Norway

Scoping Study for a Nationwide Deposit Return System (DRS) in Vietnam

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Norwegian Embassy in Hanoi represents Norway in Vietnam and Laos PDR. The Embassy is located on the 8th floor, Hanoi Towers, 49 Hai Ba Trung, Hoan Kiem, Hanoi.

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The assessment in this study is based on data, research, and insights from various sources, including public information and data provided through engagement with various stakeholders. This study aims to provide useful information, insights, and guidance in an easy-to-digest and readable format for the development of a Deposit Return System in Vietnam.

This document is for informational purposes only and should not be used for commercial purposes. We would like to express our gratitude to all the support of stakeholders who spent valuable time providing us with information and data to complete this study.

This study was commissioned and supervised by the Norwegian Embassy in Hanoi and Innovation Norway Vietnam.

The study was conducted by **Eunomia Environmental Research & Consulting Ltd**, a global sustainability consultancy. Founded in 2001, Eunomia provides evidence-based policy and strategy services across the circular, low carbon, and natural economy sectors. Known for pragmatic, science-based solutions, the company supports governments, NGOs, and businesses worldwide in addressing climate, biodiversity, and pollution challenges. More: https://eunomia.eco/

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Glossary

Term	Definition/Description
Automated Return	The process of a return location receiving, scanning, refunding consumers, and storing returned used beverage containers using a Reverse Vending Machine. This is opposed to "Manual Return".
Barcode	Barcodes are the identifier for a product line (including beverage containers). They are the same barcodes scanned by retailers at the checkout to register the sale of the beverage container. In a DRS, barcodes are used in recording the number of beverage containers sold and in recording the used beverage containers returned. This information is used by the System Operator for monitoring performance of the DRS.
Central case	A term used when discussing assumptions used for modelling. Where assumptions have a range of possible values, the assumptions used for modelling are based on midpoint values — positioned between the minimum and maximum potential outcomes.
Closed-Loop Recycling	Also referred to as “container-to-container” recycling. The process of using recycled material to create products for the same purpose as the original material was used for. In this study, used PET beverage bottles and used aluminium cans being recycled back into new PET beverage bottles and aluminium cans, respectively, would be closed-loop recycling. This is opposed to “Downcycling”.
Collection Fee	A fee paid to waste reclaimers who are registered with the System Operator of the proposed DRS. The Collection Fee is funded by the DRS on a per container basis (not by weight). The Collection Fee is in addition to the refunded deposit. The Collection Fee is an important element, since waste reclaimers may refund consumers the full deposit value in order to receive a used beverage container from a consumer. The Collection Fee is therefore the minimum net income per used beverage container for registered waste reclaimers. The Collection Fee could be paid electronically to waste reclaimers directly by the DRS, or paid in cash by a junkshop, with the junkshop reimbursed by the DRS.
Collection Rate	This is calculated as the percentage of used beverage containers returned through the DRS compared with the total placed on the market.
Counting Centre	Facility to which all returned used beverage containers are transported for sorting and baling. Used beverage containers that have not been counted and compacted by reverse vending machines are first counted by industrial counting machines at the counting centres. These are usually run by the System Operator.

Term	Definition/Description
Craft Recycling Village	Recycling processes carried out by individuals in settlements, typically using unsophisticated methods of processing materials. Many craft recycling villages process PET bottles and aluminium cans, downcycling the materials into other products. Materials are usually purchased from junkshops or directly from waste reclaimers.
Deposit Return System (DRS)	A system in which a fully refundable deposit is applied to in-scope beverage containers. This incentivises consumers to return their used beverage container to a return location in order to redeem their deposit. The used beverage containers are then recycled.
Depot	Dedicated return locations for consumers to return their used beverage containers, typically using manual return methods. However, it may be that automated returns are used, if required. Depots may also be used for returning large volumes of used beverage containers. Depots could be located where there are clusters of retailers that are not able to be return locations (e.g., small or informal), but where there may be a need for consumers to return their used beverage containers.
Downcycling	The process of using recycled material to create products of lower quality or functionality than what the original material was used for. For example, using used PET beverage bottle material to produce furniture. This may be due to contamination of the recycled material, the use of ineffective recycling methods, or other reasons. This is opposed to "Closed-Loop Recycling".
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 they place on the market. For this study, reference is made to Vietnam's EPR for packaging legislation, which is featured in the Law on Environmental Protection 2020.
Formal Sector	Also referred to as the "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*".[1]
HORECA	Acronym for **Ho**tels, **Re**staurants and **Ca**fes/**Ca**tering. HORECA typically sell beverages to consumers in beverage containers that are in-scope to a DRS. In this study, HORECA sites would not act as return locations.

[1] UNESCWA (N.D.). Term: Formal Economy. Available at: link

Term	Definition/Description
Informal Sector	Also referred to as the "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."*[2]
Junkshop	A facility that purchases and aggregates materials from waste reclaimers and other sellers of material (e.g., householders and businesses). The materials are then sold to larger junkshops or to recyclers. Junkshops are independent entrepreneurs whose core business is trading and who are dependent on commodity markets. In this study, junkshops that register with the System Operator of the proposed DRS would be return locations for waste reclaimers.
Mandatory DRS	A mandatory DRS is one that legally requires all obligated producers and obligated retailers to participate in the system. A mandatory DRS requires national legislation to be created, including the scope, deposit value, stakeholder responsibilities, targets, and penalties for non-compliance. (Also see Voluntary DRS below).
Manual Return	The process of a return location manually receiving, scanning, storing, and refunding a consumer or waste reclaimer the deposit (and Collection Fee for registered waste reclaimers) 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.
Placed on Market (PoM)	A term commonly used for the number of beverage containers or weight of beverage container material sold to consumers in a given location and timeframe.
Polyethylene Terephthalate (PET)	A type of plastic (polymer) commonly used for plastic beverage containers - usually bottles.
Producer	The entity first placing the in-scope beverage container on the market in Vietnam, which may be a brand owner, manufacturer, importer, or distributor.
Producer Fees	Also known as "Industry Fee". A per-container fee paid to the System Operator by the producer that first places the beverage container on the market. Producer Fees are set by the System Operator to cover the net costs of managing the DRS.

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

Term	Definition/Description
Return Location	Official locations to which used beverage containers can be returned by consumers or waste reclaimers for a deposit refund (and Collection Fee for registered waste reclaimers). In this study, the proposed return locations for consumers would be retailers and depots; while for waste reclaimers, registered junkshops would be the return locations.
Reverse Vending Machine (RVM)	A machine that accepts, scans, and stores in-scope used beverage containers so that the consumer can redeem their deposit. This is a way in which returns can be automated. Some RVMs also compact the containers.
Separate Collections	A return channel/method in which waste reclaimers collect used beverage containers from consumers (or whoever has the used beverage container with refundable deposit). This may involve waste reclaimers collecting used beverage containers door-to-door from householders and/or businesses. Waste reclaimers then take the used beverage containers to registered junkshops to redeem the deposit (and Collection Fee if the waste reclaimer is registered).
Service Fee	Also known as “Handling Fee”. A per-container fee paid by the System Operator to third-party return locations (retailers and junkshops). The Service Fee is paid for each in-scope used beverage container that the return location receives. Service Fees are intended to cover the necessary costs of receiving used beverage containers in an efficient manner, compensating them for their time, resources, and costs. In this study, it is proposed that Service Fees are paid to retailers and registered junkshops that participate in the DRS.
Sorted from Refuse	A return channel/method in which waste reclaimers pick or recover used beverage containers from refuse bins, litter bins, dumpsites, landfill sites, and the wider environment. Waste reclaimers then take the used beverage containers to registered junkshops to redeem the deposit (and Collection Fee if the waste reclaimer is registered).
System Operator	Industry-owned, not-for-profit central organisation responsible for the managing and operating the DRS (e.g., managing the data, finances, and logistics). Similar to that of a Producer Responsibility Organisation in Extended Producer Responsibility schemes.
Unredeemed Deposits	Also known as “Unclaimed Deposits”. Deposits that have been paid by consumers but not claimed for a refund. These unredeemed deposits are retained by the System Operator, offsetting some of the costs of managing the DRS.

