# Researching a Deposit Return System for South Africa

## Costs and Benefits of Implementing a Mandatory Deposit Return System for Beverage Packaging

October 2024

Supported by

Funded by

## Study Funders

Alliance to End Plastic Waste

Norwegian Ministry of Foreign Affairs, represented by the Royal Norwegian Embassy in Pretoria

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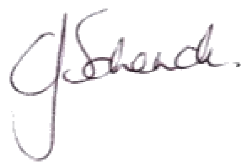

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# Executive Summary

## Introduction

Deposit return systems (DRSs) have proven successful in achieving high collection rates of single-use beverage containers when implemented in various countries around the world. In a DRS, consumers pay a small fully refundable deposit when they purchase a packaged beverage. The deposit is then refunded when the used beverage container is returned to a return location. The used beverage container is then recycled.

By applying a deposit to single-use beverage containers, a DRS creates a financial incentive for consumers to return used containers for recycling. The deposit also assigns a value to discarded beverage containers, which motivates consumers and potentially waste reclaimers to recover used containers in order to claim the deposit value. The increase in collection rate achieved in a DRS has associated benefits in reducing litter and the loss of materials to terrestrial and marine environments, in reducing greenhouse gas emissions, and in improving local air quality, creating jobs, and increasing the circularity of the materials in scope.

This report explores the costs, benefits, and risks of implementing a mandatory DRS for single-use beverage containers in South Africa. A workshop run by the World Wide Fund for Nature (WWF) in 2022 found consensus among stakeholders (including representatives from retailers, brand owners, government, non-governmental organisations (NGOs), academia, and waste reclaimers) regarding the potential benefits of a mandatory DRS in South Africa. The report details the findings of a research project, funded by the Alliance to End Plastic Waste and Norwegian Ministry of Foreign Affairs, designed to answer the key research questions arising from the workshop. In addition to detailing the main findings from the study, it also draws upon information and analysis contained in several supplementary reports, which are available from the same locations as this report.

## Scope of a DRS in this Study

The DRS considered in this report is a mandatory system in that it would obligate beverage producers to be part of the system, to cover the system costs, and to collectively meet any requirements set for the system, such as achieving collection rate targets. As such, a DRS is a type of extended producer responsibility (EPR). A DRS in South Africa should be viewed in the context of the South African Government's drive towards a circular economy, including reference to a deposit refund instrument, as featured in *A Circular Economy Guideline for the Waste Sector* in 2020.[1]

South Africa is a socially and economically diverse country. Informal retailers and hospitality outlets are highly active in South Africa, accounting for around 70% of beverage container sales to end consumers. The remaining 30% of beverage container sales to end consumers are from formal retailers and hospitality outlets. Informal waste reclaimers – who are considered the "back-bone" of recycling in South Africa – recover recyclable materials from landfill sites and the wider environment and sell the materials to Buy Back Centres (BBCs). BBCs then typically sell the materials to recyclers. Waste reclaimers are independent entrepreneurial workers, and an important part of this study has been to consider how a DRS could operate in a way that would fairly incorporate waste reclaimers.

There is currently no mandatory DRS for single-use beverage containers in South Africa, with most recyclable materials being collected for recycling by waste reclaimers operating in the informal waste

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[1] A Circular Economy Guideline for the Waste Sector (2020), Department of Environment, Forestry and Fisheries, Republic of South Africa. Available at: https://www.dffe.gov.za/sites/default/files/docs/circulareconomy_guideline.pdf

management sector. There are, however, voluntary DRSs for reusable glass and plastic beverage containers in South Africa, operated by the drinks sector.

While there are numerous examples of successfully mandatory DRSs for single-use beverage containers in other jurisdictions, few (if any) of these examples neatly fit the circumstances in South Africa. Perhaps the closest existing example is the DRS in the Republic of the Seychelles. However, the Republic of the Seychelles' DRS does not fully refund consumers their deposit and there are limited return locations. Despite these limitations, the Republic of the Seychelles' DRS reports a high collection rate, combining consumer and waste reclaimer returns.

The scope of a mandatory DRS for single-use beverage containers in South Africa considered in this report includes PET and HDPE plastic beverage bottles, aluminium beverage cans and glass beverage bottles, all between 150ml and 3L. Fresh milk is excluded from scope due to potential concerns related to odour issues at retailers and other return points. Liquid paperboard beverage cartons are excluded from scope as there is no clear recycling pathway for these composite materials currently. Liquid paperboard beverage cartons (and other material types) could be introduced into a DRS at a later date, once recycling solutions are developed. The DRS consists of a fully refundable deposit for each in-scope container, which would be refunded to the consumer (or waste reclaimer) when the used beverage container is returned to a return location.

# Approach

This study took the overarching approach of first researching the various design aspects and parameters necessary to conduct a cost benefit assessment of a DRS for South Africa, before subsequently conducting the assessment. The cost benefit analysis compares a DRS after several years of development, operating in a steady state, against the current situation of collection in South Africa. The study has not compared a DRS against other situations for how the collection and recycling of beverage containers could develop.

An important component of this study has been on-the-ground research into key aspects that define the South African context. This research has included engaging with the key entities in the informal economy through waste reclaimer interviews and workshops, as well as surveying BBCs and informal retailers and HORECA (Hotels, Restaurants, Cafes/Catering) establishments. The research undertaken for this study also included a market overview consisting of field surveys and data analysis, and a literature review of South African legislation and DRS/EPR legislation from nations in Africa and beyond.

This report is accompanied by supplementary reports providing further details of the research findings on:

- A market overview of beverage container sales and waste management in South Africa.
- A literature review of waste reclaimer activities and legislation in South Africa and other relevant countries in Africa and beyond.
- Surveys of waste reclaimers and BBCs in South Africa regarding their current activities and income levels.
- Structuring a DRS for success in a South African context, based on global best practice.

Section 5.0 of this report provides a summary of the recommendations for structuring a DRS for success in South Africa found in the supplementary report.

# Key Findings

**Quantity of Containers Placed on the Market**

Research was undertaken to estimate the total quantities of beverage containers placed on the market (PoM) in South Africa. Following initial research, the study became aware that other studies showed higher estimates of the quantities PoM than had been found in the initial research. The impact assessment was therefore conducted with two estimates of PoM, a low POM reflecting the research findings and a high PoM.

**Collection Rate**

Based on the research and analysis undertaken, this study suggests that it is possible to design a bespoke DRS for single-use beverage containers in South Africa. Based on analysis of other DRS schemes, it would seem likely that a DRS with a deposit value of between ZAR 1 and 2 per container, and the return point coverage allowed for in this study, should be able to increase collection rates to 90%, and therefore reduce littering. This is higher than South Africa's existing EPR beverage container collection rate targets of 64% to 70%, depending on material type.

**Return Channels**

This report uses the term 'return channel' to describe the methods with which used beverage containers could be returned for recycling. Through the development of return channels and through consultation with waste reclaimers, two different collection scenarios were developed for assessing the costs and benefits of a DRS for South Africa.

Both scenarios had an element of return through formal retail. The two scenarios differed in their combinations of the following other channels:

- **Waste reclaimer returns through separate collection** – Waste reclaimers obtain used containers from consumers and exchange these for the deposit. When containers are taken to Deposit Buy Back Centres (D-BBCs), waste reclaimers would receive both the deposit value and (if the waste reclaimer is registered) a service fee per container.

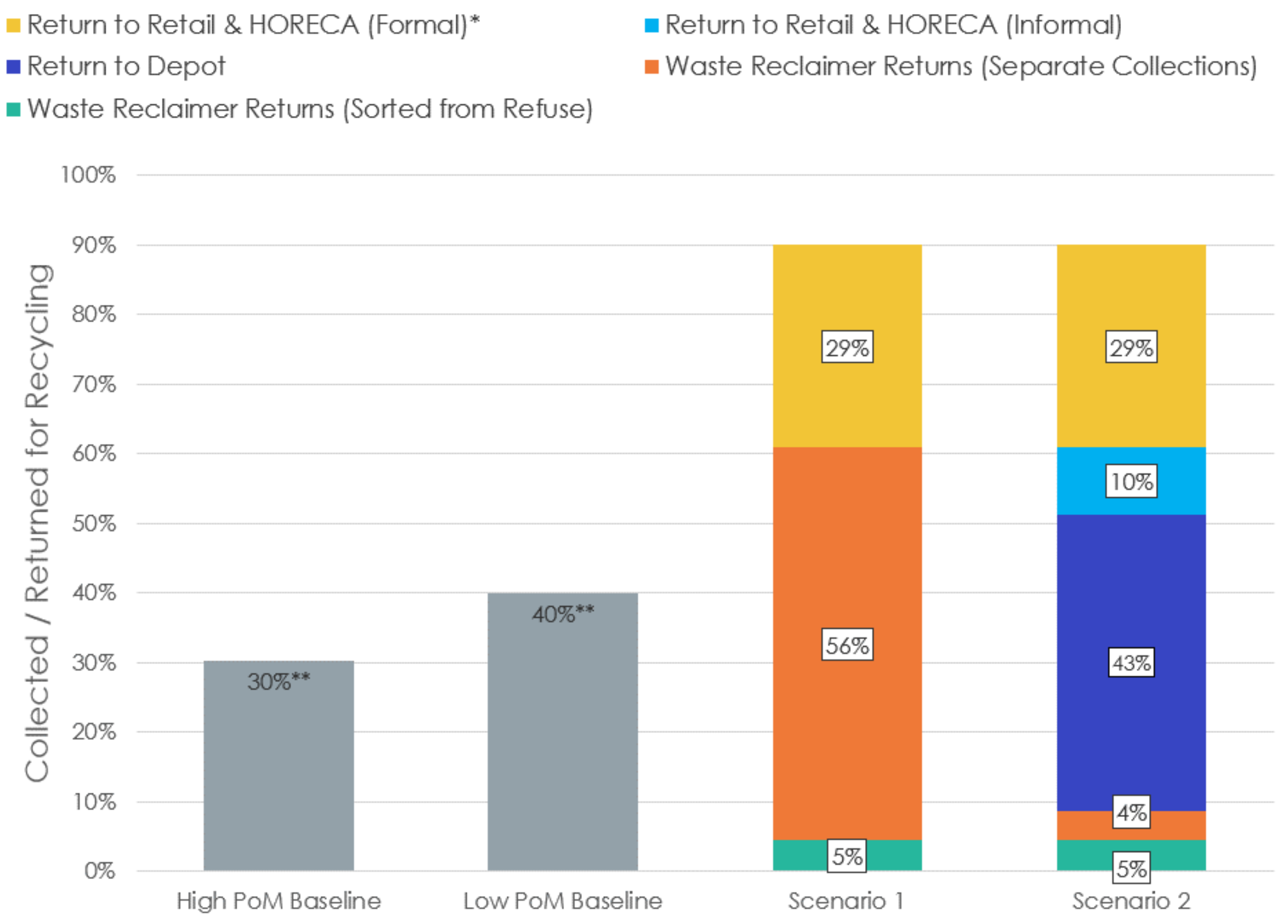
- **Waste reclaimer sorted from refuse** – Essentially a continuation of current practice in which waste reclaimers sort deposit bearing containers from refuse (bins, dumps and landfills) and take them to D-BBCs to receive the deposit value and (if the waste reclaimer is registered) a service fee per container. This method would involve far fewer containers than current practice, but the unit value per container would be much higher than it currently is.

- **Consumer returns to depots (and some informal retail) –** Locations organised by the DRS system operator allow consumers to return used containers and redeem the deposits.

Scenario 1 has a high level of waste reclaimer integration with no consumer returns to depots. Following feedback received in workshops with the informal sector, the level of potential engagement of waste reclaimers was uncertain. As such, a Scenario 2 was developed with a lower level of waste reclaimer integration.

The two scenarios were developed not to be selected options for policy makers, but to demonstrate the potential range of impacts from greater or lesser engagement by waste reclaimers. The amounts of material shown through each collection channel was estimated across the different return channels and scenarios and is shown in Figure ES 1.

## Figure ES 1: Return Routes for Beverage Containers




*Notes:*

** Includes a small percentage of direct collections by the DRS from HORECA (see Appendix A.1.1)*

***Baseline collection rates are average estimates based on the total weight of PET, HDPE, aluminium and glass beverage containers collected relative to weight placed on the market. Most of this tonnage is collected by waste reclaimers, with a minor component from formal collections – not shown on chart due to significant data uncertainties.*

**Environmental Savings**

A DRS could also deliver net greenhouse gas (GHG) emission reductions on both the low and high PoM baseline and two return route scenarios modelled, with reductions of between 119 and 294 thousand tonnes $CO_2e$ per year. An increase in recycling activity is the most impactful factor, with an additional 305 to 477 thousand tonnes of used plastic, metal, and glass containers being recycled per year and less waste being sent to landfill and littered.

In addition, a DRS could achieve a reduction in environmental externalities (considering GHGs and localised air pollutants) of between ZAR 0.5 and 1.2 billion per year, and a reduction in litter disamenity (i.e., the extent to which citizens are negatively impacted by littering in in their local neighbourhood) of approximately ZAR 6.1 billion per year. There are uncertainties associated with these estimates, however. The savings in monetised environmental externalities and litter disamenity are greater than the overall cost of the DRS to producers in terms of producer fees (an increase in the range of ZAR 1.7 to 3.2 billion per year compared to current EPR fees). There could also be cost savings associated with avoided landfilling of used beverage containers, estimated at between ZAR 40 to 69 million per annum. These avoided costs could be invested into other activities and projects.

**Job Creation and Waste Reclaimer Incomes**

It was estimated that a DRS could result in an increase in formal employment throughout the beverage supply chain, creating between 4.6 and 8.7 thousand additional jobs. Between 1.7 and 31.5 thousand new informal jobs could be created for waste reclaimers 'separately collecting' DRS containers from consumers, with incomes potentially increasing by up to 38%. However, the total number of waste reclaimer jobs could increase or decrease (estimated from -3.6 to +31.1 thousand) depending on the quantity of returns waste reclaimers undertake. Although the number of waste reclaimer jobs continuing the current practice of sorting waste for refuse may decrease (by 0.4 to 5.3 thousand), there is still potential for higher incomes for these jobs under DRS due to the high value of containers bearing unredeemed deposits sorted from refuse, relative to current material values. Any formal jobs created could be taken up by workers switching from informal to formal employment, although the extent of such a switch has not been estimated.

Moving from current practices to DRS collections could have further benefits to waste reclaimer incomes in terms of a switch from a price per kg of material, which varies over time and place, to a fixed amount per container, which would not vary from week to week nor from region to region. Also, a large amount of the work waste reclaimers would be undertaking in a DRS reflects a move away from working on landfills and dumpsites and from picking through refuse bins, to handling containers that have been source segregated, which could have health benefits for waste reclaimers.

However, it is important to recognise that not all waste reclaimers may benefit from a DRS and that by changing the systems, risks are introduced. These risks are discussed in Section 4.0 of the report.

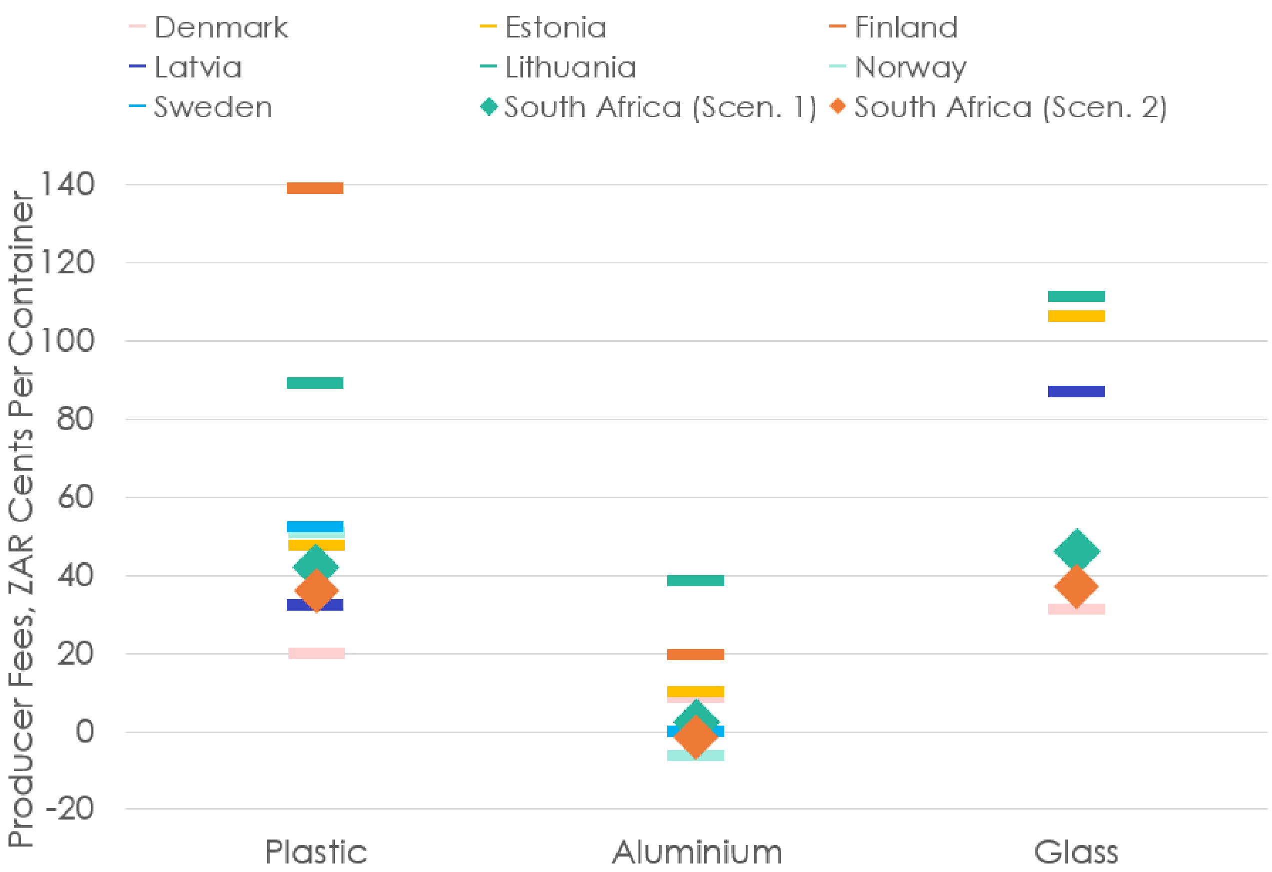
**Monetary Costs of a DRS**

The total cost of a DRS to beverage producers is estimated at ZAR 1.9 to 3.5 billion per year. The main determinant of the overall cost is the number of containers PoM, as producer fees are paid per container. Transport costs are also relatively high in a South African DRS compared with other jurisdictions, reflecting large transport distances in South Africa, and for PET bottles, the high average volume of containers. Furthermore, estimated producer fees for a South African DRS are comparable with the lower end of average fees for DRSs in Europe (Figure ES 2). Sensitivity analysis on an increase of the deposit amount from ZAR 1 to ZAR 2 shows that this would be likely to reduce producer fees.

**Impacts on Municipalities and National Government**

The costs of a DRS would not be borne by either municipalities or the national Government, rather, a number of cost benefits have been identified. Municipalities would see some cost reductions on their existing services from reduced disposal costs and potential savings in street cleaning and emptying street litter bins. Disposal cost savings from diverting beverage containers from landfill are estimated at ZAR 40 to 69 million per annum (ZAR 0.7 to 1.1 per capita).

### Figure ES 2: Estimated Fees for South Africa DRS and Producer Fees for Existing European Systems, ZAR cents per container

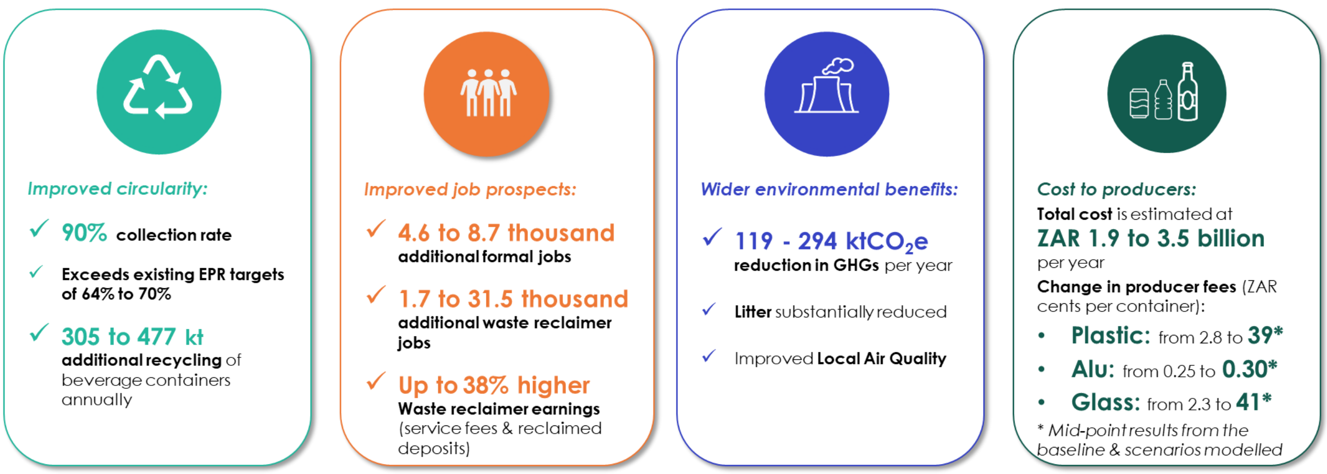



# Summary of Findings

The study's key findings regarding the impacts of a DRS for South Africa in terms of key metrics are illustrated in Figure ES 3 below.

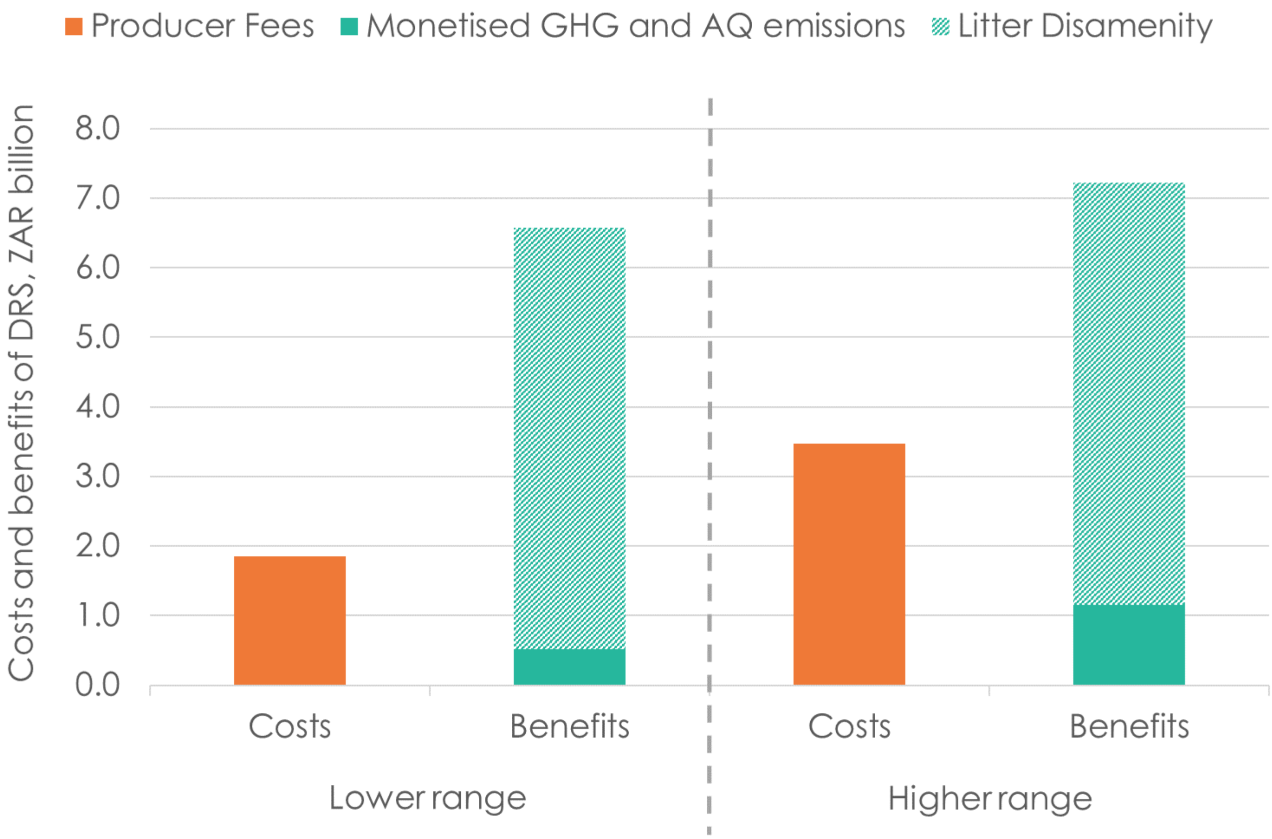
### Figure ES 3: Key Metrics of a DRS for South Africa

**A beverage DRS**, with a **1 ZAR deposit** could result in:



While a South African DRS would come at increased costs to beverage producers compared with current EPR costs, it would likely deliver much higher collection rates and environmental benefits. From a policy perspective it is not necessarily essential to demonstrate that the benefits totally exceed the costs to proceed with such a DRS. The overall central values of the aspects monetised in this study show that overall costs are less than the environmental monetised benefits that would be gained, even if litter disamenity was much less than estimated in this study. Furthermore, a significant part of the cost is in turn spent in new jobs with associated economic benefits. A summary of the costs and benefits are shown in Figure ES 4.

**Figure ES 4: Summary of Costs and Benefits of Proposed DRS, ZAR Billion**




# Risks, Uncertainties and Potential Next Steps

A South African DRS would require careful structuring to function optimally. This would include following proven best-practice design principles based on global experience. These principles would include establishing a single System Operator responsible for the DRS, led by producers, operating as a non-profit, licensed by government and required to meet collection rate targets. Government would need to produce further legislation in addition to the existing EPR legislation to mandate a DRS for beverage containers. These matters are explored further in the Supplementary Report on Structuring a Deposit Return System for Success in South Africa.

While this study has designed a DRS to limit its negative impacts on waste reclaimers and BBCs, and also provide benefits and opportunities, there would be risks. These include availability of beverage containers to waste reclaimers from consumers and in refuse (depending on consumer behaviour), the extent to which waste reclaimers and BBCs register with the DRS in order to receive the service fee and handling fee (respectively), impacts on cashflow for waste reclaimers, and risks of theft of cash and/or containers. Options to address these risks include use of electronic payment systems to mitigate cash theft risks, waste reclaimers redeeming deposits and service fees (if registered) in smaller loads, and providing support to waste reclaimers and BBCs for registering with the DRS.

A number of risks can be managed by following the principles set out in the Supplementary Report on Structuring a Deposit Return System for Success in South Africa. However, managing many of the risks and uncertainties identified in this report will require further research to better understand the likely impacts of implementing a DRS in order to further refine the DRS design. This research would need to take the form of practical and operational trials and further stakeholder engagement.

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# Glossary

| Term | Definition/description |
|---|---|
| Automated Return | The process of a return location receiving, handling, storing, and refunding to a consumer or waste reclaimer the deposit for returned used beverage containers using a Reverse Vending Machine. This is opposed to "Manual Returns". |
| Barcode | Barcodes are the identifier for a product line or stock-keeping unit (SKU). They are the same barcodes scanned by retailers at the checkout to register the sale/ check the price. In a DRS, barcodes are used to count the number of units placed on the market and returned by SKU. |
| Buy Back Centres (BBCs) | The existing facilities that purchase and aggregate recyclable materials from waste reclaimers and other suppliers. The materials are then sold to larger BBCs or recycling companies. |
| Collection rate | This is calculated as the percentage of deposit bearing containers collected through the DRS compared with the total placed on the market. |
| Counting Centre | Facility to which all returned used beverage containers (UBCs) are transported for sorting and baling. UBCs that have not been counted and compacted by reverse vending machines (RVMs) are first counted by industrial counting machines at the counting centres. These are usually run by the system operator. |
| Deposit Return System (DRS) | A system in which a refundable surcharge is applied to beverage containers to encourage consumers to return the beverage container for recycling or reuse. |
| Deposit Buy Back Centres (D-BBCs) | The assumed future facilities that would take back collected deposit bearing beverage containers from waste reclaimers and other entities with relatively large numbers of containers. In many cases these could be existing BBCs with some modifications to processes. |
| Depots | These are dedicated centres for consumers to return their used beverage containers to, either using manual or automated return methods. These can often be used for large volumes of used beverage containers. |

| Term | Definition/description |
|---|---|
| Extended Producer Responsibility (EPR) | A "polluter pays" mechanism in which producers of certain products (including packaging) are financially and/or operationally responsible for the end-of-life treatment of products. For this study, reference is made to South Africa's EPR for packaging legislation, which is explored in more detail in the accompanying Supplementary Report on the Literature Review. |
| Formal Economy | As defined by the OECD: "*As contrasted with the informal economy, the part of an economy of which the government is fully aware and that is regulated by government authorities, particularly in the areas of contract and company law, taxation and labour law*".[2] |
| Handling Fee | Fee paid by the system operator to third party return points for each beverage container they take back. Handling Fees are intended to cover the average costs of taking back containers in an efficient manner. |
| High Density Polyethylene (HDPE) | A type of plastic (polymer) commonly used for plastic beverage containers - usually bottles. |
| HORECA | Acronym for **Ho**tels, **Re**staurants and **Ca**fes/**Ca**tering. |
| Informal Economy | As defined by the International Labour Organisation (ILO): "*All economic activities by workers and economic units that are – in law or in practice – not covered or insufficiently covered by formal arrangements; and does not cover illicit activities.*" [3] |
| Manual Return | The process of a return location manually receiving, handling, storing, and refunding a consumer or waste reclaimer the deposit for returned used beverage containers. This is opposed to returns using "Automated Returns" using Reverse Vending Machines. |
| Material Revenue | The economic value/revenue achieved by selling the returned used beverage container materials to recycling facilities or other buyers. |
| Off-trade | Consumption away from the premises - retailers such as supermarkets, hypermarkets and convenience stores. |

[2] UNESCWA (N.D.) Term: Formal Economy. Available at: link
[3] ILO (2015) *Transition from the Formal Economy Recommendation, 2015 (No. 204). Workers' Guide*. Available at: link

| Term | Definition/description |
|---|---|
| On-trade | Consumption on premises - establishments such as bars, restaurants, coffee shops, clubs, hotels. |
| Placed on Market (PoM) | A term used for the number or weight of packaging material sold to consumers in a given timeframe. |
| Polyethylene Terephthalate (PET) | A type of plastic (polymer) commonly used for plastic beverage containers |
| Producer | A producer is the entity selling the first selling the packaged beverages on to the market. |
| Producer Fees | Per container fee paid by the producer or importer that first places the beverage container on the market. Fees are set by the system operator to cover the net costs of managing and recycling the beverage containers, after material revenues and unredeemed deposits. (Also referred to as "Industry Fee".) |
| Return Point/Location | Official locations to which UBCs can be returned for a deposit refund. |
| Reverse Vending Machine (RVM) | A machine that accepts used (empty) beverage containers so that the consumer can redeem their deposit. Some machines also compact the containers. |
| Separate Collections | A method in which used beverage containers are collected directly from the consumer (or whoever has the deposit bearing material after consumption) by waste reclaimers. |
| Service Fee | A fee paid to registered waste reclaimers by the Deposit Return System on a per returned beverage container basis (not per kg). This is in addition to the refunded deposit. The service fee is an important element, since waste reclaimers may refund consumers the full deposit value in order to receive a used beverage container. The service fee is therefore the minimum net income per DRS container for registered waste reclaimers. |
| Sorted from Refuse | A term used to describe several methods where waste reclaimers pick or recover used beverage containers from refuse bins, litter bins, dumpsites and landfill sites. |
| Spazas, Taverns and Shebeens | Retailers and bars operating in the informal economy and typically found in lower-middle and low-income areas, as well as in city and town centres. |

| Term | Definition/description |
| --- | --- |
| Stock Keeping Unit (SKU) | Stock-keeping unit - an alphanumeric code assigned to products and/or variants in a retailer's catalogue. |
| System Operator | An organisation responsible for the operation of the DRS – managing the data, finances and logistics. |
| Unredeemed deposits | Deposits that have been paid by consumers but not claimed for a refund. (Also referred to as unclaimed deposits). |
| Used Beverage Container (UBC) | Empty beverage container that may, or may not, be returned for a deposit refund. This report uses the term to refer to any used beverage container made from plastic, aluminium or glass. |
| Waste Reclaimers | Individuals or entities, who collect recyclable materials including used beverage containers from various sources including households, HORECA, litter and dumps and are operating within the informal economy. (Also referred to as "Waste Pickers".) |

# 1.0 Introduction

## 1.1 Background

In 2022, the World Wide Fund for Nature (WWF) ran a workshop to gather views from stakeholders regarding a mandatory Deposit Return System (DRS) for single-use beverage containers in South Africa. Just over 50 stakeholders attended the workshop, including representatives from retailers, brand owners, government, non-governmental organisations (NGOs), academia, and the informal economy. Findings from the workshop and pre-workshop survey were summarised in a report.[4] The report indicated that there was consensus regarding the potential benefits of a mandatory DRS in South Africa. These included the potential to reduce litter, complement South Africa's Extended Producer Responsibility (EPR) for packaging requirements and targets, and the potential to include waste reclaimers in its design. However, there were some questions and concerns raised, which are listed in Appendix A.3.0.

