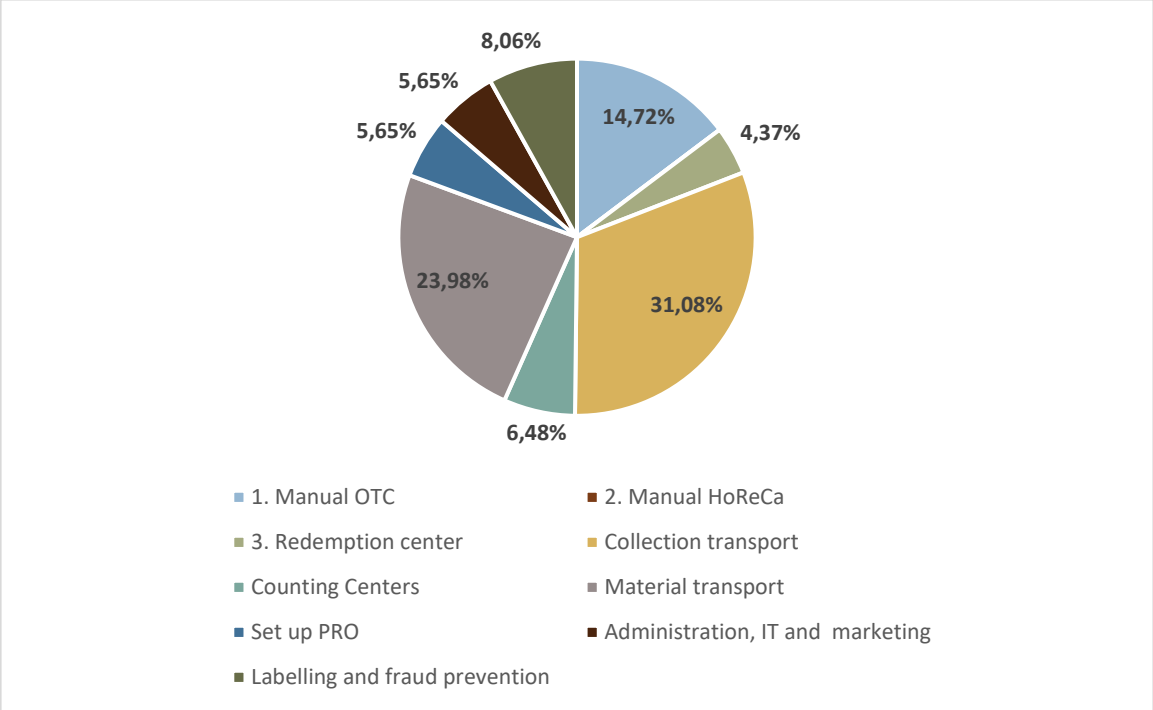


Figure 6-9 Share of total costs of setting up the DRS system, Scenario 1 (LBG, 2022)

The handling fees required to cover infrastructure and logistic costs per material type and return flow (see Table 6-15 and Table 6-16) are shown below.

Table 6-21 Handling Fee per beverage container in Scenario 1 (LBG, 2022)

Handling fee per beverage container			
	PET	**Can**	**Glass**
1. Manual OTC	0,060 €	0,017 €	0,020 €
2. Manual HoReCa	0,029 €	0,017 €	0,026 €
3. Redemption center	0,019 €	0,022 €	0,017 €

There are three main revenue streams concerning the system's revenues: materials sales, unredeemed deposits, and producer fees.

The high-quality material collected in the DRS system is valuable, especially in aluminium and PET material types. Glass material value is dependent on glass package production and demand for clean packaging glass in the region.

Material values are partially unpredictable due to high market fluctuations. The values used to calculate such revenues are considered slightly conservative.

The second part of DRS revenues is the unclaimed deposits of unreturned packages paid by the consumers. This revenue component depends on the deposit value and the convenience of the returns. The consumer who does not return the package takes part in financing the system following the polluter pays principle.

For unredeemed deposits, the calculated return rate was 90%, however, the planned collection rate in retail was 80% and 83,6%, including HoReCa. This difference is due to the obligation of DRS operator to prepare to pay out all the deposits if the returns increase. The DRS Operator has to be prepared for an increase in the return rate of the packages and returns long time after consumption of the beverage. Therefore, the unclaimed deposits' deposit revenues cannot be directly used to finance the system. A cautiously operating DRS Operator keeps some part of the unclaimed deposits in the reserve to prepare for a situation where a higher number of deposits are claimed back by the consumers.

Table 6-22 Revenues from the system in Scenario 1 (LBG, 2022)

REVENUES						
Material revenues	**Material value (EUR/t)**	**kg/unit**	**Units collected**	**Tons collected**	**Absolute Revenue (EUR)**	**Revenue per unit (EUR)**
Material revenue Alu	1.500 €	0,011	12.540.000	139	208.164 €	0,02 €
Material revenue Glass	- €	0,177	89.452.000	15.815	- €	- €
Material revenue PET	270 €	0,033	45.980.000	1.522	410.810 €	0,01 €
SUM					**618.974 €**	
Deposit Revenues	**Deposit (EUR / unit)**	**Units POM**	**Return Rate**	**Absolute Revenue (EUR)**	**Revenue per unit (EUR)**	
Deposit revenue Alu	0,04	15.000.000	90%	60.000,00 €	0,005 €	
Deposit revenue Glass	0,04	107.000.000	90%	428.000,00 €	0,005 €	
Deposit revenue PET	0,0411	55.000.000	90%	226.050,00 €	0,005 €	
Unredeemed containers Alu		2.508.000				
Unredeemed containers Glass		17.890.400				
Unredeemed containers PET		9.196.000				
SUM				**714.050,00 €**		

To calculate the producer fees that beverage producers and importers must pay per packaging type, total revenues per material type were subtracted from total DRS operations and administration costs. The difference, divided by the number of packaging on market, reflects the unit cost per material type, equivalent to the producer's fee.

Table 6-23 Producer Fees Calculations in Scenario 1 (LBG, 2022)

	PET	Can	Glass
REVENUES			
Material revenues	410.810 €	208.164 €	- €
Deposit revenue	226.050 €	60.000 €	428.000 €
Total revenues	**636.860 €**	**268.164 €**	**428.000 €**
Costs of DRS operations & administration	**2.451.608,93 €**	**283.157,37 €**	**4.274.861,64 €**
Total - producer fee	**1.814.748,53 €**	**14.993,37 €**	**3.846.861,64 €**
Units POM	55.000.000	15.000.000	107.000.000
Producer fee per unit	**0,033 €**	**0,001 €**	**0,036 €**

6.3.3.2. Scenario 2

Following the same calculations as Scenario 1, Table 6-24 shows the costs of establishing the collection scheme's infrastructure and operations in one year.

Main costs of the system are related to:

- **Purchase of packaging material**.

- **Personnel and space costs**.

Table 6-24 Collection infrastructure - Investment & Operation per year in Scenario 2 (LBG, 2022)

	TOTAL COST				COST PER COLLECTED PACKAGE		
	PET	Can	Glass	Total	PET	Can	Glass
1. Manual OTC							
Personnel	22.975,63 €	6.266,08 €	44.698,05 €	**73.939,76 €**	0,001 €	0,001 €	0,001 €
Packaging material	310.500,24 €	23.993,20 €	352.083,07 €	**686.576,51 €**	0,008 €	0,002 €	0,005 €
Space	850.560,00 €	63.792,00 €	212.640,00 €	**1.126.992,00 €**	0,023 €	0,006 €	0,003 €
Total	**1.184.035,87 €**	**94.051,28 €**	**609.421,12 €**	**1.887.508,27 €**	**0,031 €**	**0,009 €**	**0,008 €**
2. Manual HoReCa							
Personnel	-	-	-	-	-	-	-
Packaging material	-	-	-	-	-	-	-
Total	-	-	-	-	-	-	-

The logistic costs were also calculated considering the handling of different materials and return flows, as shown in Table 6-25.

Table 6-25 Logistic Costs per year in Scenario 2 (LBG, 2022)

	TOTAL COST				COST PER COLLECTED PACKAGE		
	PET	Can	Glass	Total	PET	Can	Glass
Collection transport							
1. Manual OTC	958.115,01 €	74.036,16 €	844.999,37 €	1.877.150,54 €	0,025 €	0,007 €	0,012 €
2. Manual HoReCa	201.737,25 €	33.858,00 €	418.635,36 €	654.230,61 €	0,024 €	0,015 €	0,026 €
Total	**1.159.852,26 €**	**107.894,16 €**	**1.263.634,73 €**	**2.531.381,15 €**	**0,050 €**	**0,022 €**	**0,038 €**

It is expected that Scenario 2 has higher logistic costs due to efforts in transporting uncompacted materials coming from redemption centers.

Flows 1 and 2 were taken into account for calculating the costs of counting lines. Considering that volumes of beverage containers increased in flow 1, costs associated with infrastructure are also higher when compared with Scenario 1.

Table 6-26 Counting line costs estimations in Scenario 2 (LBG, 2022)

	TOTAL COST				COST PER COLLECTED PACKAGE		
	PET	Can	Glass	Total	PET	Can	Glass
Counting Centers							
Counting cost	241.450,37 €	19.691,32 €	-	261.141,70 €	0,005 €	0,002 €	- €
Consolidation, sorting, baling	76.076,00 €	6.938,80 €	200.372,48 €	283.387,28 €	0,0017 €	0,0006 €	0,0022 €
Total	**317.526,37 €**	**26.630,12 €**	**200.372,48 €**	**544.528,98 €**	**0,007 €**	**0,002 €**	**0,002 €**

Note: It was assumed that counting lines are not purchased but leased. In case counting lines are purchased, there would be an impact of 750.000 € in the counting costs.