Term	Definition/Description
Used Beverage Container	An empty beverage container. This report uses the term to refer to used beverage containers made from PET or aluminium that are in-scope for the DRS. Used beverage containers must not be crushed in order to redeem the deposit, as this may prevent the DRS label/barcode from being scanned and identified.
Voluntary DRS	A voluntary DRS is one which is established by industry acting alone (either single producers, or multiple producers acting together), without legal enforcement or requirements to do so. These tend to have limited participation from producers and retailers, often resulting in limited coverage and low return rates from consumers.
Waste Reclaimers	Also known as “Waste Pickers” or “Informal Sector Workers”. Overarching term for individuals or entities who collect or recover materials, including used beverage containers, from various sources such as households, HORECA, streets, bins, dumpsites, and landfills. Waste reclaimers operate within the informal sector.

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Executive Summary

The Norwegian Embassy in Hanoi and Innovation Norway, in consultation with Vietnam's Ministry of Agriculture and Environment (MAE) commissioned Eunomia Research & Consulting (Eunomia) to assess a possible design for, and the costs and impacts of, a well-designed nationwide Deposit Return System (DRS) for single-use beverage containers for Vietnam. This report is intended to provide MAE with an evidence base to inform future research and policy development around such a system. Alongside Extended Producer Responsibility (EPR), a DRS in Vietnam offers a potentially significant and effective measure implementing the Government's drive towards a circular economy, as is outlined in Article 142 of the 2020 Law on Environmental Protection.[3] Specifically, a DRS can achieve very high recycling rates and therefore reduce the reliance on raw materials for new products and reduce adverse impacts on the environment, which are aims in Article 142.

A DRS for single-use beverage containers typically applies a small, fully refundable deposit to each beverage container included in the system. This deposit creates a financial incentive for consumers and others (e.g., waste reclaimers) to return used beverage containers to a return location to redeem the deposit. Return locations may include retailers, and hotels, restaurants, and cafes (HORECA), or dedicated return points. The returned containers are usually sent to a counting centre for monitoring purposes and/or a sorting facility to be sorted, before going to a recycling facility to be recycled. 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.

DRSs are recognised as a proven mechanism for achieving very high return rates of beverage containers for recycling. There are over 40 jurisdictions around the world that have a DRS for single-use beverage containers, including in Europe, America, Africa, the Middle East, and Oceania. Particularly well-designed DRSs can achieve return rates of over 90%, and tend to be mandatory.[4] Introducing a DRS creates various jobs, including roles in collection, sorting, and administration. While a common argument made against DRS for single-use beverage containers is that it negatively impacts beverage sales, there is no definitive evidence suggesting that this is the case.

This study considers a nationwide DRS for Vietnam, covering single-use PET bottles and aluminium cans – though the scope could expand to include additional materials over time. Research suggests that around 98% of single-use beverage containers placed on the market in Vietnam consist of PET bottles (33% of total) and aluminium cans (65% of total). While the existing collection rates of these containers are relatively high (believed to be about 50% for PET and 80% for aluminium), the large majority of the material is downcycled into other products. For example, one study suggested that of the aluminium cans recovered in

[3] The National Assembly (2020). Law No. 72/2020/QH14 on Environmental Protection. Available at: https://faolex.fao.org/docs/pdf/vie212027.pdf

[4] Reloop (2024). Global Deposit Book 2022: An Overview of Deposit Systems for Single-Use Beverage Containers. Available at: link

Vietnam, only 1% are exported for closed-loop ("can-to-can") recycling, with the remainder downcycled or disposed.[5] A DRS can capture high volumes of high-quality, food-grade recyclable material for closed-loop recycling.

As Vietnam is socially, economically, and infrastructurally different from the jurisdictions where a DRS has so far been (or is due to be) implemented, it is especially important that a DRS for Vietnam is carefully designed with the specific national context in mind. This includes consideration of the beverage market, existing waste management processes, informal sector, politics, economy, culture, and geography.

While no other Southeast Asian country has yet implemented a nationwide DRS for single-use beverage containers, the system's success in Vietnam could serve as a model for neighbouring nations. By adopting global best practices and lessons learned and tailoring them to local conditions, Vietnam could demonstrate leadership in sustainable development and circular economy practices. A DRS also provides job and business opportunities in the green economy, such as logistics, sorting, administration, and recycling.

Approach and Key Findings

This study consisted of a mixed methods approach, involving reviews of academic and grey literature (e.g., reports and documents by non-government organisations and consultancies), analysing data provided from project partners, interviews with key stakeholders (including representatives of the informal sector), and two workshops. Along with the proposed nationwide DRS, a pilot DRS was also designed and recommended. A pilot could test the key design elements of the DRS, providing valuable lessons learned for the potential nationwide DRS.

The study presented here models one potential outcome of implementing a nationwide Deposit Return System (DRS) in Vietnam. This represents a "central case" estimate, meaning that where assumptions have a range of possible values, the assumptions used for modelling are based on midpoint values — positioned between the minimum and maximum potential outcomes.

While there are uncertainties in some of the assumptions used, and risks around DRS implementation, it is possible to mitigate these through informed DRS design and appropriate supporting policy instruments (see the 'Managing Uncertainties and Risks' Executive Summary subsection, below). The results show that the modelled DRS could produce various environmental, economic and social benefits to Vietnam, as detailed in the subsections below.

DRS Design for Vietnam

In designing a DRS for Vietnam, the study considered how best practice design elements from existing DRSs apply in Vietnam's specific context. It also included bespoke elements

[5] Roland Berger (2023). Aluminium Cans Market Assessment – Vietnam. No link

that incorporate the informal sector, which is currently delivering much of the country's recycling. The key DRS design elements are summarised in Table E-1.

Table E-1: Key Design Elements of a DRS for Vietnam

DRS Element	Recommendation	Rationale and Further Information
Container materials	PET bottles and aluminium cans	Around 98% of single-use beverage containers placed on the market in Vietnam consist of PET bottles (33% of total) and aluminium cans (65% of total). It is possible to capture very high volumes of high-quality recyclable material in a DRS. Due to comparatively low consumption levels of HDPE, PP, glass, and liquid paperboard beverage cartons, these are deemed unsuitable for inclusion at the initial stage of a DRS – although additional materials could be included over time.
Container size	150ml – 3L (inclusive)	It is believed that most single-use beverage containers in Vietnam are between 150ml and 3L, with no known beverage containers <150ml and a limited proportion being over 3L.
Beverage types	Exemptions for wine, spirits, and milk-based dairy drinks	The scope of the DRS would include water, soft drinks, juice, beer, cider, iced tea, and other drink types. Import complications associated with wine and spirits, plus a lack of identified wine and spirits in PET or aluminium beverage containers, means they should be exempt. Storing empty milk-based dairy drink beverage containers at return location may lead to hygiene issues, so these should also be exempt.
Deposit level	1,000–2000 VND per container	A deposit value of 1,000–2,000VND per container could result in a return rate of 80–90%. A midpoint deposit value of 1,500VND per container has been modelled, although in practice it would be practical to avoid the now rarely used 500VND note. This rate should be monitored and potentially increased if required. The pilot DRS should provide further insights into a suitable deposit value, if this is pursued.

DRS Element	Recommendation	Rationale and Further Information
Consumer returns	Retailers and depots	Using retailers and depots as return locations for consumers would maximise convenience and improve return location coverage. At all return locations, consumers would be refunded the full deposit per returned used beverage container. Retailers would be paid a "Service Fee" per used beverage container that they receive. This would compensate them for receiving, scanning, and storing the containers. Retailers with automated returns (i.e., using Reverse Vending Machines) would receive higher Service Fees per container than those using a manual return approach. This reflects the higher capital and operational expenditures associated with RVMs. However, RVMs contribute to reductions in system-wide expenditures, particularly in relation to collection logistics and counting centre operations. The higher Service Fee thus also functions as a financial incentive to encourage return points, where the scale of containers returned merits it, to adopt RVMs. Depots do not require a Service Fee, since they would be operated and funded by the System Operator.
Waste reclaimer returns	Registered junkshops	Junkshops would be return locations for waste reclaimers. In order for junkshops to be return locations, they would need to register with the DRS System Operator. At the junkshops waste reclaimers would receive the full deposit per used beverage container (collected from consumers or recovered from bins, litter, or landfill). The containers would need to be uncrushed (i.e., the DRS label being readable) in order for the DRS label to be scanned and deposit to be refunded. Interviews with informal sector stakeholders indicated that waste reclaimers do not typically crush bottles or cans, though further assessment of this may be required. Registered waste reclaimers (i.e., those registered with the DRS System Operator) would receive an additional "Collection Fee" per container in addition to the deposit value. Like retailers, registered junkshops would be paid a "Service Fee" per used beverage container that they receive. This would compensate the junkshop for receiving, scanning, and storing the containers. The junkshop Service Fee would be lower than that paid to retailers due to the estimated lower costs incurred by junkshops.