This project addresses the six key research questions that arose during the workshop, summarised in Table 1-1**.** The project findings are detailed in this report in addition to the accompanying four supplementary reports which are titled:

- Supplementary Report on Literature Review
- Supplementary Report on Market Overview
- Supplementary Report on Waste Reclaimer and Buy Back Centre Surveys
- Supplementary Report on Structuring a Deposit Return System for Success in South Africa

[4] De Kock, L. (2022*). Feasibility of a Mandatory Deposit Return Scheme for Beverage Container Packaging in South Africa: Workshop Report*. WWF South Africa, Cape Town, South Africa. No Weblink Identified.

**Table 1-1: Key Research Questions Raised in the WWF Workshop and Where in this Report they are Addressed.**

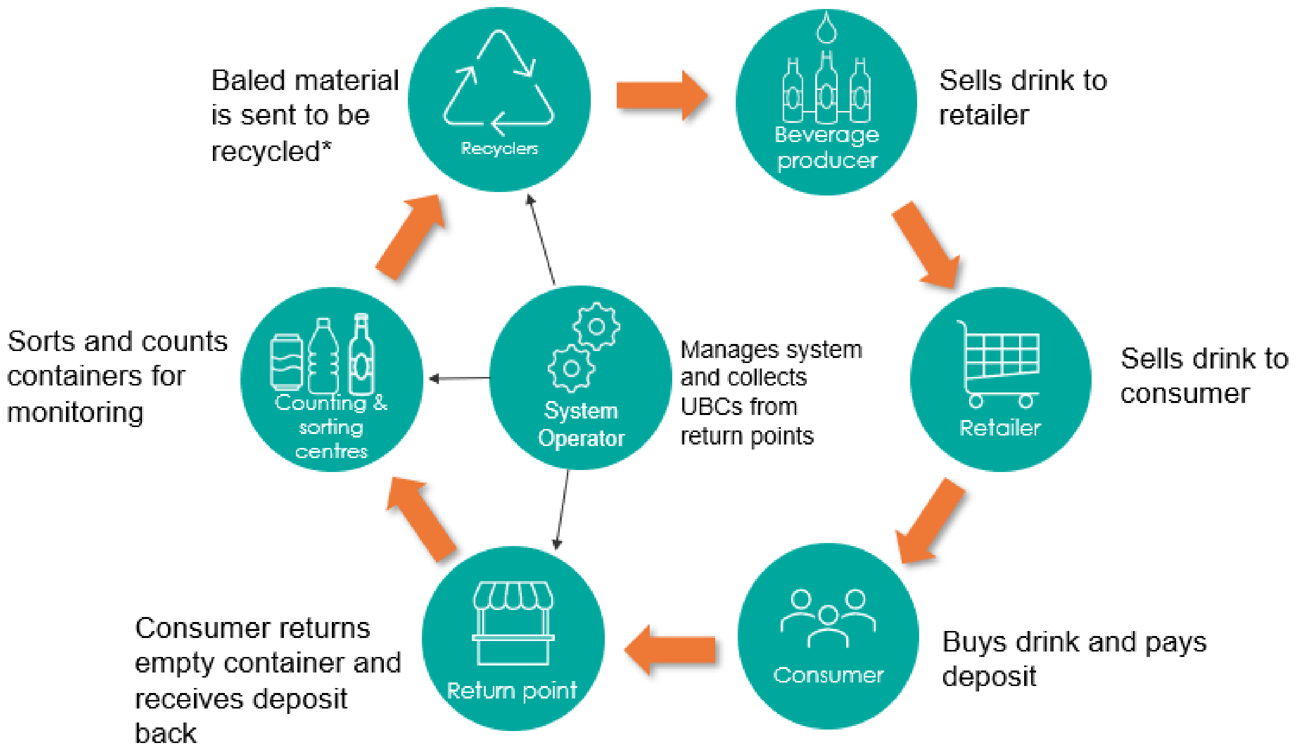
| Key research questions raised in the WWF workshop | Relevant section in this report | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| Options and the roles and responsibilities of stakeholders for a DRS in South Africa | | | ✓ | ✓ | ✓ |
| The relationship between a DRS and existing EPR in South Africa | | | | ✓ | ✓ |
| Implications and socio-economic benefits for waste reclaimers from a DRS in South Africa | | | | ✓ | ✓ |
| The operational and cost implications of a DRS in South Africa | | | | ✓ | ✓ |
| The legal and regulatory implications of a DRS in South Africa | | | | | ✓ |
| Compliance and fraud management considerations of a DRS in South Africa | | | | | ✓ |

Note: Some of these research questions are further addressed in the relevant supplementary reports.

## 1.2 What is a DRS?

In a DRS for single-use beverage containers (e.g., plastic bottles, aluminium cans, glass bottles), consumers are charged a small extra fee (i.e., a deposit) when they purchase a beverage product, which is then fully refunded when they return their used beverage container to a return location for recycling. The refundable deposit thus incentivises consumers to recycle their used beverage packaging. Consumers can return their used containers to various types of return points such as retailers, bars, depots, and/or other dedicated return locations. An example of a DRS for single-use beverage containers is provided in Figure 1-1 showing the typical material flow of containers throughout the value-chain.

**Figure 1-1: Example of a DRS for Single-Use Beverage Containers, Showing the Material Flow of Containers Throughout the Value-Chain.**




**Minor losses during sorting/recycling process will be sent to residual disposal.*

A DRS should be seen in the context of the South African government's drive towards a circular economy. Godfrey (2021) describes a circular economy as an economic model which keeps materials and products in circulation for as long as possible through practices such as reuse of products, sharing of underused assets, repairing, recycling and remanufacturing. It is based on three principles: design out waste and pollution; keep products and materials in use; and regenerate natural systems.[5] In 2020, the Department of the Environment, Forestry and Fisheries published a *Circular Economy Guideline for the Waste Sector*.[6] The guideline provides practical, economical and policy instruments to enhance circularity in the waste sector. One of the economic instruments is the reference to deposit refund instrument. Great emphasis is placed by the guideline on the potential a circular economy holds to create increased income and entrepreneurial opportunities.

South Africa has a voluntary DRS for some reusable glass and plastic bottles for certain soft-drinks, beer, and other alcoholic beverages. These systems are operated by the drinks industry, such as Coca-Cola and South African Breweries (SAB), which have different deposit values for the various bottle types and sizes (see accompanying Supplementary Report on Market Overview for details). However, there is currently no mandatory DRS for single-use beverage containers in South Africa.

Although this report focuses on the costs and benefits of a DRS for single use beverage packaging, the development of such a system could well be developed with reusable packaging incorporated as well. Reuse packaging could carry on as a separate system of both type of packaging could be combined into a single return system with interoperability of systems between both reuse and single use packaging.

[5] Godfrey, L. (2021). The Circular Economy as Development Opportunity: Exploring circular economy opportunities across South Africa's economic sectors. Pretoria, CSIR. Available at: link

[6] Department of the Environment, Forestry and fisheries (DEFF). (2020). A Circular Economy Guideline for the Waste Sector— A Driving force towards Sustainable Consumption and Production. Available at: link

There are many examples of voluntary DRSs for refillable beverage containers in markets similar to South Africa, which are generally operated by the beverage industry. However, there is only one notable example of a mandatory DRS for single-use beverage containers in a similar market to South Africa, which is the Republic of the Seychelles. The DRS applies a partial deposit refund, with depots being the return locations for consumers and waste reclaimers (i.e., retailers are not return locations). Despite this, the DRS achieves a high reported return rate of over 90% due to a combination of consumers and waste reclaimers returning containers to depots. Please refer to the Supplementary Report on Market Overview for further information on the voluntary DRS in South Africa, and to the Supplementary Report on Literature Review for mandatory and voluntary DRS and EPR in markets comparable to South Africa, with an active informal economy.

The overall aim of a DRS for single-use beverage containers is to increase the quantity and quality of used containers that are returned and recycled, thus reducing reliance on raw materials for new containers and reducing litter. By diverting used containers away from disposal and litter, and toward recycling, various negative environmental and health impacts can be reduced – such as reduced greenhouse gas emissions associated with the manufacturing of products by using secondary materials rather than virgin materials, and the reduction of water pollution and microplastics by diverting used containers away from landfills and litter.

A DRS can also improve traceability of returned used beverage containers, which is important for production of plastic food-contact recycled material. Improved quality of recyclable material can be achieved since only "food grade" beverage containers are collected for recycling, and there is no mixing post collection with other materials or containers not used for food grade applications. Therefore, this type of collection can facilitate recycling processes producing food grade recyclate. While a DRS might be able to improve data on the types of containers that are not collected for recycling it would not be able to provide insights to what happened to these materials, e.g. whether they were landfilled or lost to the environment or oceans.

Collection rates of 90% or higher of beverage containers placed on the market are achieved by many existing DRSs around the world.[7] A mandatory DRS, which is what this project explores, is 'mandatory' because it will require beverage producers[8] to be part of the system, cover the system costs, and collectively meet any obligations set for the system (typically collection rate targets being a major one). To make the system mandatory, government would need to produce some further legislation in addition to the existing EPR legislation (refer to the Supplementary Report on Structuring a Deposit Return System for Success in South Africa for further details).

A DRS is a type of EPR and has many similar features to existing EPR systems. Specifically, a DRS would make beverage producers responsible for paying the costs of the system (that are not covered by revenues) to achieve the targets set in legislation (further detailed in Section 4.5). These costs are paid by producers to the System Operator as producer fees. Producer fees are payable for each beverage container placed on the market that is in-scope of the DRS.

Another feature of DRS, similar to existing EPR systems, is that a DRS would require at least one organisation to manage the system, equivalent to a Producer Responsibility Organisation (PRO) in an EPR system. In a DRS, these entities are typically called a System Operator. Essentially, they are a PRO which is responsible for meeting the obligations for a DRS as set out in legislation. One possibility in the transition of in-scope DRS containers from EPR to DRS would be to allow EPR PROs to tender for the role of DRS System Operator. These PROs may be well positioned to act as a System Operator. Refer to the Supplementary Report on Structuring a Deposit Return System for Success in South Africa for further details on a DRS and EPR for packaging.

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[7] Reloop (2022) *Global Deposit Book 2022: An Overview of Deposit Return Systems for Single-use Beverage Containers*. Available at link

[8] Obligated producers would typically include all producers placing containers onto the South African market above a de minimis threshold – this would include importers.

# 2.0 Methodology

This project consisted of multiple 'tasks' which gathered information about South Africa's beverage container market, waste infrastructure and performance, and other key aspects to inform the design and modelling of DRS scenarios for South Africa and understand potential DRS impacts. Crucially, this included researching beverage sales and recycling activities taking place in South Africa's informal economy, consisting of those undertaken by informal sales outlets, waste reclaimers, and buy-back centres (BBCs). Figure 2-1 presents an overview of the tasks undertaken.

### Figure 2-1: Tasks Performed as Part of the Project


The required qualitative and quantitative information was gathered through desk-based research, on-site surveys, site visits, and in-person workshops.

The cost benefit analysis conducted compares a DRS after several years of development and in a steady and evolved state, against the current situation of collection in South Africa. The study has not compared a DRS against other situations of how the collection and recycling of beverage containers could develop.

The workshops were used to share research findings and propose DRS design options to waste reclaimer representatives to gather feedback. This feedback allowed the DRS design to be amended and the modelling to be updated. For further details of the methods used in Tasks 1 and 2, please refer to the accompanying Supplementary Reports, which consist of a literature review of waste management systems and waste reclaimers in South Africa and in other relevant countries, a market overview of beverage container sales and waste management in South Africa, and findings from surveys of waste reclaimers and buy back centres in South Africa.

# 3.0 Selecting Designs of a DRS

## 3.1 Beverage Container Market Overview and Waste Management

### 3.1.1 Placed on Market Assumptions

This section describes the information and assumptions used for modelling. For further information about current beverage container sales routes, placed on market (PoM) estimates, and waste management activities in South Africa, please refer to the accompanying Supplementary Report on Market Overview.

The weight of beverage containers in scope of this study placed on the market, and estimated tonnages of recycling are shown in Table 3-1.

**Table 3-1: Placed on Market and Recycling Tonnages of Single-Use Beverage Containers Per Annum**

| | PET [1] | HDPE [2] | Aluminium | Glass |
|---|---|---|---|---|
| Placed on market, thousand tonnes [3] | 132 | 6.5 | 45 | 423 |
| Recycling, thousand tonnes | 64 [4] | 3.9 [5] | 30 [6] | 141 [7] |
| Recycling rate, % [8] | 48% | 60% | 66% | 33% |

Notes

1. PET refers to polyethylene terephthalate.
2. HDPE refers to high-density polyethylene – note that beverage containers for fresh milk are excluded, see Section 3.1.2.
3. Midpoint value from data analysis conducted by the team. Data sources included packaging supply information from PROs, published technical and academic reports, stakeholder interviews, official statistics, Government resources, and estimates.
4. Based on Petco recycling tonnage data.
5. Estimate based on industry data.
6. Based on MetPac recycling tonnage data. Assuming 12k tonnes categorised as exported is recycled.
7. Estimate for single-use glass based on The Glass Recycling Company data.
8. Recycling rates do not correlate precisely with published figures (e.g. in PRO's annual reports) but are rather derived based on total POM (based on midpoint values of low/high range from material flow analysis data) and reported recycling tonnages.

The values provided in Table 3-1 are estimates based on best available information and industry knowledge. There is uncertainty around these figures, due to each PRO using different calculation and reporting methods for packaging data. Additionally, the methods are either not reported, or only reported in inadequate detail, in reports published by the PROs.

Perhaps the data with the most uncertainty relates to the PoM data, with some estimates giving significantly higher PoM values, which would result in lower recycling rates. For instance, a report from the International Union for Conservation of Nature (IUCN) stated that approximately 230,000 tonnes of PET bottles are placed on the market each year in South Africa – roughly double the tonnage shown in Table 3-1.

While it is beyond the scope of this study to estimate the extent of these uncertainties in any detail, the uncertainty has been addressed by conducting the modelling with two baselines – a 'low' baseline based on (largely) industry data, and a 'high' baseline with higher PoM tonnages, as shown in Table 3-2.

'High' PoM estimates for PET are based on the IUCN report and discussions with various entities in South Africa. There was no similar alternative data available for HDPE, aluminium, and glass, and discussions with key stakeholders suggest that the extent of any underestimates for PoM tonnages HDPE, aluminium, and glass could be significantly lower than that for PET. This study has therefore used a conservative estimate of 20% higher tonnages for HDPE, aluminium, and glass in the sensitivity analysis.

Other than the ranges of uncertainty stated the design is based on estimates of "current" PoM values and have not made allowances for further projections in relation to growth from growth of beverage sales. The study has not modelled any reduction in PoM associated with a reduction of beverage sales due to the implementation of a DRS as the research did not uncover any evidence of this relationship. A recent study of various DRSs around the world using historical data did not find any definitive evidence suggesting that the introduction or change of a DRS impacted beverage sales.[9]

**Table 3-2: Beverage Containers Placed on Market in Scope of DRS (Low / High Estimates), Thousand Tonnes**

| Baseline | PET | HDPE | Aluminium | Glass |
|---|---|---|---|---|
| Low | 132 | 6.5 | 45 | 423 |
| High | 230 | 7.9 | 54 | 508 |

**The analysis undertaken for this report has been performed against two baselines to reflect the range of uncertainty regarding data on the tonnages of beverage containers PoM in South Africa. The low baseline is largely based on industry data, while the high baseline reflects higher PoM estimates made by other stakeholders.**

## 3.1.2 Beverage Container Scope

The proposed scope of beverage containers to include in a DRS, on which the PoM tonnages shown above are based, are described here.

### Material Type

A DRS can target different used beverage container materials and types. For the following study, the DRS material in scope includes single-use PET and HDPE bottles, single-use aluminium cans, and single-use glass bottles, hereafter termed 'plastic', 'metal' and 'glass' used beverage containers, respectively. It is believed that there are no steel beverage containers PoM in South Africa. Liquid paperboard beverage cartons are excluded from scope, as there is no clear recycling pathway for this composite packaging currently. Liquid paperboard beverage cartons could be introduced to a DRS at a later date if recycling solutions are developed.

### Beverage Types

The types of used beverage containers targeted include containers for all beverages except for fresh milk. These are excluded due to potential concerns related to odour issues at retailers and other return points.

[9] Reloop (2023). The Impact of Deposit Return Systems on Beverage Sales. Available at: link

### Container Volume

For the purposes of modelling, the lower boundary of container size is set at 150ml, although further work will be required in the future to decide on the exact lower size threshold. This is due to the following:

- There are practical challenges associated with small (typically below 150ml) containers due to difficulties in recognition and counting both via RVMs and counting centres, and in fitting the deposit logo and required barcode size on their labels.
- Small beverage containers account for a small amount of the market. Data acquired by the project team reveals the following for number of beverage containers PoM in South Africa:
    - It is believed that there are no HDPE or non-alcoholic glass bottles under 200ml;
    - Less than 1% of alcoholic glass bottles are under 100ml, with about 80% being 300ml and above;
    - Less than 0.1% of PET bottles are under 100ml, with 99% being 300ml and above;
    - Less than 0.01% of aluminium cans are under 100ml, with 93% being 300ml and above.

Containers up to and including 3 litres are included in the DRS. This is a common threshold in DRSs to exclude very large containers which cannot be returned via RVMs or counted using automated equipment in counting centres.

**The scope of the DRS considered in this report includes PET and HDPE plastic beverage bottles, aluminium beverage cans, and glass beverage bottles, all between 150ml and 3L. Beverage containers for fresh milk are excluded from scope.**

# 3.2 DRS Return Scenarios for South Africa

## 3.2.1 Design Considerations

Waste reclaimers are currently active in collecting used beverage containers for recycling in South Africa. Their activities encompass a range of collection methods, in which containers are reclaimed mostly from residual waste streams. This includes picking containers from residual waste bins before they are emptied in formal collections and picking containers from landfills and dump sites and the wider environment. Waste reclaimers gain their income from selling the beverage containers for the scrap value (per kg) to recycling aggregators (BBCs and intermediaries). Descriptions of this waste reclaimer activity is covered more extensively in the Supplementary Report on Waste Reclaimer and Buy Back Centre Surveys and the Supplementary Report on Literature Review.

There has been extensive research into the ways that waste reclaimers are organised in South Africa, on the views of waste reclaimer organisations regarding the formalisation of waste reclaimer roles, and potential organisational changes such as tor cooperative models of working. The study has considered DRS design scenarios recognising that waste reclaimers are independent private sector entrepreneurs who generally wish to carry on working on a similar basis in the future. While the study has not assumed formalisation of roles or further structured ways of working, such as the formalisation of cooperatives, such options would not be precluded if waste reclaimers deemed them suitable in the future.

An important part of the design considerations for a potential DRS in South Africa involves understanding how existing waste reclaimer work could be integrated into a DRS, and potentially facilitate fair renumeration and improvements in working conditions for waste reclaimers.

In addition to waste reclaimer integration, there are other important design aspects to consider if a DRS is to be successful. An extremely important aspect would be ensuring that consumers who pay deposits on beverage containers have reasonable access to locations where they can return containers and redeem the deposits. This reasonable "coverage" of return locations is necessary across all communities and across the entire country.

Insights into how beverage sales look in different communities in South Africa are covered in the Supplementary Report on Market Overview, and the study has drawn upon the relevant information in the considerations on DRS design. For example, there is a large amount of informal retail activity in South Africa – about 70% of beverage container sales to end consumers are through informal retailers and hotels, restaurants, and catering (HORECA) outlets – and this is important in considering what the return channels might look like in those communities where informal sales are high.

In designing return channels, it is also important to consider fraud prevention and ways of ensuring that deposit values are only paid out where a deposit was charged. Furthermore, return channels should also be efficient for all entities in the value chain. Important principles on this matter are covered in the Supplementary Report on Structuring a Deposit Return System for Success in South Africa. However, perhaps the most important design consideration is the importance of counting beverage containers returned to the system to ensure that deposits are only released for containers where a deposit was originally levied.

Throughout the return channel design process, it was recognised that South Africa's specific circumstances make determining several aspects challenging. Uncertainty will persist until practical attempts are made to better determine what stakeholders' likely responses to a DRS might be (e.g., through running DRS trials). In particular, the responses of the following key stakeholders are uncertain:

- **Consumers** – It is uncertain whether consumers would opt to return their containers to retail (return-to-retail), give their containers to waste reclaimers, or dispose of their containers without being reimbursed the deposit.

- **Waste reclaimers** – It is uncertain how waste reclaimers would respond to a DRS, particularly with regards to new opportunities to collect containers from consumers, which is outside of their current working practices.

- **Retailers and Buy Back Centres** – It is uncertain what number of retailers and Buy Back Centres would opt in to become return points, including informal retailers (spazas), thereby increasing the convenience for consumers to return-to-retail.

The following sections of this report detail the approach and selection of return channels and set out two scenarios for a South African DRS. Both scenarios consist of a similar overall system design but differ in terms of the assumed responses to a DRS from both consumers and waste reclaimers, and therefore the return methods for used containers. The reality would likely lie somewhere between the two scenarios, depending on how waste reclaimers respond to DRS opportunities.

The following sections explain the scenarios and the rationale behind the selection of these scenarios. The concepts presented reflect South Africa's varied living conditions, geography, access to retailers, coverage of BBCs, and existing waste reclaimer activity, amongst other factors.

The scenarios involve a hybrid of multiple return locations:

- **Return-to-Retail** – retailers above a specific floor size threshold have a legal obligation to take back containers and refund consumers their deposits. This can be through manual or automated returns, a decision which would be the choice of the retailer.

- **Waste Reclaimer Returns** – return of containers by waste reclaimers to buy back centres. The term Deposit-Buy Back Centres (D-BBCs) is used to describe those facilities that accept DRS containers. These containers are mainly collected directly by waste reclaimers from consumers, with a smaller proportion picked from bins and containers left in the environment (litter, dumpsites etc). Waste reclaimers would be able to identify beverage containers that carry a deposit by the inclusion of a DRS marking/label on the beverage container.

- **Depots** – return of containers to return points, operated by the System Operator. These are dedicated standalone centres for consumers (not for waste reclaimers to receive Service Fees) to return containers to, either with manual collection or automated returns with high-speed RVMs.

Within the various methods of return, it will be necessary to identify deposit carrying containers to ensure that deposits are redeemed only on containers on which they were levied. There are various possible approaches to facilitate this requirement, and full details are provided in the supplementary report on designing a DRS for success; however, a brief summary is as follows:

1. Beverage containers within a DRS would typically be marked with a symbol that can be recognised by eye and which identifies a container as having a deposit charged. The same containers will also have a barcode the unique reference number (SKU) from which would be registered as having a deposit charged upon it. See Figure 3-1.

## Figure 3-1: Example of deposit markings


2. Obligated producers would be obliged to: charge the deposit value when placing the containers on the market, mark the containers with the correct marker, register the barcodes with the system and pass the charged deposits to the DRS system operator so that they can pass the deposits back through the collection chain.

3. Within the different collection channels there are options for "manual return" and automated returns. In scenarios many of the containers would be collected by waste reclaimers and other business entities. These returns would be considered manual as collectors would probably mainly rely on the visual container markings to identify containers with a deposit. There is also the possibility that collectors with smartphones could scan barcodes with smartphones and check whether the SKU has a deposit charged.

4. All returns would ultimately need to pass a point in the supply chain where the system considers the container "counted" and releases the deposit from the system operator to the collector. At the point of being counted, the container is typically managed so that it would not be easy to be counted again. This can be done by ensuring that counting entities operate within an appropriate audit chain from the system operator, and in some cases can be done by "devaluing" the container (i.e., compacting or breaking the container so it cannot be "returned" again). With manual returns, the study has assumed that all containers will need to be kept whole and returned through the various channels to counting centres. These are official bulking centres that would be contracted or operated by the system operator. Automated returns via RVMs are assumed to be officially counted by the system and the point of automated return.

The current situation regarding beverage containers is that recyclers pay for end-of-life containers, with these payments (alongside some EPR contributions) paid to suppliers, who make payments up the supply chain to the collectors, who are generally waste reclaimers. These "material incomes" vary from time to time, from locality to locality and between different entities in the supply chain. The introduction of a DRS would necessitate a change from these arrangements, and this has been assumed in all the return channel scenarios. Collectors and intermediaries would no longer be paid on a "per kg" basis for used beverage containers, but instead would be paid "fees" on a per container basis. These fees would be set by the system operator and could be mandated by legislation. In exchange for paying fees and deposits, the system operator would own the collected material and would sell that material to recyclers. These arrangements would bring a number of distinct advantages:

- Collectors, BBCs and intermediaries would no longer be subject to market fluctuations or local differences in the amount of money paid and instead would gain certainty and consistency on incomes.

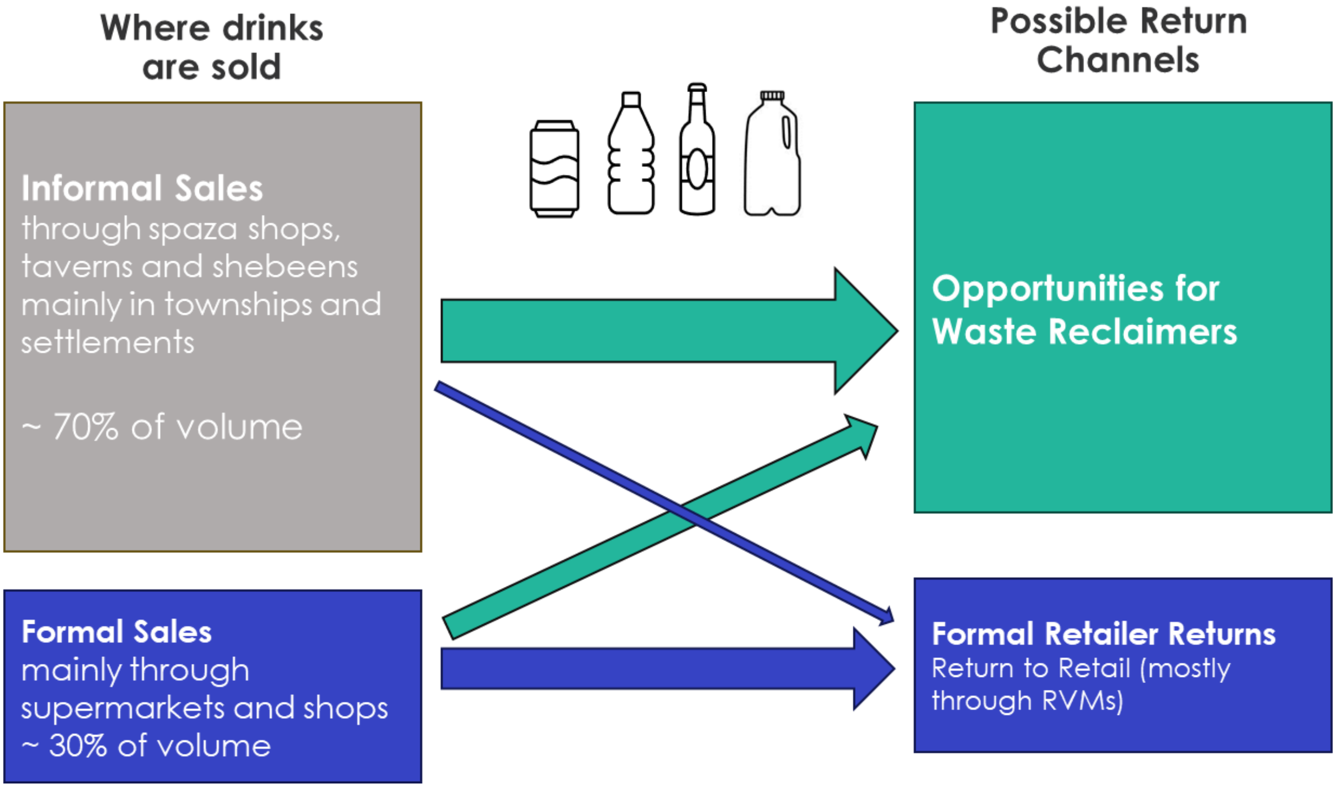
- Producers, via the system operator, would gain the incomes from sales of materials to recyclers and could help develop the recycling supply chain through the ability to enter into longer term supply contracts.

A DRS would generate more high-quality materials for recycling, which in turn will need more recycling capacity. As explained further in the accompanying Supplementary Report on Market Overview, there are formal recyclers of PET, HDPE, aluminium, and glass materials in South Africa, with some exporting recycled material. This study has not considered the recycling capacity gap or exactly how recycling capacities would increase. However, in other markets where DRS has been implemented, the higher levels of high quality feedstock (aggregated through a small number of sellers who can offer long term agreements with recyclers) tend to facilitate the growth of recycling capacity.

### 3.2.2 Scenario 1

This scenario was partially developed based on initial research before being further explored and refined as a result of feedback gathered in workshops with waste reclaimers. The initial development was important to ensure that, as far as possible, all important design criteria other than integration of waste reclaimers was also considered. The guiding principle for considering return channels was that 30% of beverage sales to the final consumer are through formal retail and 70% are through informal retail, as shown in Figure 3-2.

**Figure 3-2: Sales and Return Channel Relationship**




## 3.2.2.1 Returns via Retail

### The role of formal retail in return channels

Many of the European, Noth American and Australian deposit schemes mandate that retailers of beverages (above a certain size of premises) allow for the return of containers via the retail premises either via automated returns or manual returns. Retailers would be paid fees by the System Operator for providing this service. This return method has proven effective in the markets mentioned and it would appear similarly applicable for formal retailers in South Africa. Given that this is a proven method for premises that account for 30% of beverage sales, the study has determined that part of Scenario 1 would be that approximately 30% of beverage container returns would be via a return-to-retail model.

### The role of informal retail in return channels

Although informal retail would appear to account for approximately 70% of informal sales, survey responses (see Supplementary Report on Market Overview) of these vendors indicate that typically their premises would be too space constrained to facilitate returns.

## 3.2.2.2 Waste Reclaimer Returns

By far the most important return channel, dealing with approximately 70% of returns, could be waste reclaimer services – if suitable models could be developed and waste reclaimers choose to engage with this opportunity. This would require meeting the following two important design criteria:

1. Integrating waste reclaimers into a collection system where containers are kept separately from other wastes and providing fair renumeration.

2. Providing coverage of opportunities to return containers and redeem deposits in communities where sales of beverages to the final consumer are typically informal.

This would be made both through a new "separate collections" method concept and a "sorted from refuse" method concept. These methods are explored in the following sub-sections.

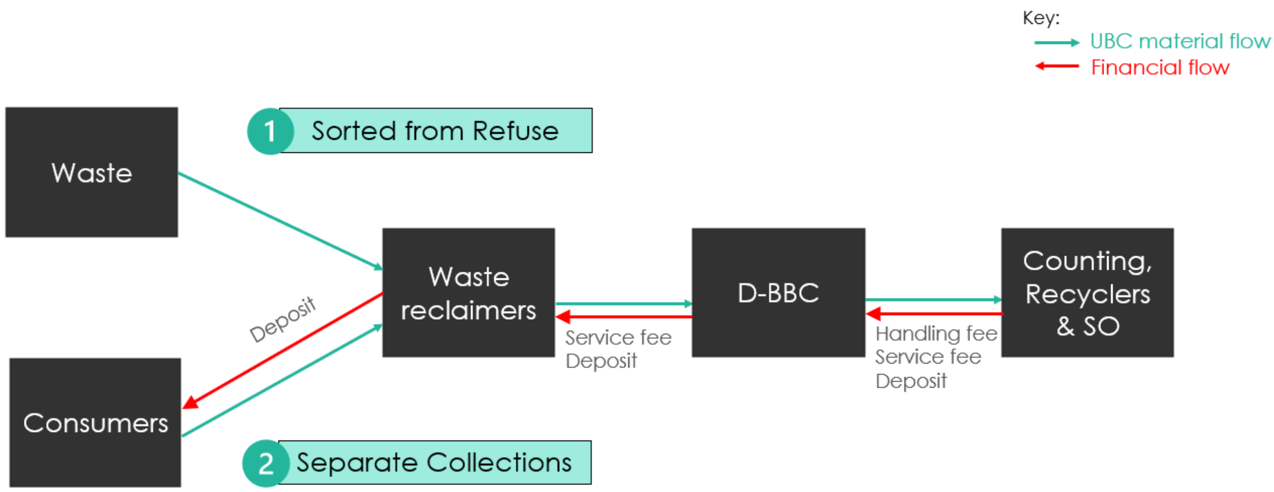
In both "separate collections" and "sorted from refuse", waste reclaimers will need to have infrastructure to take containers to, so that containers can be bulked and monies exchanges. In the study the term Deposit Buy Back Centres (D-BBCs) is used to describe these facilities. In practice it would be the responsibility of a system operator to ensure that sufficient coverage of these facilities would be in place to cover all communities. In many cases these could be existing BBCs, accumulation centres set up by the system, or mobile units. In all cases, these D-BBCs would need to allow for waste reclaimers to return containers both in relatively small batches and quite large batches, and using a variety of methods to transport and handle to containers.