The costs related to the export of full containers remain the same for both scenarios.

Other costs ratios associated with setting up the PRO, administrative and marketing and labelling and fraud prevention costs also do not differ between scenarios.

Summing up all the costs described above, **approximately 8 million euros would be required to set up the DRS in Kosovo under the condition stipulated in Scenario 2**.

Table 6-27 DRS in Cape Verde Total Costs in Scenario 2 (LBG, 2022)

	TOTAL COST			
	PET	Can	Glass	Total
Return location costs				
1. Manual OTC	1.184.035,87 €	94.051,28 €	609.421,12 €	1.887.508,27 €
2. Manual HoReCa	-	-	-	-
Collection transport	1.159.852,26 €	107.894,16 €	1.263.634,73 €	2.531.381,15 €
Counting Centers	317.526,37 €	26.630,12 €	200.372,48 €	544.528,98 €
Material transport	91.291,20 €	8.326,56 €	1.581.544,80 €	1.681.162,56 €
Set up PRO	192.689,40 €	16.583,15 €	255.848,12 €	465.120,67 €
Administration, IT and marketing	192.689,40 €	16.583,15 €	255.848,12 €	465.120,67 €
Labelling and fraud prevention	275.270,57 €	23.690,21 €	365.497,31 €	664.458,10 €
Costs of DRS operations & administration				
(used for Producers Fee - Revenues)	***3.413.355,07 €***	***293.758,63 €***	***4.532.166,68 €***	**8.239.280,39 €**

The major cost drivers are shown in Figure 6-10.

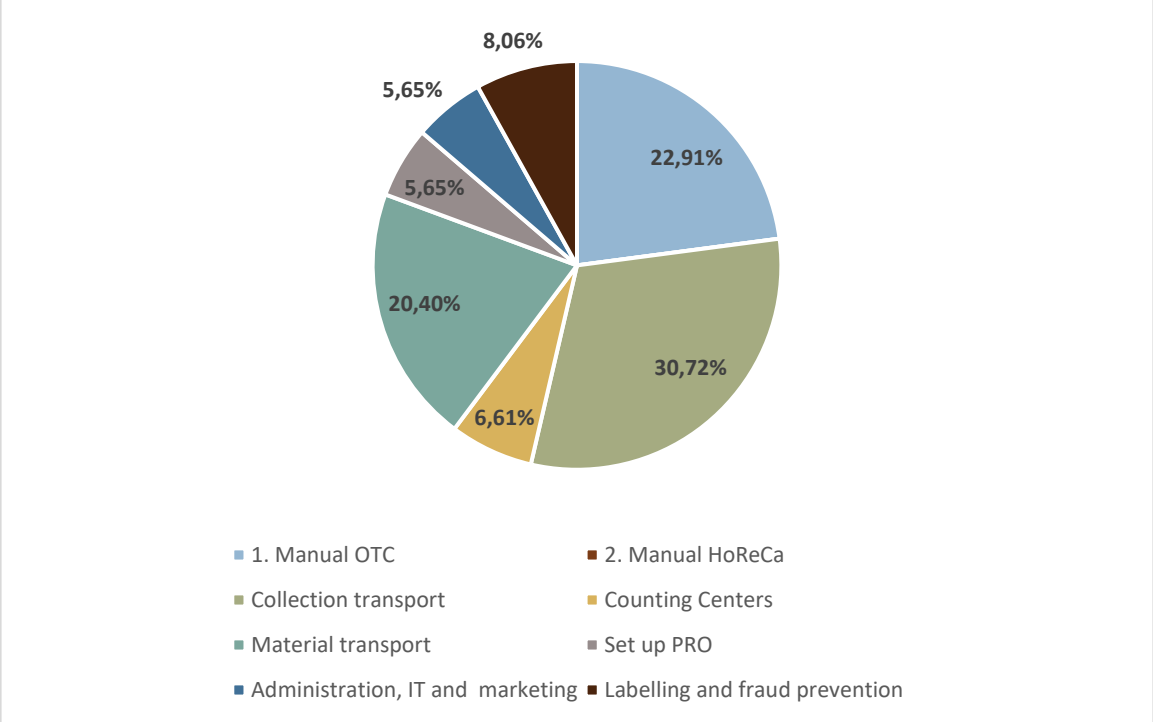


Figure 6-10 Share of total costs of setting up the DRS system, Scenario 2 (LBG, 2022)

The handling fees required to cover infrastructure and logistic costs per material type and return flow are below.

Table 6-28 Handling Fee per beverage container in Scenario 2 (LBG, 2022)

Handling fee per beverage container			
	PET	**Can**	**Glass**
1. Manual OTC	0,062 €	0,018 €	0,020 €
2. Manual HoReCa	0,030 €	0,017 €	0,026 €

The **revenues planned for Scenario 2 related to materials sales and unredeemed deposits remain the same as Scenario 1**.

Since costs of the system are different between Scenario 1 and 2, producer fees will also differ.

Table 6-29 Producer Fees Calculations in Scenario 2 (LBG, 2022)

	PET	Can	Glass
REVENUES			
Material revenues	410.810 €	208.164 €	- €
Deposit revenue	226.050,00 €	60.000,00 €	428.000,00 €
Total revenues	**636.860 €**	**268.164 €**	**428.000 €**
Costs of DRS operations & administration	**3.413.355,07 €**	**293.758,63 €**	**4.532.166,68 €**
Total - producer fee	**2.776.494,67 €**	**25.594,63 €**	**4.104.166,68 €**
Units POM	55.000.000	15.000.000	107.000.000
Producer fee per unit	**0,050 €**	**0,002 €**	**0,038 €**

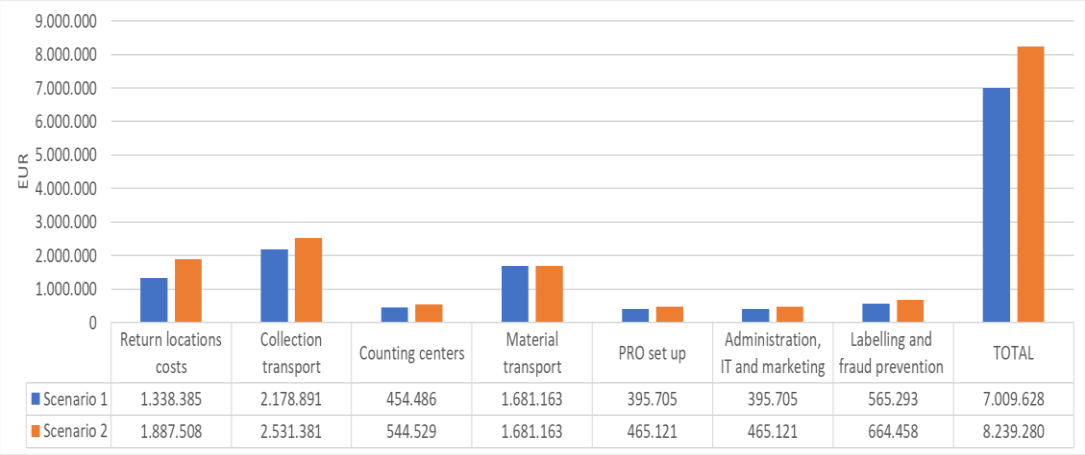
6.3.3.3. Comparison between Scenarios

The **main points that should be highlighted from the difference between implementing scenario 1 with a less manual approach against scenario 2 with a 100% manual return of beverage containers are**:

- The **implementation of scenario 2 is 18% more expensive than scenario 1**. The main difference between scenarios is if 12 redemption centers are set up on the islands, the logistic costs of collecting containers and handling manual operations at retail shops are reduced.
- The **low labour costs[3] in Cape Verde make a scheme design with manual operations more attractive than in most DRS countries**. **However, finding a balance between manual operations and optimizing logistics by setting up RVMs** (which make the system more efficient and save space and transport costs) **is highly important**.
- The **assumed shift from retail to redemption center returns instead of full manual OTC gives scenario 1 a competitive advantage**.

[3] Cape Verde minimum wage is 13.000 escudos or 118 EUR/month (data from desktop research)

- It can be said that the **RVM investment magnitude is not critical from the total system cost perspective** if the redemption center network is attractive enough for the consumers.
- The **labour force required for carrying out operational tasks varies slightly between scenarios 1 and 2.** In scenario 1 it was assumed that people hired to work at redemption centers should equal to 2 employees/shift and two shifts should be covered. In scenario 2, more people are expected to be employed to work in logistics an at the counting center.



	Return locations costs	Collection transport	Counting centers	Material transport	PRO set up	Administration, IT and marketing	Labelling and fraud prevention	TOTAL
Scenario 1	1.338.385	2.178.891	454.486	1.681.163	395.705	395.705	565.293	7.009.628
Scenario 2	1.887.508	2.531.381	544.529	1.681.163	465.121	465.121	664.458	8.239.280

Figure 6-11 Comparison between scenarios

Note: As mentioned before, it was assumed that for scenarios 1 and 2, RVMs and counting lines are leased and not purchased. If this machinery is purchased, both scenarios will face impact in costs. Refer to subchapter 6.3.2 for more details.

A comparative summary between scenarios 1 and 2 is presented below.