DRS Element	Recommendation	Rationale and Further Information
Legal status	Mandatory	DRS is a form of Extended Producer Responsibility (EPR), since it makes producers responsible for paying the costs of the system to achieve targets set out in legislation. As such, to align with Vietnam's existing mandatory status of EPR for packaging, the proposed DRS in Vietnam should be mandatory for all in-scope producers and obligated retailers, and not voluntary. A voluntary DRS would risk limited participation from producers and retailers, likely resulting in low return rates from consumers. A mandatory DRS, on the other hand, would require all obligated producers and retailers to participate in the system, which may achieve economies of scale to improve system efficiencies. Making it mandatory would maximise participation rates from producers and retailers, maximise coverage of return locations, ensure fairness and consistency, and maximise return rates from consumers. A mandatory DRS would require legislation to be created, including the scope, deposit value, stakeholder responsibilities, targets, and penalties for non-compliance.
Ownership	Industry	The most effective systems are those run by the beverage industry (i.e. the obligated producers) with strong involvement of the retailers as return locations (return to retail). Industry ownership means that the beverage industry can use its expertise to improve cost-effectiveness. By allowing industry to operate a DRS, obligated producers can strive to minimise producer fees through engaging retailers network as return points for containers, while delivering on the requirements that are set on the System Operator by law. In Vietnam, the system ownership could be adapted with careful consideration of how retailers and the informal sectors are involved in the system governance to improve efficiencies.
System Operator	Single System Operator	A single System Operator has full visibility of all the flows of data, and this is essential in ensuring the DRS is well run and cost-effective. It would also reduce complexities associated with multiple System Operators. The System Operator will continually look for ways to improve the efficiency of the DRS. There are various methods of forming a System Operator (e.g., via government tender or [preferably] industry formed with government licensing).
Return rate target	90% for PET bottles and aluminium cans	Well-designed DRSs can achieve return rates of 90% or greater after several years of operation. Targets, set in legislation by government, are an essential component of a DRS.

Environmental Benefits

Modelling undertaken for the study estimated that implementing the proposed DRS would result in significant environmental benefits, as follows:

- **Increased recycling:** A DRS could be expected to result in an additional **21 to 77 thousand tonnes of used beverage containers being recycled per annum**, diverting waste from landfill, dumpsites, and open burning, and reducing littering.

- **Reduced greenhouse gas emissions:** By capturing high-quality materials for recycling, the DRS could reduce approximately **265 thousand tonnes of CO_2e emissions annually**.

- **Reduced plastic pollution**: High return rates would minimise plastic leakage into the environment, supporting Vietnam's commitments under its National Action Plan for Marine Plastic Litter and National Strategy for Integrated Management of Solid Waste to 2025, with a Vision to 2050.

- A reduction in **environmental externalities** (considering greenhouse gas emissions and localised air pollutants) of **1.4 trillion VND per annum**.

- A reduction in **litter disamenity** of approximately **10.1 trillion VND per annum**. This is based on a 'willingness to pay' methodology, which is explained further in Section 5.5 of this report.

- These benefits align with Vietnam's national sustainability goals, including achieving net-zero emissions by 2050 and reducing marine plastic litter by 75% by 2030.

Economic and Social Impact

The proposed DRS is also projected to create significant economic opportunities while addressing current inefficiencies in the waste management system:

- **Cost-effectiveness for producers:** Estimated Producer Fees (i.e., the cost paid by beverage producers to the System Operator per beverage container placed on the market) **are expected to be less than half the cost of fees in typical European DRSs**, making the DRS financially attractive as a means for beverage manufacturers to achieve the highest possible return and recycling rates for their containers. The total estimated cost to producers through Producer Fees in the proposed DRS is 720 billion VND per annum. While there are high costs associated with the setup and operations of a DRS, studies suggest that a DRS can represent long-term economic benefits compared with conventional waste management systems (e.g., kerbside collection) where the intention is to transition towards a more circular economy. Some DRSs in Europe, America, and Australia, and New Zealand have been found to

be more cost-effective than conventional waste management systems from between two to 10 years following implementation of a DRS.[6]

- A DRS could result in an increase in **formal employment**, throughout the beverage supply chain, of around **6.4 thousand additional jobs**.

- The proposed DRS is designed to not be detrimental to **waste reclaimer income**. The economic estimates around this are uncertain, due to large uncertainties regarding current collection rates by waste reclaimers, productivity (including estimates of productivity after introduction of a DRS), and incomes. However, based on central case estimates in the modelling, it may have a neutral or even positive impact on waste reclaimer income – depending also on how consumers, waste reclaimers, and junkshops interact with each other and with the proposed DRS. It would provide opportunity through waste reclaimer integration into a DRS, while also offering formal employment opportunities to waste reclaimers. While we provide some commentary on uncertainties in the next subsection, the central case assumptions used in the modelling indicate that an estimated **9.6 thousand waste reclaimer jobs** could be created with a DRS, these being:

    - **7.8 thousand jobs** could be created for waste reclaimers through 'separate collections' (which are similar to current 'door to door' collection methods in Vietnam) of used beverage containers, with incomes similar to current average earnings.

    - **1.8 thousand jobs** could be created for landfill and street waste reclaimers in sorting DRS containers from refuse.

- To summarise the overall employment impacts, formal jobs are estimated to increase by 6.4 thousand under a proposed DRS, while it could also create opportunities for an additional 9.6 thousand informal jobs.

Managing Uncertainties and Risks

The main uncertainty in the modelling was around the proportions of used beverage container returns returned to retail and depots, as opposed to junkshops via informal sector waste reclaimers. In practice, this is expected to be affected by the adopted deposit value and the convenience of retail and depot return locations. Careful attention to these aspects of the DRS design is advised prior to implementation.

Other sources of uncertainty in the modelling were due to data limitations concerning quantities of beverage containers placed on the market, current waste management activities, and informal sector activities and prices. In general, as there are no comparable examples of mandatory DRSs for single-use containers in markets similar to Vietnam's to draw upon, and various assumptions and forecasts needed to be made (such as the behaviour of consumers in response to DRS implementation – as mentioned above), there

[6] Lakhan, C. (2024). Evaluating the Effectiveness, Costs, and Challenges of Deposit Return Systems for Beverage Containers: A Meta-Analysis. *World Journal of Advanced Engineering Technology and Sciences*, 13(01), pp112–131. Available at: link

are inherent uncertainties in particular modelling assumptions. Nevertheless, the assumptions used are considered reasonable central case estimates. Whilst the current assignment modelled just one potential outcome of a DRS, future work could include sensitivity analysis on the assumptions used, to test how changes affect the economic and environmental impacts.

Other key risks include exploitation of the DRS through fraud, and the possibility of low return rates from consumers and waste reclaimers – though this can be managed once clearer understanding of the response to the deposit value is known in the Vietnam situation.

Piloting the DRS would provide practical insights into implementing a DRS in Vietnam, helping to fill data gaps and firming up understanding of how a DRS should best be designed to succeed in Vietnam. A pilot should lead to improvements upon the design modelled in the study to help ensure that any risks are managed and mitigated.

In addition, further consultation with key stakeholders in the value chain (i.e., Government, producers, retailers, junkshops, waste reclaimers, and consumers) would be expected to assist in provision of information and in risk management.

Conclusions

The research, analysis and stakeholder engagements undertaken within this study have served to establish a viable outline design of a DRS for single-use beverage containers in Vietnam, which will increase collection and recycling rates of used beverage containers.

The study presents the case for a nationwide DRS by assessing financial considerations, job creation, and environmental impacts. The next steps towards a DRS in Vietnam would include further consultation with stakeholders, and further work in developing the impact case around economic, environmental, and social impacts – including investigation and sensitivity analysis around the current uncertainties. Such additional consultation and analysis could address uncertainty of data, further define and support the design choices, and assist in risk mitigation.

A possible pilot of the DRS would provide further insights into the practical realities of implementing a DRS in Vietnam and how best to design a DRS for success. This could allow the design explored in the study to be improved upon, further reducing the associated uncertainties and risks.

It is also necessary to consider a wider view on how EPR can best be designed and operationalised so that DRS and EPR work in symbiosis to tackle Vietnam's waste problems while providing opportunities for environmental protection and social improvement. DRS is a highly valuable tool to assist in the transition to a circular economy, though additional parallel waste management activities and initiatives are needed to provide the vital comprehensive reforms to the country's waste and materials management problems.