Also in both "separate collections" and "sorted from refuse", waste reclaimers would collect/recover bottles, cans, and other recyclable materials that do not have a deposit applied (identifiable by a lack of deposit markings) or potentially deposit bearing containers that are no longer redeemable because the deposit markings are damaged. In these instances, these materials may be sold to BBCs for scrap value (per kg), as in the current circumstances.

It is only possible to consider these supply chains at a relatively high level in such a study as this. For a successful DRS to operate, substantially more consideration would be needed as to how to facilitate and design both waste reclaimer collection methods into the supply chain. There would also need to be detailed logistical arrangements to bulk, count, and transport the returned containers.

The "separate collections" and "sorted from refuse" concept methods are shown in Figure 3-3. Sections 3.2.2.3 and 3.2.2.4 describe the flow of beverage containers and associated financial flows through the DRS in both these methods.

## Figure 3-3: Outline of Proposed Waste Reclaimer Return Methods




***Note: UBC stands for Used Beverage Container***

### 3.2.2.3 Separate Collections

In the *separate collections* return method, containers are collected directly from the consumer (or whoever has the deposit bearing material after consumption) by waste reclaimers. The process is as follows:

1. A beverage container is sold to the consumer. The deposit (per container) is included in the purchase price.
2. After consumption, the waste reclaimer collects the used beverage container from the consumer and pays ("refunds") the consumer the deposit. Waste reclaimers would be able to identify beverage containers that carry a deposit by the inclusion of a DRS marker/logo on the beverage container.
3. The waste reclaimer goes to a D-BBC to return the container, where they are paid ("refunded") the deposit, on a per container basis (not per kg). Registered waste reclaimers (further details below) are also paid an additional "service fee", on a per container basis (not per kg), for their role in the system.

It is important to note that the deposit and service fee are two separate elements of the DRS. It should also be noted that in a DRS, registered waste reclaimers will receive both the deposit payment ("refunds") and service fee on a per container basis. For waste reclaimers that are not registered, they would be eligible to redeem the full deposit per container, but would not be eligible to receive an additional service fee per container. The way in which the deposit and service fee payments are reported or recorded (on receipts etc.) would need to be decided by government.

As the deposit, assumed to be paid out upfront and in full to the consumer by the waste reclaimer, is reimbursed to the waste reclaimer once the beverage container is returned to the D-BBC, there is no net income or loss to the waste reclaimer.

The service fee is an important element for separate collections, since waste reclaimers may refund consumers the full deposit value upfront in order to receive a used beverage container. The service fee is therefore the minimum net income per container for registered waste reclaimers. It is proposed that waste reclaimers need to register with the System Operator to receive a service fee.[10] The process of registering should be clear, transparent, fair, affordable, and uniform across South Africa. This may require regulation to ensure the registration process is not abused, which will need to be decided by government. Furthermore, to encourage and support the uptake of registration from waste reclaimers, a social management plan may be required, in which DRS registration training, support, and awareness raising for waste reclaimers could be targeted. Such training and support could also be provided to BBCs for registering with the DRS in order to receive handling fees. There is a risk, however, that not all waste reclaimers would register with the DRS in order to receive the service fee. This could result in lower income levels to non-registered waste reclaimers and limit their potential to carry out separate collections.

Waste reclaimers could obtain containers from consumers through a range of potential routes, including:

- Door-to-door from households;
- From taverns / shebeens (informal HORECA) needing to dispose of containers consumed on the premises;
- Kiosks or similar at high-traffic locations, such as transport hubs; and
- Spazas (those choosing to provide a service for consumers to redeem containers).

[10] Proposed service fees would replace existing payment of 'collection service fees' under current EPR legislation, for beverage containers in scope of DRS only.

Waste reclaimers could work independently or come together in working groups. With this return method, consumers are reimbursed their deposit, and choose to do so through waste reclaimer channels as the preferred, and likely most convenient, return option.

### 3.2.2.4 Sorted from Refuse

In any DRS, a minority of consumers opt not to return their container and redeem the deposit, and therefore dispose of their container (in refuse or littering).[11] These containers will go, as is the case currently, into bins or are littered.

The proposed *sorted from refuse* return method is essentially a continuation of business-as-usual – the picking of containers from refuse bins, as well as other locations, such as littered waste. Waste reclaimers collecting this material can go to a D-BBC to return the container, and as described above for *separate collections*, are reimbursed the deposit and (if registered) are given an additional service fee per returned container. **Waste reclaimers earn the deposit and (if they are registered) an additional service fee per container**,

### 3.2.2.5 Waste Reclaimer Feedback

Workshopping with waste reclaimer representatives did not generate significant changes or improvements to scope. After the workshop, the waste reclaimers were asked to provide feedback to the proposal, which they declined to do. The findings of the workshops are detailed in Appendix A.2.0 and summarised in the Supplementary Report on Waste Reclaimer and Buy Back Centre Surveys. In general, views were mixed. Some representatives saw potential benefits in moving away from landfill and refuse picking and towards more stable and potentially fairer incomes. Some representatives expressed concern that there would be too few available containers in refuse to allow for the "sorted from refuse" scenario to be viable. It was perhaps the "separate collections" method that created the most debate with concerns raised on:

1. A change from picking materials to door-to-door collections of material from consumers;
2. Waste reclaimers' ability to transact the return of deposits in terms of cashflow, the availability of smartphones to digitally transact, and the safety of carrying either cash or smartphones.

Further conversations were had on waste reclaimers' ability to identify deposit containers and keep them in a redeemable state (so that DRS markers and barcodes can be identified and scanned) until they reach a D-BBC.

Some of these concepts are explored in the sensitivity analysis in the impacts sections of this report. Essentially, similar to other risks identified, improved certainty on these aspects is only likely to be gained through trialling and piloting these concepts.

In summary, waste reclaimers neither wholly supported nor indicated opposition to the concepts of scenario 1. It was difficult to ascertain the scale of likely engagement and support to the concept of waste reclaimer returns via the separate collections concept. As such, an alternative was developed in Scenario 2 to facilitate policy developers in understanding the impacts between the two potential return channel scenarios.

[11] This is due to issues of relative income (i.e., high earners may not feel a sufficient economic incentive to return containers) and/or convenience (e.g., on the go consumption without easy access to return points).

### 3.2.3 Scenario 2

In response to the waste reclaimer feedback on Scenario 1, the study considered an additional Scenario 2, based on the same design concepts but differing primarily in terms of waste reclaimer engagement with the DRS. In scenario 2, it is assumed that:

- There is less take-up of *separate collection* return activities by waste reclaimers, but no change in the number of containers *sorted from refuse*, which continue to be the main source of revenue for waste reclaimers.[12]

- Most containers sold informally are instead returned by consumers to depots run by the System Operator, with consumers having their deposits refunded at these centres. Half of the containers returned to depots are modelled as returned to automated depots equipped with RVMs, and half are modelled as returned to depots with manual return.

- Some containers sold informally are also returned to informal retailers (spazas). These retailers would need to meet certain criteria to opt-in, with this likely only being possible for larger retailers with more sophisticated processes and systems, and sufficient storage capacity for beverage containers (see Supplementary Report on Market Overview for survey responses from spazas on the potential for inclusion in a proposed DRS).

While the reality would likely be somewhere between scenarios 1 and 2, by including both, this study is able to consider a sensible range of plausible outcomes for a South African DRS. It is important to note that the two scenarios are not separate policy options, nor would Scenario 2 exclude either waste reclaimers or BBCs. Rather, the two scenarios show the impacts of a range of behaviours by consumers, waste reclaimers, retailers, and BBCs in response to a mandatory DRS.

[12] It is assumed in both scenarios that only 5% of containers returned in a DRS are returned to the system by waste reclaimers via the 'sorted from refuse' route. These containers are those for which consumers opt not to return the container for a deposit, and instead, for convenience or other reasons, dispose of the container in general refuse. Usually in deposit systems this accounts for 10% or less of containers placed on market (i.e. 90%+ of containers are redeemed for the deposit by the consumer). Furthermore, not all containers going into refuse will be reclaimed by waste reclaimers, hence, while the exact % is uncertain, the modelling assumption – 5% of containers returned – is viewed as a conservative estimate.

# 4.0 Impacts of a Proposed DRS

The analysis of the potential impacts of a proposed DRS is presented below. All results are presented in terms of impacts in a single year, after a DRS has been fully implemented and has reached a steady state in terms of overall operation and performance. The specific impacts for key stakeholders are discussed further in Section 4.9. A detailed description of modelling assumptions is provided in Appendix A.1.0. It is worth noting that a DRS for single-use beverage containers, as examined in this study, can be compatible and interoperable with DRS systems for reusable beverage containers. However, further investigation and analysis into this is beyond the scope of this study. For the avoidance of doubt, the mandatory DRS of single-use beverage containers in this study considers South Africa's voluntary DRS for reusable containers to operate in parallel with (and not being incorporated into) the mandatory DRS for single-use containers – both DRSs operating separately.

It is also important to highlight that while this study has designed a DRS to limit its negative impacts on waste reclaimers and BBCs, and provide benefits and opportunities, there are risks and uncertainties in many of the impacts found in this study. Where appropriate, some of the key risks are explored through sensitivity analysis and further qualitative evaluation.

Examination of three key parameters (Collection Rate, Deposit Level, and Return Point Coverage) in DRSs in other jurisdictions shows an interrelationship between these concepts, where higher collection rates tend to be driven by higher deposit levels and good convenience of return points.[13] The approach to these matters was to determine what would be the likely appropriate deposit levels and return point coverage to achieve a demonstratable and likely collection rate.

# 4.1 Collection Rates

The potential impact of the proposed DRS on collection rates is presented in Figure 4-1. A significant increase in collection rates is seen for all materials after implementation of a DRS, which is likely to achieve collection rates of 90% or greater after reaching a steady state of operation. A 90% collection rate (and higher) can be achieved in well-designed DRSs, such as in Croatia, Denmark, Finland, Germany, Iceland, Lithuania, and Norway.[14] Over 90% return rate has also been achieved in the DRS in the Republic of the Seychelles, through a combination of consumer returns and waste reclaimer returns (see section 2.1 of Supplementary Report on Literature Review). These modelled collection/return rates in South Africa are compared to Year 5 (2026-27) collection targets under existing EPR legislation (dotted horizontal black lines).[15]

Collection rates are likely to increase by between 38 and 60 percentage points for plastic, and 24 to 35 percentage points for aluminium.[16] Collection rates for glass are also likely to increase significantly, by between 57 and 62 percentage points, as glass is collected less than other beverage container materials currently. For all materials, a DRS would be likely to result in collection rates significantly higher than targets set in legislation.

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[13] Reloop (2024). *Deposit Return Systems: How they Perform*. Available at link

[14] Reloop (2023). *Global Deposit Book 2022: An Overview of Deposit Return Systems for Single-Use Beverage Containers.* Available at: link

[15] Collection rate targets for Year 5 of the EPR system are 70% (PET), 70% (Aluminium), 65.4% (Glass), 64% (HDPE).
(as listed in the *National Waste Management Act, 2008 (May 2023 Amendment)*, Department of Forestry, Fisheries and the Environment. Available at link)

[16] For the purposes of modelling, PET / HDPE are combined, and reported as 'plastic'.

**Figure 4-1: Collection Rates Before (Baseline) and After Proposed DRS Implementation, %**

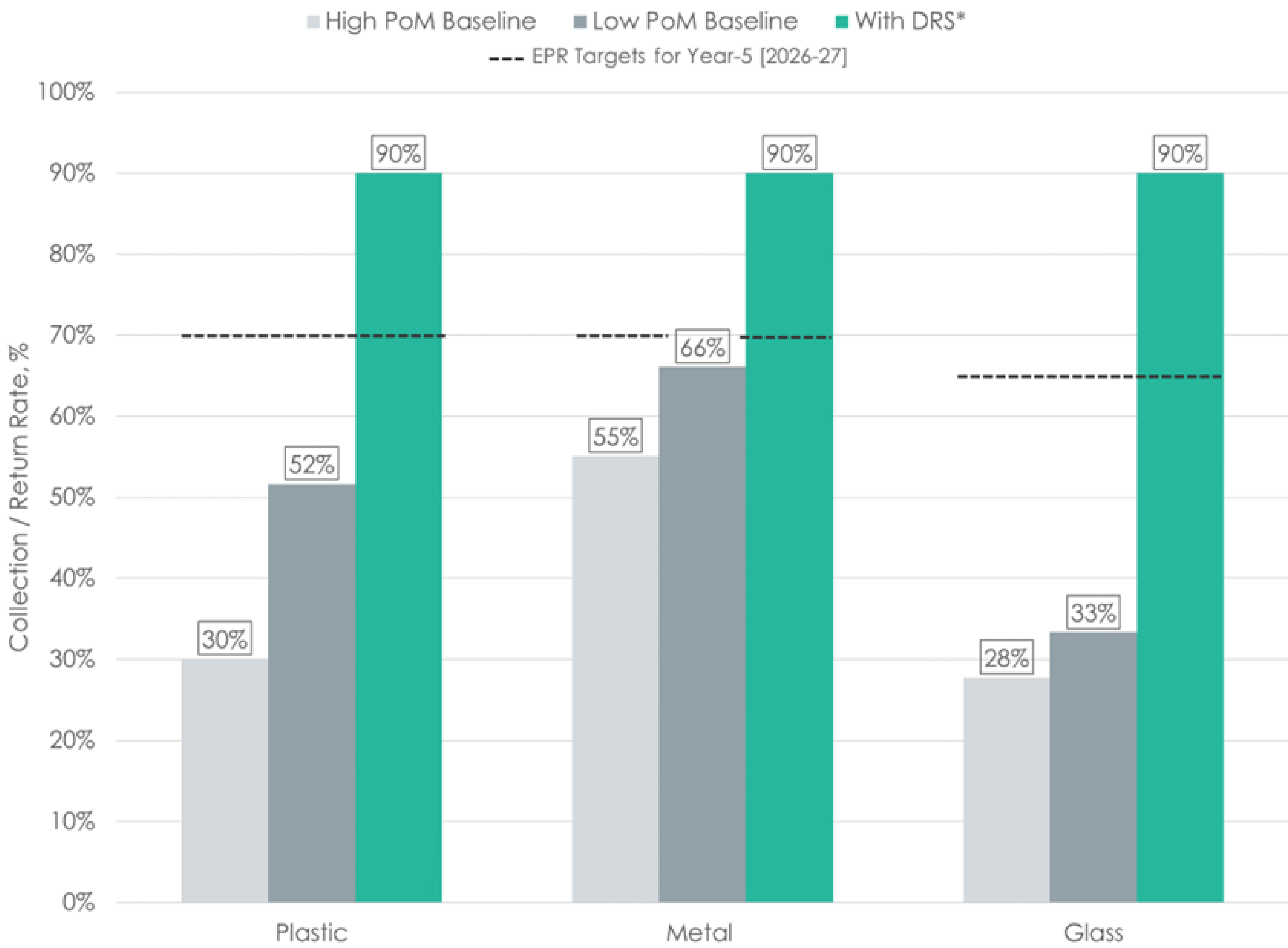
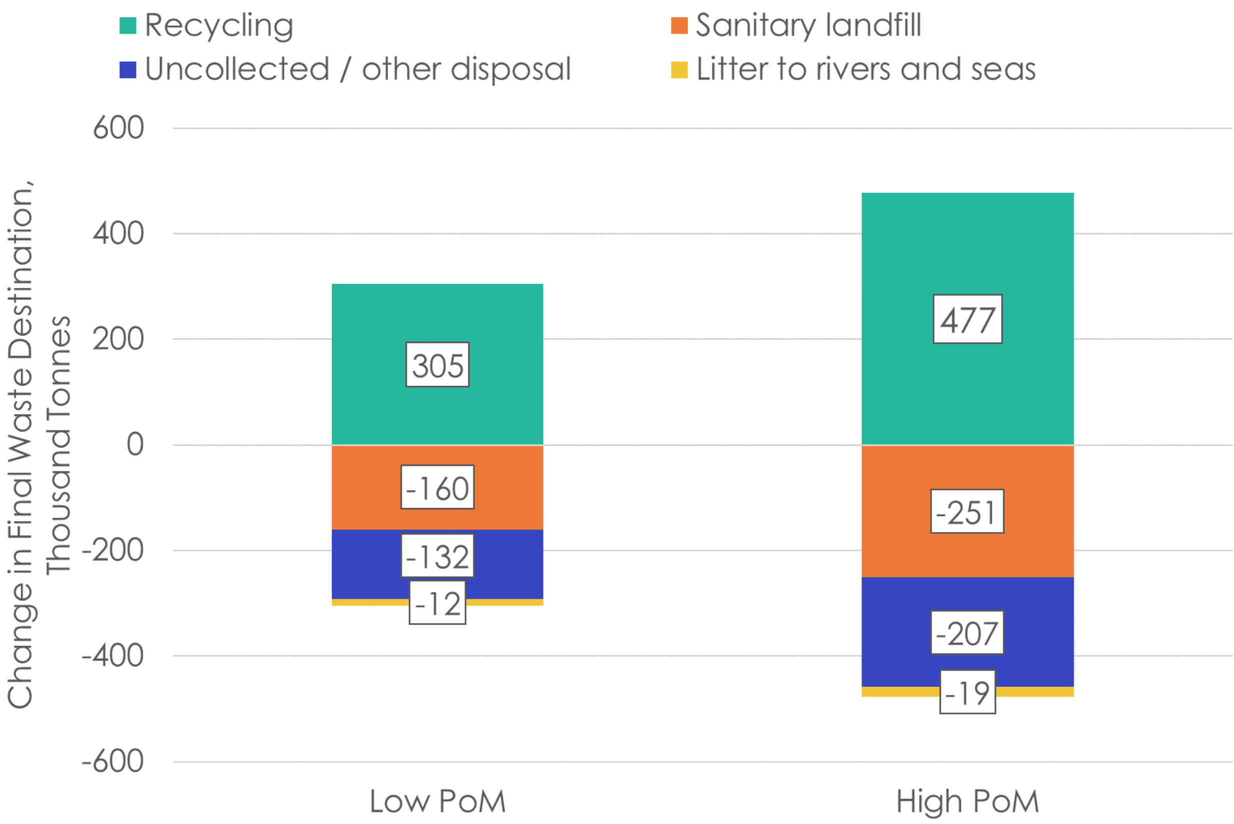



Figure 4-2 shows the estimated change (in thousand tonnes) per year in the end destinations of waste, relative to the low and high baselines, after implementation of the proposed DRS. Recycling of beverage containers could increase by 305 to 477 thousand tonnes per annum, with significant reductions in sanitary landfill, uncollected / other disposal and litter to rivers and seas.[17]

[17] Available data for these latter two categories is poor and is subject to considerable uncertainty and is based on estimates from the literature for plastic only. The category 'uncollected / other disposal' includes all uncollected waste, non-sanitary landfill, open dumping, burning, and litter to land. Any litter estimated as going into the marine environment (rivers and eventually seas), is included in the final category.

**Figure 4-2: Change in Waste Destinations per Annum after Implementation of Proposed DRS, Thousand Tonnes**




**Under a South African DRS, collection rates for beverage containers would increase significantly, particularly for plastic bottles and glass bottles, exceeding the collection targets set out in EPR legislation.**

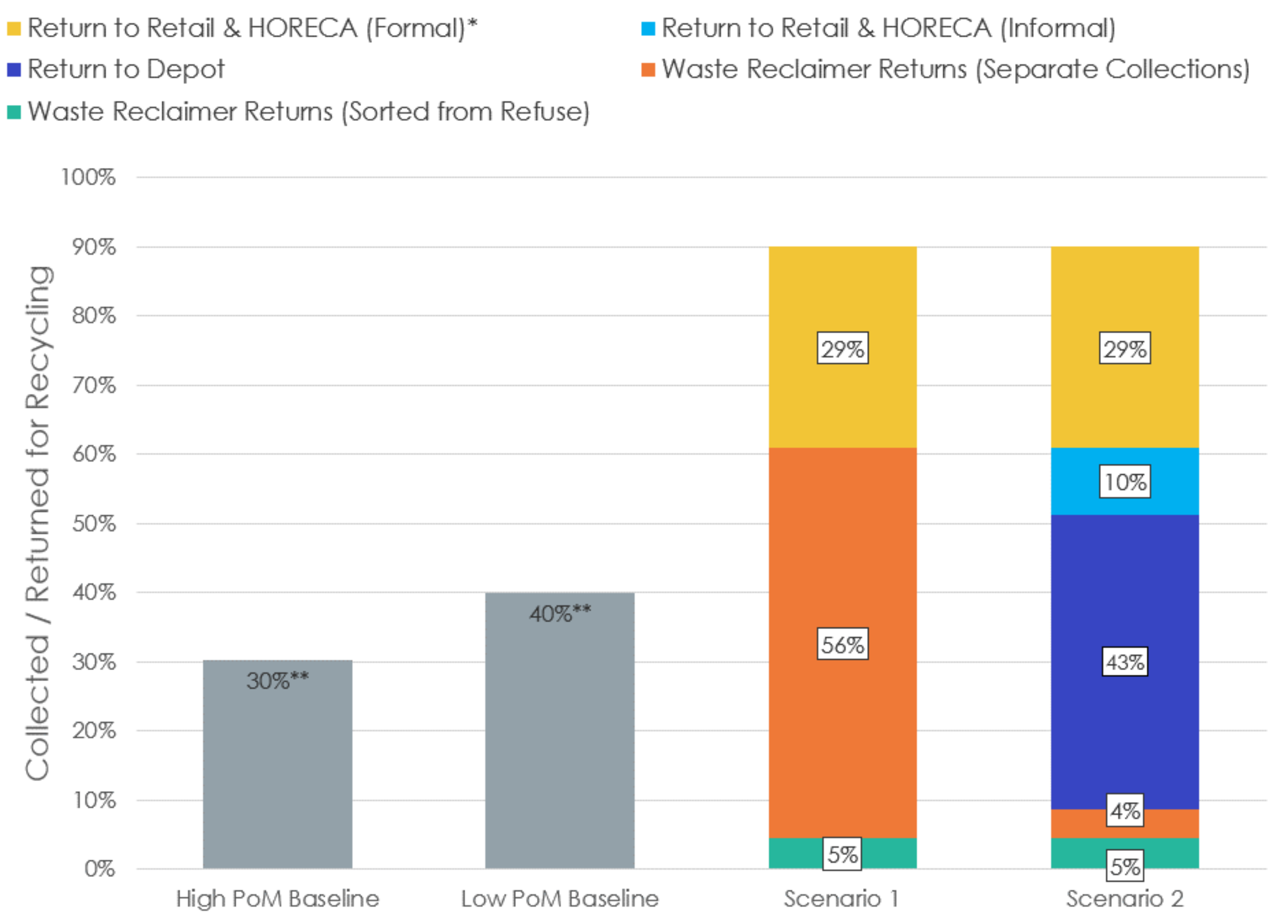
# 4.2 Return Channels and Coverage

## 4.2.1 Material Flows through the Return Channels

The overarching assumption that a 90% collection rate would be possible if a suitable deposit level was applied and return locations were sufficiently convenient has been applied to both return channel scenarios and then the division of the 90% collection rate has been apportioned between the different types of channel according to the assumptions around informal and formal sales divisions. The return channels for used beverage containers (plastic, metal, and glass) for the two scenarios are presented in Figure 4-3. Return routes vary by material (not shown here); for example, available data demonstrates that more glass beverages are sold informally compared to other materials, and therefore this study assumes that less takeback of glass takes places at formal retailers. These material specific assumptions are detailed in Appendix A.1.1.

The scenarios are compared to the estimated baseline recycling performance (for plastics, aluminium, and glass beverage containers combined, by weight) under both high and low PoM baselines. The 'real' recycling rate is likely to be somewhere between these rates – i.e. between 30% and 40%.

**Figure 4-3: Return Routes for Beverage Containers**




Notes:

** Includes a small percentage of direct collections by the DRS from HORECA (see Appendix A.1.1)*

***Baseline collection rates are average estimates based on the total weight of PET, HDPE, aluminium and glass beverage containers collected relative to placed on market. Most of this tonnage is collected by waste reclaimers, with a minor component from formal collections – not shown on chart due to significant data uncertainties.*

## 4.2.2 Return Point Coverage

A DRS must provide sufficient coverage of return points for consumers to ensure that returning containers is relatively convenient, and therefore optimise return rates. It is important that all consumers, in different types of communities, and whether in urban or rural locations, are able to return containers, and these principles are incorporated into the proposed design, as detailed in Section 3.2.

Although a metric for "convenience" does not exist, data from existing high-performing DRSs provides a suitable benchmark for required coverage under DRSs. This can be considered in terms of the number of return points per inhabitant / per km. The former metric is more useful to consider in South Africa, as available data to compare coverage is all from European DRSs which are predominantly a higher population density, and so naturally have more return points per km.

Within European DRSs, coverage of return points varies from 0.5 to 2.9 return points per 1,000 inhabitants, with a median of 0.9.[18] In the proposed DRS for South Africa, there are 0.3 and 0.7 return points per 1,000 inhabitants in Scenario 1 and 2 respectively.[19] This excludes waste reclaimers (and buy back centres) for which the concept of 'coverage' is difficult to define or quantify.

The coverage of return points (i.e. retailers and depots) in the proposed DRS is therefore on the low side in comparison to DRSs in Europe. However, in both scenarios consumers also have the option to return containers via waste reclaimers, and in Scenario 2, these account for the majority of containers returned (see Section 4.2). Therefore, on balance, it is expected that the design proposed in this study for South Africa will provide sufficient 'coverage' for consumers. With such a novel design, further analysis prior to and/or assessments after implementation will be required to ensure that the DRS provides sufficient convenience to consumers.

# 4.3 Deposit Level

The deposit level is an important parameter of a DRS and is one of the main determinants of the collection rate achieved by the system (the degree of convenience for consumers to return containers is another key parameter in this regard). The chosen level of deposit needs to strike a balance between multiple, sometimes competing, factors. These include:

- Affordability to the consumer (i.e., how the deposit level compares to the costs of beverages and income levels);
- Providing a sufficient incentive for consumers to return containers (essential to achieving high collection rates); and
- Not setting the deposit level so high as to adversely affect sales and/or encourage fraud.[20]

Within South Africa, it is also particularly important to consider that:

1. South Africa is characterized by a high number of low-income earners (and a few high income and small number of middle-income earners). Thus, a deposit level which is affordable for a consumer earning an average wage may not be affordable for much of the population.[21]

2. The deposit level should be set at a value which does not adversely affect waste reclaimer incomes. This includes consideration of the potential impacts of different deposit levels on the availability of beverage containers in a DRS to waste reclaimers.

Analysis of collection rates and deposit levies levied (equalised against purchasing power metrics) across a range of existing DRSs indicated that deposit value of between ZAR 1 and ZAR 2 per container is likely to achieve a 90% collection rate with adequate convivence of return points.

**This study has used a ZAR 1 deposit per container** for the purposes of modelling the costs and impacts of the DRS considered in this project. This is on the lower range of deposit values which could feasibly incentivise a high (90% or above) collection rate. Best practice is for a DRS to start at a lower deposit level which can then be increased over time if required based on system performance – it is far less practicable to move from a higher to lower deposit level. Furthermore, the adverse impacts of a too-

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[18] Based on data for Denmark, Estonia, Finland, Latvia, Lithuania, Norway and Slovakia
[19] These figures include all consumer-facing return points, that is, retailers, depots (in Scenario 2), and HORECA establishments with a formal collection from the DRS and exclude buy back centres and HORECA establishments / retailers which are not formally part of the scheme, but still take back containers. This is a comparable scope to comparable data from European DRSs.
[20] Reloop (2023). *A Guide to Modern Deposit Return Systems: 10 Essential Practices*. Available at: link
[21] IBRD (2018*) Overcoming Poverty and Inequality in South Africa*. Available at link.

high deposit value on sales, potential fraud, and/or unaffordability for lower income consumers are significant, and a cautious approach of starting low and increasing as required is therefore sensible.

Some existing DRSs have this approach set in legislation, with the System Operator given a certain number of years to meet a specified collection rate target, which if not achieved entails a mandatory sequential increase in deposit level until the target is met.

**This study has also modelled a sensitivity with a ZAR 2 deposit per container** to understand the change in net costs for the DRS due to increased revenue from unredeemed deposits. In this sensitivity, the collection rate remains the same as with a ZAR 1 deposit, as feasibly both deposit rates could incentivize high returns, and there is no data with which to assess how much higher collection rates could be with a higher deposit.

## 4.4 Service Fees

The service fee (on a per container basis) paid to registered waste reclaimers by the System Operator is similar in principle to the "collection service fee" required to be paid to waste reclaimers under EPR, as set out in Section 18 of the National Environmental Management Waste Act (see Supplementary Report on Literature Review). A similar approach to that described in this legislation is recommended here, that being:

- Service fees are paid on a per container basis (not per kg) only to waste reclaimers who register with a central database, administered by or accessible to the System Operator; and
- The per container rate at which the service fee is set is recommended to be 'agreed' between the System Operator and waste reclaimers, and reviewed on an ongoing basis (e.g., annually).

For the avoidance of doubt, the service fee would be paid to registered waste reclaimers in addition to the refunded deposit. As such, registered waste reclaimers would receive the full deposit value and the service fee for each in-scope DRS container taken to a D-BBC. The service fee is an important element for separate collections, since waste reclaimers may refund consumers the full deposit value in order to receive the DRS containers. The service fee is therefore the minimum net income per DRS container for registered waste reclaimers.

The way in which the deposit and service fee would be reported and recorded on receipts would be the decision of government. For waste reclaimers that are not registered, they would receive the deposit only. There is therefore a risk to non-registered waste reclaimers, since they would not be eligible to the service fee payment per returned DRS container. This could limit the potential to carry out separate collections from consumers, since consumers might request the full deposit in order to obtain the DRS container.

It was necessary to determine reasonable levels of service fees for the purposes of estimating overall DRS costs. The study's approach to this matter was to triangulate service fees against both existing waste reclaimer incomes and in order that future service fees, in conjunction with productive assumptions would likely provide an increase in waste reclaimer incomes, provide an incentive to engage with a DRS and provide better income in the separate collections return channel than sorting from refuse. The outcomes of this analysis are the rates of service fee per container shown in Table 4-1. These are the values that have been used in the modelling of the impacts in this report. The top row of Table 4-1 shows the value per container (not per kg) paid to waste reclaimers by BBCs, based on the study's survey of BBCs (see Supplementary Report on Waste Reclaimer and Buy Back Centre Surveys).

### Table 4-1: Service Fee Rates, ZAR Cents per Container

| | Plastic | Aluminium | Glass |
|---|---|---|---|
| Current material value | 7 | 19 | 6 |
| Service fee | 12 | 12 | 18 |

| | Plastic | Aluminium | Glass |
|---|---|---|---|
| Service fee (sensitivity) | 20 | 20 | 30 |

The lower 'service fee' rates are used as the central assumption while the higher rates are tested as a sensitivity. Together these provide a reasonable low/high range of potential service fees. A minimum service fee rate of ZAR 12 cents is suggested for plastic and aluminium – this is roughly equivalent to the average of the prices currently paid per container for plastic and aluminium by BBCs, and therefore seems like a sensible low estimate of potential service fees. For some materials, waste reclaimers will be moving higher volumes and lower weights under a DRS compared to present, as containers in a DRS cannot be compacted to the extent they are currently for some materials until they enter a system operator counting process; this has been considered in these proposed service fee levels. A 50% higher service fee is suggested for glass, due to the significantly higher weight and associated difficulty of transportation for this container type.[22]

The extent to which waste reclaimers would register, and therefore be paid a service fee per container returned, is difficult to determine. The survey of waste reclaimers found that only 18% are members of ARO or South African Waste Pickers Association (SAWPA) or other such associations, and that 15% are registered on the national database (i.e., SA Waste Picker Registration System). The process of registering with a DRS should therefore be clear, transparent, fair, affordable, and uniform across South Africa. This may require regulation to ensure the registration process is not abused, which will need to be decided by government. Furthermore, to encourage and support the uptake of registration from waste reclaimers, a social management plan may be required, in which DRS registration training, support, and awareness raising for waste reclaimers could be targeted. Such training and support could also be provided to BBCs for registering with the DRS in order to receive handling fees. There is a risk, however, that not all waste reclaimers would register with the DRS in order to receive the service fee. This could result in lower income levels to non-registered waste reclaimers and limit their potential to carry out separate collections.