Table 6-30 DRS design parameters comparison, scenarios 1 and 2 (BFS, 2022)

DRS design parameters	Unit	Scenario 1	Scenario 2
Counting lines	Unit	2	3
Counting centers	Unit	1	1
Redemption centers	Unit	12	0
Operational jobs created	Jobs	220	210
Administrative jobs created	Jobs	7-9	7-9
Handling fee (PET)	EUR/unit	0,019-0,06	0,03-0,062
Handling fee (Alu)	EUR/unit	0,017-0,022	0,017-0,018
Handling fee (Glass)	EUR/unit	0,017-0,026	0,02-0,026
Producer fee (PET)	EUR/unit	0,033	0,05
Producer fee (Alu)	EUR/unit	0,001	0,002
Producer fee (Glass)	EUR/unit	0,036	0,038

6.4. Considerations

The resulting calculations are based on market data, desktop research and assumptions from the experts' experience in DRS in other countries. The report is an initial approach to the DRS scheme design in Cape Verde. It is strongly suggested that all data collected, and assumptions are validated through a comprehensive market research study.

Once data is clarified, and more findings are obtained, the BMCT can be polished and different scenarios modelled.

Refer to chapter 8 for a detailed explanation of the comprehensive market research.

7. Management case

The Management Case focuses on the scheme's structure and feasible design options. To understand the possible management scenarios, a cascade methodology approach was followed (refer to Figure 7-1):

- First, a broad context of the Producer Responsibility Organization is introduced, including its main responsibilities and involved actors.
- Then, a diagram with the main stakeholders relevant to DRS in Cape Verde was developed
- Following, the main actor's responsibilities were defined.
- Finally, an outline for a PRO setup based on its six main functions (operations, communications and financial management, quality and audit, sourcing, and membership) was proposed.

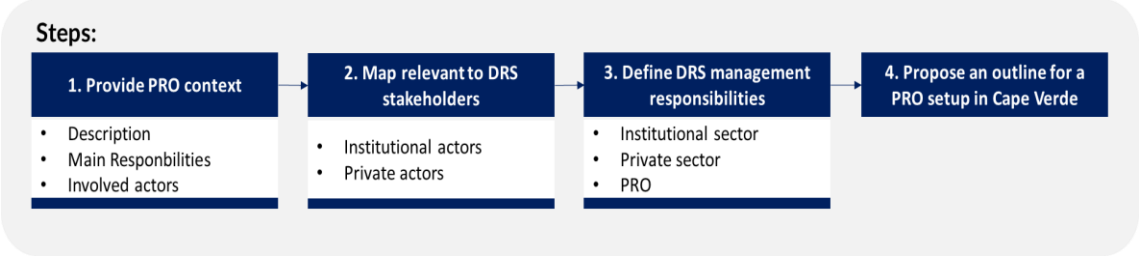


Figure 7-1 Summary of the management case methodology approach (BFS, 2022)

7.1. Producer Responsibility Organization (PRO)

Following the arguments shown in the Strategic Case, **the project to design and implement a deposit return scheme was proposed to comply with Cape Verde´s recycling objectives for packaging containers. If implemented, DRS will be the first concrete approach to the polluter pays principle in the country under EPR**.

The main management entity of a DRS is the so-called PRO. A **PRO is a company that organizes producers' compliance with EPR obligations and targets – operationally and financially**. Generally, a collective PRO is funded by producers, importers and retailers in the proportion of their market share for the products or streams covered by the EPR regulations.

Concerning the management scenario, while the government is mainly responsible for driving the establishment of DRS in the country, the new entity is responsible for setting the whole administrative framework and making the necessary investments.

The **legal entity structure of the PRO varies between the different systems**. All systems of governance will be tasked with all, or some, of the following actions (Eunomia, A Scottish Deposit Refund System, 2015):

- Calculating producer´s and handling fees;
- Setting labelling prerequisites;
- Analyzing database;
- Managing financial flows;
- Controlling logistic system components (RVMs, manual take-back, consolidation centers);
- Awareness campaigns; and
- Monitoring return rates.

In practice, **there are several models, which can be roughly categorized into the following three divergent parameters**:

- **Private organization Vs State-run institution/authority;**
- **Centralized Vs Decentralized;** and
- **For-profit company Vs Non-profit organization (NPO).**

Table 7-1 shows EU examples of clearing systems, operators and leading stakeholders.

Table 7-1 PRO in EU countries - Adapted from (CM Consulting & Reloop Platform, 2016)

Country	Clearing System	Public / Private	Operator & Administrator	Stakeholders	
Croatia	Centralized	Public	Environmental Protection and Efficiency Fund	-	
Denmark	Centralized	Private NPO	Dansk Returnsystem A/S	Brewers	100%
Estonia	Centralized	Private NPO	Eesti Pandipakend OÜ	Association of Producers of Soft Drinks	25%
				Association of Brewers	25%
				Association of importers of Soft Drinks and Beer	25%
				Retailers Association	25%
Finland	Centralized	Private NPO	PALPA	Retailer	50%
				Beverage Producer	50%
Germany	Decentralized	Private NPO	ADM: Deutsche Pfandsystem GmbH / OP: Retail and Industry	Retail Association	50%
				Food Association	50%
Norway	Centralized	Private NPO	Infinitum AS	Grocery Manufacturers´ Service Office	7.5%
				Association of Wholesale Grocers	33.5%
				Coop Norway	15%

				Federation of Petrol Dealers	1.5%
				Federation of Food and Drink Industry	7.5%
				Brewers Service Office	35%
Sweden	Centralized	Private NPO	AB Svenska Returpack	Retail	25%
				Brewers	50%
				Grocers Association	25%

7.1.1. Public Vs Privately operated PRO

The systems can be either run by state authorities or industry organizations.

Most of the systems in Europe are governed by industries and monitored by governmental stakeholders. For example, Dansk Retursystem, from Denmark, is a private PRO owned mainly by Carlsberg. In Sweden, Returpack, the PRO is 50% owned by the Brewers of Sweden, 25% by the Swedish Retail Association and 25% by the Food Retailers Association. If the DRS is governed by industry, it is beneficial to set up a management board to oversee the design and operation of the system and ensure any targets are met.

In some cases, the state plays more of an advisory role, like Germany, where most of the system is owned and run by the private sector. The role of the system administrator is limited to the management of marking standards, specifications of the IT interfaces and certification requirements. The administrator has direct involvement in the operational matter and/or funding scheme (Eunomia, A Scottish Deposit Refund System, 2015).

Table 7-2 Pros and cons of different PRO management scenarios (BFS, 2022)

	Privately own non-profit Organisation	**State-run Organisation**
Description	The most common route adopted in recent international deposit return schemes. It has recent precedent, with several European, privately operated, non-profit model schemes functioning effectively. Monitored by governmental stakeholders.	Cape Verde government owns and is responsible for the DRS Operator activities. Fixed fees for producers are established.
Examples	Finland, Germany, Lithuania, Sweden, Norway, Netherlands.	Croatia (only EU country). An extrabudgetary fund funds the entity.

Advantages	Producers have the responsibility to operate the system. Operational and financial risks with producers (EPR principles). A strong drive of the private sector to minimize the costs. Investments are made to optimize efficiency. Costs paid by the producers and importers, natural optimization in the industry stakeholders. High incentives to perform and tends to maximize efficiency. Government can control the results without major investments.	Higher control of the scheme than would be available through a privately owned entity. Requires less sophisticated regulations, given the direct control of the operations and finances. Revenues of unredeemed deposits and sale of materials can be used to fund other waste management initiatives.
Disadvantages	Requires public sector monitoring of performance through regulation rather than direct control. Challenging setup if private sector parties do not follow mutually accepted business practices. Does not cover the management of packages outside DRS scope.	Higher investments costs for setting up the system for the Government of Cape Verde – bear financial risks. Distrust from producers and importers on the efficiency of the system. Considered as tax, lacking incentives to reduce costs. Can reduce the commitment from private sector. Not transparent. It can be driven by political motivations to optimize other than system efficiency. Need for establishing a management team and building capacity among governmental stakeholders for operating the PRO.

7.1.2. Centralized vs Decentralized PRO(s)

DRS, like EPR schemes, can be monopolistic or may contain multiple system operators in competitions. In a centralized system, the beverage industry usually creates a non-profit privately-owned organization and controls the operations and finance of the system. In a decentralized

system, competition between organizations is allowed since no single entity is responsible for the system's operation or success. The pros and cons of both setups are shown Figure 7-2.

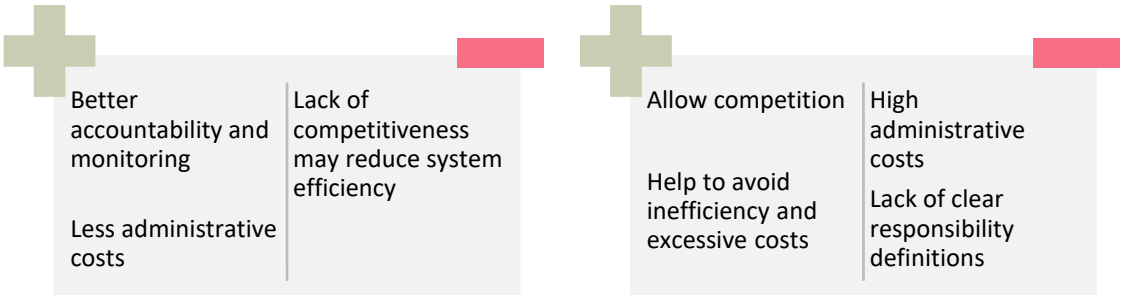


Figure 7-2 Centralized (left) and Decentralized (right) system: Pros and cons

Centralized systems offer greater accountability and transparency since the responsibility lies in one organization. This organization is responsible for publishing annual reports. It also accounts, sets fees for producers, monitors participants and frauds and ensures that all deposits are correctly initiated and refunded and that all fees are paid. This means all producers know what they are required to pay, and if the annual accounts are published publicly, producers can use their market knowledge to assess whether all competitors are paying their fair share. A centralized system might be more efficient, as the single operator arranges all containers to be collected and transported (rather than individual producers doing this for their containers). This approach also allows to market the material in bulk to negotiate the best price deal (Eunomia, A Deposit Refund System for the Czech Republic, 2019).