1.0 Introduction

The Norwegian Embassy in Hanoi and Innovation Norway, in consultation with Vietnam's Ministry of Agriculture and Environment (MAE) have commissioned Eunomia Research & Consulting (Eunomia) to assess a possible design for, and the costs and impacts of, a Deposit Return System (DRS) for single-use beverage containers for Vietnam. This report is intended to provide MAE with an evidence-base around a nationwide DRS for single-use beverage containers in Vietnam. This report will be used to support policy development and development of pilot projects that offer both MAE and producers the opportunity of a more effective approach to EPR fulfilment.

1.1 What is a DRS?

A DRS for single-use beverage containers typically applies a small, fully refundable deposit to each beverage container included in the system. This deposit creates a financial incentive for consumers and others (e.g., waste reclaimers) to return used beverage containers to a return location to redeem the deposit. Return locations may include retailers, bars, or dedicated return points (depots). The returned containers are usually sent to a counting centre for monitoring purposes and/or a sorting facility to be sorted, before going to a recycling facility to be recycled.

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 environmental impacts compared with disposal and litter. DRSs are recognised as a proven mechanism for achieving very high return rates of beverage containers for recycling. Many European countries have achieved return rates of over 90%, while the global median return rate is 76% - please refer to Reloop's "Global Deposit Book 2022" for an overview of DRS designs and achievements in jurisdictions around the world.[7] Globally, over 40 jurisdictions have implemented a DRS for single-use beverage containers, including European and Oceanian countries, Canadian provinces, American and Australian states, and one Middle Eastern and one African country.[8] Worth noting is the Republic of the Seychelles' DRS, due to its active waste reclaimer involvement. In 2016, the DRS achieved a return rate of over 90% for PET bottles and aluminium cans. Of this about 50% was returned by consumers. Over 90% of the discarded (50%) containers were reportedly recovered from bins, streets, and landfill sites and returned by waste reclaimers to redemption centres in order to redeem the deposits.[9]

Furthermore, since DRSs collect beverage containers as a pure material stream (i.e., not mixed with containers used for harmful substances or contaminated with other waste) they can be more easily recycled back into new beverage containers in a 'closed-loop', thus

[7] Reloop (2024). Global Deposit Book 2022: An Overview of Deposit Systems for Single-Use Beverage Containers. Available at: link

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

[9] Lai, A., Hensley, J., Krutli, P., and Stauffacher, M. (2016). Solid Waste Management in the Seychelles: USYS TdLab Transdisciplinary Case Study 2016. Available at: link

reducing reliance on virgin raw materials. DRSs can also be an effective tool to reduce littering – with one study in the USA finding that, overall, States with a DRS had over 50% less DRS litter (bottles and cans) and 30% less non-DRS litter (other materials) per capita than States without a DRS.[10] Where used beverage containers would otherwise be collected and managed by municipalities, a DRS may reduce collection costs incurred by municipalities, since much of the used containers are returned through a DRS. Similarly, a DRS can reduce litter management costs facing municipalities.

A DRS requires obligated beverage producers[11] to participate, pay any outstanding system costs (after material revenues and unredeemed deposits are accounted for), and collectively meet obligations set for the system (typically return rate targets being a major obligation). DRS is a form of Extended Producer Responsibility (EPR), since it makes producers responsible for paying the costs of the system to achieve targets set out in legislation. A DRS can operate alongside and complement EPR for packaging legislation, and is an increasingly common combined approach in other countries. A DRS can achieve synergies with EPR, as it can improve the quality and quantity of recyclable material (often suitable for closed-loop recycling) and reduce litter from consumers far more effectively than EPR alone. Conflicts tend to be limited to financial implications on EPR such as reduced high-value material in EPR funded systems and therefore reduced revenue, though potentially somewhat balanced by reduced EPR system operating costs.[12] To make a DRS mandatory, DRS legislation is created, usually including a requirement to meet a specified return rate target (commonly 90%), supported by effective monitoring, enforcement, and financial penalties for non-compliance. A specified return rate target ensures that a DRS performs to a high standard, using various mechanisms to maximise the quantities of used beverage containers captured for recycling. Government would need to produce further legislation in addition to the existing EPR legislation to mandate a DRS for beverage containers. A DRS typically requires one organisation to manage the system, equivalent to a Producer Responsibility Organisation (PRO) in EPR. In a DRS, this type of organisation is known as a System Operator. The outstanding system costs (not covered by material revenue and unredeemed deposits) are paid by producers to the System Operator in the form of Producer Fees.[13] Producer Fees are payable for each in-scope beverage container placed on the market. Further information about design elements of a mandatory DRS for single-use beverage containers can be found in Appendix A.1.0.

A simplified diagram of a typical DRS for single-use beverage containers is provided in Figure 1-1, showing the typical material flow of containers throughout the value-chain. System Operator involvement is also shown.

[10] Keep America Beautiful (2021). 2020 National Litter Study – Summary Report: May 2021. Available at: link

[11] Obligated producers would typically include all producers (including importers) placing containers onto the Vietnamese market above a set threshold.

[12] Laubinger, F. et al. (2022). Deposit-Refund Systems and the Interplay with Additional Mandatory Extended Producer Responsibility Policies. OECD Environment Working Papers, No. 208. Available at: link

[13] It is also worth noting that there are also usually registration fees charged to producers when registering with a System Operator. However, registration fees are low compared with Producer Fees. In some cases, producers under a certain turnover or packaging threshold are exempt from paying registration fees.

There are substantial setup and operational costs for a DRS, requiring investments into return locations and infrastructure (such as Reverse Vending Machines), logistics, administrative costs, and consumer education and awareness campaigns. However, these costs can be offset by the avoided costs of alternative/conventional waste management solutions (e.g., kerbside collections and litter picking) and from the revenue generated from unredeemed deposits and material sales. A cost benefit analysis of DRSs in jurisdictions in Europe, America, Australia, and New Zealand suggested that the payback period for their implemented DRSs were between two and 10 years.[14]

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.[15]

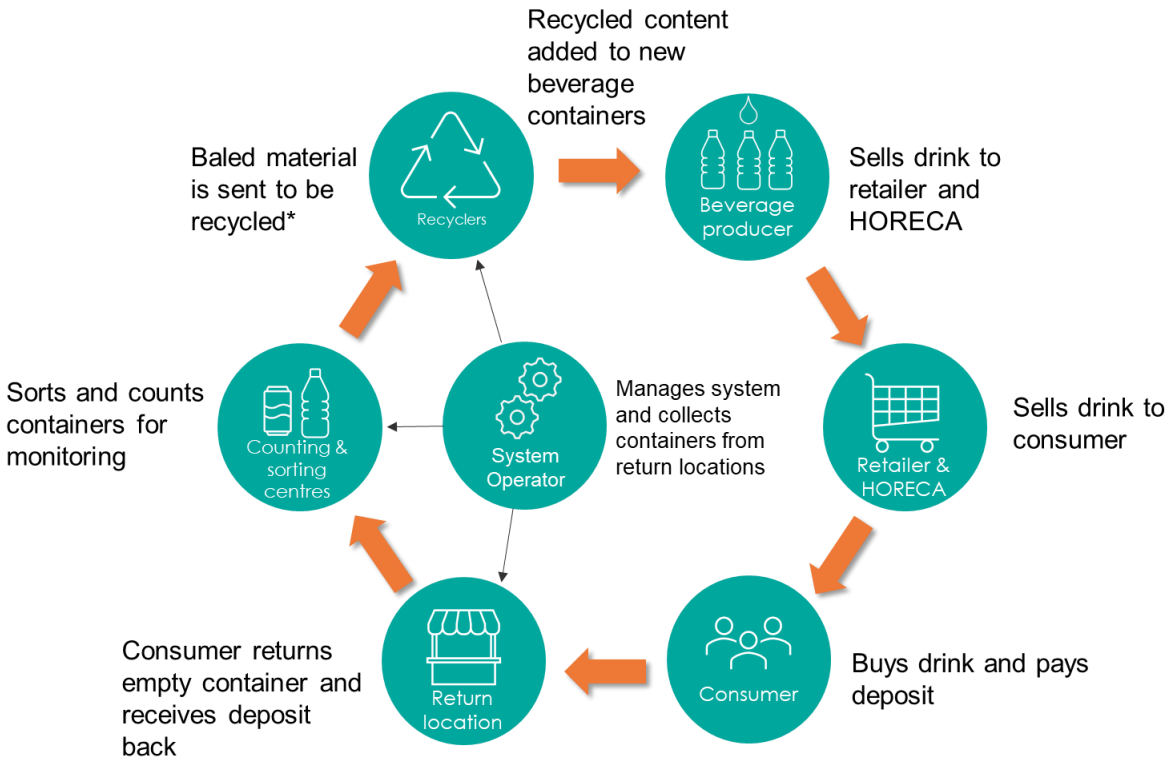
Finally, it is worth recognising the common argument made against DRS for single-use beverage containers that it negatively impacts beverage sales. A recent study examining historical data of various DRSs around the world did not find any definitive evidence that the introduction or change of a DRS impacted beverage sales. There are complexities in terms of other factors that often influence beverage prices and sales, such as market competition, inflation, weather, supply-chain disruptions, and health trends, to name a few.[16]