For the analysis of waste reclaimer incomes, this study assumes that this general level of registration will continue – i.e., a service fee is paid on 20% of containers 'sorted from refuse' returned by waste reclaimers. All waste reclaimers returning containers via separate collections are assumed to register with the DRS and be paid a service fee – indeed they must be in order to be paid for this service.

# 4.5 Costs of the DRS

The costs and revenues of a DRS, which are paid for and accrue to the System Operator include the following:

- **Administration:** costs for ongoing management of the DRS
- **Container return costs**: costs of returning containers through the different return channels, these include **handling fees** (paid to retailers and buy back centres), **service fees** (paid to registered waste reclaimers) and **depot costs** (operated in-house)
- **Transportation:** logistics costs for transporting containers in trucks from return points to counting centres, including bins / bags.
- **Counting centres:** final consolidation, counting, sorting, and baling of returned containers at counting centres. Given the size of South Africa, distances between major metropolitan centres

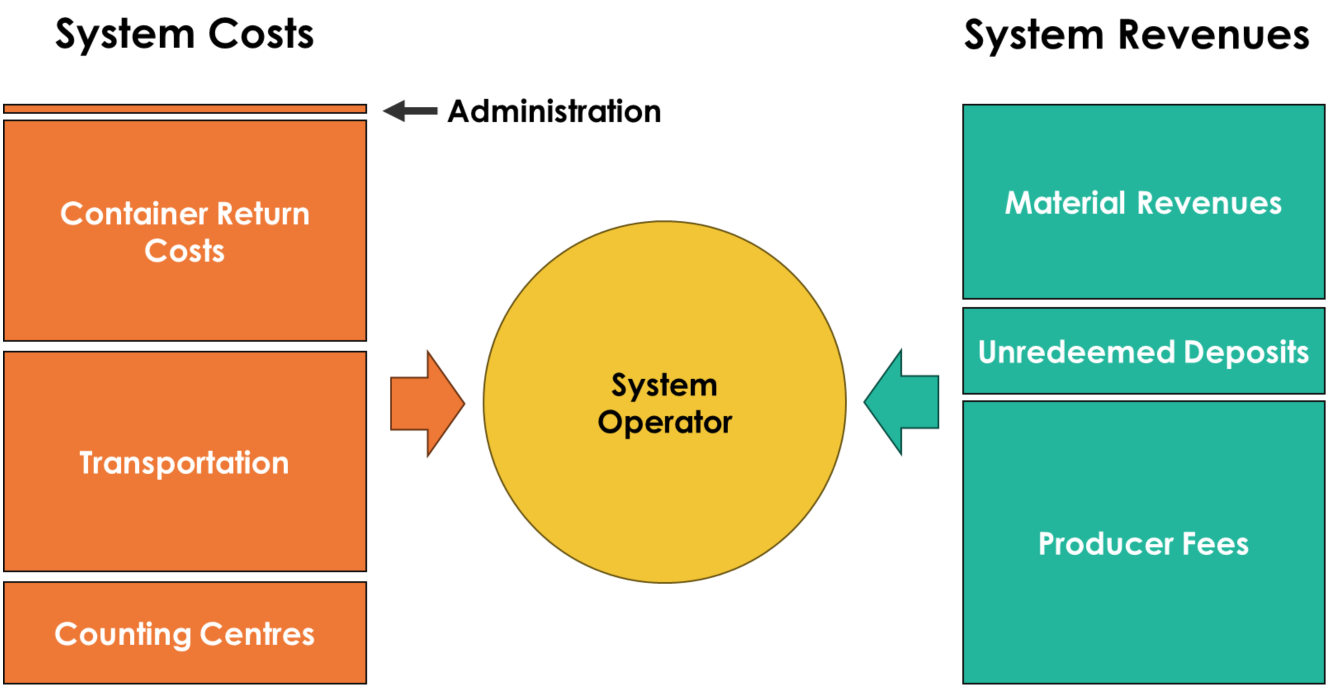
[22] Aquila Environmental (Pty) Ltd and the University of the Western Cape (2022) *Barriers to glass collection for the informal waste pickers and Buy Back Centres in South Africa*, Report for The Glass Recycling Company, 5th April 2022.

and the number of containers to be processed by the DRS, the modelling has assumed that seven regional counting centres are required.

- **Material revenues**: The System Operator owns all beverage containers returned to the DRS and earns revenue from the sale of material to recyclers.
- **Unredeemed deposits:** for containers that are not redeemed by consumers (or waste reclaimers), the deposit paid becomes a revenue to the system.

Beverage producers pay producer fees to the System Operator for every container placed on the market, with these payments covering system costs not covered by other sources of revenue (i.e., material revenues and unredeemed deposits). These producer fees replace any existing fees for beverage containers under the current EPR system. Different producer fees are commonly charged for plastic, aluminium and glass based on the costs/revenues for each of these materials. An example of the proportion of costs and revenue is shown in Figure 4-4.

### Figure 4-4: Costs and Revenues in Proposed DRS




The costs and revenues per year for the System Operator of a proposed DRS estimated in this study are shown in Figure 4-5 and Figure 4-6 respectively. Producer fees, which are paid by producers for each container placed on the market, are estimated at between ZAR 1.9 and 3.5 billion per annum (shown in labels in Figure 4-6). These fees will cover approximately 44-50% of the costs of a DRS, with the remainder covered by material revenues (34-48%) and unredeemed deposits (16-18%).

**Figure 4-5: Costs per Annum for the System Operator of a Proposed DRS, ZAR Billion**

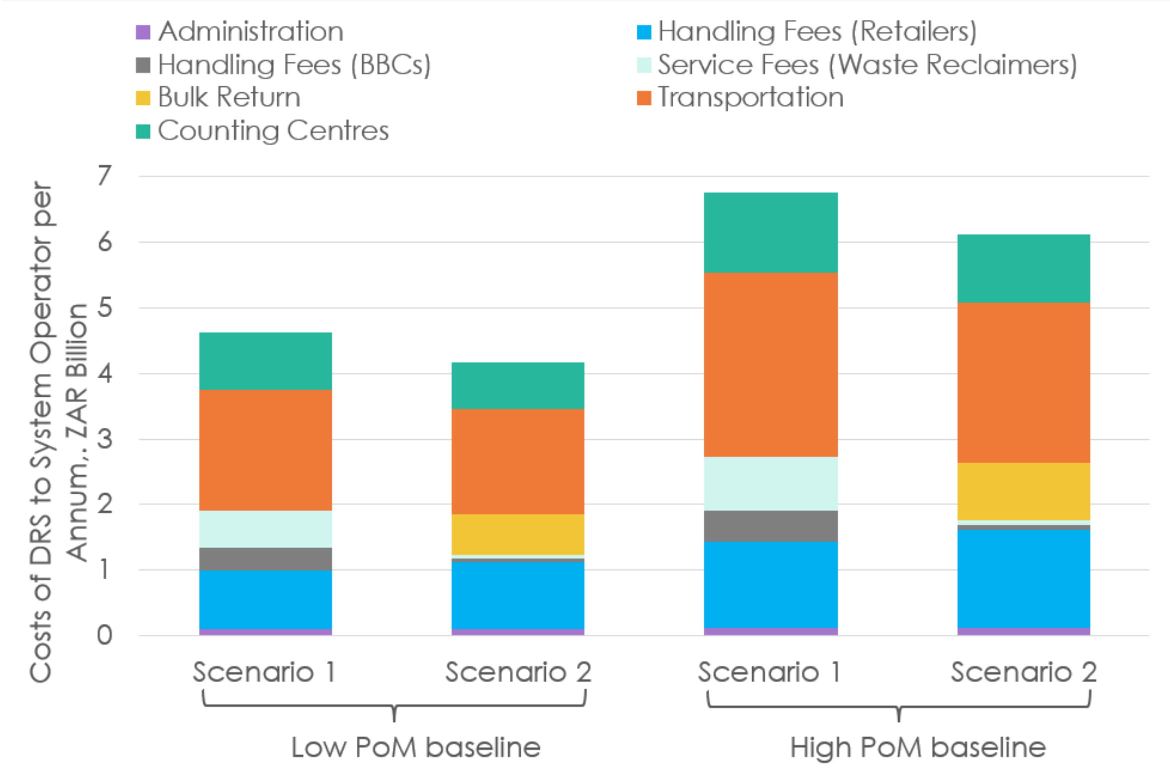
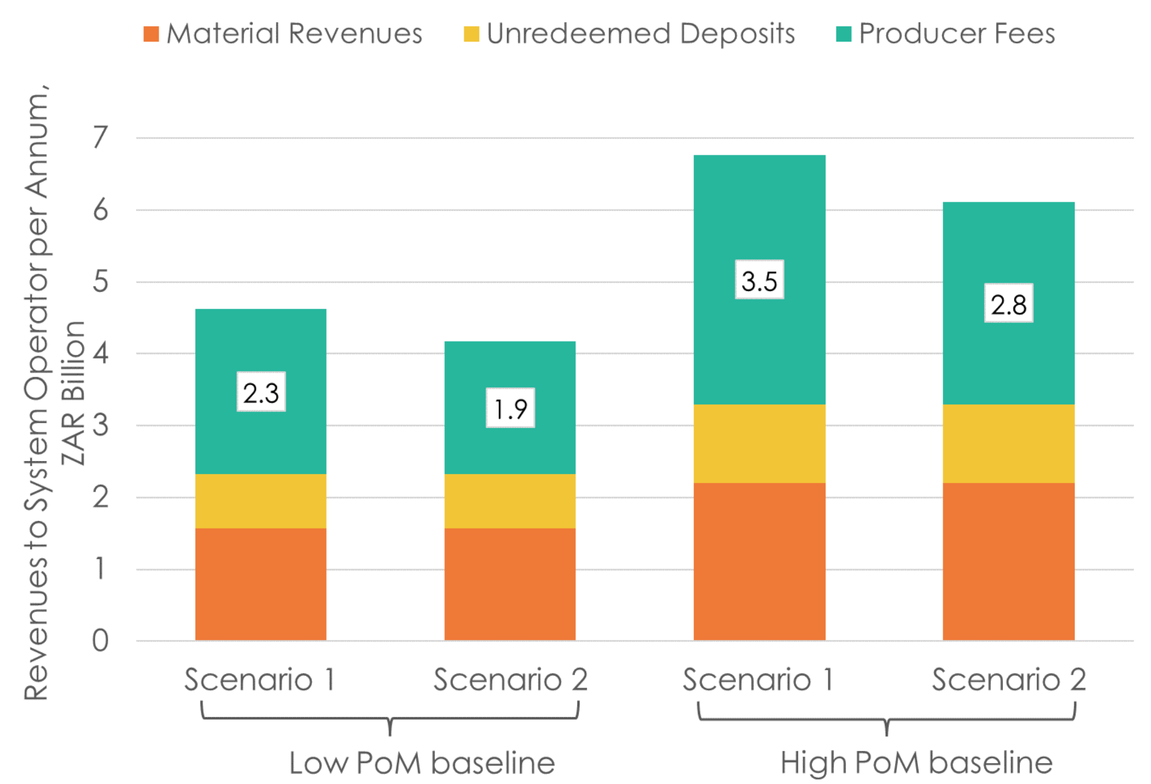



**Figure 4-6: Revenues per Annum for the System Operator of a Proposed DRS, ZAR Billion**



As the figures above show, the major factor determining overall cost is the number of containers PoM, captured in the low and high PoM baseline.

Estimated producer fees are approximately 20% lower under Scenario 2. This is due to how costs to the DRS for containers returned through each return channel vary. This is shown in Table 4-2, which sets out the estimated costs for returning and transporting containers through each return channel – costs are in ZAR cents per container returned.

### Table 4-2: Costs of Handling and Transportation by Return Channel, ZAR cents per container [1]

| Fee | Handling fee[2] | Service fee | Transport | Total Cost |
|---|---|---|---|---|
| Retailer (RVM) | 47 | N/A | 14 | 61 |
| Retailer (Manual) | 19 | N/A | 38 | 57 |
| Waste Reclaimer Returns (Separate Collections) | 7 | 13 [3] | 32 | 52 |
| Waste Reclaimer Returns (Sorted from Refuse) | 7 | 3 [4] | 32 | 42 |
| Depot (RVM) | 23 [5] | N/A | 13 | 36 |
| Depot (Manual) | 15 [5] | N/A | 32 | 48 |

Notes

1. Based on Scenario 2, low baseline (variability in these figures between scenarios / baselines is low)
2. Handling fees are calculated based on the costs borne to typical retailers (space, labour, and RVM costs – if applicable). As is common in DRSs, retailers can opt for RVM or manual return, RVM handling fees are higher due mainly to the additional cost of installing and maintaining RVMs.
3. Average service fee across all beverage container materials.
4. Service fee is lower as only 20% or returns via this route are paid a service fee (see Section 4.4).
5. This is an internal cost to the DRS (rather than a handling fee, as depots are built and operated by the DRS). The cost shown here is a cost per container and is comparable to a handling fee.

Relative to Scenario 1, the main change in Scenario 2 is lower returns by waste reclaimers (separate collections), and higher returns to depots (assumed to be half RVM / half manual). As can be seen in Table 4-2Table , return to depot is estimated to be the lowest cost return channel.

Transport costs are a significant determinant of overall cost, especially within South Africa. Costs for transporting compacted containers (from RVMs) are roughly a third of similar costs for un-compacted containers (from manual return, including waste reclaimer returns). This is due to a similar difference in average volume of compacted / un-compacted containers.

A detailed breakdown by material type of the costs and revenues of for the System Operator of a proposed DRS is presented in Table 4-3. These are the same costs as presented Figure 4-5 and Figure 4-6. In this table the cost is presented in terms of a cost per container PoM. Costs are shown for the low baseline only.[23]

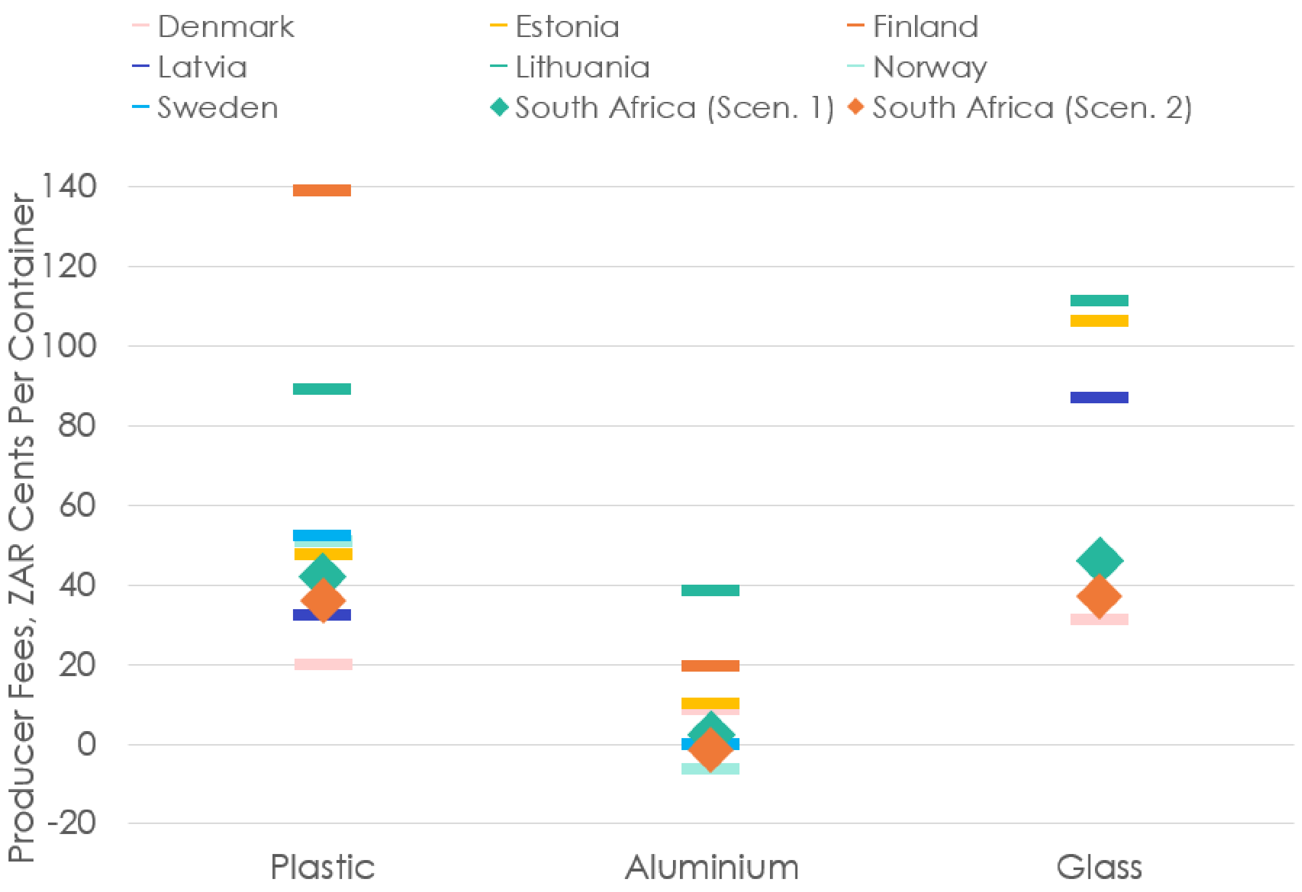
[23] Per container costs demonstrate little variance between the low and high baselines – approximately 5% difference.

### Table 4-3: Annual DRS Costs Per Container Placed on the Market (Central Baseline), ZAR cents

| | Scenario 1 | | | Scenario 2 | | |
|---|---|---|---|---|---|---|
| | **Plastic** | **Alu** | **Glass** | **Plastic** | **Alu** | **Glass** |
| Central Administration Costs | 1.4 | 1.4 | 1.4 | 1.4 | 1.4 | 1.4 |
| Handling Fees (Retailers) | 13.8 | 10.2 | 9.1 | 15.7 | 11.5 | 11.2 |
| Handling Fees (D-BBCs) | 5.0 | 3.2 | 5.3 | 0.7 | 0.5 | 0.8 |
| Service Fees (Waste Reclaimers) | 6.4 | 7.1 | 11.5 | 0.6 | 0.6 | 1.1 |
| Depot Costs | 0.0 | 0.0 | 0.0 | 7.3 | 7.9 | 10.6 |
| Transport and Containment Costs | 32.7 | 11.3 | 25.4 | 29.1 | 9.2 | 21.6 |
| Counting Centres | 10.6 | 11.0 | 14.4 | 9.0 | 9.2 | 11.5 |
| **Gross Annual Operating Costs** | **69.8** | **44.2** | **67.1** | **63.8** | **40.3** | **58.3** |
| Income from Material Revenues | 17.6 | 31.7 | 11.0 | 17.6 | 31.7 | 11.0 |
| Income from Unredeemed Deposits | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 |
| **Net Cost / Producer Fee** | **42.3** | **2.5** | **46.2** | **36.2** | **-1.4** | **37.3** |

These net costs are compared to current producer fees for existing DRSs in Europe in Figure 4-7 below.

**Figure 4-7: Estimated Fees for South Africa DRS and Producer Fees for Existing European Systems, ZAR cents per container**




Key conclusions from these results, with reference to existing DRSs in Europe, are as follows:

- The net costs of a DRS in South Africa are at the lower end of average costs for DRSs in Europe.[24]
- Operating costs are reflective of the relative difference in labour, rent and other costs in South Africa compared to equivalent European costs. Costs for returning containers i.e. handling fees paid to retailers and depots (including service fees paid to registered waste reclaimers, and in Scenario 2, depot costs) – are in the region of half the cost of a typical European DRS.[25]
- However, transport costs are relatively high per container, in the region of 20-50% higher than in a typical European DRS.[26] This is due to three reasons:
    - The relatively low population density in South Africa and large distances from container return points to counting centres.

[24] Ranges based on lower / upper quartiles of producer fees for DRSs in Denmark, Estonia, Finland, Latvia, Lithuania, Norway and Sweden
[25] Comparison with average handling fees for DRS in Denmark, Estonia, Finland, Latvia, Lithuania, Norway and Sweden
[26] Based on a comparison of transport costs per container to published costs for DRS in Lithuania and Norway

- The high proportion of manual returns in the proposed South African system. Containers returned manually are transported uncompacted in a DRS, while RVMs compact containers at the point of return, and so container volume and therefore transport costs are much lower, as discussed above. In a typical European DRS, RVMs account for ~90% of returns (the remainder manual), while in the proposed South African system, 26 – 50% (in Scenario 1 and 2 respectively) are returned through RVMs.

- Transport costs are relatively high for plastics and are higher on a per container basis than for glass, which is not usually the case in other countries. This is due to the average volume for plastic beverage containers in South Africa – 1.3 litres (43% of PET beverage containers are soft drinks containers 2 litres and above) - which is approximately double the average volume of PET beverage containers in Europe.[27]

- Even with higher transport costs, total gross operating costs are still significantly lower than a typical European DRS. However, revenues from unredeemed deposits are lower. Modelling was conducted with a ZAR 1 deposit, which, while seen as an appropriate introductory rate for South Africa (see Section 4.3), is much lower than typical deposit values in European DRSs, typically 2 to 4 times higher. This has a large impact on revenues, as unredeemed deposits (from the approx. 10% containers that may not be returned by consumers) are a key source of revenue for a DRS. A higher deposit value is included as a sensitivity.

- As is usually the case for DRSs, costs for glass beverage containers are the highest, followed by plastic, and fees for aluminium are close to zero or negative, due primarily to the high material value of aluminium. More unusually, the difference in costs between plastic and glass is fairly small – this is due to relatively high transport costs for plastic (due to large containers), and estimated material revenues for plastic/glass that are lower/higher respectively than commonly seen on global markets.

To summarise, total operating costs of a South Africa DRS are significantly lower than a typical European DRS. Revenues are also lower, mainly due to the deposit value and the impact of this on revenue from unredeemed deposits. **Low costs and low revenues add up to a net cost that is similar to a European DRS.** The net costs of DRS are also compared to current EPR fees paid by producers in South Africa in Section 4.9.

- **The major factor affecting the DRS's total cost is number of beverage containers PoM, which is subject to uncertainty. The potential PoM range is reflected in the low and high PoM baselines.**
- **Estimated producer fees are approximately 20% lower in Scenario 2 than in Scenario 1. This is mainly because in Scenario 2 almost 50% of containers are returned through depots, which is lowest cost of all return channels considered (return to retail, return by waste reclaimers and return to depots).**
- **Scenarios 1 and 2 are not separate policy options. Rather, they capture a range of plausible outcomes for a South African DRS, depending on how waste reclaimers, consumers, retailers and buy back centres respond to the DRS.**
- **Potential producer fees for a South Africa DRS are at the lower end of average costs for DRSs in Europe.**

[27] Compared to confidential industry data for 21 EU Member States.

# 4.6 Social Impacts

## 4.6.1 Jobs

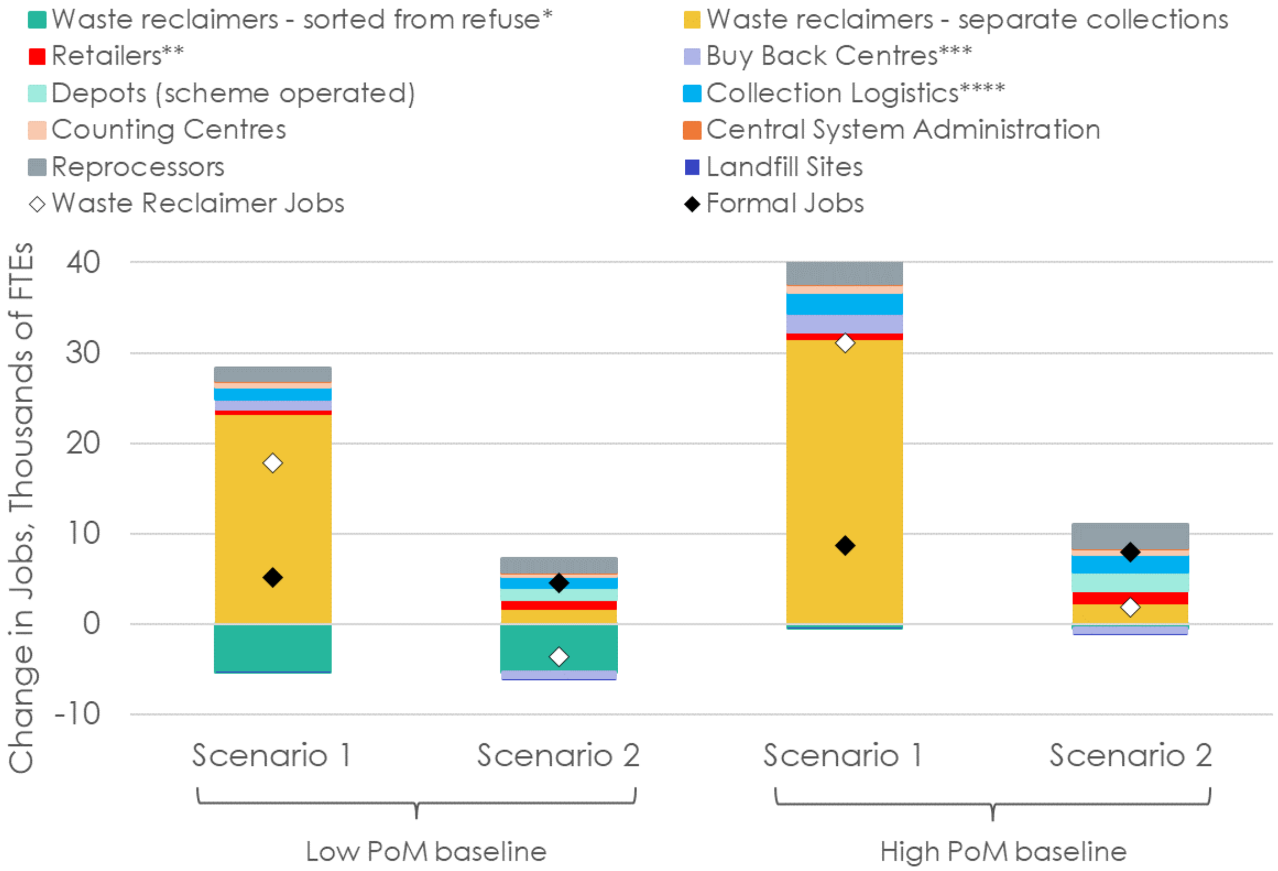
There are various jobs that are created when a DRS is introduced, with material throughput being a primary driver for the creation of jobs. Jobs include collection, sorting, and administrative roles – both directly and indirectly.[28] The estimated impacts of a proposed DRS on the number of jobs in South Africa, both waste reclaimer and formal jobs, are presented in Table 4-4 and Figure 4-8. All job impacts are reported in number of full-time equivalents (FTEs) (see Appendix A.1.8 for further details and assumptions).[29]

**Table 4-4: Summary of Net Change in Jobs due to Proposed DRS Implementation, Thousands of FTEs**

| | Low PoM | | High PoM | |
|---|---|---|---|---|
| | **Scenario 1** | **Scenario 2** | **Scenario 1** | **Scenario 2** |
| Net Waste Reclaimer Jobs | 17.9 | -3.6 | 31.1 | 1.9 |
| Net Formal Jobs | 5.1 | 4.6 | 8.7 | 8.0 |
| **Net Total Jobs** | 23.0 | 1.0 | 39.8 | 9.9 |

[28] Reloop (2023). Fact Sheet: Deposit Return Systems Create More Jobs. Available at: link
[29] The change in number of workers would therefore be higher than the number of FTEs reported if some workers are on part-time hours.

## Figure 4-8: Change in Jobs due to Proposed DRS Implementation, Thousands of FTEs




*Notes:*

** This includes all current waste picking activities, and, under a proposed DRS, continued picking of non-beverage material, and picking of deposit bearing material (see Section 3.2.2).*

*** Jobs directly created by the DRS in time spent handling DRS containers.*

**** Includes consideration of change in jobs due to switch from weighing material to counting containers (as well as change in total return of beverage containers via BBCs under a proposed DRS).*

***** These are additional jobs created by the DRS, taking into consideration existing collection jobs for transporting collected beverage containers.*

### Waste Reclaimer Jobs

The number of waste reclaimer jobs could go up or down depending on the proportion of containers returned by waste reclaimers:

- In Scenario 1 (high returns by waste reclaimers), an additional 17.9 to 31.1 thousand jobs could be created.
- In Scenario 2 (low returns by waste reclaimers), a change in jobs between -3.6 thousand (i.e. net reduction) and 1.9 thousand (i.e. net increase) is estimated.

As discussed in Section 3.2, these scenarios represent an extreme of high/low returns by waste reclaimers; the likely outcome may be somewhere between these two scenarios. The current number of waste reclaimer jobs (which these estimated changes are relative to) is not well understood in South Africa.

Typical estimates place the current number of waste reclaimers in South Africa between 60 and 90 thousand.[30,31,32]

In both scenarios, the number of waste reclaimers carrying out 'sorted from refuse' activities are likely to reduce, by approximately 5.3 thousand jobs under a low PoM baseline, 0.4 thousand jobs under a high PoM baseline. This is due to the substantial reduction in the quantity of beverage containers disposed of in bins by consumers.

Conversely, under all scenarios, new waste reclaimer jobs are created in carrying out 'separate collections' of DRS containers. The number of these new jobs created could be anywhere from 1.7 thousand (under Scenario 2, and a low PoM baseline) up to 31.5 thousand (under Scenario 1, and a high PoM baseline) additional jobs.

There is considerable uncertainty in these estimates due to their sensitivity to productivity assumptions (i.e. the number of containers collected in a specified time unit) under a future DRS, which are difficult to predict. This is particularly true for 'separate collection' activities, which would be a significant change in working methods for waste reclaimers. Time associated with sorting through other components of refuse to obtain high value items would be saved but conversely additional time would be associated with checking with beverage items had deposits associated with the, transacting the deposit exchange and any additional time at D-BBCs associated with container counts. High productivity, i.e. assuming more containers are collected per waste picker per day / month would mean higher incomes per waste pickers, yet fewer overall jobs, and vice versa for lower productivity. In either case, the cost to the System Operator in terms of service fees would not change, as these are paid out per container returned (not per kg). These assumptions, and the overall methodology for considering incomes and job numbers for waste reclaimers, is discussed further in Appendix A.1.8.2. To further refine these estimates, it would be necessary to conduct suitably scoped operational trials.

## Formal Jobs

Formal jobs are estimated to increase by between 4.6 and 8.7 thousand under a proposed DRS, with most of this change accounted for by the low/high placed on market assumptions. Approximately 10% less new jobs are created under Scenario 2 relative to Scenario 1, mainly due to higher automated return through RVMs in this scenario, and reduced transport jobs due to greater overall compaction of containers.

Around a quarter of these additional jobs are in collection logistics, and a similar proportion at recycling facilities required to manage the increased collection of containers. In Scenario 1, a significant number

**A South African DRS could either lead to a net increase or decrease in waste reclaimer jobs (estimated from -3.6 to +31.1 thousand) depending on the quantity of returns waste reclaimers undertake. There is a significant opportunity for waste reclaimers to carry out a new role in providing 'separate collections' of beverage containers from consumers.**

**The DRS would create formal jobs in counting centres, at depots and in administration, as well as in collection logistics, at retailers, and at recyclers. The total number of new formal jobs created would be between 4.6 and 8.7 thousand.**

[30] Godfrey (2021) *Quantifying economic activity in the informal recycling sector in South Africa*, South African Journal of Science, September 2021

[31] Govender, D.; Govender, T.; Whyte, C.; (2023) *Market Study of the Circular (& Waste) Economy of South Africa*, African Circular Economy Network, August 2023

[32] Baya (2021), *Identifying the prospects of job creation along the value chain of plastic recycling*, university of Western cape, July 2021.

of new jobs are created at BBCs, estimated at 1.1 to 2.1 thousand jobs, due to the high number of returns via waste reclaimers. While under Scenario 2, new jobs are created instead at depots (1.4 to 2.0 thousand), while a reduction in jobs at BBCs is possible (from 0.7 to 0.8 thousand less jobs).