7.2. Institutional and Private Stakeholders

A prerequisite for a successful operation is a clear set of regulations, detailing without room for interpretation, the roles and responsibilities of the various stakeholders.

Figure 7-3 exemplifies stakeholders being typical actors in EPR systems / PRO.

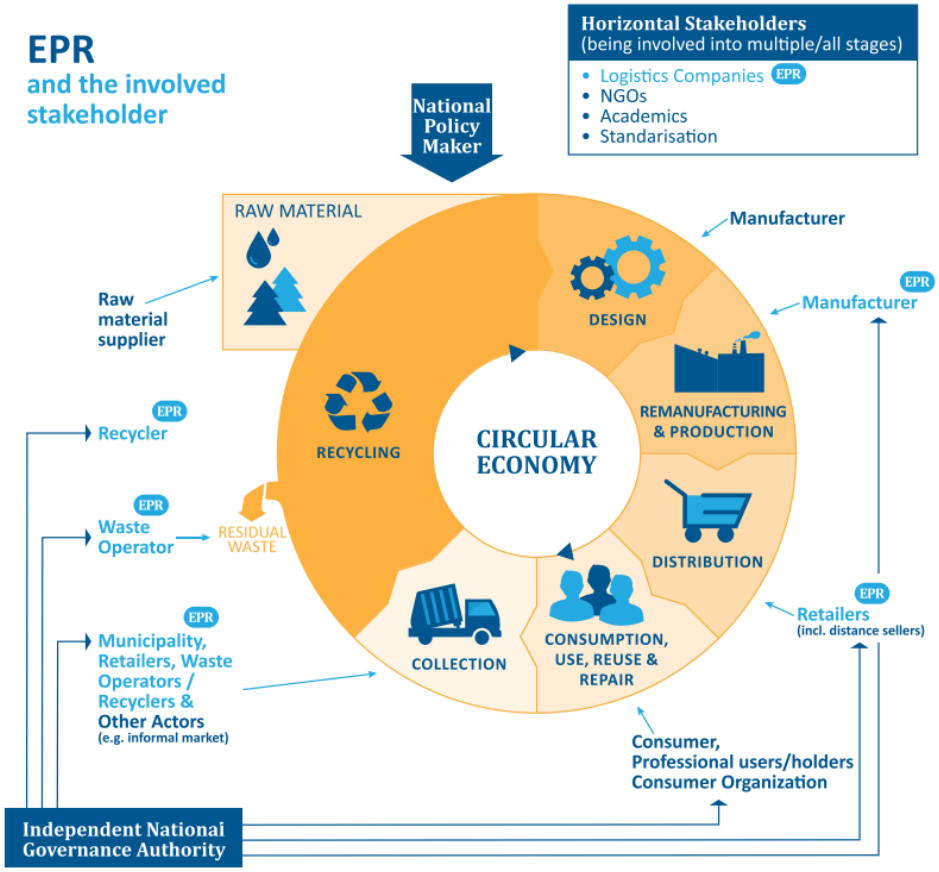


Figure 7-3 Prerequisites for a successful EPR (and PRO) operation (Parliament, 2020)

The legal foundation needs to define which parties must participate/pay packaging fees in the system. In Cape Verde, key stakeholders for the implementation of DRS are:

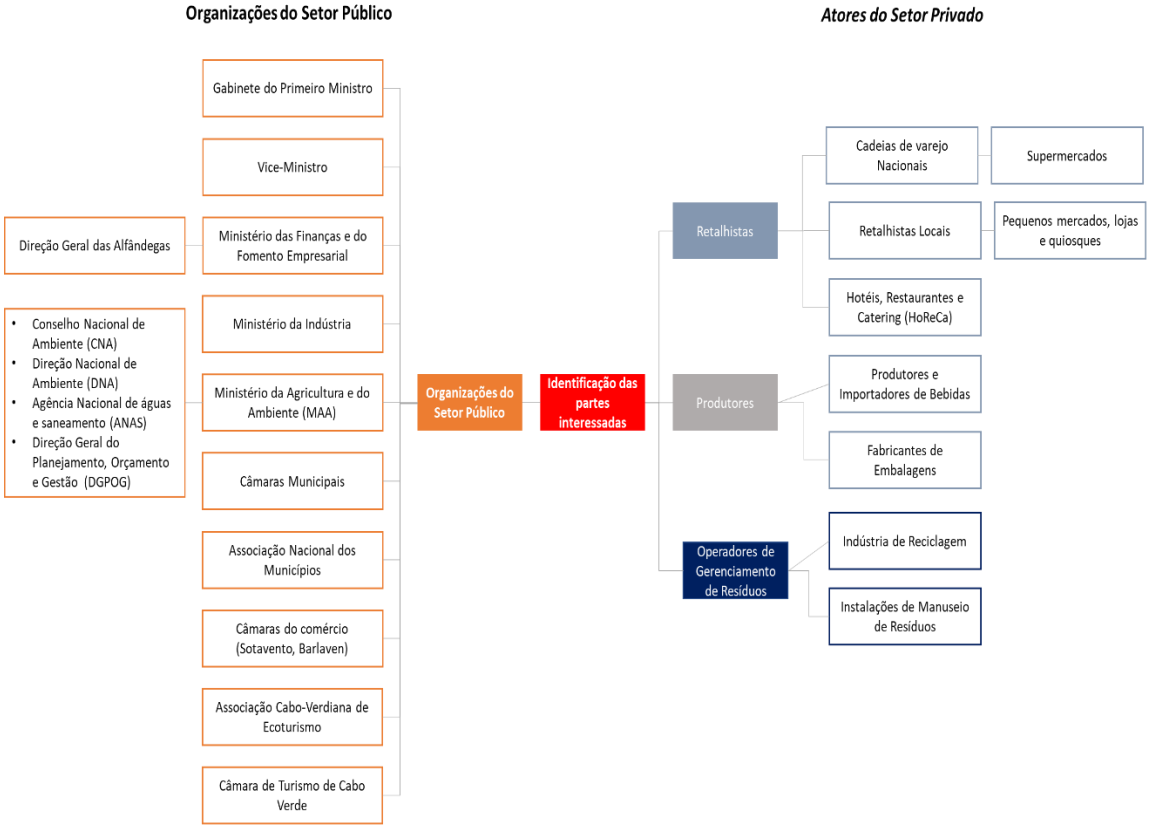


Figure 7-4 Key Public and Private Stakeholders in Cape Verde (BFS, 2022)

As observed in Table 7-1, DRS participating stakeholders are likely to include the beverage industry and relevant associations (scheme funders) and retailers (entities responsible for material return). Depending on the scope of the DRS (see Chapter 5.1.1), actors such as brewers, distillers, and soft drink manufacturers might also be considered. One substantial operational component concerns logistics, and their representation might be advantageous.

The main beverage manufacturers/importers in Cape Verde are:

- Cavibel/CERIS (Equatorial Coca Cola Bottling Company);
- Tecnicil Indústria; and
- BoNatura.

Grogue producers also play an important role in the production of strong liquours in Cape Verde.

For example, PALPA, in Finland, is a non-profit organization, owned and operated 50% by the beverage industry and 50% by the retail industry and funded by fees paid by participating producers and importers whose products are covered by the system. Members pay both a registration fee and an annual fee, set according to the type and volume of products placed in the

system (Ettlinger, 2016). System setup investments are covered by joining fees paid by each producer or importer joining the systems operated by PALPA.

7.3. Proposed roles and responsibilities

From the management perspective, **institutional actors are generally responsible** for:

- **Drafting a clear and precise legislative framework**.
- **Setting the targets** for the PRO, including return rates and collection network.
- **Engaging with the private sector** sets the deposit level and monitors return rates.
- **Monitoring the PRO and controlling the achieved results** compared to the targets.

While **private stakeholders are mainly responsible** for:

- **Marking deposit packages** with deposit logo and unique and universal bar code.
- **Managing deposit payment transactions** from beverage bottles and cans.
- Developing a network for **container collection**.
- **Managing and financing the PRO** via material recycling sales and setting and collecting producer fees.

Whereas led by a public, private or a mixed capital entity, the general responsibilities of the PRO are described below:

- **Create, finance, operate a functional joint management return system** of beverage containers.
- **Enter**, under non-discriminatory conditions, **contracts with related beverage producers, brand owners and importers** to make sure they participate in the system.
- **Manage determined waste stream** (PET bottles, aluminium cans and glass bottles) on behalf of the represented producers to an extent corresponding to the aggregate volume of the obligations of each individually.
- **Run the tenders to select the suppliers and support or carry out audits checking quality and compliance of their first-tier suppliers** according to harmonized standards and take appropriate corrective actions in case of non-conformities.
- **Incentivize producers** following the harmonized principles of “incentives for best-designed containers” set by the policymakers.
- **Fulfil on behalf of all represented producers their documentation obligations** such as:
    - registration and reporting obligations;
    - keep reporting records separately for each represented producer; and
    - regularly submit summary reports to the Ministry of Agriculture and Environment (MAE) on behalf of all represented producers and retain the reported data:

  - information about the quantity of the specified waste stream for which they provided collection, transport, preparation for reuse, recovery, recycling, processing, and disposal.
  - information about the number of specified products placed on the market by the producers they represent.
- **Report** under-/overcollection **quantities to governmental monitoring body**.
- **Support or carry out nationwide promotional and educational activities** focusing on end-users concerning separate collection and waste prevention.
- **Finance R&D projects** to improve the collection, recycling rates, reuse; and
- **Support of EPR policymaking** in a stakeholder's consultation.