[14] Lakhan, C. (2024). Evaluating the Effectiveness, Costs, and Challenges of Deposit Return Systems for Beverage Containers: A Meta-Analysis. *World Journal of Advanced Engineering Technology and Sciences*, 13(01), pp112–131. Available at: link

[15] Reloop (2023). Fact Sheet: Deposit Return Systems Create More Jobs. Available at: link

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

Figure 1-1: Example of a DRS for single-use beverage containers, showing the material flow (orange arrows) of containers throughout the value-chain



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

1.2 About this Study

This report considers a potential nationwide DRS for single-use beverage containers for Vietnam – for PET bottles and aluminium cans. Justification for these materials will be provided later in this report. Information has been sourced from desk-based research, engagement with key relevant stakeholders in the value-chain, and workshops with key stakeholders to present and receive feedback on the proposed design elements of proposed nationwide DRS. Additionally, this study proposed a pilot DRS to be conducted which includes similar design elements to the proposed nationwide DRS (such as the scope of beverage containers, deposit value, and involvement of waste reclaimers and junkshops). Findings from the pilot DRS could be used to gather vital lessons learned for a nationwide DRS.

Globally, over 40 jurisdictions have implemented a DRS for single-use beverage containers, including European and Oceanian countries, Canadian provinces, American and Australian states, and one Middle Eastern and one African country.[17] Other countries, such as the United Kingdom, Spain, and France plan to implement a mandatory DRS in the near future.

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

However, no Southeast Asian country has yet implemented a mandatory DRS for single-use beverage containers. While Singapore is due to implement a mandatory nationwide DRS for single-use beverage containers on 01 April 2026 [18], in some respects Singapore is more similar to some Europe and North America countries than it is to Vietnam.

As Vietnam is socially, economically, and infrastructurally different from those jurisdictions where a DRS has been (or is due to be) implemented, it is important that any DRS for Vietnam is carefully designed, with the specific national context in mind. This includes the likes of the beverage market, existing waste management processes, informal sector, politics, economy, culture, and geography. Furthermore, a successful Vietnamese DRS could potentially influence other Southeast Asian countries to consider implementing a DRS, learning from Vietnam.

This report considers the national context and proposes a DRS design for a well-designed nationwide DRS for single-use beverage containers in Vietnam. This includes economic, environmental, and social impact modelling in order to estimate potential impacts from a DRS. Specifically, this report includes:

- The project's process (Section 2.0).
- A background to Vietnam's waste management, beverage container market, and relevant policies (Section 3.0).
- The key design elements of the proposed DRS for Vietnam (Section 4.0).
- Modelled environmental, economic, and social impacts of the proposed DRS (Section 5.0).
- An overview of the key proposals, findings, and next steps for the proposed DRS in Vietnam (Section 6.0).

The main report seeks to provide the reader with key information and findings from the modelling process. Additional information is provided in the Appendices, including: further detail regarding design considerations to ensure a DRS is successful; an overview of feedback from the stakeholder interviews; information about the voluntary DRS for refillable containers in Vietnam; and assumptions and further interpretation of the modelling process used in this study.

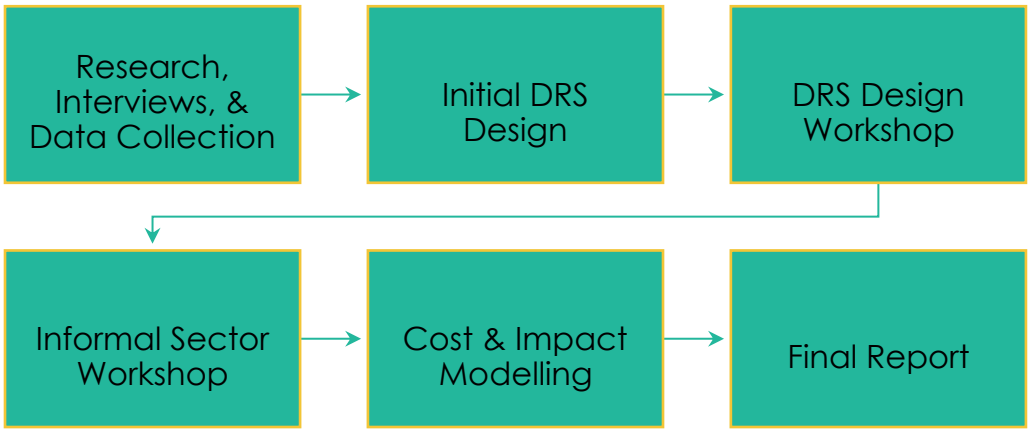
[18] National Environment Agency (2024). NEA Licenses Scheme Operator To Design And Operate The Beverage Container Return Scheme. Available at: link

2.0 Project Process

This project consisted of multiple 'tasks' which gathered key information about Vietnam that was required to design a proposed nationwide DRS and model its impacts. Crucially, this included researching beverage sales and waste collection and recycling activities taking place in Vietnam's formal and informal sectors. This, and other, information was gathered using a mixed methods approach, involving desk-based research of academic and grey literature (e.g., reports and documents by non-government organisations and consultancies), use of a data request form provided to key relevant stakeholders to complete, interviews with key stakeholders, analysis of data provided by stakeholders relating to beverage sales and informal sector survey responses, and two design feedback workshops – one with stakeholders throughout the value-chain, and one with informal sector representatives. An overview of the stakeholder interview responses can be found in Appendix A.2.2.

Figure 2-1 presents an overview of the tasks undertaken in this project, whereby various information and feedback gathered throughout the project allowed refinement of the DRS design elements.

Figure 2-1: Process of Project Tasks for this Project



3.0 Background

3.1 Waste Management in Vietnam

As of 2023, Vietnam had a total population of 100.3 million people.[19] Vietnam is also a popular tourist destination, attracting many tourists from all over the world. Approximately 25 million tonnes of municipal solid waste (MSW) is generated per year[20], of which about

[19] General Statistics Office (N.D.). Population. [Selected whole country for 2023.] Available at: link

[20] MONRE (2023). Vietnam Ranks in the Group of 20 Countries with the Largest Plastic Waste in the World (translated). Available at: link

60% is from urban areas.[21] The amount of MSW generated in urban areas is increasing at about 10–16% per year[22], which Vietnam's waste infrastructure is struggling to adequately manage.[23] Increasing MSW is particularly prevalent in regions with high urbanisation, industrialisation, and tourism.

Not all MSW is collected in Vietnam: between 84%[24] and 87%[25] is collected in urban areas, between 40–55%[26] and 63%[27] is collected in rural areas, and under 10% is collected in remote and mountainous areas.[28] Where waste is not collected, residents and businesses are known to dispose of their waste in an uncontrolled manner.[29] Overall, about 60% of Vietnam's MSW is disposed of outside of the formal waste management system – e.g., at unmanaged dumpsites, by open burning, and by littering.[30]

Overall, only around 10%[31] to 15%[32] of Vietnam's MSW is believed to be recycled – of which a large amount is likely 'downcycled'. Due to a lack of formal waste recycling infrastructure and reliance on landfill for MSW, most recycling is carried out by the informal sector. One study suggested that 83% of plastic waste collected for recycling is by the informal sector.[33] However, since materials from the informal sector lack traceability and can be of low quality, they are often 'downcycled' rather than being recycled back into similar products in a 'closed loop'.[34]

[21] MONRE (2023). Pressure on Domestic Waste Treatment in Our Country Today (translated). Available at: link

[22] MONRE (2023), Law on Environmental Protection 2020: Comprehensively Changing the Method of Managing Domestic Solid Waste (translated). Available at: link

[23] USAID (2020). Clean Cities, Blue Ocean: 3R/SWM and Marine Debris Reduction Strategy Alignment Assessment, Vietnam. Available at: link