### 4.6.2 Waste Reclaimer Incomes

Figure 4-9 presents the estimates of monthly income for a typical waste reclaimer before and after a DRS. Assumptions for this analysis are detailed in Appendix A.1.8.2. A similar set of uncertainties exist in the calculations of waste reclaimer incomes that exist for the calculations of waste reclaimer jobs (see section 4.6.1) in that productivity estimates are uncertain and would need to be clarified through suitably scoped operation trials.

It is also important to note that this analysis is based on "average" incomes both in current waste reclaimer activity and estimated for a DRS. Waste reclaimers are a diverse community with a wide range of incomes associated with regional differences, working hours, and access to more or less productive territories. The supplementary report shows further insights to many of these variations. It is likely that some waste reclaimers would be more likely to benefit from changes to a DRS and some are less likely and correspondingly some may benefit more than the average income figures presented here and some less so. In any further development of a DRS, particularly through operational trials, it would be important to assess whether fair access to DRS work is made available and whether any proposed DRS methods would be likely to disadvantage various groups within the Waste Reclaimer community such as women or the older people.

Current incomes include earnings from all waste collected by typical waste reclaimers (beverage and non-beverage materials, such as paper and card). Under a proposed DRS, earnings are presented for two different waste collection 'jobs':

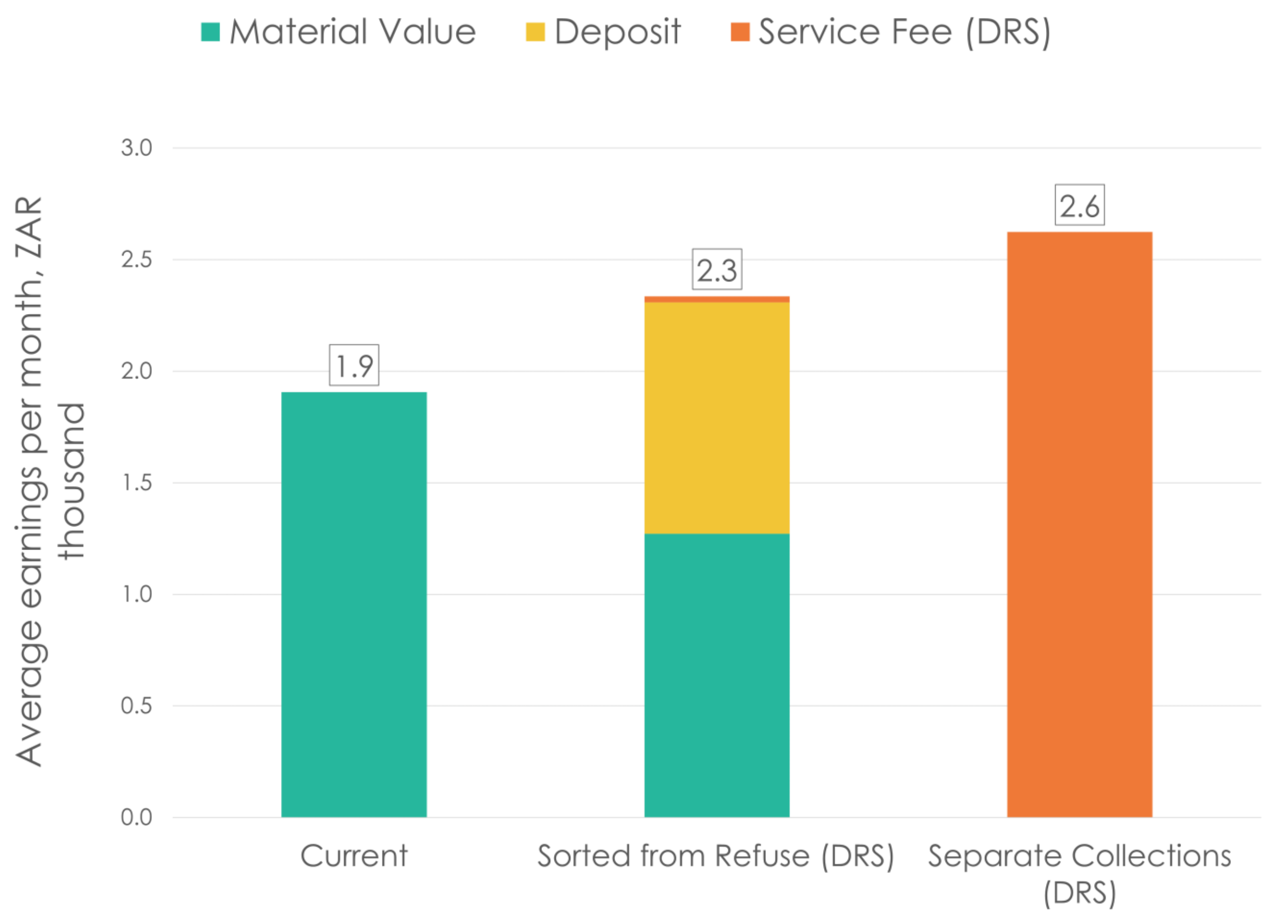
1) Waste reclaimers undertaking 'sorted from refuse' activities, that is, continuing to pick for both non-beverage material (for the material value) and deposit-bearing beverage containers (to return for the deposit, and service fee if registered); and

2) 'Separate collections' of beverage containers (direct from consumers, HORECA etc).[33]

Further details of these proposed roles for waste reclaimers in a DRS are set out in Section 3.2.2. Where waste reclaimers obtain beverage containers that are not part of the DRS or the deposit cannot be redeemed (e.g., container is crushed and DRS label is unable to be read), then the container may be sold to a BBC on a per kg basis based on its commodity value – as is the case currently. For the avoidance of doubt, the per kg rate would be set by the BBC and would be a separate system from a DRS, as would be the case for other non-DRS materials.

[33] In practice waste reclaimers may choose to mix these activities - they are differentiated for the purposes of showing income by activity for modelling.

## Figure 4-9: Average Monthly Earnings of a Waste Reclaimer, ZAR Thousand




This analysis indicates that earnings could increase by up to 38% compared to current levels under a DRS, from ZAR 1.9 thousand per month (a rough average of estimated current earnings for a typical waste reclaimer) to ZAR 2.3 - 2.6 thousand per month with a DRS, depending on the type of collection activity undertaken. Note that these results are highly sensitive to the rate of service fee, which is further explored in Section 4.8.1.

Earnings for individual waste reclaimers could vary significantly from this average value; with any proposed DRS there will be waste reclaimers that stand to receive more or less benefit (see Section 4.9 for more information on this).

As discussed in Section 4.6.1, there is considerable uncertainty with these estimates, not least due to variable data on current earnings (which studies suggest can vary from roughly ZAR 800 to roughly ZAR 4,000 per month, see Supplementary Report on Literature Review), and assumptions on the productivity of waste reclaimers. These are discussed further in Appendix A.1.8.2.

It is understood that a 'collection service fee' rate of ZAR 15 cents per kg of material has been adopted by PROs in South Africa. This fee, under existing EPR legislation, is paid by PROs to registered waste reclaimers for material sold at BBCs (in addition to the material price paid by the BBC). However, it is understood that only a very small number of waste reclaimers are being paid this fee at present.[34] Based on data for the average composition of material collected by waste pickers supplied by the African Reclaimers Organisation (ARO), this study estimates that waste reclaimers claiming this fee currently could see an uplift in current average earnings for beverage containers (within scope of a proposed

[34] eWASA (2024) *Working with Waste Reclaimers*, January 15th 2024. Available on LinkedIn at link

DRS) of approximately 7%. Potential current and potential future income in a DRS for a reclaimer claiming this collection service fee are shown in Table 4-5.

**Table 4-5: Average Monthly Earnings of a Waste Reclaimer with 'Collection Service Fee', ZAR Thousand**

| | Current | Sorted from Refuse (DRS) | Separate Collections (DRS) |
|---|---|---|---|
| Material Value | 1.9 | 1.3 | - |
| Collection Service Fee (Existing EPR)[1] | 0.13 | - | - |
| Deposit | - | 1.0 | - |
| Service Fee (DRS) | - | 0.03 | 2.62 |
| **Total** | **2.03** | **2.34** | **2.62** |

Notes:

1. Collection service fees for beverage containers within scope of a proposed DRS are included in this analysis. Fees for non-beverage containers are not included.

Therefore, for waste reclaimers claiming a 'collection service fee' under the existing EPR system (and continuing to do so for non-beverage material under a proposed DRS), average earnings would still increase compared to current levels, but by a slightly lower amount, estimated as approximately a 34% increase above current earnings for waste reclaimers sorting from refuse, and by around 61% for waste reclaimers carrying out 'separate collections'.

**Following the implementation of a South African DRS, average earnings per month are likely to increase for waste reclaimers: by around 15% / 23% above current earnings for waste reclaimers sorting containers from refuse (for those claiming / not claiming 'collection service fees' for beverage containers under the current EPR system), and by around 29% / 38% for waste reclaimers carrying out 'separate collections'. There are, however, uncertainties surrounding these estimates, and there are risks posed by a DRS, such as material availability, speed of recovering and selling containers, theft, and**

# 4.7 Environmental Impacts

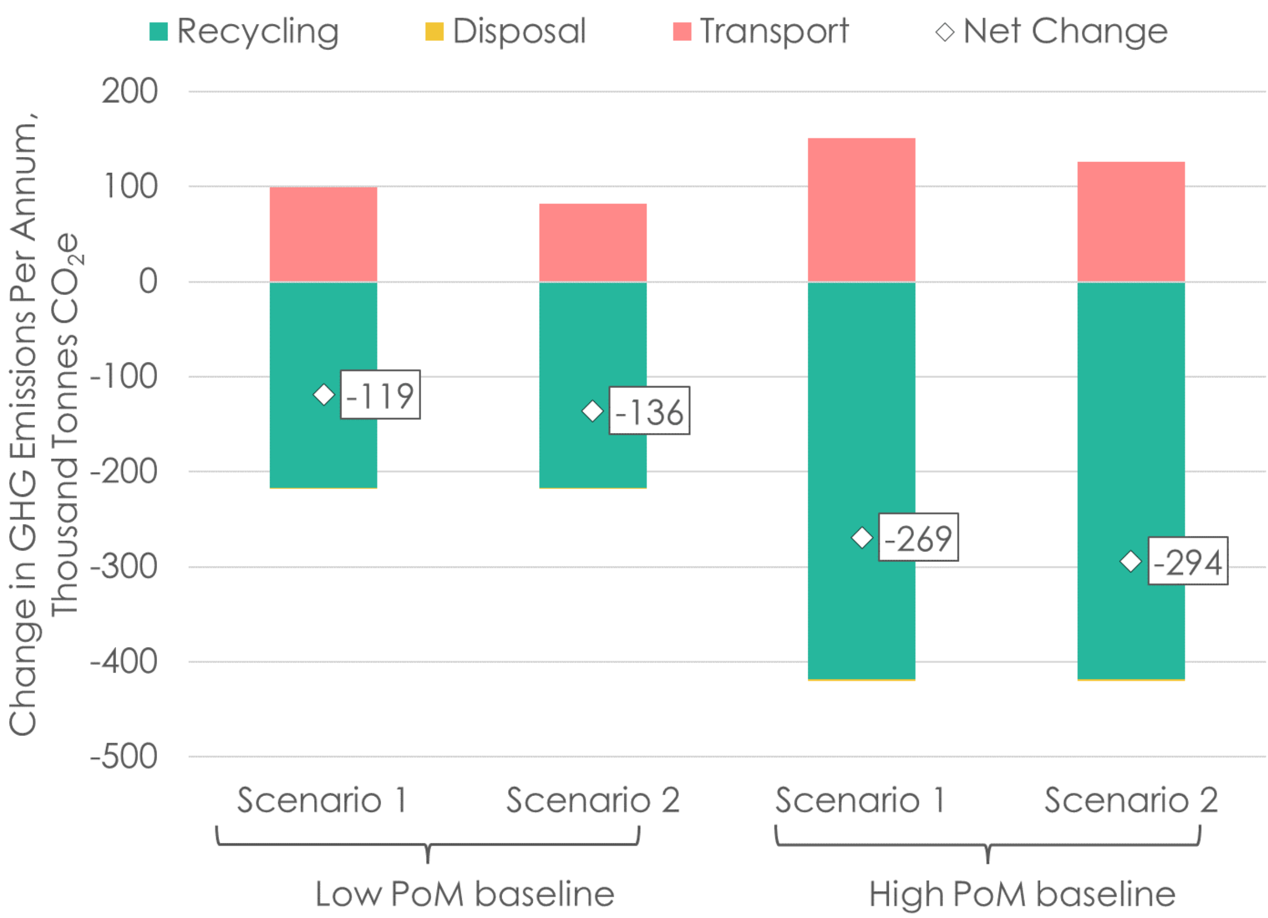
The environmental impacts of introducing a proposed DRS are presented below, and the methodology for this assessment further described in Appendix A.1.7.

With the introduction of a DRS, additional beverage containers will be recycled and less virgin material will be used, resulting in net lower greenhouse gas (GHG) emissions. Transportation to collect DRS containers and onward transport to counting centres will cause additional GHG emissions.[35] Recycling and other waste management routes, and transportation also lead to emissions of a range of compounds (particulate matter, nitrous oxides etc.) which have an impact on air quality (AQ). The change in GHG emissions estimated for a proposed DRS under both scenarios is presented in Figure 4-10.

[35] These are 'additional' transport emissions from a proposed DRS i.e. the change relative to estimated current emissions (without a DRS) related to transportation of collected beverage containers.

This figure shows the *change* in emissions, which is compared to estimated emissions from waste management and related transport emissions in South Africa currently.

**Figure 4-10: Change in GHG Emissions per Annum after Introduction of Proposed DRS, Thousand Tonnes of $CO_2$ equivalent**




GHG savings from recycling and disposal are higher than the additional transport emissions from a DRS, resulting in total savings of between 119 and 294 thousand tonnes $CO_2$e per annum.[36] Much higher savings are achieved under a high PoM baseline, due to a greater volume of material placed on the market, and a higher actual increase in overall performance (see Section 4.1).

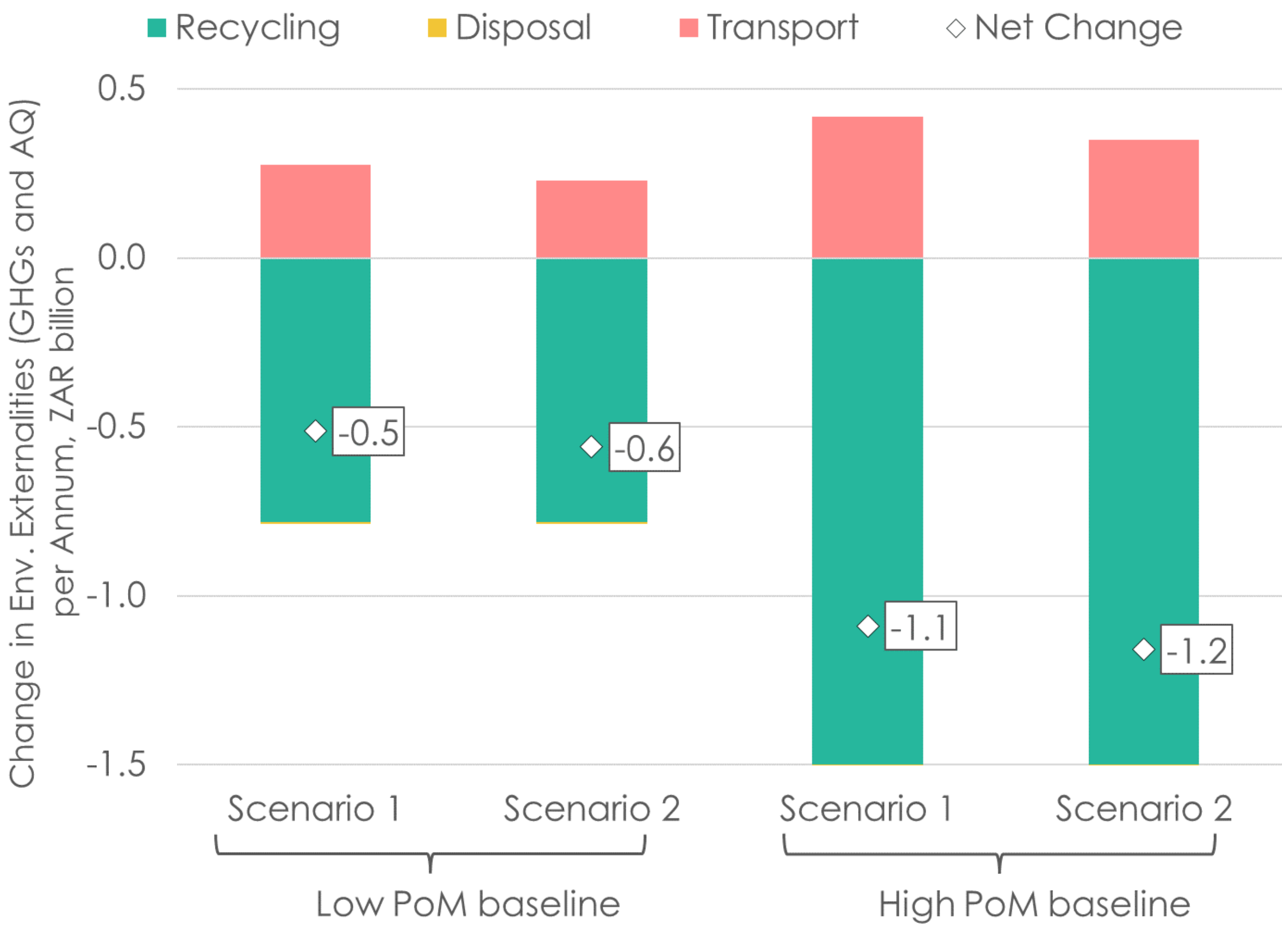
A greater reduction in GHG emissions (an additional 9-14% savings compared to Scenario 1 under a high/low baseline) is seen in Scenario 2. In this Scenario, more containers are compacted in RVMS at the point of collection compared to Scenario 1, and therefore the overall volume of containers for onward transportation, and related GHGs from transport, are lower.

The estimated financial benefit of this change in environmental externalities (GHG emissions and AQ) is presented in Figure 4-11and detailed in Appendix A.1.7.

Reduction in costs from lower $CO_2$ emissions and Air Quality impact between ZAR 0.5 to 1.2 billion are achievable under a proposed DRS.

[36] Savings on disposal are small as these relate only to processing materials on landfill sites – plastics, aluminium and glass are all inert and so do not degrade in landfill and so there are no savings in terms of avoided emissions of methane.

**Figure 4-11: Change in Environmental Externalities (GHG and AQ) per Annum after Introduction of Proposed DRS, ZAR billion**




Another important environmental benefit of introducing a DRS is reducing the amount of land and marine litter. Litter has impacts on citizens' wellbeing, the environment, and the economy. These can include impacts on quality of life from living in less clean neighbourhoods, to physical damage or injury, to concerns about plastic pollution on wildlife or human health, to impacts on local tourist economies.[37]

The environmental impacts of litter pollution are not limited to South Africa. Plastic pollution is recognised as a serious global problem, especially in the marine environment[38], which is likely to be the end destination for plastic litter that is not recovered. Notably, the Global Plastics Treaty is likely to require measures to be taken to reduce plastic pollution.

The negative impacts litter generates can be collectively considered as 'litter disamenity', the value of the burden they are assessed to place on society. One way to monetise this is by asking the public how much they would be 'willing to pay' for reductions in litter. There are other methodologies to valuing the costs of litter, however, 'willingness to pay' is the preferred approach for this study as it provides an estimate of the indirect externalities of litter, most significantly the visual disamenity of litter to citizens, which relevant studies demonstrate is the largest component of damage costs relating to litter (see Appendix A.1.7.6 for further details). There is also a lack of data available for other potential valuation methods, as research into the costs of litter is still in its infancy.

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[37] Eunomia (2013). Contributed to a Zero Waste Scotland report '*Scotland's litter problem: quantifying the scale and cots of litter and flytipping*'. No longer available online.
[38] WWF (2022). *Towards a Treaty to end Plastic Pollution*. Available at link

It should be noted that 'willingness to pay' approaches are not comprehensive, in terms of encompassing all costs in relation to littering, and are dependent on the availability and quality of data relating to the public's willingness to pay. A full picture is particularly hard to arrive at for South Africa. There are no specific disamenity studies conducted for South Africa and little data on the quantity, nature, and distribution of litter throughout South Africa. The estimates are therefore based on data for litter in Europe, both in terms of the types and distribution of litter, and the potential willingness to pay for reductions in littering – there is no data on which to base the views of the community in South Africa regarding littering.

The best estimates are an **overall reduction in litter disamenity of ZAR 6.1 billion per year following DRS implementation.** These estimates include an adjustment to account for South Africa's gross domestic product (GDP) at purchasing power parity (PPP) per capita.

**A South African DRS would result in net benefits to the environment, including:**

- **A reduction in greenhouse gases (GHGs) of between 119 and 294 tonnes $CO_2e$ per year.**
- **A reduction in environmental externalities (considering GHGs and localised air pollutants) of between ZAR 0.5 and 1.2 billion per year.**
- **A reduction in litter disamenity of approximately ZAR 6.1 billion per year.**

**The savings in monetised environmental externalities and litter disamenity (ZAR 6.6 to 7.3 billion) are greater than the increase in cost of the DRS to producers as producer fees (ZAR 1.9 to 3.5 billion).**

## 4.8 Sensitivity Analysis

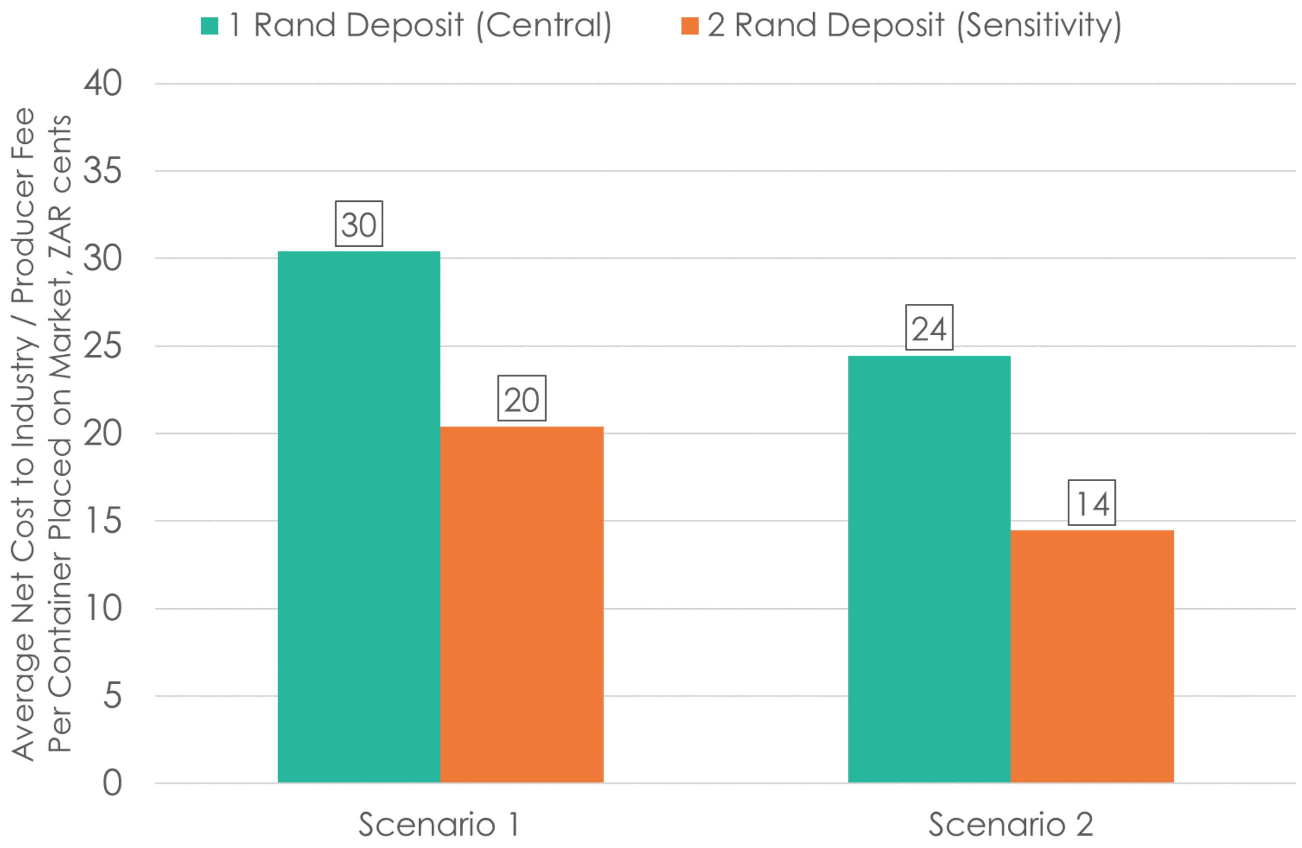
The impacts of varying two key variables in the analysis are presented in this section, these relate to the deposit level and level of service fee paid to waste reclaimers.[39]

### 4.8.1 Deposit Level

The results of modelling a DRS with a higher deposit of ZAR 2 per container, in terms of the net producer fee paid per container, are presented in Figure 4-12. Further discussion of the potential deposit level in a South African DRS can be found in Section 4.3.

[39] All results are presented for the low baseline only. Per container costs demonstrate little variance between the low and high baselines – approximately 5% difference.

**Figure 4-12: Producer Fees Per Container Placed on the Market (Deposit Level Sensitivity), ZAR cents**




A ZAR 2 deposit would double the revenue from unredeemed deposits (at a similar level of collection rate), and therefore lowers the cost of a proposed DRS significantly. Average producer fees per container with a ZAR 2 Deposit are estimated at ZAR 20 cents per container for Scenario 1, ZAR 14 cents per container for Scenario 2. These levels of producer fee are markedly lower than average costs for DRSs in Europe.

The total change in producer fees paid per annum for this sensitivity analysis is shown in Table 4-6, showing the range in fees for the low/high PoM baselines. Producer fees could decrease by 33% under Scenario 1, and 44% under Scenario 2, if a ZAR 2 deposit is applied.

**Table 4-6: Producer Fees per Annum (Deposit Level Sensitivity), ZAR Billion**

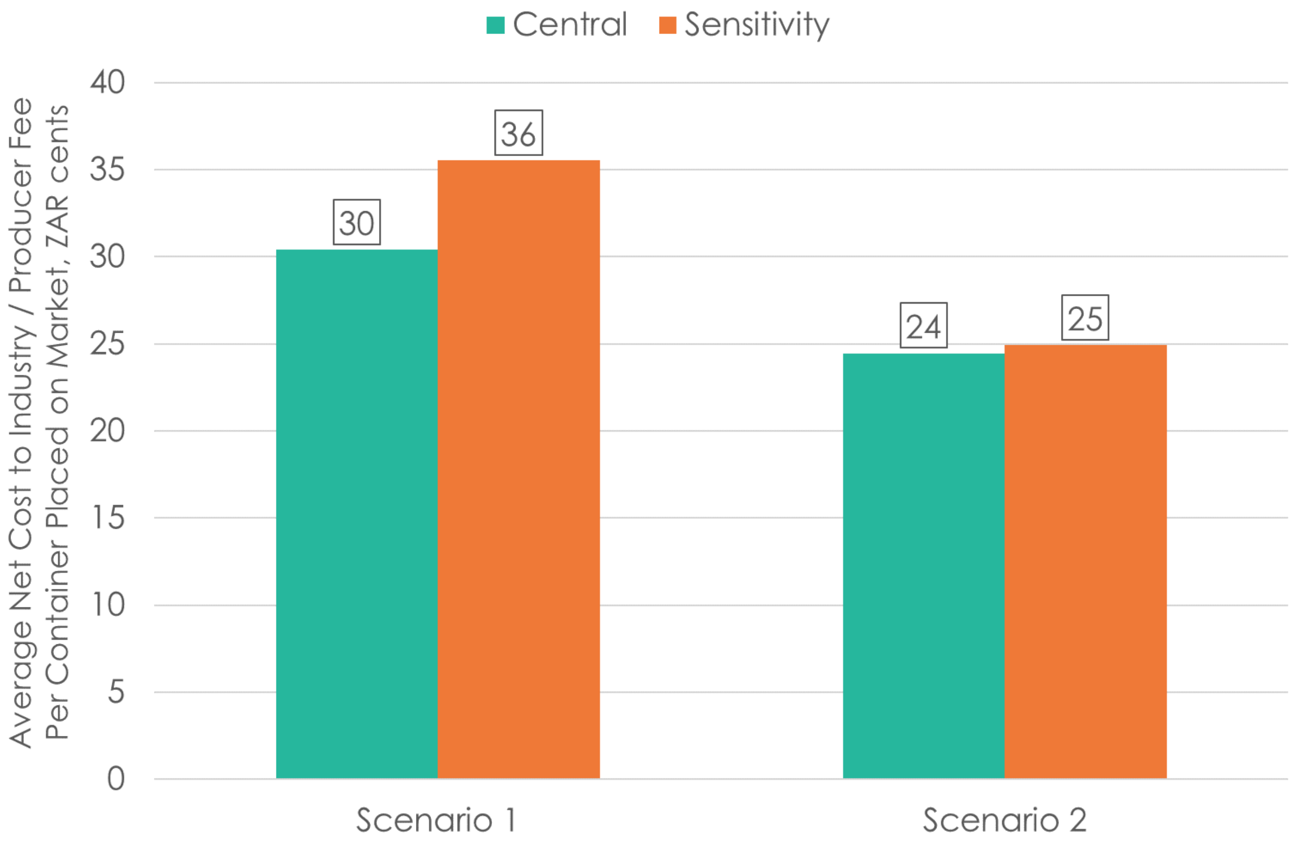
| | Scenario 1 | Scenario 2 |
|---|---|---|
| ZAR 1 Deposit (Central) | 2.3 – 3.5 | 1.9 - 2.8 |
| ZAR 2 Deposit (Sensitivity) | 1.5 – 2.3 | 1.1 – 1.7 |

## 4.8.2 Service Fee

The results of modelling a DRS with a higher service fee, in terms of the net producer fee paid per container, are presented in Figure 4-13. The methodology and assumptions for this analysis are discussed further in Section 4.4. Service fee rates are in per container (not per kg) and are as follows:

- Central assumption – ZAR 12 cents per container for plastic and aluminium; ZAR 18 cents per container for glass.
- Sensitivity – ZAR 20 cents per container for plastic and aluminium; ZAR 30 cents per container for glass.

### Figure 4-13: Producer Fees Per Container Placed on the Market (Service Fee Sensitivity), ZAR cents



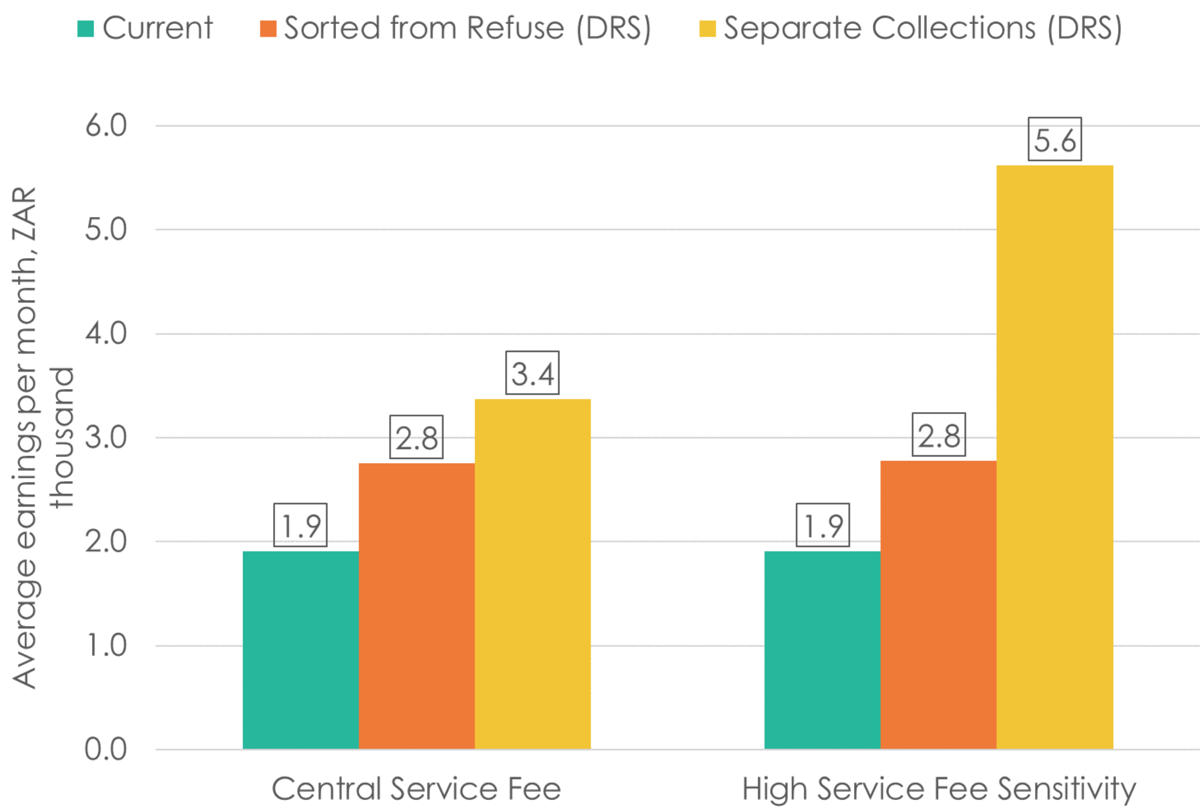

A higher service fee would increase the costs in Scenario 1 by approximately 17%, with a minimal increase in Scenario 2, thereby increasing the cost difference between Scenario's with high/low return by waste reclaimers to D-BBCs (Scenario 1/2 respectively). The total change in producer fees paid per annum for this sensitivity analysis is shown in Table 4-7 showing the range in fees for the low/high PoM baselines.