Detailed roles and responsibilities of key actors in Cape Verde are further described in Annex 9.1

Considering the key factors mentioned above, a practical setup could be built around, a single PRO for all beverage containers:

- Operating as a private entity under beverage producers, importers, and retailers' direct or indirect governance.
- With a mission to develop and manage the overall take-back operations.
- Leveraging the informal sector for the first steps of the collection process.
- Fulfilling an initial and hence ambitious educational role towards the citizens.
- With an additional role to foster, through mechanisms yet to define, the development of the necessary sorting and the recycling infrastructure.

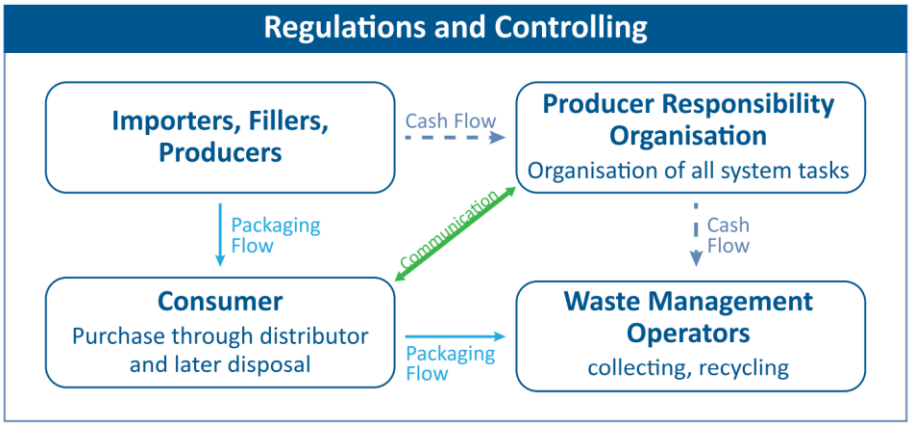


Figure 7-5 Single PRO system (GIZ, 2018)

7.4. Outline for a PRO setup

Based on the mission outlook described above, a relevant PRO entity would include the following functions:

- **General management**.
- **Producer relationship management**, ensuring the identification, contracting, and reporting of the obligated producers, training of the producers, and identification of free riders. This function also entails calculating the respective obligation of each producer based on put on market data and/or market share.
- **Sourcing**, ensuring the identification, tendering, and contracting of the various service providers, especially for collection, sorting and recycling and including the informal sector.
- **Operations management**, ensuring the efficient performance of the physical activities, related documentation, and reporting.
- **Communication management**, ensuring the education and awareness of the public and the participants in the EPR system.
- **Finance**, overseeing the PRO finance and controlling activities.
- **Quality and audit** verify that the PRO and supply chain participants operate at the required quality levels and that producers' declarations are accurate.

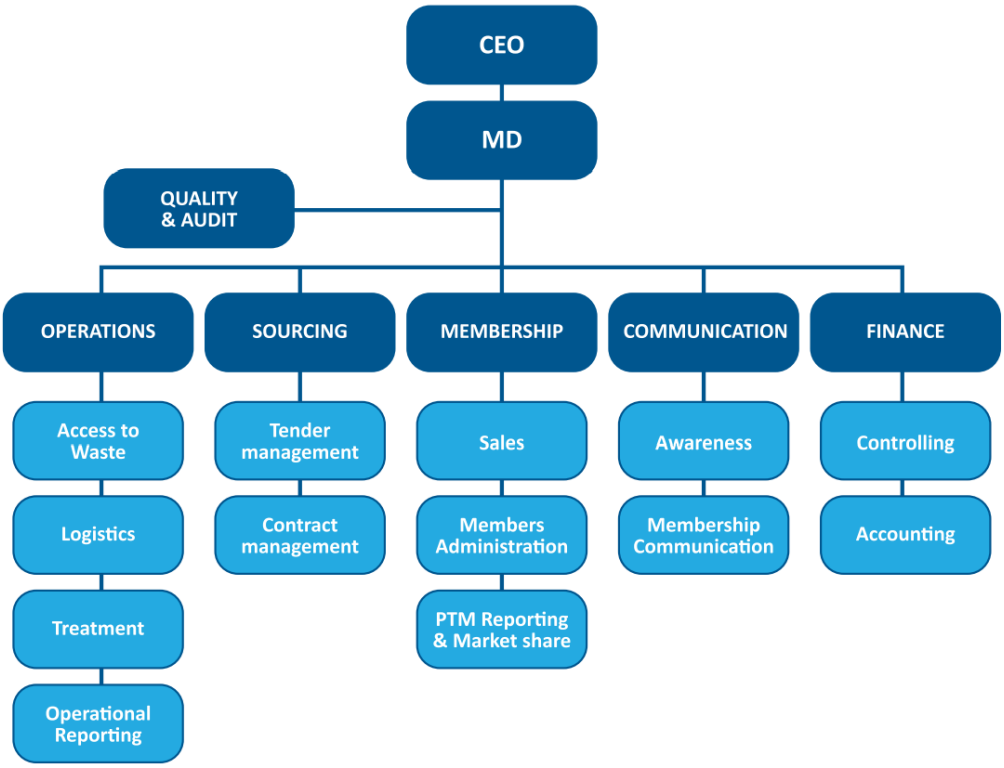


Figure 7-6 Functions within the PRO (LBG, 2020)

8. Conclusions and Next Steps

This chapter summarises the **main observations from modelling the initial approach to the design of the DRS tailored to Cape Verde´s context**. It also elaborates on the immediate steps after completing this pre-feasibility study and the action plan to implement the system.

The results from this business case were achieved by close cooperation with institutional and private stakeholders. Private sector stakeholders have expressed their interest in supporting the project with information. Getting more information from these stakeholders will further improve the accuracy of this report's financial estimations and calculations, and the adaptability of the calculation model makes it possible.

After carefully analyzing the potential implications and modelling the introduction of DRS in Cape Verde, the following conclusions were realized:

Island Context

- Some factors that improve the feasibility of DRS in Cape Verde include its advantageous geographical condition of not sharing borders. This benefits fraud prevention by having limited connections or ports for material traffic and thus, cautiously controlling imported goods. Furthermore, the risk of fraud at the industrial level is lower than in countries with land borders with less control over the movement of goods. Finally, high logistics cost reduces the risk of fraud by importing fraudulent material.
- The factors that decrease the feasibility of DRS in Cape Verde involve the high logistics costs to transport the collected material within the islands; this leads to an increase in the cost of the PRO. Also, the high costs of exporting the collected material for recycling reduce the system´s revenues and raise the producer´s fee.

Material Volumes

- Currently, recyclable volume collection rates are low, and the feasibility of building recycling facilities around beverage package volumes is restricted.
- It is likely that, at least in the first years of implementation, collected material will have to be sold for export. This reduces the potential of closing the loop locally.
- Through the consolidation of DRS, it is expected that investments will arise from new business possibilities through volume consolidation and clean material.

Market structure

- A small number of producers control a significant share of the market. If these producers are committed to participating, the setup of PRO is feasible compared to many other countries.

- The connections between public and private sector actors increase the feasibility of DRS implementation in the country.
- Average store size, space limitations and operational labour cost suggest that investing in a large RVM network to retail shops would not be feasible. RVMs are a feasible option in redemption centers.

Consumer readiness

- Consumer readiness can be a challenge to DRS's feasibility because most consumers are not exposed to DRS in other countries, and it would be a new concept requiring intensive consumer education.
- To address this, scenario 1 stipulated the instalment of redemption centers, which aim to improve logistics and have an awareness effect on the citizens.
- In the DRS system, the consumer´s cost and reward are immediate, and the money value of the return is tangible. DRS system can be a good step in generating consumer awareness of recycling.
- DRS is generally well accepted by citizens due to its convenience and improvement in street cleaning and reduction of marine litter.

Technical Knowledge

- Currently, technical knowledge of the functioning of DRS in Cape Verde is very limited. The international consultant team conducted one session (2-day Workshop) of capacity building for public and private stakeholders.
- For the efficient establishment of DRS, it is necessary to invest in capacity-building sessions to train local experts to lead the implementation of the system at a later stage.

Data Compilation

- There is a lack of centralized data on the market structure, including the number and size of retailers, producers & importers, and the HoReCa sector.
- A deep market study must be conducted for a more concrete estimation of costs and implications.
- A registry system for the production and import of all relevant stakeholders must be developed to accommodate entries and support monitoring of the system.

Interested Parties & Strategic Development

- Cape Verde has already initiated the development of legislation based on the polluter´s pay principle and EPR premises, among others, for packaging waste. DRS would be inserted in such a context as a concrete tool for this execution.

- In general, private actors would also be interested in its development due to international targets such as multinational companies (e.g. Coca-Cola commits to achieve 30% of R-PET by 2030), corporate social responsibility, and increased awareness of consumers.
- As shown throughout the study, DRS in Cape Verde is a feasible instrument to improve collection rates, develop the recycling infrastructure in the country, concretely establish the first PRO in the country and be pioneer in the development of the system in the African continent.

The establishment of DRS was initiated in the 1990s and has gained worldwide popularity to enhance the recycling quota, attend to national and international targets, and avoid marine life littering. Due to its complexity, such an implementation usually takes a minimum of 3 years to be concretized.