[24] USAID (2020). Clean Cities Blue Ocean: 3R/SWM and Marine Debris Reduction Strategy Alignment Assessment – Vietnam. Available at: link

[25] Department of Climate Change (2021). Report on National Environmental Status for 2016-2020. Available at: link

[26] USAID (2020). Clean Cities Blue Ocean: 3R/SWM and Marine Debris Reduction Strategy Alignment Assessment – Vietnam. Available at: link

[27] Department of Climate Change (2021). Report on National Environmental Status for 2016-2020. Available at: link

[28] USAID (2020). Clean Cities Blue Ocean: 3R/SWM and Marine Debris Reduction Strategy Alignment Assessment – Vietnam. Available at: link

[29] WWF (2021). Assessment of Extended Responsibility (EPR) For Plastic Packaging Waste in Viet Nam. February 2021. Available at: link

[30] USAID (2020). Clean Cities Blue Ocean: 3R/SWM and Marine Debris Reduction Strategy Alignment Assessment – Vietnam. Available at: link

[31] USAID (2020). Clean Cities, Blue Ocean: Initial Solid Waste Management Assessment (ISWMA), Vietnam. Available at: link

[32] FiinGroup (2024). Sector Preview: Vietnam Waste Management – Toward Sustainable Development. Available at: link

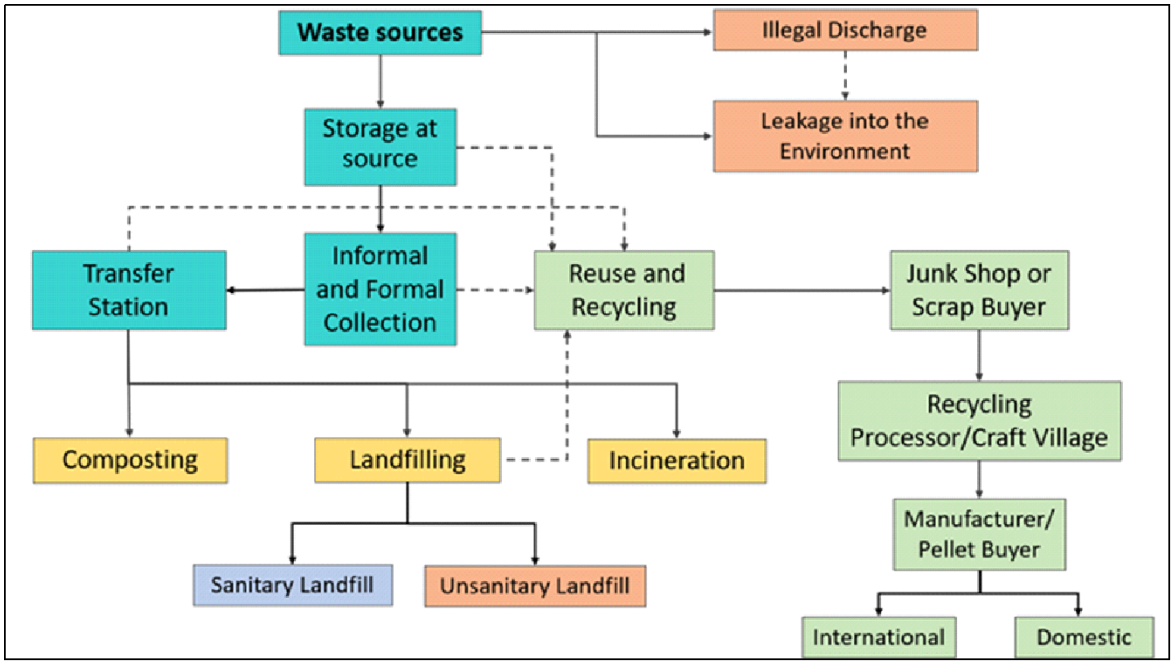
[33] NPAP (2022). Vietnam Plastic Action Assessment and Roadmap Considerations. Available at: link

[34] P4G (2020). Market Report: Market Analysis for rPET Factory: Feedstock, Competitors, Buyers. Available at: link

The informal sector engages in collection, picking, sorting, transportation, and recycling activities, tending to target materials that are high value, such as metals, plastics, and cardboard. Collection from households and businesses is undertaken by many waste reclaimers, with many other waste reclaimers recovering materials from streets, bins, and landfill sites. Waste reclaimers then sell the recovered materials to junkshops, which in turn tend to sell them to larger junkshops, recycling facilities, and/or craft recycling villages for recycling or often 'downcycling'.

Although the informal sector plays an important role in managing Vietnam's waste, it provides an incomplete circular economy solution. The waste management system requires improvement through both modernisation and integration of the informal sector. Further information on existing and upcoming policies relating to waste management can be found in Section 3.3. As part of this improvement, a DRS for single-use beverage containers could help to close the gaps in the system by improving both the quantity and quality of material recovered for recycling, since food-grade material would be returned and not mixed with other waste. The role of the informal sector (specifically waste reclaimers and many junkshops) in this study's proposed nationwide DRS for single-use beverage containers in Vietnam is discussed in detail in Section 4.4.2. Figure 3-1 provides a simplified flowchart of MSW collections and pathways in Vietnam currently.

Figure 3-1: Simplified MSW Flow for Vietnam. Source: USAID[35]



It is worth noting Vietnam's aspiration to become a high-income country by 2045 and that Vietnam has a net-zero emissions commitment by 2050, as declared at the 26th Conference of Parties to the UNFCCC ("COP26").[36] Commitments and legislation have been

[35] USAID (2020). Clean Cities Blue Ocean: 3R/SWM and Marine Debris Reduction Strategy Alignment Assessment – Vietnam. Available at: link

[36] International Climate Initiative (N.D.). Vietnam's Prime Minister Announces Net-Zero Target at COP26. Available at: link

implemented in Vietnam which strive to reduce the environmental impacts associated with MSW, with some relevant examples to a DRS for single-use beverage containers provided in Section 3.3. As such, improvements in waste management in Vietnam are demanded.

Improved waste management, such as a beverage container DRS, can create additional jobs and stimulate economic activity, contributing to Vietnam's growth. By reducing litter and improving the quantity and quality of recycling, a DRS can enhance environmental health, which is crucial for sustainable development. Additionally, a DRS promotes recycling and reuse, aligning with circular economy principles, ensuring resource efficiency and economic resilience. A DRS also reduces the need for new raw materials, reduces greenhouse gas emissions from production and disposal, thus supporting Vietnam's net-zero commitment, fitting with Vietnam's National Strategy on Climate Change, and contributing to emission reduction targets.

Working from examples of successful DRS implementations in countries like Germany and Norway, a DRS for single-use beverage containers could be developed to fit Vietnam's specific context. This will support Vietnam achieving its targets and help with progress towards its goals of becoming a high-income country and achieving net-zero emissions, demonstrating a strong commitment to sustainable development.

3.2 Beverage Containers

Beverage container sales in Vietnam are complex, comprising single-use and refillable containers of various sizes, beverages, and materials. These containers can be sold to consumers at retailers, and hotels, restaurants, and cafes (HORECA) operating in both the formal and informal sectors, as well as at bars and through online sales. There was no identified official or publicly available data about the quantity of beverage container units sold through formal and informal outlets in Vietnam, however, stakeholder interviews suggested that informal outlets contribute to a major source of beverage sales.

Data published by Reloop for 2019 highlights that single-use PET bottles and metal cans (believed to be aluminium, based on literature and stakeholder interviews) contribute to the vast majority of single-use beverage container sales in Vietnam.[37] PET bottles are mostly used for water, energy/sports drinks, and iced tea; while metal cans are mostly used for beer and cider, along with carbonated drinks and energy/sports drinks. About 6.2 billion single-use PET bottles and 7.9 billion single-use metal cans were reportedly placed on the market in Vietnam in 2019, compared with about 0.1 billion single-use glass bottles (largely for beer and cider) and 0.2 billion single-use liquid paperboard beverage cartons (largely for juice) [please refer to the "What We Waste Dashboard" for further information[38]]. This equates to about 55% metal cans, 43% PET bottles, 1% glass bottles, and 1% liquid paperboard beverage cartons (by number of containers). Analysis of survey responses from beverage container distributors on an island in 2023/24 also suggested similar proportions,

[37] Reloop (2024). What We Waste Dashboard. Available at: link

[38] Reloop (2024). What We Waste Dashboard. Available at: link

in which 63% of beverage containers were aluminium cans, 35% were PET bottles, and 2% were glass bottles.[39]

Sales of beverage containers increased considerably in Vietnam between 2010 and 2019, with single-use PET bottles and single-use metal cans roughly doubling in sales, while single-use glass bottles and single-use liquid paperboard beverage cartons roughly tripled.[40] Other literature sources suggest alternative placed on the market figures for single-use beverage containers. For instance, a 2022 report suggested 4.6 billion single-use PET bottles, 9.3 billion metal cans, 1.7 billion glass bottles, 0.9 billion beverage cartons, plus 0.1 billion HDPE bottles and 0.01 billion PP bottles placed on the market in Vietnam in 2020.[41] Another 2022 report suggested an annual figure of 12.6 billion metal cans placed on the market in Vietnam.[42] Despite these differences, it is apparent that PET bottles and metal cans (believed to be aluminium) contribute to the vast majority of single-use beverage containers placed on the market in Vietnam.