### Table 4-7: Producer Fees per Annum (Service Fee Sensitivity), ZAR Billion

| | Scenario 1 | Scenario 2 |
|---|---|---|
| Central | 2.3 – 3.5 | 1.9 - 2.8 |
| Sensitivity | 2.7 – 4.1 | 1.9 – 2.9 |

A higher service fee would lead to significantly higher earnings for waste reclaimers undertaking 'separate collections' of DRS containers. As shown in Figure 4-14 average monthly earnings for this activity could increase to more than ZAR 5 thousand per month.

**Figure 4-14: Average Monthly Earnings of a Waste Reclaimer, ZAR Thousand**




**Higher waste reclaimer service fees result in higher producer fees. How much more expensive is determined by the proportion of returns by waste reclaimers, which could be up to 17% (under Scenario 1). Waste reclaimers carrying out 'separate collection' will benefit from higher incomes with higher service fees.**

## 4.9 Summary of Impacts on Key Stakeholders

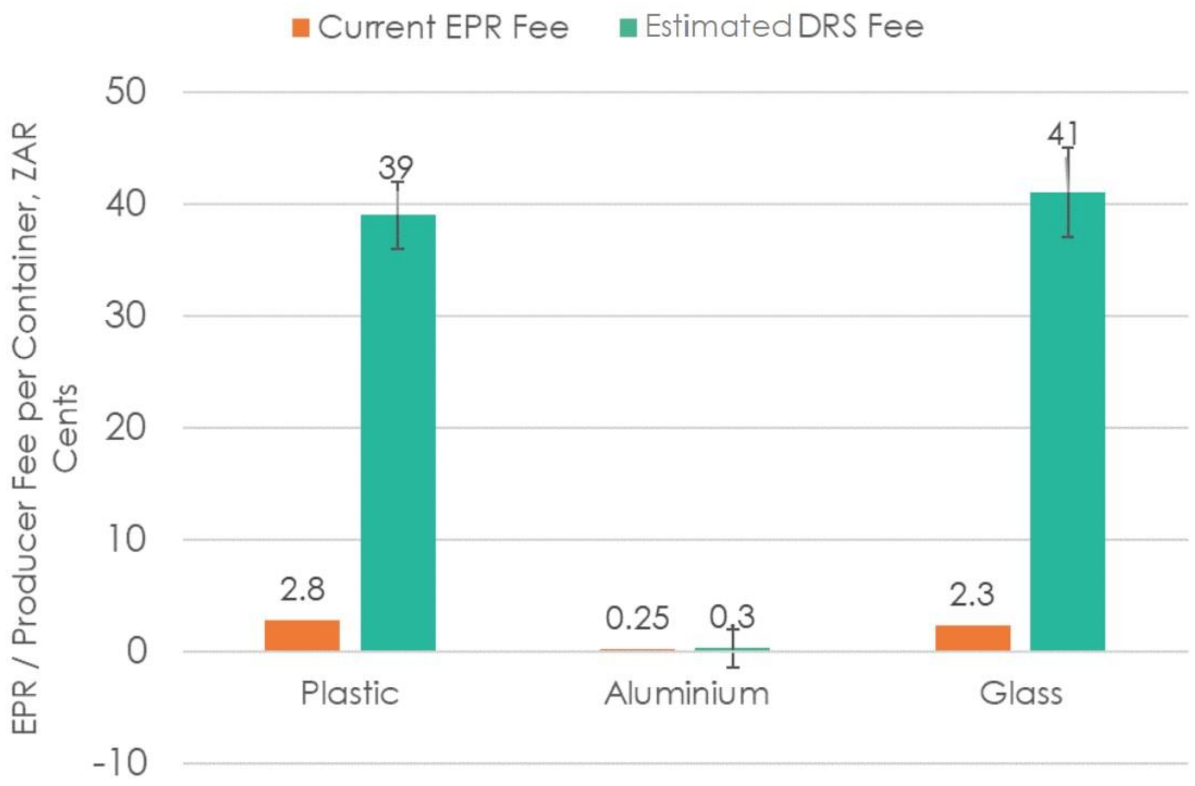
This section provides a summary of the operational, financial, environmental, and social impacts to key stakeholders if DRS was introduced in South Africa.

### Producers

Fees per container for the current EPR system are compared to potential producer fees per container for a proposed DRS in Figure 4-15 and a detailed analysis of the net change in costs to producers per container and per kg placed on the market is in Table 4-8.[40]

[40] Fees per kg for the current EPR system have been translated to equivalent fees per container to enable comparison with this standard metric for DRS studies.

## Figure 4-15: EPR costs for Producers in South Africa, ZAR Cents Per Container




## Table 4-8: Weighted EPR Costs for Producers in South Africa, Per Annum

| | | PET | Aluminium | Glass | Total |
|---|---|---|---|---|---|
| EPR / producer fee, ZAR per kg | Current | 0.72 [1] | 0.14 [2] | 0.09 [3] | - |
| | With DRS | 9.3 to 10.7 | -0.7 to 1.1 | 1.4 to 1.7 | - |
| EPR / producer fee, ZAR cents per container | Current | 2.8 | 0.25 | 2.3 | |
| | With DRS | 36 to 42 | -1.4 to 2.0 | 37 to 45 | |
| Total EPR / producer fees, ZAR billion | Current | 0.10 to 0.17 | 0.006 to 0.007 | 0.037 to 0.044 | 0.14 to 0.22 |
| | With DRS | 1.3 to 2.6 | -0.03 to 0.06 | 0.58 to 0.85 | 1.9 to 3.5 |
| | Net Change | 1.2 to 2.4 | -0.04 to 0.05 | 0.55 to 0.81 | 1.7 to 3.2 |

| | PET | Aluminium | Glass | Total |
|---|---|---|---|---|

Notes:

1. Weighted average EPR fee based on rates paid to Petco [41], Polyco [42] and eWASA.[43]
2. Weighted average EPR fee based on rates paid to MetPac [44] [45] and eWASA [46] [47].
3. Weighted average EPR fee based on rates paid to The Glass Recycling Company [48] and eWASA [49].

As can be seen, except for aluminum (for which there is minimal change in EPR / producer fees), EPR / producer fees per container and per kg and total costs paid by producers will increase by more than an order of magnitude under a DRS.

Total costs (paid by all producers) could increase from current estimated costs of ZAR 0.14 – 0.22 billion per year, to ZAR 1.9 to 3.5 billion per year under a proposed DRS. However, a DRS would also deliver significant increases in collection rates and environmental performance compared to the current EPR performance. Higher performance to achieve collection targets will come at a higher cost under any system. The current EPR system is not yet achieving the collection targets set out in legislation and likely a much higher fee is required to achieve those targets (although the methods to do this under the current system are not clear).

## Waste Reclaimers

This study considered two possible methods of return by waste reclaimers: separate collections and sorted from refuse.

'Sorted from refuse' is effectively a continuation of current waste picking practices – the amount of material available will be much lower after implementation of a DRS compared to currently, but the earnings per container (the deposit + service fee if applicable) are much higher. Earnings per month could increase by up to 43% compared to current average earnings (up to 35% for reclaimers who do claim a 'collection service fee' under the current EPR system), but available jobs will decrease.

'Separate collections' is a potential new activity for waste reclaimers to engage with a DRS, buying containers from consumers, and selling them to D-BBCs.

- Potential earnings up to 38% higher than current average earnings are possible under a proposed DRS, and up to 29% higher for reclaimers who claim a 'collection service fee' for beverage containers under the current EPR system. Between 1.7 and 31.5 thousand new jobs with this level of income could be created.
- Uncertainty around the level of engagement (by waste reclaimers / consumers) in this novel approach to returning containers is reflected in the two scenarios considered in this study. This was conducted in response to concerns raised by waste reclaimers in workshops conducted during this study, over whether they would or could adapt to the proposed *separate collections* return methods (see Appendix A.2.0).

Waste reclaimers are a diverse community, and the implementation of such a system such as this is likely to present different benefits and risks for various parts of the community. For example, a key output from the waste reclaimer workshops conducted in this study was concerns cited over separate collections. This method requires interactions of reclaimers with householders / consumers, which is not currently

[41] Petco EPR fee PET beverage bottles (ZAR0.75/kg) as of October 2024. Available at: link
[42] Polyco EPR fee for PET (ZAR0.40/kg) as of October 2024. Available at: link
[43] eWASA EPR fee for PET (ZAR0.45/kg) as of October 2024. Available at: link
[44] MetPacSA EPR fee for aluminium cans sourced from local converters (ZAR0.13125/kg) as of October 2024. Available at: link
[45] MetPacSA EPR fee for imported filled aluminium cans (ZAR0.14625/kg) as of October 2024. Available at: link
[46] eWASA EPR fee for aluminium cans sourced from local converters (ZAR0.105/kg) as of October 2024. Available at: link
[47] eWASA EPR fee for imported filled aluminium cans (ZAR0.117/kg) as of October 2024. Available at: link
[48] The Glass Recycling Company EPR fee for all glass packaging (ZAR0.08664/kg) as of October 2024. Available at: link
[49] eWASA EPR fee for all glass packaging (ZAR0.08664/kg) as of October 2024. Available at: link

common practice in South Africa. There were also concerns related to security due to the relatively high value of a deposit and the cash required to make these payments.

While this study has designed a DRS to limit its negative impacts on waste reclaimers, and provide benefits and opportunities, there would be risks. These include availability of beverage containers to waste reclaimers from consumers and in refuse (depending on consumer behaviour), the extent to which waste reclaimers register with the DRS in order to receive the service fee, the speed of recovering and selling containers (i.e., visually checking for a DRS marking/logo to indicate the container carries a deposit and transaction process at the D-BBC), impacts on cashflow for waste reclaimers, and risks of theft of cash and/or containers. Examples of options to address risks include use of electronic payment systems to mitigate cash theft risks, and providing support to waste reclaimers to register with the DRS. However, it is uncertain whether such mitigating measures would be enacted or effective. If a DRS is implemented, the impacts on waste reclaimers would need to be monitored and mitigating measures would need to be implemented and also monitored. If a DRS is not carefully adopted with these issues in mind, this could cause problems (e.g., job losses, reduced income) for certain groups in the community.

### Retailers

Retailers acting as return points for the DRS will be compensated for their efforts with per container handling fees, which are commonly set based on negotiation between the System Operator and representatives from the retail sector. Suggested levels of handling fee paid to retailers, based on the analysis, are as follows:[50]

- Retailers with RVMs – ZAR 47 cents per container
- Retailers with manual return – ZAR 19 cents per container

Handling fees are higher for retailers with RVMs, as these retailers bear the significant cost of installing, maintaining, and providing floor space for RVMs. For both retailer types, the overall impact is expected to be cost-neutral.

### Municipalities & National Government

The DRS is not funded by either municipalities or national government. However, there are a range of potential benefits, including:

- Municipalities will see some cost reductions on their existing services, from reduced disposal costs, and potential savings in street cleaning and emptying street litter bins. However, as much of the existing collections are conducted by waste reclaimers, savings to municipalities are unlikely to be significant.
- Disposal cost savings from diverting beverage containers from landfill are estimated at ZAR 40 to 69 million per annum (ZAR 0.7 to 1.1 per capita). There may be additional cost savings associated with reduced collections and litter clearing, though these have not been quantified in this study (though avoided litter disamenity cost has been estimated).
- DRS will lead to lower carbon emissions and emissions of air pollutants. A system, once established, would results in reduced emissions of 119 to 294 thousand tonnes of $CO_2e$ per year, and total savings in environmental externalities of ZAR 0.5 to 1.2 billion.

[50] Average fees for all materials – suggested fees per container by material are as follows:
Retailers with RVMs: Plastic – ZAR 47 cents; Aluminium – ZAR 45 cents; Glass – ZAR 50 cents
Retails with manual return: Plastic – ZAR 26 cents; Aluminium – ZAR 14 cents; Glass – ZAR 25 cents

- A reduction in littering will benefit communities through an improved natural environment worth potentially ZAR 6.1 billion in reduced litter disamenity and reduce municipalities' costs associated with litter.

- The introduction of a DRS has been shown to increase residents' knowledge and awareness of how to dispose of waste more responsibly. A survey in Lithuania two years after the introduction of a DRS found that 85% of consumers admitted that the introduction of the DRS encouraged them to sort out all other types of waste more responsibly.[51]

- DRS will lead to an increase in formal employment and potential new roles for waste reclaimers.

The Market study (see Supplementary Report on Market Overview) did not find that municipalities were collecting any significant amounts of beverage containers for recycling but, this may be changing or have changed since the data was gathered. Anecdotally, there appears to be appears to be increasing amounts of municipal waste processed through Material Recovery Facilities (MRFs). These facilities can be operated by municipalities or by private entities via contracts with municipalities. In some cases, they may have roles for waste reclaimers.

Due to the lack of data this study did not consider the monetary impacts on existing MRF operations. However, depending on how a DRS was set up the impacts could be similar to those shown for the Waste Reclaimer "sorted from refuse" return channel. This means there would be substantially fewer beverage containers available. However, if the DRS allowed for deposit redemption and service fees for the beverage containers recovered by MRFs, the overall income could be slightly higher than without a DRS.

## Buy Back Centres

Costs (handling fees) paid to D-BBCs redeeming containers for the DRS are set at a level to cover the costs of handling and storing containers and some profit margins. It is recommended that these fees are set based on a negotiation process between the System Operator and representatives from D-BBCs. Suggested handling fees paid to D-BBCs, based on the analysis, are of the order of ZAR 7 cents per container.[52]

Time spent by D-BBCs managing returned containers (and associated jobs and revenue) could either increase or decrease compared to current levels in a proposed DRS - this is dependent on the level of returns via waste reclaimers.

BBCs currently accept used beverage containers and other materials to be transported to their site using various methods – such as on trolleys and in bags. Under a DRS, D-BBCs should continue to accept in-scope used beverage containers transported in by waste reclaimers using trolleys and bags, or other transportation methods. This would avoid restricting waste reclaimers' operations. Similarly, there should be flexibility over D-BBC operating hours and days. However, the extent to which specific aspects of D-BBCs operations should be made uniform, and where flexibility should be allowed, needs to be decided by government, considering legislation and best practice surrounding H&S, operating times, and other factors.

While this study has designed a DRS to limit its negative impacts on BBCs, and provide benefits and opportunities, there would be risks. These include availability of beverage containers and the extent to which BBCs register with the DRS in order to receive handling fees. If a DRS is implemented, the impacts

[51] Užstato Sistemos Administratorius (USAD) (2021). *Lithuania's Deposit System*. Available at: link

[52] Average fees for all materials – suggested fees per container by material are as follows: Plastic – ZAR 9 cents; Aluminium – ZAR 5 cents; Glass – ZAR 8 cents.

on BBCs and D-BBCs would need to be monitored and mitigating measures would need to be implemented and also monitored.

### Consumers

With a DRS, consumers will be paying for the refundable deposit that will be included in the price of each container. It is important to set the deposit level balancing between incentivising a high return rate versus creating consumer pushback and fraud.  It is essential to make it easy and convenient for consumers to return containers.

It should be noted that there is potential for a producer to decide to pass the cost of the producer fee (see Table  for an estimated producer fee per beverage container), in full or in part, onto the consumer by increasing the purchase price of a beverage. The extent to which a producer decides to pass the cost of the producer fee onto the consumer will vary between individual producers and the products they place on the market. This possibility exists with all forms of EPR fees.

Research on current return systems for reusables in South Africa demonstrates that some consumers (and waste reclaimers) receive less than the full value of the deposit when returning containers. Similar risks exist in a DRS for single use containers for redemptions at informal sector operators, that is, return to informal retailers or waste reclaimer returns. However, this risk seems relatively low, as consumers are likely to have other options to redeem containers for the full deposit at formal return points (retailers and depots). Any return points offering lower than the full deposit value would therefore be unattractive to consumers, unless perhaps they offer significantly more convenience.

### Producer Responsibility Organisations (EPR)

Depending on how government procures the System Operator, there is nothing that precludes existing PROs in South Africa's EPR from becoming the System Operator of a DRS. Indeed, they may be well placed to take on this this role. However, the System Operator would probably have new requirements in terms of governance and other obligations and so would not be simply an extension of existing activities under the PRO. One possibility in transitioning beverage containers from EPR to a DRS could be to allow EPR PROs to tender for the role of DRS System Operator, though this would need to be decided by government.

After implementation of a DRS, producers, instead of paying EPR fees to existing PROs for in-scope beverage containers, would pay producer fees to the DRS System Operator. Existing PROs would not receive EPR fees for in-scope DRS beverage containers under the existing EPR system and would not bear the costs of end-of-life management of such in-scope DRS beverage containers either. This should mitigate conflicts between the existing EPR and a DRS.

### Existing Deposit Return Systems for Reusable Containers

There would be no material impacts on existing return systems for reusable containers if a DRS for single-use beverage containers was implemented in South Africa. A DRS could be designed to integrate takeback of single-use and reusable containers, as seen in some European DRSs. The costs and benefits of such integration could be evaluated in future work (not assessed in this study).

# 5.0 Structuring a DRS for Success

This section is a summary of the key points highlighted in the Supplementary Report on Structuring a Deposit Return System for Success in South Africa.

The DRS explored in this study is 'mandatory' because it would require all beverage producers to be part of the system, cover the system costs, and collectively meet the obligations set for the system (e.g., collection rate targets). A mandatory DRS is a type of EPR and has many similar features to existing EPR systems. Specifically, a DRS would make obligated beverage producers responsible for paying the costs of the system to achieve targets set in legislation.

Existing DRSs around the world take various approaches to DRS design, including the roles of the System Operator and other actors in the system. This section provides a summary of recommendations for DRS design in South African context, based on best-practice globally.

## 5.1 System Governance and Structure

In terms of ownership of the system, the most effective DRSs in other jurisdictions are those run by the beverage industry (i.e., the obligated producers). By allowing industry to run and govern the system, obligated producers can run the system to minimise producer fees, whilst delivering on the requirements in law. It is likely that having a single System Operator in South Africa would reduce complexity and may be more efficient than dividing resources across multiple System Operators. A System Operator can operate as for-profit or non-profit entity. However, for South Africa, it is recommended that the System Operator would be non-profit. A non-profit offers greater transparency and accountability, as well as the ability to reinvest any surplus funds into further improving the system and other environmental initiatives.

There are various methods of forming a System Operator. The government could appoint a System Operator through a tender process, or it could be left to industry to form a System Operator and apply for approval / licensing from government. One option could be that EPR PROs could tender for the role of DRS System Operator, though this would need to be decided by government.

The role of government would be to set legislation requiring a mandatory DRS to be implemented. Government would need to produce some further legislation in addition to the existing EPR legislation to mandate a DRS for beverage containers. DRS legislation typically includes the following:

- Collection rate targets, recommended at 90%, to be achieved by a set date.
- A minimum deposit value per beverage container.
- The minimum scope of beverage containers in-scope of the DRS.
- A minimum coverage of return points.
- Any mandatory requirements for retailers to provide a take-back service.
- An obligation for return points to take back all used beverage containers and refund consumers their deposits.
- Administration of the system and reporting requirements.
- A requirement that the System Operator operates as a non-profit.
- Sanctions (including financial penalties) for failures and non-compliance by the System Operator and ultimately producers.

- Minimum communications spending by the System Operator.

Legislation could also include a variety of provisions to ensure integration and fair terms for waste reclaimers. These could include:

- Minimum service fees applicable across the country.
- Fair terms and conditions for accessing D-BBCs, redeeming deposits, and receiving service fees.
- Obligations on the System Operator to communicate, provide guidelines, and otherwise support waste reclaimers.

# 5.2 Structure and Obligations of System Operator

A System Operator would have a pivotal role in a DRS, including:

- Managing the system data, which includes commercially sensitive information.
- Managing the payment of deposits, paying handling fees to third-party return points, and paying service fees to waste reclaimers.
- Ensuring that return points comply with specified requirements.
- Receiving producer fees from producers.
- Organising and provision of the collection, transport, processing, and sale of the collected material from return points.
- Marketing the system.

# 5.3 Obligations of Producers

Producers would be responsible for the collection and further management of their beverage containers for recycling, likely nominating a System Operator to fulfil these obligations on their behalf. Producers would initiate the deposit when placing in-scope beverage containers on the market and would be responsible for charging the deposit in addition to the price of the beverage to their customers. Producers would also be responsible for paying producer fees to the System Operator. Producer fees for the DRS would replace existing EPR fees for the in-scope DRS beverage containers under the current EPR for packaging system.

Producers would also be required to ensure that their beverage containers were appropriately marked with relevant DRS information and artwork. Beverage containers should also have barcode verification to ensure effective reporting on beverage container sales and returns. The basic principle would be that no beverage container (specified in DRS legislation) could be placed on the South Africa market without a deposit.

The main roles of producers (including importers) would be to:

- Establish/join a System Operator.
- Set the System Operator's objectives and hold them to account.
- Appoint representatives to sit on the System Operator board.
- Finance the DRS infrastructure and fund its net annual operating costs through producer fees.

- Initiate the deposit and charge it to their customers (wholesalers, retailers etc.).
- Ensure container designs comply with the System Operator specifications and are registered with the System Operator.
- Mark their containers with the deposit logo and any agreed codes.
- Report to the System Operator monthly on sales numbers placed on the market.
- Report to the government annually on sales numbers placed on the market.

# 5.4 Return Channel Roles and Obligations

There should be a legal obligation on retailers to ensure they pay the deposit when purchasing in-scope beverage containers from their suppliers, and that they charge the deposit to their customers at the point of sale. Many retailers are also producers/importers of beverage containers, and so should be involved in taking back not only beverage containers that they produce, but also beverage containers from other producers. Legislation should mandate certain retailers (e.g., those over a certain size/floor area) to accept returns of used beverage containers from consumers. Below the threshold, retailers could choose to opt-in on a voluntary basis. Used beverage returned by consumers to retailer return points should not need to have been purchased from that retailer, as this would otherwise increase inconvenience and complexity for consumers. Retailer return points should be compensated for their time and resources for every used beverage container returned to them, in the form of handling fees. Handling fees should also encourage retailer support of the system.

Informal retailers should not be mandated to take back used beverage containers from consumers in a DRS in South Africa. They should, however, have the option to voluntarily opt-in to be return points, provided they meet certain criteria.

The main roles and responsibilities of retailers in a DRS would be to:

- Paying the deposit to their suppliers and charging the deposit to their customers (for in-scope beverage containers).
- Appointing representatives to sit on the System Operator board, where applicable.
- Retailers over a certain threshold providing collection infrastructure to take back used beverage containers from consumers.
- Refunding deposits in full to consumers for each returned used beverage container (through manual or automated (RVM) returns).
- Maintaining collection infrastructure to the standards set by the System Operator, including cleaning RVMs.
- Storing used beverage containers for collection by the System Operator.
- Advising customers where their nearest return point is if they are not return points.

Existing BBCs are recommended to be the main return points for waste reclaimer returns in a DRS in South Africa. Similar to retailers, D-BBCs would be paid a handling fee per used beverage container that they receive. The handling fee would reimburse the D-BBC for their time and resources associated with receiving and managing used beverage containers from waste reclaimers. While BBCs should be allowed to become a D-BBC on a voluntary basis (i.e., not mandated), handling fees for D-BBCs should be set at a rate whereby margins are favourable and are at least equal or greater than current profit margins for buying and selling used beverage containers currently. For most D-BBCs, used beverage container returns would operate alongside the existing trade in other non-beverage container materials. The used beverage container revenue model for BBCs for would therefore change from one which is based on material sales to a handling fee revenue model.

BBCs would need to register with the DRS to become a D-BBC and meet minimum criteria in terms of quality control, processes, and auditability in order to act as return points. Smaller BBCs that would not register, or were unable to do so, could still act as accumulation points for beverage containers, operating as part of the informal recycling economy.

Waste reclaimers would return containers to D-BBCs (and any other 'return depots' operated by the System Operator). The D-BBC would pay waste reclaimers the deposit value for the container, and registered waste reclaimers would also be paid a service fee. Registration of waste reclaimers would need to be carefully considered by the System Operator, and further work required to understand the most appropriate methods of registration. Service fees would ideally be paid to registered waste reclaimers directly by the System Operator via electronic transfer, after the D-BBC had logged the transaction. This could be a cash transaction, paid by D-BBCs to waste reclaimers on behalf of the System Operator (with the D-BBC reimbursed for this payment), but this would be prone to fraud risk. There would be potential to use smartphone apps and electronic transfer systems for these service fee payments. Apps could also be used to facilitate payments through the supply chain of deposits, such as D-BBCs paying waste reclaimers deposits and waste reclaimers paying consumers their deposits when undertaking 'separate collections'.

# 5.5 Fraud Management and Prevention

Generally, there are two types of fraud in a DRS: one on the supply-side, in which there is not enough money going into the system; and one on the returns-side, in which the system is paying out more money that it should. The broad types of fraud likely to be encountered in a DRS on the **supply-side**, and the range of measures which could reduce the risk of fraud, are as follows:

- **Producers/ importers failing to register with the System Operator**, either to use the absence of a deposit to gain a competitive advantage with customers, or to still charge the deposit to their customers (wholesalers/ retailers) while not paying producer. This could be mitigated via legal requirements, with penalties, for all producers/importers to ensure a deposit is applied to all their in-scope beverages, and for retailers to ensure a deposit is applied to all in-scope beverages. Other measures could include designing RVMs/counting machines to reject UBCs without a registered barcode, and industry / System Operator market surveillance.

- **Producers/ importers under-reporting sales** to not pay their fair share of producer fees or deposits, or to either use the absence of a deposit to gain a competitive advantage with customers, or to still charge the deposit to their customers (wholesalers/ retailers) while not paying producer fees. This could be mitigated via legal requirements, with penalties, for all producers/importers to ensure a deposit is applied to all their in-scope beverages, and for retailers to ensure a deposit is applied to all in-scope beverages. Other measures include: border checks (e.g., for containers without deposit logos or invoices with no mention of deposits); contractual agreements, with penalties, between the System Operator and producer, obligating them to accurately report sales; and, counting SKU sales and returns by unit, with the System Operator identifying unusually high collection rates.

- **Retailers buying/ importing un-registered beverages (for which the System Operator has not been paid producer fees or deposits)** to profit by either then applying the deposit to the beverages they sell and/or reducing the cost of their beverages to gain a competitive advantage. This could be mitigated via legal requirements, with penalties, for retailers to ensure a deposit is applied to all in-scope beverages, and via the contractual relationships between retailers and the System Operator under return-to-retail systems. Other measures include: border checks; barcodes for beverage containers that are unique to South Africa and its DRS so that RVMs/counting machines reject imported UBCs that are not part of the DRS; and, counting SKU sales and returns by unit, with the System Operator identifying unusually high collection rates.

The broad types of fraud likely to be encountered in a DRS on the **return-side**, and the range of measures which could reduce the risk of fraud, are as follows:

- **Consumers importing beverage containers from another country (where there is no deposit or a lower deposit)** to claim a refund on a deposit that was not paid. This can be mitigated via border checks, mandating barcodes for beverage containers that are unique to South Africa and its DRS so that RVMs/counting machines reject imported UBCs that are not part of the DRS, and counting SKU sales and returns by unit, with the System Operator identifying unusually high collection rates.

- **Consumers trying to return containers that are out of the scope of the system (such as a liquid paperboard beverage carton or a milk bottle)** to claim a refund on a deposit that was not paid. This could be mitigated via designing RVMs/counting machines to reject UBCs that do not have a registered barcode, raising awareness at manual return points about what containers are in scope, and by counting centres identifying out-of-scope manual returns and the responsible return points.

- **Returning a container more than once** to claim a deposit that has already been refunded. This could be mitigated via RVMs compacting the containers so they cannot be returned again (containers have to be intact with a readable barcode for a refund to be issued). RVMs could also be equipped with anti-fraud measures to disable paying before the UBC reaches the compactor. Containers can also be stored securely, with access for authorised personnel only.

- **Return points over-reporting returns** to claim additional deposit refunds and handling fees. This could be mitigated via System Operator issuing payments based on RVM data, basing manual return payments on counting centre data, and contractual arrangements between the System Operator and return points.

- **Counterfeit labels/stickers being attached to unregistered UBCs** to claim a refund on a deposit that was not paid. This could be mitigated via registering precise container specifications (weight, shape, colour) with RVMs / counting machines so that they can cross-reference these with registered barcodes. Other measures include counting SKU sales and returns by unit, with the System Operator identifying unusually high collection rates.

- **Returned UBCs being stolen**, to then be sold for the material value. This can be mitigated via storing UBCs securely in accordance with System Operator requirements, ensuring a secure chain of custody for sealed bags during transportation, random spot-checks on bags from RVMs, and undertaking manual checks / counts of containers at counting centres.

- **D-BBCs recording containers as returned by registered reclaimers where waste reclaimers are not in fact registered,** to profit from a service fee that is not then passed on to a reclaimer. This can be mitigated via requiring that waste reclaimers have to be registered and demonstrate their identity with a discrete account, and by having D-BBCs authorise service fee payments to registered waste reclaimers but then paying the money directly by electronic transaction to the registered waste reclaimer, not via the D-BBC.

One of the key decisions to be taken, in consultation with the beverage industry, would be the use of barcodes for beverage containers that are unique to South Africa and its DRS. Essentially, the combination of barcodes and other DRS markers would identify beverage containers that are in-scope for the DRS in South Africa and that are deposit bearing.

# 6.0 Key Findings

Based on the research and analysis undertaken, this study has found that:

- A DRS can be designed that would meet the needs of South Africa and would include PET and HDPE plastic beverage bottles, aluminium beverage cans and glass beverage bottles, all between 150ml and 3L, excluding dairy products.

- It is assumed that a DRS could feasibly achieve high collection rates of approximately 90% – higher than any of the existing EPR targets. A deposit rate of ZAR 1 is recommended, which may be adequate to achieve this target. If, after implementation, this target is not achieved, increasing the deposit level to ZAR 2 would most likely yield 90% or greater returns.

- There are significant environmental improvements resulting from a DRS, including:

    - An additional 305 to 477 thousand tonnes of waste would be recycled per year and less waste sent to landfill and littered.

    - A reduction in GHGs of between 119 and 294 thousand tonnes $CO_2e$ per year.

    - A reduction in environmental externalities (considering GHGs and localised air pollutants) of between ZAR 0.5 and 1.2 billion per year.

    - A reduction in litter disamenity (i.e., the extent to which citizens are negatively impacted by littering in in their local neighbourhood) of approximately ZAR 6.1 billion per year.

- The total cost of a DRS to beverage producers is calculated at ZAR 1.9 to 3.5 billion per year. This cost is dependent on several factors, captured in a range of scenarios and sensitivities that were conducted:

    - The main determinant of overall cost is the number of containers placed on the market in scope of a DRS, requiring a producer fee to be paid. There is uncertainty on this data, captured in this study in our low / high placed on market baselines. The low baseline is largely based on industry data, while the higher baseline reflects higher PoM estimates made by other stakeholders.

    - A Scenario (2) with more returns by consumers to depots comes at a lower cost than one with higher returns by waste reclaimers (Scenario 1). However, the latter scenario creates more jobs and overall income for waste reclaimers, and a greater increase in formal employment.

    - Transport costs are high in a South African DRS compared with other jurisdictions, reflecting the large distances in South Africa, and, for PET bottles, the high average volume of containers compared to in many other markets.

    - If the deposit level was increased to ZAR 2 per container, there would be a significant reduction in producer fees.

- These costs are higher than current EPR costs in South Africa, as shown in Figure 6-1 per container placed on the market (in a DRS this is known as the 'producer fee'). However, existing EPR costs reflect a much lower level of performance – any alternative system to DRS which improves collection rates will also incur a higher cost, even if this alternative could meet higher EPR targets.

- Producer fees for a South African DRS are comparable with the lower end of average fees for DRSs in Europe, as shown in Figure 6-2.