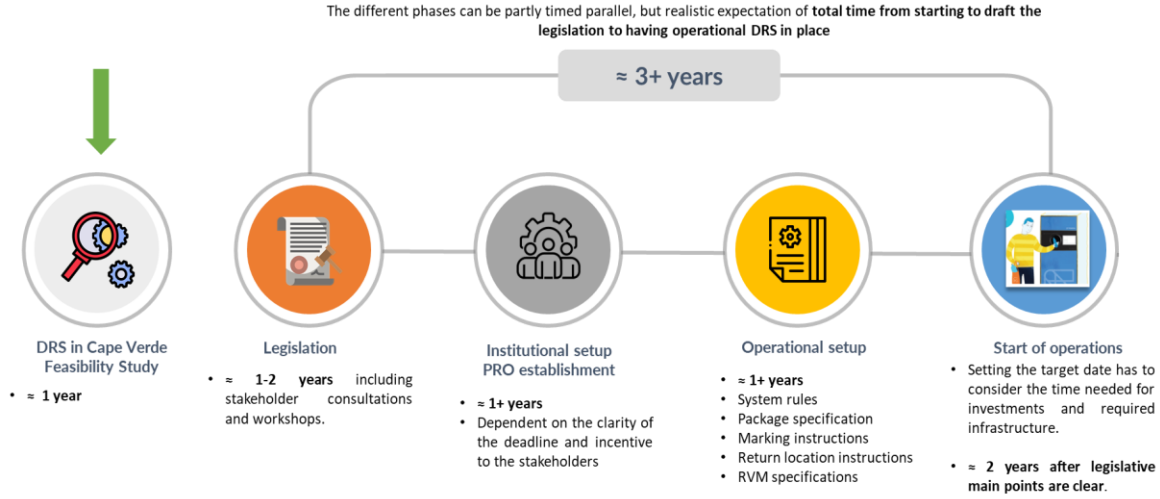


Figure 8-1 Typical DRS implementation timeline (LBG, 2021)

As seen in Figure 8-1, it is suggested that before moving to the implementation phase of DRS, a one-year feasibility study is conducted, and the following activities are carried out:

- **Build capacities within the country** by holding workshops and reaching an equitable understanding of DRS within the relevant actors. In other words, prepare the country for the implementation of the scheme.
- **Conduct an in-depth market study to validate the collected data** focused on reaching the relevant authorities and industries to provide updated figures. The international expert´s team is gathering initial data, but further engagement and discussions with institutional and relevant key players to request more figures are foreseen.

- **Design a stakeholder communications plan** based on the currently mapped stakeholders. In other words, create stakeholder working groups and design a strategy to communicate and receive constant feedback from key players.
- **Gather stakeholders' feedback and opinion on the proposed scheme design** by launching a tailored survey with questions consistent with the actors' backgrounds.
- **Conduct a consumer behavior survey** to understand the Cape Verde citizen's demands and wishes concerning the scheme design.
- **Refine the Business Case** to achieve a tailored and accurate scheme design for Cape Verde. The data collected in the market study and the analysis of the stakeholder´s and consumer behavior survey can be used to produce further iterations of the Business Model Calculation tool.
- **Conduct a legislative gap analysis study** to identify the areas of opportunity (compared to existing DRS schemes) and the best approach to drafting the legal framework for DRS in Cape Verde.
- **Hold consultation sessions with governmental and private actors to agree on the initial scheme design decisions** such as institutional setup, legislative framework approach, labelling approach and its harmonization in the country, awareness campaigns and communication to the public.

A road map for establishing DRS in Cape Verde is shown in Table 8-1.

Table 8-1 Road map for the implementation of DRS in Cape Verde (BFS, 2022)

MAIN ACTIVITIES AND DETAILED TASKS	RESPONSIBLE / SUPPORT	WITHIN 1 YEAR	1-3 YEARS	3+ YEARS
Capacity building of local stakeholders				
Identify institutional change agents and capacitate the selected individuals in the overall system design and implementation. Hold a series of workshops to reach an equitable understanding of DRS. In other words, prepare the country´s decision makers for the implementation of the scheme.	Consultancy team	x		
Organize one or two study trips to European countries to learn about their experience with the DRS (including meeting with key governmental actors, visits to packaging collection points, recycling facilities and a PRO).	Consultancy team	x		
Conduct a comprehensive market study on the beverage industry in Cape Verde				
Hire a local expert with waste management and beverage industry knowledge to support the DRS implementation process.	Government	x		
Develop a comprehensive data base with Cape Verde´s beverage market information (retail shops in the country, main importers, main producers, beverage bottles placed in the market by size, logistics activities, etc).	Local expert / Consultancy team	x		
Hold 1:1 exchange sessions with authorities and industries to present the data collected during the pre-feasibility study and validate, update or amend it.	Consultancy team / Local expert	x		
Gather stakeholders' feedback and opinion on the potential scheme design by launching a tailored survey with questions consistent with the actors' backgrounds (including retailers, importers, beverage producers).	Consultancy team / Local expert	x		
Conduct a consumer behavior survey to understand the Cape Verde citizen's demands and wishes concerning the scheme design.	Local expert	x		
Amend and present Business Case for DRS implementation in Cape Verde				
Polish the Business Case based on the market study results to achieve a tailored and accurate scheme design for Cape Verde. Findings from the stakeholder and consumer behavior surveys should be used to produce further iterations of the Business Model Calculation tool.	Consultancy team	x		
Hold workshops to present Business Case with governmental actors, retailers and beve	Consultancy team	x		
Definition of institutional setup and stakeholder dialogue				
Identify and address knowledge gaps of Cape Verde´s public insitutions.	Local expert		x	
Elaborate on the requirements public stakeholders must acquire in terms of technical knowledge and competencies, as well as staffing.	Consultancy team		x	
Elaborate recommendations on setting up the institutional framework and managing the implementation of the DRS system.	Consultancy team / Local expert		x	
Create stakeholder working groups and design a strategy to communicate and receive constant feedback from key players.	Consultancy team		x	
Draft detailed implementation and delivery plan.	Consultancy team		x	
Detail out roles and responsibilities of all relevant stakeholder groups.	Consultancy team		x	

MAIN ACTIVITIES AND DETAILED TASKS	RESPONSIBLE / SUPPORT	WITHIN 1 YEAR	1-3 YEARS	3+ YEARS
Creation of new legislation or amendments to the Packaging Law				
Conduct a legal gap analysis study that compares DRS legislation of countries like Finnland, Germany, Lithuania, Estonia with Cape Verde.	Local legal expert / Consultancy team		x	
Formalize a government dedicated working group to enable discussion rounds and decision making.	Local legal expert / Consultancy team		x	
Hire a local legal expert that can advise the government dedicated working group.	Local legal expert / Consultancy team		x	
Develop a legal framework draft document that can be used for decision making by the working group.	Local legal expert / Consultancy team		x	
Hold 3-4 open consultation sessions with institutional and private stakeholders and present legal framework.	Local legal expert / Consultancy team		x	
Amend legal framework based on the feedback from the consultation sessions and present it.	Local legal expert / Consultancy team		x	
Producer Responsibility Organization establishment				
Define PRO structure and management.	Consultancy team		x	
Prepare the PRO bylaws, registration framework and agreements.	Local legal expert / Consultancy team		x	
Develop a platform where beverage producers and importers can register.	Local expert / Consultancy team		x	
Develop Terms of Reference and relevant documentation for the set-up of the scheme administrator.	Local expert / Consultancy team		x	
Launch PRO tender.	Government		x	
Hire administrative employees.	PRO management team		x	
Develop standard operation procedures and working guidelines.	Consultancy team		x	
Conduct capacity building sessions for relevant stakeholders.	Local expert / Consultancy team		x	
Operational set-up				
Develop database of the materials in scope to monitor targets fulfillment.	Local expert / Consultancy team			x
Define the system´s billing, labelling, and data monitoring approach.	Local expert / Consultancy team			x
Hold discussions with technology providers relevant to machinery and IT system.	Local expert / Consultancy team			x
Identify and map recycling facilities posibilities in the country.	Local expert / Consultancy team			x
Develop suitable logistic schemes for urban centers and rural areas.	Local expert / Consultancy team			x
Hold negotiations with ferry lines and hotels for the implementation of DRS.	Local expert / Consultancy team			x
Design and launch awareness campaigns and sensitization actions, including communication brochures, online marketing, municipal events, etc.	Government			x
Training general staff that will perform DRS operations such as government inspectors (waste audits), waste producers (data sharing), PRO (system management) and retailer staff (all handling and operational activities).	Consultancy team			x
Start of operations				
Develop monitoring plan.	Local legal expert / Government			x
Monitor DRS efficiency and milestones.	Government			x
Hold board meetings for system optimization.	Government			x

8.1.Final Considerations

Many regions consider container deposit schemes, which have proven concepts in several EU countries, to help meet their recycling quotas and fight litter and ocean plastic worldwide. DRS schemes have reached 70% to almost 100% of return rates, higher than any current waste collection system.

There are two main reasons container deposit schemes succeed in increasing recycling rates and reducing waste:

- **Financial incentive**: Deposit return systems provide a financial incentive for consumers to return drink containers, which might otherwise be littered or thrown in the landfill. Providing financial value to these beverage containers communicates that they have value for society. Containers are viewed and treated as a resource rather than merely as trash.
- **Increased purity**: By separating bottles and cans for recycling through reverse vending machines, drink containers are collected without contamination from other types of waste in a household recycling bin. This ensures containers can be recycled into new bottles and cans rather than used for lower-quality applications.

This reduces the reliance on raw materials needed to produce new beverages, and the recyclables end up in landfills or in nature as litter.

The evaluation of the potential implementation of DRS in Cape Verde is shown in Table 8-2.