Although single-use beverage containers are popular in Vietnam, there is a high consumption rate of refillable beverage containers, particularly glass bottles. Specifically, the majority of glass beverage bottles consumed in Vietnam are refillable (6.3 billion in 2019) as opposed to single-use (0.1 billion in 2019). Of this, beer and cider consisted of 5.6 billion (89%) of the refillable glass bottles consumed in 2019.[43] There are various beverage producers that offer their beverages in refillable glass bottles, such as Hanoi Beer, Sai Gon Beer Co, and Pepsi.[44] Beverage producers offering beverages in refillable glass bottles tend to use a refundable deposit to incentivise consumers to return their glass bottles to participating retailers – similar to the concept of a DRS for single-use containers. The bottles are then washed, refilled with a beverage, and sold to consumers.[45] One beer producer has reported high return rates achieved for their refillable glass beer bottles, claiming a return rate of almost 100%.[46] There are also about 0.02 billion refillable PET bottles used for juice, beer, and cider.[47] There are also very large (over 10L) HDPE and polycarbonate refillable water bottles, along with various sizes of refillable metal beer containers, used by consumers in Vietnam. However, their sales volumes are believed to be low compared to refillable glass bottles. (See Appendix A.2.3 for further details on the voluntary DRSs for refillable containers in Vietnam.)

[39] Site visit information provided by the Centre for Technology and Data on Environmental Pollution Control (CECT) as part of the DRS pilot research. The data was gathered between 2023 and 2024.

[40] Reloop (2024). What We Waste Dashboard. Available at: link

[41] Eunomia (2022). Beverage packaging in Vietnam: Recycling Rate & Recycling Cost. Final Report. Available at: link

[42] Roland Berger (2023). Aluminium Cans Market Assessment – Vietnam. Context, Quantitative Baseline, Options. Final Version. May 2023 – Updated August 2023. No Weblink Available.

[43] Reloop (2024). What We Waste Dashboard. Available at: link

[44] Glass Worldwide (2017). Focus on ASEAN. Issue 72, 2017. Available at: link

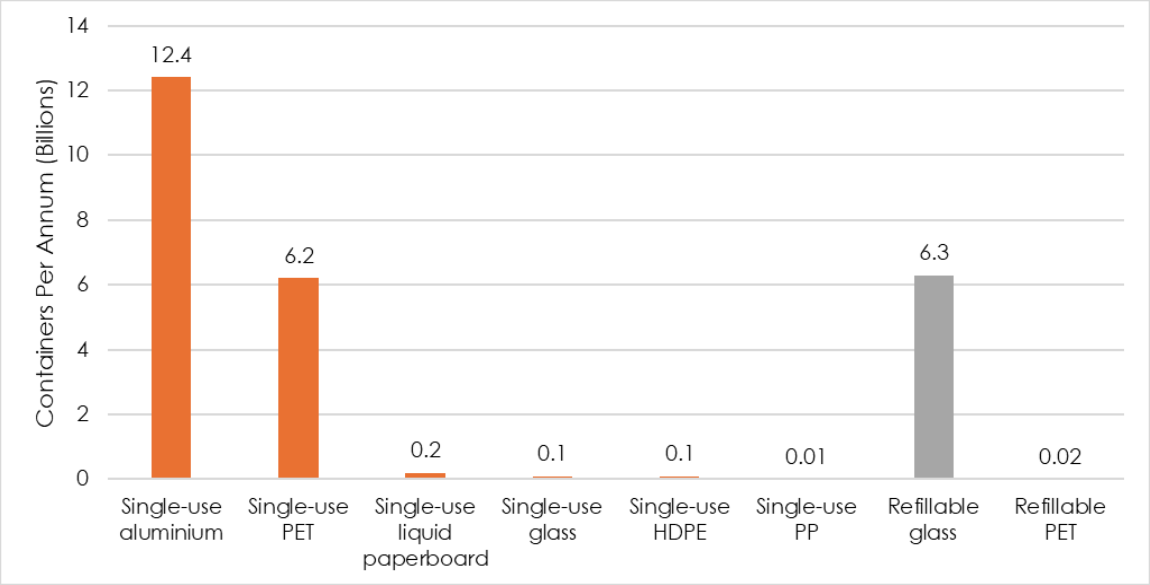
[45] Glass Worldwide (2017). Focus on ASEAN. Issue 72, 2017. Available at: link

[46] Heineken Vietnam (2019). Heineken Vietnam Leads the Sustainability Agenda in Vietnam with Circular Economy Approach. Available at: link

[47] Reloop (2024). What We Waste Dashboard. Available at: link

Figure 3-2 summarises the estimated number of single-use and refillable beverage containers placed on the market in Vietnam per annum, based on the reviewed literature and stakeholder insights.

Figure 3-2: Estimated number of beverage containers (billions) placed on the market in Vietnam per annum



As for container sizes, there was limited publicly available information regarding single-use and refillable container sizes. However, one stakeholder indicated that the vast majority of single-use containers in Vietnam are between 150ml and 3L, based on their internal data, with no known containers being below 150ml and a limited proportion being over 3L. The majority of containers over 3L are believed to be refillable containers, such as refillable plastic water bottles and refillable metal beer containers. Sales data from two major distributers on Phú Quốc indicated that over 99% of beverage containers were between 250ml and 1.5L, of which 85% were between 250ml and 333ml.[48]

Single-use beverage containers contribute to Vietnam's waste generation and litter. For instance, one study found that drinks bottles and their caps accounted for over 10% of the plastic waste (by weight) found on surveyed beaches in Vietnam.[49] Another study researching marine litter found that plastic bottles were the second most common type of litter in global marine environments (11.9% by number of items), with plastic bags being the most common (14.1%). Among their suggestions, the authors recommended that policy makers should consider implementing deposit return systems for take-away packaging, such as plastic bottles, as a way of reducing plastic leakage into the environment.[50]

[48] Site visit information provided by the Centre for Technology and Data on Environmental Pollution Control (CECT) as part of the DRS pilot research. The data was gathered between 2023 and 2024.

[49] IUCN (2021). Monitoring and Assessment Programme on Plastic Litter in Viet Nam Shoreline – Report 2020. Available at: link

[50] Morales-Caselles et al. (2021). An Inshore-Offshore Sorting System Revealed from Global Classification of Ocean Litter. Available at: link

Litter such as plastic bottles and cans are environmentally and visually damaging. However, certain beverage container materials (such as aluminium cans and PET bottles) are collected and recycled to a higher extent than others (such as glass bottles and liquid paperboard cartons). This is largely influenced by their economic value for waste reclaimers. A 2022 study estimated collected-for-recycling rates for various beverage container material types in Vietnam in 2020. It estimated 80% for aluminium cans, 50% for PET bottles, 35% for HDPE and PP bottles, 15% for glass bottles, and 5% for liquid paperboard cartons.[51] As for recycling rates, the 2022 study accounted for material losses between collection and recycling. The estimated recycling rates for beverage containers were 77% for aluminium cans, 45% for PET bottles, 32% for HDPE and PP bottles, 14% for glass bottles, and 4% for liquid paperboard cartons in 2020.[52] It is worth noting that while some of these recycling rates appear impressive, particularly for aluminium cans, much of the material is 'downcycled', with very low levels of container-to-container (closed-loop) recycling taking place. A 2022 study on aluminium beverage containers in Vietnam estimated that 99% of cans collected-for-recycling are 'downcycled' at craft recycling villages, often used for automotive parts, with the remaining 1% exported for closed-loop recycling.[53]

This study found a lack of consensus in the literature and from stakeholders for the placed on the market, collected-for-recycling, recycling, and other treatment pathways for beverage containers in Vietnam. This lack of consensus has also been reported in other studies, including one on PET collection rates.[54] Additionally, no information was identified on the national number or proportion of beverage container sales through formal and informal retailers and HORECA. While efforts have been made to assign suitable values, including through internal consultation with waste management experts at Eunomia as well as triangulation of assumptions from various sources, this represents an area of uncertainty in this study which is important to consider when assessing the outputs from the modelling later in this report. As mentioned later in this report, further investigation is recommended to address these uncertainties, including further consultation with stakeholders.