**Figure 6-1: EPR costs for Producers in South Africa, ZAR Cents Per Container**

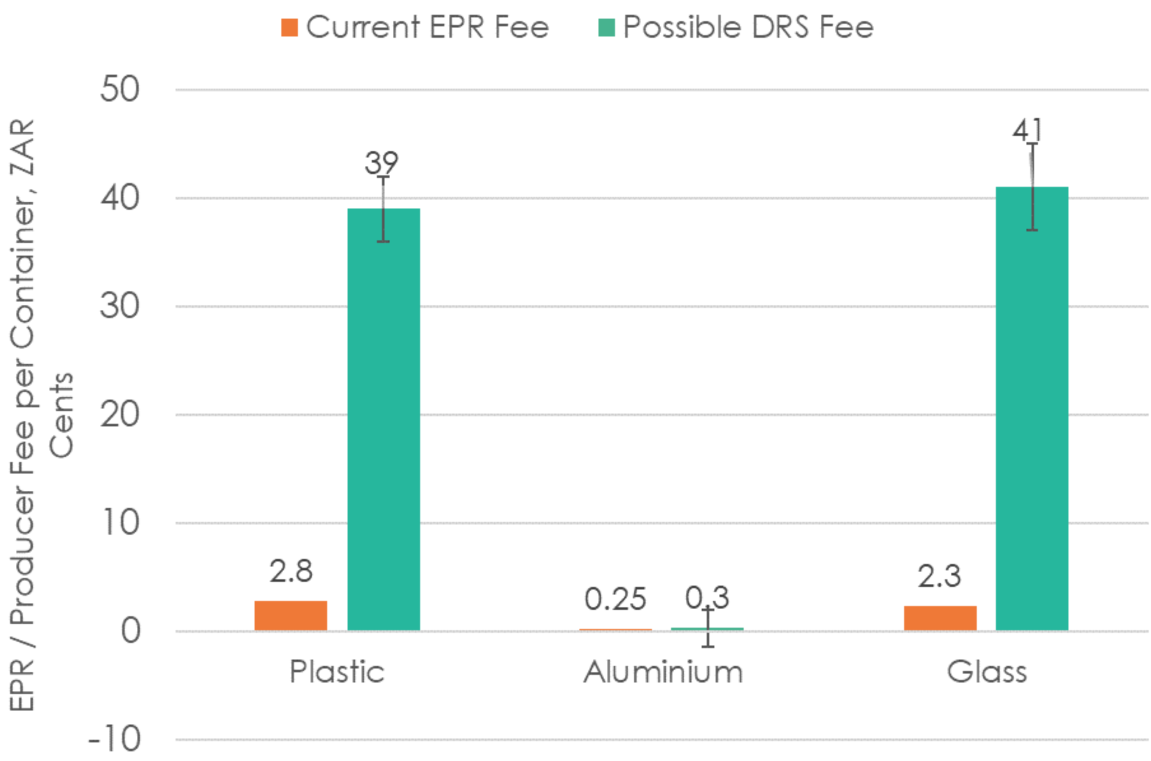
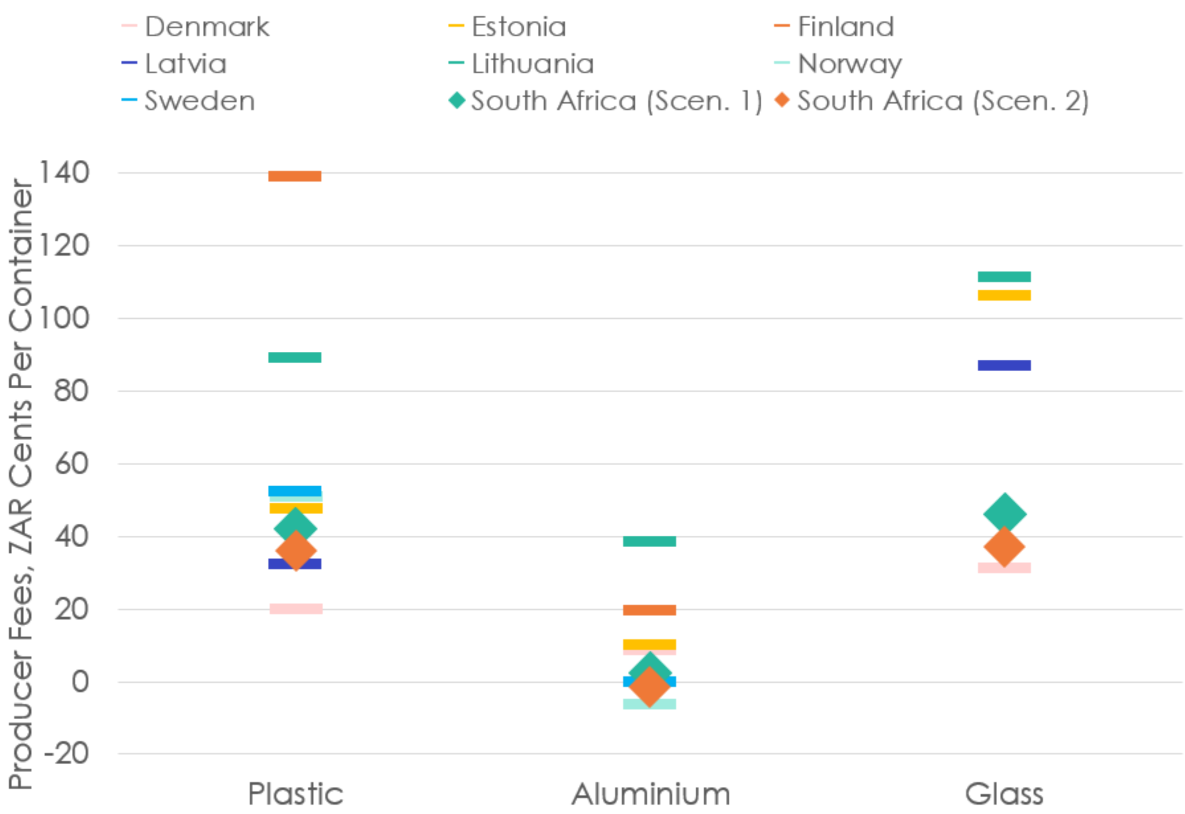



**Figure 6-2: Estimated Fees for South Africa DRS and Producer Fees for Existing European Systems, ZAR cents per container**



- The costs of a proposed DRS to producers are less than the monetised benefits of reductions in GHG emissions, improvements to local air quality, and reduced littering (in terms of 'litter disamenity) that would be gained if a DRS were implemented, even if litter disamenity was much less than estimated in this study.

- A DRS will result in an increase in formal employment, throughout the beverage supply chain, of between 4.6 and 8.7 thousand additional jobs. Any formal jobs created could be taken up by workers switching from informal to formal employment, although the extent of such a switch has not been estimated.

- The number of total waste reclaimer jobs could increase or decrease with a DRS (estimated from -3.6 to +31.1 thousand) depending on the quantity of returns waste reclaimers undertake.

    - New jobs (between 1.7 and 31.5 thousand) could be created for waste reclaimers 'separately collecting' DRS containers from consumers, with incomes of up to 38% higher than current average earnings.

    - The number of waste reclaimer jobs continuing current practices of sorting waste for refuse may decrease (by 0.4 to 5.3 thousand), although there is still potential for higher incomes under DRS for these reclaimers due to the high value of containers bearing unredeemed deposits sorted from refuse, relative to current material values.

    - A large amount of the work waste reclaimers would be undertaking in a DRS reflects a move away from working on landfills and dumpsites and from picking through refuse bins, to handling containers that have been source segregated, which could have health benefits for waste reclaimers.

- A DRS is not likely to be detrimental to waste reclaimer incomes and in our range of scenarios provides opportunity for better incomes through waste reclaimer integration.

- Retailers and buy back centres will play a key role in a South African DRS as return points for the system and will be paid handling fees by the DRS for this role.

The results of this study show that it is possible to design a bespoke DRS for single-use beverage packaging to meet the needs of South Africa to increase collection and recycling rates and reduce littering from single-use beverage containers. It has undertaken initial work to present the case for a South African DRS in terms of financial, environmental, and social impacts on employment and incomes.

Whilst this study has designed a DRS which aims to limit negative impacts on waste reclaimers and BBCs, and provide benefits and opportunities, there would be risks, many of which are identified in this report, and recommended principles to address these set out in the Supplementary Report on Structuring a Deposit Return System for Success in South Africa. Managing these risks and uncertainties will require further work. The next steps towards a South African DRS would need to take the form of practical and operational trials and further consultation with stakeholders (i.e., waste reclaimers, producers, BBCs, retailers and HORECA) to better understand the likely economic and environmental impacts of implementing a DRS and further refine the DRS design.

# Appendix

# A.1.0 DRS Modelling Technical Appendix

## A.1.1 Return Channel Return Distribution

Both Scenario 1 and Scenario 2 have been designed to provide adequate return point coverage. Scenario 1 assumes that there are 1.1 return points per 1,000 inhabitants, while Scenario 2 assumes that there are 1.5 return points per 1,000 inhabitants. However, it is important to note that on both scenarios include significant returns by waste reclaimers – a particularly convenient mode of return for consumers – not represented in the 'return point per inhabitant' figures. Return point coverage is considered adequate.

Assumptions for the proportion of used beverage containers (plastic, aluminium and glass) returned through each return channel for the two scenarios are presented in Table A - 1 and Table A - 2.Variation in assumptions for materials are a result of: (1) different sales routes (formal vs informal market) for alcoholic and non-alcoholic containers, and similarly (2) different estimates for on vs off-consumption. For example, all PET containers are non-alcoholic, which gave a higher % of sales on the formal market than alcoholic containers (which account for most glass containers). Therefore, a higher % of PET relative to glass, based on the logic for scenarios outlined in Section 3.2.2, is assumed to be returned to retail.

The % of returns stated as returned to HORECA are only those containers returned to HORECA whereby the DRS collects directly from that HORECA location. This is usually only the case for HORECA with large volumes of containers returned. Smaller HORECA will not have direct collections and need to return their containers via another return channel to redeem the deposit.

90% of containers returned to formal retail are assumed to be to retailers equipped with RVMS. This is a typical proportion seen in existing DRSs.

**Table A - 1: Distribution of Beverage Container Returns Between Return Locations – Scenario 1**

| Return Location | Type | Plastic (PET + HDPE) | Aluminium | Glass | Total |
|---|---|---|---|---|---|
| Return to Retail | Formal (RVMs) | 31% | 25% | 19% | 26% |
| | Formal (Manual) | 3% | 3% | 2% | 3% |
| | Informal (Manual) | 0% | 0% | 0% | 0% |
| Return to Depots | RVM | 0% | 0% | 0% | 0% |
| | Manual | 0% | 0% | 0% | 0% |
| Waste Reclaimer Returns | Separate Collections | 58% | 64% | 70% | 63% |
| | Sorted from Refuse | 5% | 5% | 6% | 5% |
| HORECA (direct collection) | | 3% | 3% | 3% | 3% |

### Table A - 2: Distribution of Beverage Container Returns Between Return Locations – Scenario 2

| Return Location | Type | Plastic (PET + HDPE) | Aluminium | Glass | Total |
|---|---|---|---|---|---|
| Return to Retail | Formal (RVMs) | 31% | 25% | 19% | 26% |
| | Formal (Manual) | 3% | 3% | 2% | 3% |
| | Informal (Manual) | 11% | 11% | 11% | 11% |
| Return to Depots | RVM | 22% | 24% | 27% | 24% |
| | Manual | 22% | 24% | 27% | 24% |
| Waste Reclaimer Returns | Separate Collections | 4% | 5% | 6% | 5% |
| | Sorted from Refuse | 4% | 5% | 6% | 5% |
| HORECA (direct collection) | | 3% | 3% | 3% | 3% |

# A.1.2 Return Channel Costs

Data and assumptions for the costs of returning containers through each of these return channels are provided in the sections below. All capital costs provided in this section are, within the model, annualised based on average lifetimes (e.g. 7 years for RVMs) and an interest rate of 14% based on average current commercial loan rates.[53]

## A.1.2.1 Retail Handling Fees (RVM)

The handling fee is calculated on the basis of an RVM handling an assumed 55,000 units per month, based on typical efficient RVM use in existing DRSs. Note this throughput is for the purpose of handling fee calculations – in reality, retailers will have variable throughputs, and many smaller retailers will have lower throughputs than this. Assumptions used for calculating RVM handling fee are summarised in Table A - 3.

[53] Based on '*South African Bank Interest Rates*' by the South African Reserve Bank (SARB); '*Commercial Lending in South Africa*' by the South African Institute of Chartered Accountants (SAICA)

### Table A - 3: RVM Handling Fee Assumptions

| Costs | Data | Assumptions |
|---|---|---|
| RVM Capital Costs | R 620,000 cost per RVM<br>R 80,000 installation and storeroom adaptations<br>R 85,000 compactor replacement after 4.5 years | Handling fee calculation based on the costs associated with a front/backroom RVM, as commonly used by larger retailers. |
| RVM Maintenance | R 50,000 service costs per year | Including any IT update costs |
| Time requirement per month per RVM (labour cost) | 24 hrs/month | Includes time spent handling receipts, emptying and cleaning RVMs and attending pickups. Based on 5 seconds receipt per 25 containers received, 20 minutes to clean RVMs daily, 12 minutes per bin empty and 16 minutes per collection. |
| Space Requirement per RVM | 25 $m^2$ | Includes all backroom space requirements, including a total of 5$m^2$ storage for containers, and queuing space for the front of the RVM. |

Table A - 4 summarises assumptions for calculating retail unit costs.

### Table A - 4: Retail Unit Costs

| Costs | Data | Source |
|---|---|---|
| Retailer Staff Annual Salary, R | R 96,000 | Based on estimates from data from various South African sources.[54] |
| Retail Space Cost, R/$m^2$/month | R 193 | Based on average prices of retail rental space across South African provinces, data obtained from Knight Frank South Africa. |

Costs are allocated by container based on the amount of resource taken up by each container type. Some costs are the same per-container cost for all container types; other costs are based on the volume that containers take up once compacted (e.g. bag handling, storage space). The portion of costs associated with compacted volumes are highest per container for glass, which is not compacted, and are lowest per container for aluminium, which compacts very effectively.

[54] Remweb, Bureau for Economic Research (BER) Salary Survey, South African Reserve Bank (SARB), SA Institute of Chartered Accountants (SAICA), payscale.com

### A.1.2.2 Retail Handling Fees (Manual)

For the purposes of the handling fee calculation, the values below are associated with a manual store profiled to take back 2,500 containers per month.

The number of manual stores and, consequently, the average take-back per store, depends on the requirements within the DRS, and the system operator should aim to set the requirement to provide an accessible and comprehensive coverage of return points, while preserving efficiency by exempting smaller stores with lower volumes of sales from the requirement to register as a take-back point. Small retailers can, nonetheless, act as non-official return points, providing consumers with the deposit or portion of the deposit, and reclaiming the deposit themselves by taking collected containers to a nearby RVM or depot.

Table A - 5 summarises assumptions for calculating manual handling fee.

**Table A - 5: Manual Handling Fee Assumptions**

| | Data | Assumptions |
|---|---|---|
| Time Requirement per Month (labour) per Store | 3 hrs | Includes handling containers and attending pickups. Based on 30 seconds per return of each 10 containers, and 7 minutes per pickup. |
| Space Requirement per Store | 1.6m$^2$ | Based on 1m$^2$ backroom storage and front counter space for temporary storage of small bags of beverage containers. |

Again, costs are allocated by container based on the amount of resource taken up by each container type: broadly, they split into costs that are similar per container across the different container types, and costs that are based on the volume of containers (which are lowest for aluminium).

### A.1.2.3 Waste Reclaimer Returns

Key assumptions for the two components of fees paid by the System Operator for this return channel – BBC handling fees and service fees for waste reclaimers, are detailed in this section.

#### A.1.2.3.1 Buy Back Centre Handling Fees

For purposes of handling fee calculation, it is assumed that a D-BBC handles 80,000 containers per month. Other assumptions for calculating handling fee for D-BBC are listed in Table A - 6. Monthly unit costs for a depot are summarised in Table A - 7.

**Table A - 6: D-BBC Handling Fee Assumptions**

| | Data | Assumptions |
|---|---|---|
| Time Requirement per Month (labour) per D-BBC | 83 hrs | Includes handling containers and attending pickups. Based on 5 minutes per return of an average of 100 containers, and approximately 1 hour per pickup. |

| | Data | Assumptions |
|---|---|---|
| Space Requirement per BBC | 40m² | Includes storage space and front counter space for handling beverage containers. |

### Table A - 7: D-BBC Unit Costs

| Costs | Data | Source |
|---|---|---|
| Retailer Staff Annual Salary, R | R 56,400 | Based on estimates from data from various South African sources.[55] |
| BBC Rental Cost, R/m²/month | R 64 | Based on average prices of industrial/warehouse rental spaces across South African cities, raw data collected from SA Home Traders website.[56] |

## A.1.2.3.2 Waste Reclaimers Service Fee

Assumptions for the rate of service fee are detailed in Section 4.3.2 of the report.

# A.1.2.4 Depots (RVMs)

Assumptions for the costs of depots equipped with RMs are provided in Table A - 8 and Table A - 9. As discussed in Section 3.2.3, under Scenario 2, it is assumed that half of containers returned to depots are returned to automated depots equipped with RVMs, and half to depots with manual return. A total of 78 automated depots (with RVMs) and 711 manual depots are assumed under Scenario 2 for a low PoM scenario, and 109 automated depots (with RVMs) and 1,023 manual depots for a high PoM scenario.

### Table A - 8: Capital Expenditure per Depot (RVMs)

| Capital Costs | Costs (ZAR Million) | Assumptions / Notes |
|---|---|---|
| Bulk RVMs | 5.8 | Purchase and installation cost for Bulk RVMs |
| Building costs | 1.2 | Costs of initial build of structure |
| Storage costs | 0.5 | Storage containers and loading equipment |

### Table A - 9: Operating Costs per Depot (RVMs) per Annum

| Operating Costs | Costs (ZAR Million) | Assumptions |
|---|---|---|
| Maintenance | 0.81 | Based on costs from existing depots in Europe and US |

55 Remweb, Bureau for Economic Research (BER) Salary Survey, South African Reserve Bank (SARB), SA Institute of Chartered Accountants (SAICA), payscale.com
56 SA Home Traders website. Available at link

| | | |
|---|---|---|
| Labour | 0.13 | 1 staff member at all opening hours (12 hrs per day, 6 days per week) |
| Electricity | 0.02 | Based on average energy prices across South African cities, data obtained from National Energy Regulator of South Africa (NERSA), Eskom, South African Cities Network (SACN). |
| Rent | 0.46 | Based on average prices of industrial/warehouse rental spaces across South African cities, raw data collected from SA Home Traders website.[57] |
| Overheads | 0.28 | 20% overheads, based on comparable centres. |

# A.1.2.5 Depots (Manual)

Assumptions for the costs of depots with manual return are provided in Table A - 10 and Table A - 11.

### Table A - 10: Capital Expenditure per Manual Depot (RVMs)

| Capital Costs | Costs (ZAR Million) | Assumptions |
|---|---|---|
| Infrastructure cost | 0.83 | Based on costs from similar centres in North America, adjusted for South Africa. |

### Table A - 11: Operating Costs of Manual Depot per Annum

| Operating Costs | Costs (ZAR Thousand) | Assumptions |
|---|---|---|
| Labour | 127 | Based on average wages of a manual operator in South Africa, raw data obtained from various South African sources.[58] |
| Electricity | 6 | Based on average energy prices across South African cities, raw data obtained from National Energy Regulator of South Africa (NERSA), Eskom, South African Cities Network (SACN). |
| Rent | 23 | Based on average prices of industrial/warehouse rental spaces across South African cities, raw data collected from SA Home Traders website.[59] |
| Overheads | 31 | 20% overheads, based on comparable centres |

[57] SA Home Traders website. Available at link
[58] Remweb, Bureau for Economic Research (BER) Salary Survey, South African Reserve Bank (SARB), SA Institute of Chartered Accountants (SAICA), payscale.com
[59] SA Home Traders website. Available at link

## A.1.3 Transport Costs

### A.1.3.1 Containment Costs

The costs of containment systems for beverage systems for transportation of beverage containers were also modelled. The assumptions are listed in Table A - 12.

**Table A - 12: Containment Cost Assumptions**

| Containment Type | Cost per item (R) | No. of uses | Cost per Use (R) | Notes on Assumptions |
|---|---|---|---|---|
| Large Bag | 5.5 | 1 | 5.5 | Used for plastic and aluminium (RVMs and manual) |
| Small Bag | 4.0 | 1 | 4.0 | Used for containing glass in manual stores at front counter. |
| Wheeled Bin | 286 | 52 per year | 1.8 | Used for all other glass containment. Annualised cost over 6 years with 2 in circulation for every 1 in use. |

The assumed number of used beverage containers per containment item is listed in Table A - 13.

**Table A - 13: Containment Capacities (Containers per Bag / Bin)**

| Containment Type | Compacting | Plastic | Metals | Glass |
|---|---|---|---|---|
| Large Bag (270L) | Compacted | 249 | 1000* | - |
| | Uncompacted | 102 | 292 | - |
| Small Bag (90L) | Uncompacted | - | - | 35* |
| 240l Wheeled Bin | Uncompacted | - | - | 217* |

Notes:
* Limited at this capacity due to weight constraints

### A.1.3.2 Transport Costs

This section sets out the transport assumptions for containers that are collected from retailers. The analysis estimated the costs of transport from return points to counting centres. Any transfer via intermediate transfer stations is accounted for in the distances calculated. A collection model was developed to estimate the number of vehicle days required per annum to collect the containers, and the cost of operation per vehicle. Table A - 14 lists the assumptions for estimating unit costs for transport.

### Table A - 14: Unit Costs for Transport

| | Costs | Source |
|---|---|---|
| Collection Driver Annual Salary, R | 228,000 | Average hourly wages for Code 10 and Code 14 truck drivers, based on data from various South African sources.[60] |
| Fuel cost, R / litre | R 22.1 | Average diesel price in South Africa from July 2023 - June 2024 based on monthly data from Automobile Association South Africa.[61] |

Table A - 15 lists the assumed bulk densities of containers.

### Table A - 15: Bulk Densities (kg/m³)

| Container type | Compacted | Uncompacted | Sources |
|---|---|---|---|
| Plastic | 36 | 15 | Data from RVM manufacturer adjusted for average containers weights / volumes PoM in South Africa |
| Metal | 80 | 20 | |
| Glass | 557 | 245 | |

# A.1.4 Counting Centres

Any containers redeemed via manual redemption will not have been accounted for within the system, i.e., the redemption barcode will not have been scanned, and therefore they must first be transported to a counting centre for this function, before being delivered to a re-processor. The number of counting centres required will depend on geographical factors and total container throughput. More centres will reduce the financial and environmental impacts of transportation but will also require more capital investment. Operational assumptions for counting centres are listed in Table A - 16.

### Table A - 16: Counting Centre Operational Assumptions

| | Value |
|---|---|
| Counting machine throughput capacity, containers per annum | 27 million for plastic and aluminium, 16 million for glass (assuming two shifts operated per day – 16 hours per day) |
| Downtime per day | 8 hrs |
| Number of days operating per annum | 364 |
| Number of counting centres assumed | 7 |
| Space required per Counting Machine | 100 $m^2$ |

[60] Remweb, Bureau for Economic Research (BER) Salary Survey, South African Reserve Bank (SARB), SA Institute of Chartered Accountants (SAICA), payscale.com

[61] Automobile Association South Africa, Available at link

The number of counting machines required (see Table A - 17) varies depending on the number of containers placed on the market and the proportion of those containers returned manually, and therefore requiring counting. This proportion is higher in Scenario 1.

### Table A - 17: Counting Centre Machine Requirements

| | **Low PoM Baseline** | | **High PoM Baseline** | |
|---|---|---|---|---|
| | Scenario 1 | Scenario 2 | Scenario 1 | Scenario 2 |
| Number of counting machines | 219 | 148 | 305 | 207 |

Cost assumptions for counting centres are shown in Table A - 18.

### Table A - 18: Counting Centre Cost Assumptions

| | **Value** | **Notes** |
|---|---|---|
| Counting machine capital cost | ZAR 4 million | Purchase and installation cost per counting machine |
| Additional cost per counting centre | ZAR 142 million | Additional capital cost per centre, covering infrastructure, fixed plant (sorting lines and equipment (NIR sorters for PET, glass bulking lines, baling) and vehicles |
| Overall operating cost of counting | ZAR 3.3 cents per container (aluminium and PET), ZAR 5.4 cents per container (glass) | Counting is required for manually returned (uncompacted) container only |
| Overall operating cost of sorting and bulking | ZAR 5.0 cents per container | Cost applied to all containers sent to counting centres |

## A.1.5 Administration costs

Most components of the system administration costs are fixed. These costs are assumed to be slightly higher where there are more containers in the system, requiring additional resources. Assumptions used for calculating system operator set-up and annual operation costs are summarised in Table A - 19 and Table A - 20 respectively.

### Table A - 19: System Operator Set-up Cost Assumptions

| **Set-up Cost** | **Capital Investment (ZAR Million)** | **Assumptions** |
|---|---|---|
| IT – Capital investment | 75.9 | Based on IT set up costs for comparable systems, adjusted for size of beverage container market in South Africa. |
| Office Equipment | 2.5 | |
| Project Management | 10.1 | |
| Communication | 50.6 | |
| **Total Capital Expenditure** | **139** | |

### Table A - 20: System Operator Operational Costs

| Operational Cost | Annual Cost (ZAR Million) | Assumptions |
|---|---|---|
| Staff Costs | 33.5 | Estimated staff budget for management, database, and customer service |
| Office Space | 7.7 | Based on 1069 $m^2$ office space requirement at central office rents |
| Administration costs | 17.7 | Administration, IT operational cost, legal, utilities, approximate budget based on other system data. |
| Communications | 22.0 | 1% of material revenues |
| **Total Operating Costs per Annum** | **80.9** | |

# A.1.6 Material Revenues

Material revenues for baled material sold by the System Operator to recyclers is shown in Table A - 21.

### Table A - 21: Material Revenues

| Material | Revenue, ZAR per kg | Source |
|---|---|---|
| Plastic bottles | 5.0 | High end of material prices for PET sourced from BBCs for price paid by recyclers.[1] |
| Aluminium cans | 19.0 | Average material prices paid for clean / good quality UBC based on information sourced from South African aluminium recyclers |
| Glass bottles | 0.45 | Glass price sourced from one recycler in South Africa |

Notes:

1. High-end of range of PET prices from Buy-back Centre Survey May 2024; UWC & team. Prices in South Africa for PET are low compared to typical global prices, which may reflect recycling into lower value fibre applications. Higher prices are likely for beverage containers from DRS which are higher quality, consistent supply of high volumes, and could further investment in bottle-to-bottle recycling.

# A.1.7 Environmental Impacts

Environmental impacts associated with the introduction of a DRS will occur from the following processes:

1. Recycling of additional beverage containers;
2. Reduction in disposal of beverage containers;
3. Additional collection and transportation of containers to recyclers; and
4. Reduction in impact to a person amenity associated with litter.

Each of these processes is described in further detail in the Sections below.

The two main elements considered for processes 1) to 3) are greenhouse gas (GHG) emissions and air quality impacts. The approach to valuing these two elements is set out in Section A.1.7.1 and Section

A.1.7.2. However, there is also an environmental impact to be considered. This is related to the disamenity impact associated with litter. There is a dearth of relevant studies allowing the valuation of this, but this seems too important to be assigned (implicitly) a zero value. The approach is set out in Section A.1.7.6.

## A.1.7.1 Greenhouse Gas Valuation

The monetary value placed on avoiding climate change, i.e. avoiding future emissions of greenhouse gases (GHG's) such as carbon dioxide ($CO_2$), is a key determinant of the environmental impacts of a DRS. These monetary costs are reflected in the "social cost of carbon (SCC)", which accounts for the total perceived costs to society of emitting one tonne of $CO_2$. In theory, a country's carbon price should be equal to the SCC, however, in practice, carbon prices are often set at a level deemed by policymakers as sufficient to meet emission reduction targets.[62]

In January 2024, the carbon tax rate in South Africa was ZAR 190 (€9.50) per $tCO_2e$. The carbon tax, first introduced in 2019, was originally ZAR 120 (€6) per $tCO_2e$. The rate increased by 2% plus Consumer Price Inflation (CPI) annually until 31st December 2022. Since, the rate has been subject to increases in line with CPI. [63] [64] The government of South Africa is proposing to further increase the carbon tax rate once the transition period ends in 2025. The 2022 Budget and the 2022 Draft Taxation Law Amendment Bill included plans to raise carbon tax rates per $tCO_2e$ to at least ZAR 370 (€18.50) by 2026, to ZAR 554 (€27.50) by 2030, and up to ZAR 2,215 (€111) beyond 2050. [65] [66] [67] The International Monetary Fund (IMF) projects that while a carbon tax rate of ZAR 554 (€27.50) by 2030 would contribute to reducing emissions in South Africa, the efforts would not be sufficient to meet the country's Nationally Determined Contribution (NDC) commitments. Instead, the IMF suggest that, based on internal modelling, a much higher rate of ZAR 2,215 (€111) per $tCO_2e$ by 2030 would be consistent with South Africa's NDC commitments.

South Africa's carbon price is seen as too low relative to the actual damage costs arising from climate change. Climate damage cost calculations involve the quantification of physical impacts, including but not limited to health impacts such as mortality or morbidity, losses of agricultural outputs, water supply impacts, etc. and their monetisation. [68] Deaths from extreme weather events are the largest impact, accounting for up to 63% of damage costs. [69] Currently, in South Africa, temperature-related mortality accounts for 3.4% of deaths, a figure that is expected to further increase as climate impacts worsen. In South Africa, warming as a result of climate change is projected to be double that of the global average, with temperatures rising over 4 degrees Celsius by 2100, thus further compounding temperature-related impacts. [70] Inequality is a key contributor to deaths from heat in South Africa – poorer segments of the population that live in government-built housing or informal settlements have poor insulation and are more exposed to the effects of extreme weather.

Further, climate change is expected to pose a threat to food and water security in South Africa. Rises in temperature, variation in seasonal rainfall, droughts and more intense heatwaves will make arable land less suitable for cultivating crops and increase uncertainty over water availability, which has consequences for food production. Following the 2015-2017 drought, reservoirs serving 3.7 million people

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[62] Climate Portal (2022) *Carbon pricing*. Available at link
[63] KPMG (2024) *Tax & Legal – News Alert: Carbon Tax*. Available at link
[64] ZAR to Euro conversion based on 2023 average exchange rate of 19.972 ZAR/Euro sourced from link
[65] US Dollar to Euro conversion based on 2023 average exchange rate of 0.9243 USD/EUR sourced from link
[66] US Dollar to ZAR conversion based on 2023 average exchange rate of 18.459 ZAR/USD sourced from link
[67] Q. Haonan (2023) *South African Carbon Pricing and Climate Mitigation Policy*, IMF Selected Issues Paper (SIP/2023/040), International Monetary Fund.
[68] Watkiss et al. (2005) *The Social Costs of Carbon (SCC) Review – Methodological Approaches for Using SCC Estimates in Policy Assessment*, Final Report for the Department of Environment, Food and rural Affairs. Available at link
[69] Newman, R., and Noy, I. (2023) *The global costs of extreme weather that are attributable to climate change*, Nature Communications. Available at link
[70] Chersich et al. (2018) *Impacts of Climate Change on Health and Wellbeing in South Africa*, *International Journal of Environmental Research and Public Health*. Available at link

around Cape Town dropped to 20% of capacity, leading the government to impose water restrictions. [71]

Climate change will also impact South Africa's economy. For example, rising temperatures pose a threat to habitats of South Africa's unique species, such as zebras, which are commonly found in the country's world-famous national parks. Kruger National Park, located in northeastern South Africa, is one of the largest game reserves in Africa, and contributes approximately ZAR 2.6 billion (€130 million) to South Africa's GDP annually and supports 10,000 jobs. By 2050, climate change is projected to drive tourist numbers to South Africa's national parks down by 4%, with Kruger National Park amongst those worst affected. [72]

Climate change impacts are further compounded by inequality, which in South Africa, is amongst the highest in the world. The poorest 20% of the population consume less than 3% of total expenditure, and the wealthiest 20% consume 65%. As temperatures rise, productivity and incomes are more likely to decline for poorer segments of the population than for richer segments, who have greater adaptive capacity, widening existing inequalities. [73] Further, given South Africa's income gap with the Global North, international inequalities are likely to worsen. Hotter and poorer countries are expected to have the largest increase in mortality associated with climate change. Richer countries that can successfully adapt to impacts, for example, by installing air-conditioning systems in houses, workplaces and education centres, can reduce some of the damage costs related to climate change. [74]

Given the severity of climate change impacts in South Africa, it is apparent that their carbon price significantly undervalues damages. Carbon prices in EU countries are significantly higher than in South Africa, with the European Union advising that climate change avoidance costs should start at €128 per $tCO_2$ in 2024 and be increased to €311 per $tCO_2$ in 2050, with a value of €170 per $tCO_2$ in 2030. [75] Damage costs are likely to be comparable, if not greater, in South Africa than in EU countries, hence, modelling for this study values environmental impacts based on the EU per-tonne emissions cost.