Table 8-2 Evaluation of DRS for beverage containers in Cape Verde (BFS, 2022)

Parameter	Rate	Description
Environmental aspects	**++**	The environmental aspect of the DRS is very positive since it usually has a high recycling rate that reduces landfilling and littering.
Revenue generation	**0**	There is no revenue generation within DRS since it is deposit based. In this case, no fund is created for further investments.
Market impact	**+**	Negative aspects may arise when restricted beverage container types belong to the system. This might lead to unfair competition and changes in packaging, but it is easily remediated by expanding the DRS scope. Besides, recovered material is very clean and pure, facilitating recycling. The recovery of recyclables generates new business opportunities and the creation of recycling services, eventually transcending the negative impact and presenting a positive market aspect.
Social impact	**+**	Since costs are typically borne by producers, importers and retailers and deposits are refundable, there are no adverse social effects on the functioning of DRS. It is observed from other EU experiences that the informal sector might collect containers that lay on the streets to increase revenues or even be integrated into the system. In this case, the social aspect might be considered positive.

Administrative costs	**0 or - ***	Any administrative cost is covered by the private sector and the affiliated businesses of each DRS. Even though a public entity conducts monitoring/auditing, administrative costs are not presumably high.

*Depending on the preferred scheme operation setup

9. Annex

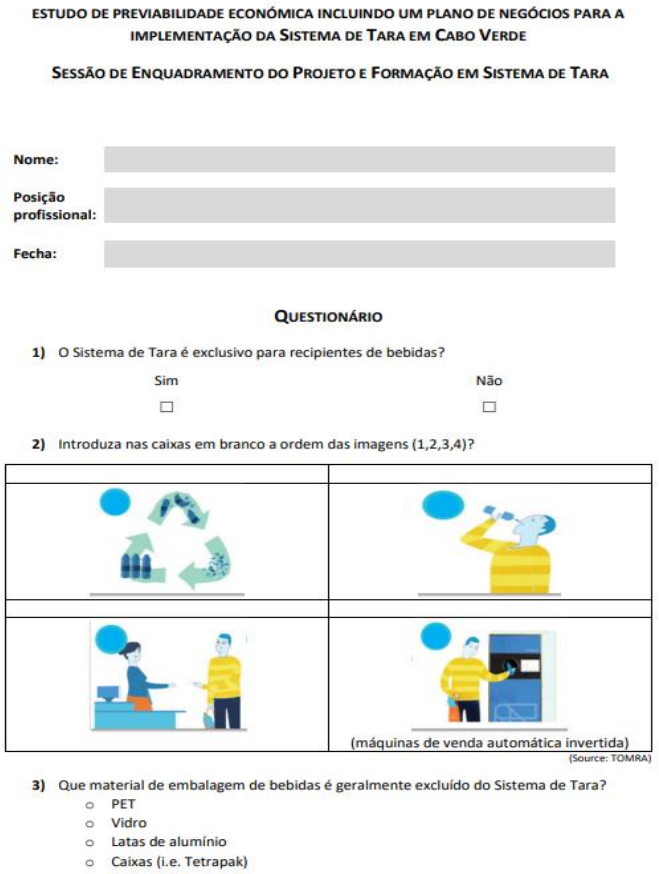
9.1. Stakeholder questionnaires

As previously mentioned in section Cape Verde Specific Strategic Objectives3.2, during the visit to Cape Verde in May 2022, the AHK Portugal and the international experts held a set of workshops with the purpose of introducing the project, start to build technical capacities on the DRS basics and explain the business case approach to public and private actors.

An initial and final questionnaire was applied to all participating stakeholders. Results were analysed to understand whether the workshop sessions helped expand the participating actor´s technical knowledge of the DRS and outline which topics remained unclear.

9.1.1. Questionnaire

Refer to Figure 9-1, Figure 9-2 and Figure 9-3 to consult the questions that were included in the initial and final survey on the DRS system basics.



ESTUDO DE PREVIABILIDADE ECONÓMICA INCLUINDO UM PLANO DE NEGÓCIOS PARA A IMPLEMENTAÇÃO DA SISTEMA DE TARA EM CABO VERDE

SESSÃO DE ENQUADRAMENTO DO PROJETO E FORMAÇÃO EM SISTEMA DE TARA

Nome:

Posição profissional:

Fecha:

QUESTIONÁRIO

1) O Sistema de Tara é exclusivo para recipientes de bebidas?

Sim ☐ Não ☐

2) Introduza nas caixas em branco a ordem das imagens (1,2,3,4)?

(máquinas de venda automática invertida)

(Source: TOMRA)

3) Que material de embalagem de bebidas é geralmente excluído do Sistema de Tara?

- PET
- Vidro
- Latas de alumínio
- Caixas (i.e. Tetrapak)

Figure 9-1 Initial and final questionnaire on the DRS system basics – page 1 (BFS, 2022)

4) Os recipientes de bebidas só são devolvidos através de máquinas de venda automática invertida nos locais de devolução?

Sim	Não
☐	☐

5) Por favor seleccione os principais actores que devem estar envolvidos no Sistema de Tara?

- Produtores e importadores de bebidas
- Retalhistas
- Operadores de Gestão de Resíduos (WMO)
- Governo
- Público
- Tudo o que foi dito acima

6) Qual é a principal responsabilidade dos intervenientes governamentais no Sistema de Tara?

- Calcular os custos do sistema.
- Proporcionar um ambiente seguro e saudável aos cidadãos.
- Elaborar leis claras e precisas, estabelecer objectivos e monitorizar o sistema.
- Controlar os componentes logísticos do sistema.

7) Que é a principal responsabilidade dos retalhistas?

- Reciclar os recipientes das bebidas.
- Levar e dar o depósito de volta aos clientes.
- Implementar uma estratégia de rotulagem específica para esses recipientes de bebidas dentro do âmbito do sistema.
- Financiar as campanhas de sensibilização.

8) Quem é responsável pela condução do Sistema de Tara (ou seja, a definição do quadro legal e dos objectivos e o controlo do sucesso do sistema)?

- Produtores e importadores de bebidas
- Retalhistas
- Operadores de Gestão de Resíduos (WMO)
- Governo
- Público
- Tudo o que foi dito acima

9) Quem é responsável pela gestão do Sistema de Tara?

- Produtores, importadores e retalhistas de bebidas
- Operadores de Gestão de Resíduos (WMO)
- Governo
- Público
- Sistema de Tara Operador

Figure 9-2 Initial and final questionnaire on the DRS system basics – page 2 (BFS, 2022)

10) É o Sistema de Tara um modelo de negócio rentável?

Sim ☐ Não ☐

11) Quem é responsável pela cobertura dos custos do Sistema de Tara?

- Produtores e importadores de bebidas
- Retalhistas
- Operadores de Gestão de Resíduos (WMO)
- Governo
- Público

12) São contentores não recuperados, por outras palavras, dinheiro que não é devolvido aos consumidores, um dos fluxos de receitas do sistema?

Sim ☐ Não ☐

13) É a taxa de manuseamento, a taxa cobrada aos produtores de bebidas por cada recipiente colocado no mercado para cobrir os custos do sistema?

Sim ☐ Não ☐

14) Qual destes é um incentivo económico para os recicladores no contexto do Sistema de Tara?

- O número de empregos criados.
- A redução do lixo marinho.
- Disponibilidade de material de alta qualidade e valor.
- Nenhum dos anteriores.

15) Quais destes são os factores que contribuem para um sistema altamente eficiente?

- Suficiência e acessibilidade dos locais de devolução.
- Participação activa de todas as partes interessadas envolvidas.
- Forte aplicação da lei por parte do governo.
- Gestão transparente do operador da DRS.
- Todos os aspectos acima referidos.

Figure 9-3 Initial and final questionnaire on the DRS system basics – page 3 (BFS, 2022)

9.1.2. Questionnaire results

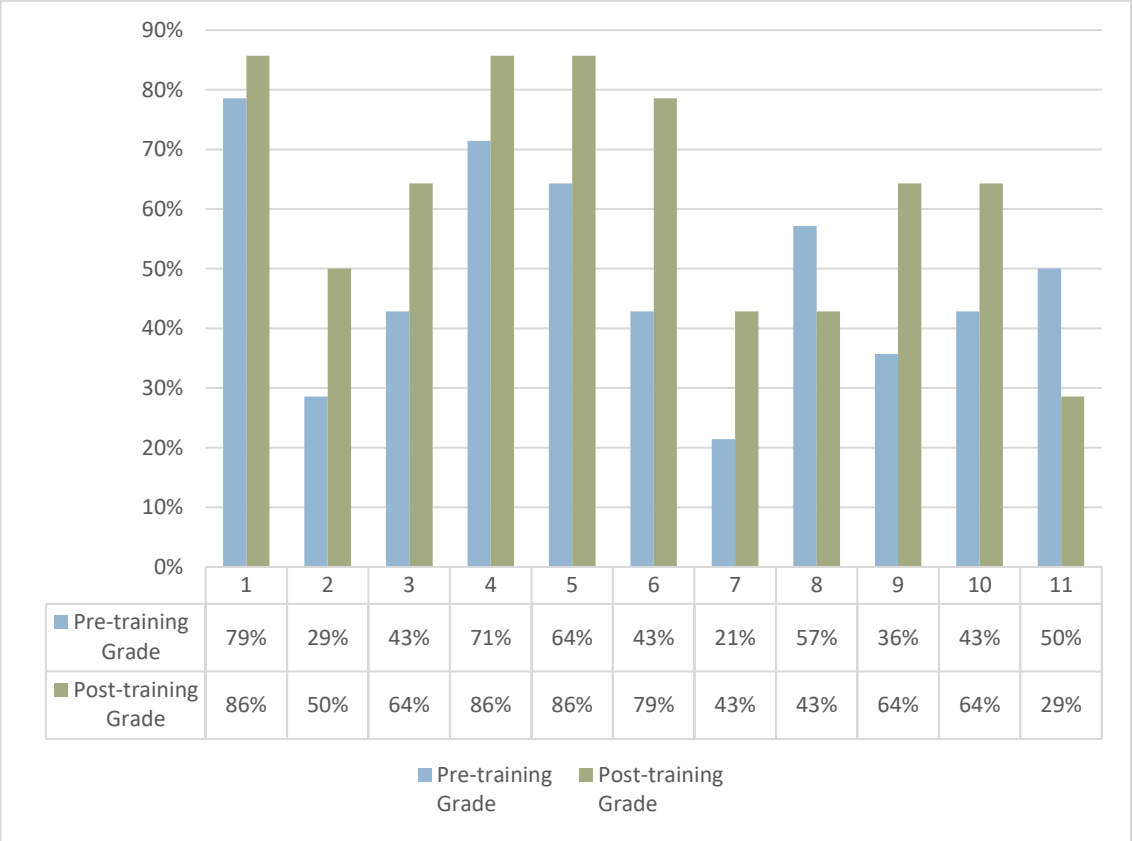
In principle, 20 stakeholders attended on the first day and 14 on the second day; however, only 11 actors participated on both days. To analyse the results of the questionnaires, information on the pre-training and post-training surveys of the 11 participants was considered. Two graphs were produced to determine the effectiveness of the training and the topics which need further explanation.