While the modelling conducted in this study is not for one particular year in the future – it is a snapshot of annual costs after the DRS has reached a 'steady state' following implementation – for the purposes of damage cost calculations, the modelling is assumed to be for the year 2030. This study therefore uses the EU value of €170 (ZAR 3,450) per $tCO_2e$ for damage cost modelling.

# A.1.7.2 Air Quality Valuation

The study considered the impacts on air quality that are expected to result from the treatment processes, including both direct and indirect impacts (the latter relating to avoided impacts associated with energy generation and the recycling of materials).

The approach is to apply external damage costs to emissions of a range of air pollutants, allowing for the quantification of impacts in monetary terms.

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[71] Johnston et al. (2024) *Climate Change Impacts in South Africa: What Climate Change Means for a Country and its People*, University of Cape Town. Available at link

[72] Dube, K., and Nhamo, G. (2020) *Evidence and impact of climate change on South African national parks. Potential implications for tourism in the Kruger National Park*, Environmental Development, Vol 33. Available at link

[73] Dasgupta et al. (2023) *Inequality and growth impacts of climate change – insights from South Africa*, Environmental Research Letters. Available at link

[74] R. Daniel Bresslet et al. (2021) *Estimates of country level temperature-related mortality damage functions*, Scientific Reports. Available at link

[75] Eunomia Research & Consulting et al., (2023) *Assessment of options for reinforcing the Packaging and Packaging Waste Directive's essential requirements and other measures to reduce the generation of packaging waste*, Publications Office of the European Union. Available at link

The analysis that follows is focussed upon emissions to air. While waste treatment processes may also in some cases affect soil and water quality, data regarding the precise nature of these impacts is less robust, and valuation data is scarcer still.

The approach to estimating damage costs is based on European data, as this provides the most complete set of data when modelling air quality. The damage costs used in this study are sourced from the European Reference Model on Municipal Waste Management, with the methodology based on previous work conducted by the EEA.[76,77]

The factors with the greatest influence on the rate of damage costs are average wage, population density and the specific geographical location e.g. if neighbouring countries are heavy polluters and thus have an impact on air quality. The damage costs have been based upon Bulgaria, as this country is most similar in terms of average wages and population density, which should make it a suitable proxy, see Table A - 22.

### Table A - 22: Air Damage Cost Assumptions

| Compound | Damage Cost, ZAR Thousand per Tonne |
|---|---|
| $PM_{2.5}$ | 233 |
| $SO_2$ | 138 |
| $NO_x$ | 23 |
| $NH_3$ | 184 |

## A.1.7.3 Recycling of Beverage Containers

GHG emissions factors for recyclables were taken from The Waste and Resources Assessment Tool for the Environment (WRATE), an environmental model which is used to assess the environmental impacts of waste management activities. Whereas a number of authors have considered the climate change benefits of recycling, much less data is publicly available regarding the air quality impacts of recycling. A cost benefit analysis of landfill bans undertaken by Eunomia provides some information on a limited number of pollutants taken from some of the studies included within its review.[78] Otherwise, however, the main source of information in this respect is life cycle databases such as Ecoinvent[79], although some trades associations have also created life cycle inventory datasets for certain of the commonly recycled materials.

GHG and air quality damage costs are calculated using the values discussed in the section above and shown in Table A - 23.

[76] Eunomia (2016) *Support to the Waste Targets Review*, Report for DH Environment, July 2016
[77] The methodology used is summarised in: European Environment Agency (2011) *Revealing the Costs of Air Pollution from Industrial Facilities in Europe*, EEA Technical Report No 15/2011, November 2011
[78] Eunomia (2010) *Landfill Bans Feasibility Research*, Final Report for WRAP, March 2010. Available at link
[79] Ecoinvent (2021) - https://ecoinvent.org/

### Table A - 23: Recycling Impacts for GHGs and Air Emissions

| Material | Tonnes of emissions per tonne of recycling[80] | | | | | |
|---|---|---|---|---|---|---|
| | $CO_2$ | PM2.5 | $SO_2$ | $NO_x$ | $NH_3$ | VOCs |
| Plastic Bottles | -1.15 | -1.08E-04 | 4.88E-06 | -2.27E-03 | 9.14E-06 | -3.51E-03 |
| Glass Bottles | -0.17 | -4.29E-05 | -2.77E-05 | -5.88E-04 | -1.50E-04 | -5.33E-05 |
| Metal Cans (Al) | -10.72 | -4.62E-03 | -7.35E-06 | -1.80E-02 | -1.45E-04 | -2.20E-03 |

*Source: WRATE2 / Prognos / Environmental Resources Management / Ecoinvent / IAA / Turner et Al*

# A.1.7.4 Disposal of Beverage Containers

Reductions in GHG emissions from reduced landfilling under a DRS are a very minor component of environmental benefits. Emissions reductions are limited to savings on process emissions on landfill sites, the materials included in this study (plastic, metal and glass) are all inert and do not release greenhouse gas emissions in landfill.[81] The landfill impacts for GHGs and air emissions can be found below in Table A - 24.

### Table A - 24: Landfill Impacts for GHGs and Air Emissions, per kg

| Material | Tonnes of emissions per tonne of landfill | | | | | |
|---|---|---|---|---|---|---|
| | $CO_2$ | PM2.5 | $SO_2$ | $NO_x$ | $NH_3$ | VOCs |
| Plastic Bottles | 0.004 | 3.73E-06 | 7.96E-06 | 1.74E-04 | 4.95E-10 | 4.30E-05 |
| Glass Bottles | 0.004 | 3.73E-06 | 7.96E-06 | 1.74E-04 | 4.95E-10 | 4.30E-05 |
| Metal Cans (Al) | 0.004 | 3.73E-06 | 7.96E-06 | 1.74E-04 | 4.95E-10 | 4.30E-05 |

# A.1.7.5 Collection of Beverage Containers

Beverage containers are collected and transported large distances to reach reprocessing facilities using trucks and other vehicles. These vehicles emit greenhouse gases, and several other compounds and particles, which damage the environment. It is important to include this impact to the cost benefit analysis.

Emissions were modelled for 12 tonne HGV and larger HGV (heavy goods vehicles). Combustion emissions were calculated in terms of carbon dioxide equivalents ($CO_2e$) and air quality. Emissions

[80] These emissions include transport, industrial processes required to recycle the material, energy used during the recycling process and avoided impacts through reduced use of raw materials.
[81] There are second order effects of plastic in landfill, from channelling which releases methane from the rotting organics, however, the extent of these emissions is not well constrained as they are dependent on overall waste composition and the structure of the landfill.

associated with diesel fuel were calculated based on EURO 6 standards, assuming new trucks purchased in South Africa will have a similar level of emissions performance.[82]

Emission factors (tonne-km) used in this study were estimated from real-world data based on a 2016 study[83] of Heavy-duty vehicles (>3tonnes) by ICCT. This study used real-world data on HGVs sourced from VTT Labs in Finland and German type-approval authority (KBA). Assumed emissions factor was the average of all tractor and rigid lorry configurations having a range of fuel consumptions. The average conformity factor (ratio of actual emissions to regulatory limit) was calculated from the same test to calculate average air particulate emissions due to combustion. This was estimated at 0.31.

As no air quality data was reported for the production of the diesel used in the trucks, further calculations were done for to calculate particulates released during combustion. This was done by applying the average conformity factor to the EURO6 limits[84] for diesel-only HGVs in steady-state testing. To calculate the emissions factor for well-to-tank diesel production, emissions factor of producing 1kg of 100% mineral-produced diesel fuel from BEIS 2023[85] data set was used. This value was found to be 0.21 kg $CO_2$e/km. This emissions factor was then converted to a per-litre basis and further into emissions per km value, based on average fuel consumption assumed in the 2016 ICCT study. The emissions factor for total well-to-wheel emissions from HGV was then obtained by adding the well-to-tank emissions factor of diesel average biofuel blend and the average emissions factor from the ICCT study. The well-to-wheel emissions factor was found to be 1.06 kg $CO_2$e/km, see Table A - 25.

**Table A - 25: Assumptions for Air Quality Calculations**

| | $NO_x$ | PM2.5 | CO | VOC | $NH_3$ |
|---|---|---|---|---|---|
| Euro VI Emissions Limits[1] | 0.46 g/km | 0.01 g/km | 3 g/kWh | 160 mg/kWh | 18 mg/kWh [2] |
| Air Quality values[3] (g/km) | 0.1435 | 0.0031 | 0.8580 | 0.0499 | 0.0055 |

Notes
1. Euro VI emissions limits retrieved from policy paper by Transport & Environment.[86]
2. Converted from ppm to mg/kWh using BREEAM technical manual. [87]
3. Calculated by multiplying Euro VI limits with average conformity factor of 0.31.

# A.1.7.6 Disamenity Impact of Litter

Litter, including the illegal dumping of waste, is a significant and growing concern in all nine provinces of South Africa. For example, in Cape Town's central business district, over 1,200 tonnes of litter and illegally dumped waste is removed and taken to landfill each year.[88] Komani, a city in Eastern Cape with a population of 70,000 people, has 120 illegal dumpsites. Of these dumpsites, nearly half are in green spaces and the rest in streets, empty residential areas, and surrounding public infrastructure. The primary reason for illegal dumping reported by residents of Komani was poor waste collection services – a public service which a third of South Africa's population do not receive. [89] Many municipalities struggle to perform their environmental management responsibilities, including the collection of waste, and

[82] International Council on Clean Transportation (2016) *A technical summary of Euro 6/VI vehicle emission standards*, Available at link
[83] International Council on Clean Transportation (2016) *NOx emissions from heavy-duty and light-duty diesel vehicles in the EU: Comparison of real-world performance and current type-approval requirements.* Available at: link
[84] Transport & Environment (2021) *Euro VI trucks still don't meet emission limits on the road.* Available at link
[85] BEIS (2023) *Conversion factors 2023: condensed set (for most users) – updated 28 June 2023*. Available at link
[86] Transport & Environment (2021) *Euro VI trucks still don't meet emission limits on the road.* Available at link
[87] BREEAM International New Construction (2021) *Pol 02 NOx emissions (Version 6)*. Available at link
[88] Good Things Guy (2023) *City to Tackle Growing Litter Problem with New Anti-Litter Campaign*. Available at link.
[89] N. Ngalo and G. Thondhlana (2023) *Illegal Solid-Waste Dumping in a Low-Income Neighbourhood in South Africa: Prevalence and Perceptions*. Available at link.

enforcement of by-laws to curb illegal dumping. [90] Moreover, litter frequently washes up on South African beaches, originating from the 90,000 to 250,000 tonnes of litter entering the oceans surrounding South Africa each year. [91]

A number of studies have sought to understand the damage costs of litter, of which there are three different types:

- Direct – e.g. the costs of collecting and managing;
- Indirect internalised – e.g. property values, mental health impacts, crime, harm to economically exploited wildlife/habitat
- Indirect externalised -e.g. visual disamenity and harm to non-economically exploited wildlife and habitat

Most studies valuing the costs of litter have focused on the 'welfare loss' - i.e. the extent to which citizens are negatively impacted – from the existence of littered items in their local neighbourhood. This welfare loss is often referred to as the 'disamenity impact' arising from litter – much of which is considered to be due to the 'visual disamenity impact' which is understandable given that litter can transform the look and feel of a place.[92] The studies have typically sought to place a monetary value on this disamenity impact through determining the amount that respondents would be willing to pay for a marginal improvement from the current situation, in terms of a proportional reduction in the levels of litter. The focus of these studies is therefore on indirect externalities, which are generally viewed as the largest cost component of littering.[93],[94] Depending on the design of survey questions and the knowledge of the sample population on littering, some 'willingness to pay' (WTP) methods may also integrate other types of costs into pricing e.g. indirect internalised costs such as the impacts of litter on property values, or costs to health services for mental health impacts.

There are a limited number of studies which have sought to directly value damage costs; however, these tend to focus on a more limited selection of costs compared to WTP studies (mostly indirect internalised). Hence, WTP is currently viewed as the preferred approach to litter cost valuation, as it encompasses the largest cost components (indirect externalised), and a limited selection of other costs. There are also other studies which, for example, add together damage cost estimates of indirect internalised costs, and WTP costs, however, there are concerns here about overlaps and double counting.[95]

The approach taken in this study draws on the findings of Wardman et al. (2011), considered to be the most relevant available study, which explored UK resident's WTP for a reduced level of neighbourhood litter.[96] It would be preferable to use WTP values relevant to the national context; however, there are no litter disamenity studies for South Africa. Therefore, the present study cautiously applied the Wardman values.

A difficulty with applying European figures in the South African context is the differences in incomes, which ultimately affect people's WTP. South Africa has a relatively small middle and upper class, with approximately a quarter of the population considered stably middle class or elite. The remaining three quarters are either poor or at risk of falling into poverty. [97] While individuals from middle- or upper-income

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[90] SABC News (2023) *Municipalities struggle to perform environmental management mandate*. Available at link.
[91] UNEP (2020) *South Africa aims to stop marine litter at its source*. Available at link.
[92] The association between a littered environment and perception of public safety / fear of crime is an example.
[93] Eunomia Research & Consulting. 'Exploring the Indirect Costs of Litter in Scotland'. Report for Zero Waste Scotland, 2013. Available at link.
[94] Eunomia Research & Consulting. 'Quantifying Direct Costs of Litter to Scottish Local Authorities and Other Duty Bodies'. Report for Zero Waste Scotland, 2013. Available at link.
[95] UNEP, Trucost, and The Plastic Disclosure Project. 'Valuing Plastic. The Business Case for Measuring, Managing and Disclosing Plastic Use in the Consumer Goods Industry', 2014. Available at link.
[96] Wardman, M., Bristow, A., Shires, J., Chintakayala, P., and Nellthorp, J., (2013) *Estimating the Value of a Range of Local Environmental Impacts*, Report for Dept. for Environment, Food and Rural Affairs, 1 April 2011. Available at link
[97] IBRD (2018) *Overcoming Poverty and Inequality in South Africa*. Available at link.

groups may be willing to pay for reductions in litter within their communities, this is less likely for individuals from lower socio-economic backgrounds. Moreover, the litter landscape varies between the two contexts. In European countries, street litter is the most common type of litter, whereas in South Africa, the litter problem is characterised by significant illegal dumping of waste and a lack of municipal collections. While litter is a larger issue in South Africa, suggesting higher litter disamenity, it is difficult to understand the full impact on WTP without country-specific values. For this reason, values from the Wardman study – adjusted for PPP – have been used as a conservative estimate of litter disamenity in South Africa.

A DRS is expected to reduce some litter issues, such as beverage containers being littered in the streets; however, it may not solve broader waste management problems such as illegal dumping. There is considerable uncertainty around the percentage of beverage containers in South Africa's 'litter'. This study has assumed that 40% of litter by volume is beverage containers and have assumed an 85% reduction in litter resulting from a DRS (common outcome in other systems).[98]

While it is possible to measure litter by weight, number of items, and volume, it is likely that visual disamenity impact is most closely related to the overall volume of litter, which depends both on the number and unit volume of littered items, rather than the weight, or only the number. While litter is composed of a number of different materials and items, of which single use plastics will comprise a proportion, no research has been found relating to how the impact varies by material and item type.

In the Wardman study, WTP was established for an improvement to 'best status' and also for a 'one-level' improvement (based on photographs illustrating different levels of littering. This research (and other studies on the topic) were reviewed by Eunomia in a report for Zero Waste Scotland in 2013, with the findings used to determine a national WTP for a less-littered environment.[99]WTP was, as would be expected, higher for a move to 'best status' than for a 'one-level' improvement. The unweighted average WTP per respondent for a 'one-level' improvement was £11.30 per month in 2011, and for a move to 'best status' was £14.18 per month.

To apply these valuations conservatively the following considerations have been made:

- Use the WTP for a 'one-level' improvement of £11.30 per month to account for total litter disamenity;
- Do not inflate to 2020 values; and
- Apply the monthly WTP figures, adjusted to South Africa on a PPP-adjusted per capita GDP basis.

Ideally, detailed analyses of litter composition and prevalence would have been used in scaling the disamenity values. However, there are very few composition analyses and those available are not readily comparable. Accordingly, it is appropriate to simply scale by PPP-adjusted (Purchasing Power Parity) GDP, noting that the figure may lead to a slight overestimate in some less-littered locations, and an under-estimate in other more-heavily littered locations. After determining the total litter disamenity, a baseline litter disamenity specific to beverage containers was calculated.

It is important to note that the calculated disamenity impacts relate only to neighbourhood disamenity, and do not cover the impact of litter that might be found on journeys to areas beyond one's neighbourhood, such as on walking excursions for example. Therefore, these estimates do not provide a complete picture of the total land-based disamenity impact associated with littered items. Indeed, in terms of neighbourhood litter, citizens may to an extent start to see this as somehow 'normal' (while still having a strong preference for it not to be there). However, for litter encountered on a walking trip in a beautiful area, for example, the sense of upset, and indeed potentially anger, which might be

[98] Eunomia (2017) *Impacts of a Deposit Refund System for One-way Beverage Packaging on Local Authority Waste Services,* report for Keep Britain Tidy, Campaign to Protect Rural England (CPRE), Surfers Against Sewage, the Marine Conservation Society, Reloop, Melissa and Stephen Murdoch.
[99] Eunomia (2013) *Exploring the Indirect Costs of Litter in Scotland*, Report to Zero Waste Scotland. Available at link

experienced when littered items are encountered, might be proportionally higher than when it is seen in a day-to-day context.

Proportional reductions in disamenity impact were calculated linearly based on anticipated reductions in volume. In respect of land-based litter, to assume a linear reduction (given the argument of diminishing returns) could well be to underestimate the benefit of such reductions. However, this approach was adopted in order to derive a conservative estimate.

Note that the methodology used for calculation of litter disamenity is still relatively new, with a significant uncertainty.

# A.1.8 Social Impacts

## A.1.8.1 Formal Jobs

The potential employment impacts associated with the introduction of a DRS were also calculated as part of the overall benefit analysis. The impacts on employment in the existing (non-DRS) waste management system were calculated using the best estimates of the number of jobs required per tonne of waste throughput.[100] These were derived from a recent review of studies on employment in the waste management sector. This included jobs relating to reprocessing of materials at reprocessor plants, and disposal and recovery of residual waste at landfills and incinerations plants. The employment assumptions used are shown in Table A - 26.

**Table A - 26: Employment Assumptions for Non-DRS Waste Management in South Africa**

| Employment Type | Average Jobs per 1000 tonnes annual throughput |
|---|---|
| Reprocessors | 10.3 (plastic), 11 (aluminium), 2.9 (glass) |
| Landfill | 0.1 |
| Incineration | 0.1 |

For the DRS system, employment impacts are taken directly from the DRS model which calculates the number of staff required for each part of the DRS system. This includes the staff used in collections of DRS material and further haulage as well as any additional retailer jobs required to receive containers brought for redemption (for manually returned containers only) and assisting with collections of DRS material from the retailer. Jobs for transport logistics and buy back centres consider the marginal change in jobs relative to current estimated jobs after implementation of a DRS.

While some jobs, such as those related to system administration, are full-time roles directly supported by the DRS, others, such as those within retailers, may only have a portion of their time associated with supporting the system. Therefore, the hours spent by individuals engaging with the system were used to calculate the number of full-time equivalent (FTE) jobs.

Jobs involved in the transport of DRS containers to redemption points are calculated based on the total distances travelled to collect and transport containers, and the number of vehicles required to fulfil the distances. It is assumed that one job is required per vehicle.

[100] The studies reviewed are summarised in: Eunomia (2016) *A Resourceful Future – Expanding the UK Economy: Technical Appendix*, Report for SUEZ Recycling and Recovery UK, September 2016

# A.1.8.2 Waste Reclaimer Jobs and Income

The methodology for estimating the number of waste reclaimers jobs and income is described here, along with a discussion of key uncertainties due to data limitations.

The starting point of the analysis was to consider the typical earnings of waste pickers. As set out in the Supplementary Report on Literature Review, estimates of the average monthly income of waste reclaimer in South Africa vary significantly, from ~ 0.5 to 3.8 ZAR thousand per month. A value approximately equivalent to the mean from the studies noted in the Supplementary Report was assumed, i.e. earnings of 1.9 ZAR thousand per month. This choice of assumption is a source of uncertainty, as the true average earnings of waste reclaimers in South Africa is not clear, given the difficulties noted in various studies (e.g. the heterogenous nature of waste pickers, lack of certainty by waste pickers of exact earnings per unit of time, biases introduced by choice of survey questions etc).

Data on the average composition of material (beverage and non-beverage) collected by waste pickers and prices paid by BBCs was supplied by the African Reclaimers Organisation (ARO), this was compared to average earnings data to estimate the typical tonnage of material collected by a waste reclaimer per year. These estimates were then compared to data on the total tonnage of beverage containers collected by waste reclaimers per annum in South Africa to calculate the number of waste reclaimers in South Africa in the baseline, estimated at ~ 44 thousand.

This estimate is for the collection of all waste streams currently targeted by waste reclaimers (beverage and non-beverage). This figure – 44 thousand - is lower than estimates of numbers of waste pickers in the literature (60 to 90 thousand, see Section 4.6.1). However, is it is calculated based on the average number of hours worked by waste pickers.

The working hours of waste pickers are not well understood; if there were significant numbers of waste pickers working lower than average hours (i.e. the median hours worked are lower than the mean), then this could account for this discrepancy. Another potential reason for this discrepancy is that the number of jobs included in the literature could include informal workers collecting waste streams outside the scope of this analysis, and/or other types of informal waste worker e.g. bakkies (middlemen). Furthermore, there are uncertainties associated with all input data – including average prices paid by BBCs (which fluctuate daily, and vary across South Africa), and the total tonnage of material currently collected by waste reclaimers in South Africa.

After this baseline of job numbers and income was established, the potential change in jobs and income under a DRS was modelled. It cannot be determined at this stage, under a proposed DRS, what ways of working waste reclaimers would undertake. For example, would they continue to target both beverage and non-beverage waste streams, and would they sort waste from refuse, undertake *separate collections* of beverage containers, or both. Furthermore, the potential productivity (i.e. the number of containers collected per unit of time) of waste reclaimers collecting DRS containers, relative to current estimated productivity levels, is uncertain, as describe below.

For the purposes of this analysis, the study assumed, as discussed in Section 4.6.2, that in future waste reclaimers would take on one of the following roles:

1) Undertaking 'sorted from refuse' activities, that is, continuing to pick for both non-beverage material (for the material value) and deposit-bearing beverage containers (to return for the deposit, and service fee if registered); and

2) ‘Separate collections’ of beverage containers (direct from consumers, HORECA etc), thereby focusing on DRS material only.[101]

These are differentiated based on the type of collection activity i.e. the first group pick containers from refuse, the second purchase containers directly from consumers, businesses etc, and earn a service fee from the DRS for this service. These roles are quite distinct, and it seems reasonable to assume that waste reclaimers will, on the whole, choose to focus on only one of them.

Productivity assumptions were assigned to each of these roles, as follows:

1) **Sorted from refuse** – for beverage material, it is assumed that waste reclaimer productivity will reduce in proportion to the availability of DRS containers in bins. It is reasoned that, while there may be savings in sorting and transportation time with fewer containers, these may be offset by the increase difficulty of collecting containers from bins when there are very few containers available. Under both scenarios modelled, only 5% of containers placed on the market are returned via the sorted from refuse route, compared to estimates of 30-40% (high/low baseline) of containers collected by the informal sector from refuse currently. Therefore, productivity is assumed to be 7x lower than current levels i.e. 7x less containers (by number) are collected per unit time.

**2) Separate collections** – It is not clear, for waste pickers undertaking *separate collection* activities, exactly how would this function in practice (door to door, from businesses such as HORECA, at key ‘on the go’ locations such as taxi ranks?). Future productivity is therefore very uncertain, and while this collection route is potentially quicker at collecting containers than sorting from refuse, there are various factors, for example, the levels of competition amongst waste pickers driven by a particular level of service fee, which could mean this is not the case. The study has therefore assumed no change in productivity compared to current levels.

Based on these assumptions, the change in jobs and income per waste reclaimer, were then calculated, based on the modelled number of containers collected by waste reclaimers under each scenario. The results of this analysis, as presented in Section 4.6 are extremely sensitivity to productivity assumptions. Using higher productivity assumptions will calculate higher incomes per waste picker (due to more material collected), and a lower total number of jobs, and vice versa for low productivity

We suggest that improvements on this methodology would require a better understanding of how waste reclaimers would respond to a DRS – what ways of working they would adopt, and the level of productivity. This could be done by trials prior to implementation of a proposed DRS and/or evaluations following implementation.

[101] In practice waste reclaimers may choose to mix these activities - they are differentiated for the purposes of showing income by activity for modelling.

# A.2.0 Waste Reclaimer Workshop Feedback

Workshops were carried out in Johannesburg, Bloemfontein, and Cape Town in February 2024. These workshops were for waste reclaimers to provide feedback on the proposed initial DRS design for South Africa. Commonly raised points and concerns regarding the proposed DRS design raised by the waste reclaimers at these workshops were:

- Overall in favour of a fixed deposit value per container, which would be above the market value of the material at a BBC.

- Overall in favour of requiring waste reclaimers to be registered in order to benefit from the DRS. However, there would need to be other benefits associated with being registered – such as recognition and protection from injury.

- Concern over reduced availability of containers, as consumers would likely want to get their deposits back themselves from nearby return points. Although the proposed deposit value of an in-scope beverage container would be higher than its current market value at a BBC, there was concern that the availability of containers would be too low to make a living.

- Concern that a DRS would take away the livelihoods of waste reclaimers, especially if it was implemented without factoring in waste reclaimers.

- Concern of not being able to redeem deposits from collected/purchased containers. This could be if the DRS labels and/or barcodes were damaged or removed. There was also concern over possible fraudulent containers given or sold to waste reclaimers which would not have a deposit to redeem. Waste reclaimers wanted a way of knowing which containers have redeemable deposits on them, possibly by using a smartphone app.

- Concern that some BBCs would not participate or not fully cooperate with a DRS if they were not consulted with as part of the DRS design.

- Concern that BBCs might only pay waste reclaimers a partial deposit. Currently, under the voluntary DRS for reusable bottles, some retailers do not give waste reclaimers the full deposit value for the bottles, so there was concern the same might happen with BBCs under a mandatory DRS for single-use containers.

- Concern that BBCs might pay someone else to collect recyclables instead of paying Service Fees to waste reclaimers, creating competition with waste reclaimers.

- Concern that householders and businesses would not understand the DRS or be aware of the services offered by waste reclaimers, limiting the number of in-scope containers being collected and returned by waste reclaimers. Similarity, households do not tend to have separate bins for sorting waste by material type, so there might be reluctance to sort their containers for waste reclaimers.

- Uncertainty surrounding the separate collections process, including interactions needed with residents, a change of role from picking containers to buying and selling materials, payment methods for buying containers from residents, cashflow constraints when buying containers from residents, and security/theft concerns if carrying larger sums of cash for buying and selling containers.

- Questions regarding payment methods. While payment could be made using a smartphone app or "Unstructured Supplementary Service Data" (USSD) for cell phones, BBCs and waste reclaimers have limited access to smartphones and cell phones, especially waste reclaimers due to risk of theft, loss, or damage when working. Previous examples of using apps and USSD highlighted that they were complicated or had transactional fees. The alternative, carrying sufficient cash to pay consumers the deposit for beverage containers, could place waste reclaimers at a risk of theft.

# A.3.0 Questions and Concerns Raised at WWF Workshop in 2022

The following findings, questions, and concerns were raised by stakeholders at the WWF workshop in August 2022 – note that wording has been taken directly from the report:[102]

- EPR has only recently become mandatory. Should mandatory DRS be introduced now?
- How would a DRS work in the South African context? How will they complement the EPR systems?
- What are the benefits of DRS versus EPR in terms of the integration of waste reclaimers?
- How would DRS be integrated into the current legislative framework, especially in relation to EPR?
- How will the integration of the DRSs and EPR systems be conducted to address fair payment for the collection of materials?
- Who will be involved throughout the value chain?
- What will be the scope of DRS?
- Where would the collection points be situated?
- Implementation in rural areas?
- The EPR regulations have targets for collection and recycling. If DRS become mandatory, would there be a separate collection and recycling target for DRS and for EPR, or would it be better to combine them?
- What would the potential impacts of DRS be across the whole value chain (producers, consumers, waste reclaimers, etc.)?
- Will there be a clear outline of the roles and responsibilities of stakeholders and how DRS would work with EPR, municipal waste management, retailers, producers and waste reclaimers?
- If a DRS is in place, where would the data on collection and recycling units/tonnages be accessed per packaging format?
- Would the current packaging need to be changed for a mandatory DRS system?
- Is there enough waste to implement a mandatory DRS?
- What does the beverage packaging universe look like today? Reuse versus single use? By material type? What are the real collection, recycling and recycled content rates?
- Should DRSs be linked with a changed ownership model – with containers/packaging remaining the property of the brand owner?
- Should a “low tech, high labour” approach drive the design and implementation of DRSs in South Africa, i.e. build it very strongly around the integration of the informal sector?
- Could DRSs be extended to explore collection for reuse before collection for recycling?
- Would the DRS system have to link closely with buy-back centres as this is where much of this material currently goes? It would require integration there as well, to ensure that they are not negatively affected.
- How will DRSs benefit the informal sector (added value)? How would they be implemented without marginalising waste reclaimers, further impoverishing poor households, concentrating power in PROs and DRS operators and impacting negatively on the income of thousands of families?
- How will DRSs improve the working conditions of waste reclaimers? How will they improve the profitability of their work?

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[102] De Kock, L. (2022). Feasibility of a Mandatory Deposit Return Scheme for Beverage Container Packaging in South Africa: Workshop Report. WWF South Africa, Cape Town, South Africa. No Weblink Identified.

- How will DRSs support small, medium and micro-enterprises (SMMEs) (support container rental, for example)?
- If we must reskill waste reclaimers, what new skills will they need to acquire (to be empowered) to ensure meaningful participation in a reimagined DRS system?
- What is the job creation potential along the value chain from DRSs?
- What are the elements and strengths of reclaimers today on which a DRS could leverage?
- How do we ensure that waste reclaimers play a role in the co-creation of this DRS system?
- Participation in DRSs would incur costs, as is the case with the EPR levy, per tonne or per unit. So would the results obtained (collection, clean material, less leakage, effective recycling) from these DRS costs justify the cost of a DRS?
- What is the actual current recycling rate for PET bottles in South Africa without a DRS? What could it be with a DRS?
- What is the business case for DRSs? Do the economics work? And does the business case development include the informal sector?
- What would the management costs for the development and implementation of DRSs in South Africa be?
- At what level will the deposit be pegged? It must be high enough to encourage a change in behaviour, but not so high that it stops people from buying ready-made beverages. How would this be decided? What would the mechanism be to calculate the DRS for individual packing substrates (plastic, paper (liquid paper board), metal, glass)?
- What is the possibility of EPR fees funding DRS equipment (vending machines)?
- Will DRSs increase the cost of doing business for companies, especially due to the need to design packaging that is recycled at scale in South Africa?
- What is a viable business model as part of waste collection?
- What would the total cost per kilogram or tonne of a DRS system be to producers in South Africa?
- We must assess the relationship between a mandatory DRS and national and local policy, legislation and the regulatory framework, and with a socio-economic lens.
- How do you ensure that the regulatory framework for a mandatory DRS would enable agility?
- What will the legal implications be?
- How will DRSs be regulated?
- How would DRSs be integrated into the current legislative framework, especially in relation to EPR?
- What is the collective shared vision for the success of DRSs, and for the packaging value chain and waste management system that should guide the design and implementation of DRSs and EPR?
- How will DRSs be developed? They should be inclusive through co-creation and co-implementation. By whom, for whom?
- How do we come up with a better methodology for designing DRSs that are inclusive for the entire value chain, especially waste reclaimers? How will the stakeholder engagement process work for the design and implementation of DRSs?
- How do we encourage greater participation of the informal sector?
- How do we secure support from the industry?
- Who will raise awareness about DRSs?
- How are we going to educate consumers and create consumer awareness about DRSs?
- How will DRSs influence brand owners to participate in the design and implementation of a DRS system?
- How will adequate government oversight be secured?
- How will compliance and fraud be managed?
- Would the costs to participate in the DRS system be kept in the private sector or will there be a tax going to the public fiscus?

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