The first graph corresponds to the participant´s results before and after the capacity-building workshop. The following results were seen:

- Nine out of the 11 participants improved their comprehension of the topic by showing a raise of 14% on average in their grades. This means that before the training, the average

grade of the stakeholders on day 1 was 49%. After the workshop the average grade was 63%.

- Participants 8 and 11 showed a lower score on day 2, when compared to their initial results.
- On day 1, the score of two out of 11 stakeholders was higher than 70%. This means that they correctly answered at least 10 of 14 questions. On day 2, five out of the 11 participants obtained a score higher than 70% on day 2.



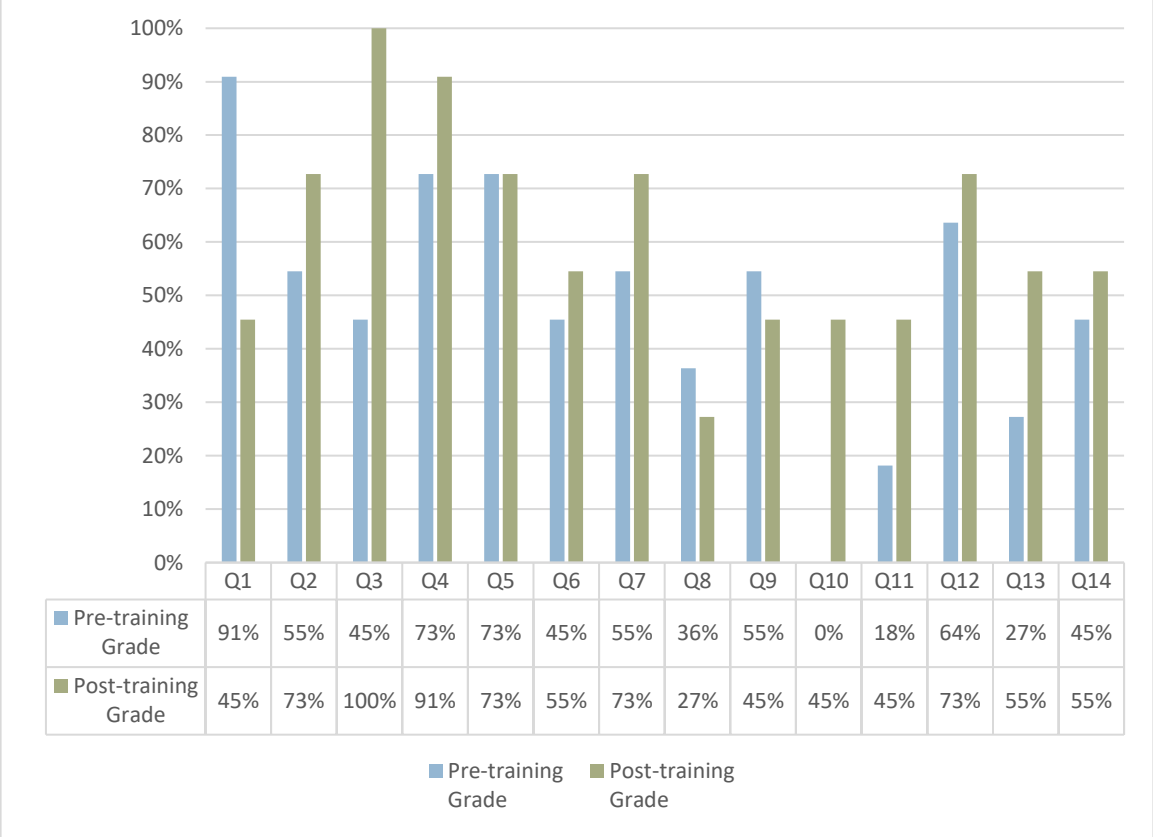
	1	2	3	4	5	6	7	8	9	10	11
Pre-training Grade	79%	29%	43%	71%	64%	43%	21%	57%	36%	43%	50%
Post-training Grade	86%	50%	64%	86%	86%	79%	43%	43%	64%	64%	29%

Figure 9-4 Participants' questionnaire results pre- and post-training (BFS, 2022)

The second graph shows the analysis of the 14 questions that were asked to the participating actors. Some of the following key points can be highlighted:

- Questions on the scope of the system, the collection approach and the stakeholders involved showed the highest scores on day one (1,4 and 5).
- On day 2, five out of 15 questions had a higher grade than 70%. This means that topics relevant to the scope of the system, the collection approach, stakeholders involved and system revenues were clear.

- On day 2, confusion was evident on which actors are in charge of running the system and who is responsible for managing the DRS. Scores in these questions went down when compared to the day 1.
- Furthermore, the concepts which need further reinforcement are:
  - Who runs and manages the DRS.
  - Main responsibilities of public and private actors.
  - The scheme administrator and its financial role in the DRS.
  - The financial estimation particulars (i.e., who covers the costs of the system).



	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14
Pre-training Grade	91%	55%	45%	73%	73%	45%	55%	36%	55%	0%	18%	64%	27%	45%
Post-training Grade	45%	73%	100%	91%	73%	55%	73%	27%	45%	45%	45%	73%	55%	55%

Figure 9-5 Pre and post-training replied questions analysis (BFS, 2022)

9.2. Detailed roles and responsibilities for key actors in Cape Verde in DRS

Ministry of Environment and Agriculture (MAA)

- Sets policies/rules/targets addressing all stages such as:
  - Product design: legal minimum standards and incentives.
  - Life-cycle process: waste transport, treatment, & recycling in a dynamic and competitive market environment.

- Publishes a set of rules defining the roles and responsibilities of each stakeholder.
- Publishes auditable minimum targets for the Producer Responsibility Organization.
- Controls of PROs and other actors collecting (including "informal sector") vs performance and compliance with minimum requirements for PROs.
- Assures transparency, efficiency, competition and "good governance" of EPR systems (via audits and competition authorities).
- Combats:
    - Conflicts of interest among stakeholders.
    - Freeriding through suitable sanctions.
    - Illegal imports/exports.
- Maintains a list of compliance-controlled waste collectors, sorting centers and recyclers.
- Sets reporting requirements for the reporting system.
- Facilitates exchange of best practices.

National Water and Sanitation Agency (ANAS)

- Registers and monitors all actors (producer, Waste Collectors, Sorting Centers, Recyclers and other relevant waste operators, incl. PROs) in a transparent way (national register or through PRO if applicable and practical).
- Ensures a level playing field among all actors (collecting/waste treating parties incl. PROs) such as:
    - Transparent permission process.
    - Fair access to waste.
    - Transparent, non-discriminatory, and competitive tenders (for collection, sorting and treatment).
    - Clearing of over-/under collection (clearinghouse) in case of multiple PRO.
- Directly manages non-compliances or, if not possible, reports monitored non-compliances to MAA:
    - Monitors all actors' performance (collecting/waste treating parties, incl. PROs).
    - Audits the PRO regularly through a transparency and efficiency assessment.
    - Audits collecting/waste treating parties or in coordination with MAA.
- Facilitate the exchange of best practices among all actors (collecting/waste treating parties, incl. PROs).

Producers & Importers

- Design and manufacture products that follow the requirements set by the policymakers (material composition, design, and labelling) and aim for products that:
    - Are energy efficient.
    - Are easy to recycle.

  - Use recycled materials.
- Register in the relevant PRO.
- Ensure and finance proper and legal management of specified waste streams within the scope, incl. ensure the recovery and recycling of assigned volumes through the PRO.
- Join the PRO following the same requirements as being applicable for PROs.
- Provide information about the number of specified products placed on the market and the necessary details (such as weight of products/materials) specified by the PRO.
- Keep and retain records and reports.
- Support policymaking in stakeholder consultation.

Retailers

- Fulfil all producer and importer requirements if acting as “producer” by putting a product onto the market (e.g., importer).
- Establishment of the collection network.
- Ensure the return of the defined deposit.
- Ensure and finance proper and legal management of specified waste streams within the scope, incl. ensure the recovery and recycling of assigned volumes through the PRO.
- Keep and retain records and reports.

Waste managers (including informal sector)

- Support PROs and producers in achieving the regulatory targets.
- Gather waste separated according to types and secure it against deterioration, theft, or undesired movement.
- Ensure that sorting and treatment of waste from any source follows the relevant process.
- Ensure waste traceability regulations and good practices are always met, including reporting the recorded data as appropriate to the PRO.
- Carry out audits checking quality and compliance of their first-tier suppliers following quality standards and take appropriate corrective actions in case of non-conformities.
- Enlist with the registry as an approved Recycler/Waste Operator.

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