3.3 Vietnam Policies Relevant to DRS

The Vietnamese Government is increasingly aware of the major challenges of protecting the environment and improving the management of Vietnam's waste. It is taking action to address these challenges through appropriate strategic decisions, legislative initiatives, investment, and infrastructural and technological advances. These include legislation,

[51] Eunomia (2022). Beverage packaging in Vietnam: Recycling Rate & Recycling Cost. Final Report. Available at: link

[52] Eunomia (2022). Beverage packaging in Vietnam: Recycling Rate & Recycling Cost. Final Report. Available at: link

[53] Roland Berger (2023). Aluminium Cans Market Assessment – Vietnam. Context, Quantitative Baseline, Options. Final Version. May 2023 – Updated August 2023. No Weblink Available.

[54] P4G (2020). Market Report: Market Analysis for rPET Factory: Feedstock, Competitors, Buyers. Available at: link

action plans, and strategies that set out requirements and targets for increasing waste separation, collection, reuse, recycling, and incineration.[55]

The key identified national environmental policies and legislation relating to a potential DRS for single-use PET and aluminium beverage containers are summarised in Table 3-1.

Table 3-1: Summary of Key Policies in Vietnam Relevant to a DRS for Single-Use Beverage Containers

National Strategy for Integrated Management of Solid Waste to 2025, with a Vision to 2050[56]

• Sets out, among others, commitments regarding the collection and treatment of household and non-household waste.
• The National Strategy was amended in May 2018. The amendment adjusted certain commitments, with the following collection and treatment targets being set:
  ○ A municipal waste collection rate of 90% by 2025, and 100% by 2050.
  ○ A municipal waste recycling rate of 85% by 2025, and 90% by 2050.
  ○ A collection rate for solid waste from households in rural villages of 70% by 2025, and 90% by 2050.
  ○ A collection rate for solid waste from craft villages of 80% by 2025, and 100% by 2050.
Relevance to DRS: A DRS would ensure a very high collection rate for in-scope used beverage containers, returned through the return locations.

Law on Environmental Protection 2020[57], supplemented by Decree 08/2022/ND-CP Detailing a number of articles of the Law on Environmental Protection 2020[58], amended and supplemented by Decree 05/2025/ND-CP[59]
• Vietnam's primary environmental law, providing statutory guidelines on resource use, along with statutory guidelines on environmental protection and measurement. It came into force in January 2022, replacing the previous 2014 Law. • From 01 January 2025, businesses, organisations, households, and individuals will be required to separate MSW at source into three waste streams – food waste, reusable and recyclable waste, and residual waste. • Introduces the "polluter pays principle", which places responsibility on producers of certain products and packaging for the management of waste at end-of-life. Beverage containers are one of the types of packaging targeted. • Articles 54 and 55 make producers and importers of products and packaging responsible for the waste collection and treatment of the products and packaging they place on the Vietnamese market – i.e., EPR. Producers and importers subject to Packaging Recycling

[55] UN_ESCAP (2021). Closing the Loop on Plastic Pollution in Da Nang City, Vietnam. Baseline Report. Available at: link

[56] National Strategy for Integrated Management of Solid Waste to 2025 With a Vision to 2050. Available at: link

[57] Law on Environmental Protection 2020. Available at: link

[58] Decree 08/2022/ND-CP Detailing a number of articles of the Law on Environmental Protection 2020. Available at: link

[59] Tilleke & Gibbins (2025) Decree 05 Updates Extended Producer Responsibility Regulations in Vietnam. Available at: link

Obligations will need to recycle packaging according to the mandatory recycling rates and specifications or make a financial contribution to the Vietnam Environmental Protection Fund. The recycling targets for packaging range from 10% up to 22%, depending on the type of packaging. Rigid PET and aluminium packaging have a mandatory recycling target of 22%.

Relevance to DRS: A DRS is a form of EPR, since it makes producers responsible for paying the costs of the system to achieve targets set out in legislation. A legislated DRS can operate alongside and complement EPR for packaging legislation. A DRS can achieve synergies with EPR, as it can improve the quality and quantity of recyclable material (DRS material is often suitable for closed-loop recycling) and reduce litter from consumers more effectively than EPR alone. Conflicts tend to be limited to financial implications on EPR such as reduced high-value material in EPR funded systems and therefore reduced revenue, though potentially somewhat balanced by reduced EPR system operating costs.[60] It would also be important to avoid conflicts and confusions between a DRS and EPR for packaging, which covers beverage packaging. This includes conflicts/duplication of reporting and producer fee payments. Ultimately, it would be for the Government to decide how to manage the transition of in-scope beverage containers (proposed as certain PET bottles and aluminium cans) from EPR to a DRS, the potential role of PROs in EPR systems, and to ensure conflicts and confusions between EPR and a DRS are avoided. Appendix A.1.0 provides a discussion which can help to ensure the success of a DRS.

National Action Plan for Management of Marine Litter by 2030[61]

- Sets out Vietnam's overarching aim of reducing land-based and marine-based plastic litter.
- Includes targets to reduce marine plastic litter by 50% by 2025, and by 75% by 2030. To achieve this, the Action Plan aims to utilise a circular economy model, with improved plastic waste collections, recycling, and reuse systems.
- Includes targets to prevent the use of single-use plastics and non-biodegradable plastic bags in coastal tourism areas, tourist attractions, accommodations and other seaside tourism services by 80% by 2025, and by 100% by 2030.
- Additionally, it aims to improve public awareness of single-use plastics. Beach cleanup campaigns and monitoring of plastic litter are also required.

Relevance to DRS: A DRS including single-use PET bottles could support the reduction of plastic pollution, as high proportions of used containers are typically captured for recycling and litter is often reduced in other DRS examples. This could divert some of the plastic bottles and lids away from litter and leakage, and into recycling.

National Action Plan on Circular Economy implementation by 2035 (Decision No. 222/QD-TTg dated Jan 23, 2025)[62]

- Promotes sustainable production and consumption, utilising secondary materials, limiting waste generation, and reducing negative impacts on the environment.
- Promotes green job creation and develop new value chains associated with the circular economy.
- Introduces targets to collect and treat 95% of municipal solid waste in urban areas and 80% in rural area, and to reduce waste being sent to landfill to less than 50% of the total collected volume.

[60] Laubinger, F. et al. (2022). Deposit-Refund Systems and the Interplay with Additional Mandatory Extended Producer Responsibility Policies. OECD Environment Working Papers, No. 208. Available at: link

[61] *National Action Plan for Management of Marine Plastic Litter by 2030.* Available at: link

[62] Nguyen, H. (2025). Personal Communication. 20th February 2025.

- Includes piloting and scaling up waste management models towards a circular economy as one of the listed tasks.

Relevance to DRS: A DRS would promote a circular economy by increasing the availability of high-quality recyclable (secondary) material and reducing the amount of used beverage containers being sent to landfill. A DRS also creates green jobs and new stakeholders in the value chain – such as logistics, counting and sorting, and recycling companies.

In addition to the policies above, Vietnam has also made several environmental commitments, which a DRS for single-use beverage containers could support due to the associated environmental benefits. Examples of Vietnam's environmental commitments include, but are not limited to:

- At COP26, Vietnam committed to achieving net zero carbon emissions by 2050.[63]
- At COP26, Vietnam joined the Global Methane Pledge to reduce global methane emissions by 30% from 2020 levels by 2030 (which includes methane emissions from waste management).[64]
- Vietnam participated at the fifth session of the Intergovernmental Negotiating Committee (INC-5, known as the Plastics Treaty) in November 2024, where Vietnam and other nations were to develop a legally binding instrument on tackling plastic pollution.[65] The global legally binding instrument was not successfully negotiated within the 2024 talks, but negotiations continue in 2025.[66]
- The Vietnam National Action Plan on Sustainable Consumption and Production (2021–2030) identifies priority activities and tasks to implement and promote sustainable consumption and production in Vietnam, moving towards a circular economy while improving the quality of people's lives and enhancing sustainable lifestyles. Of relevance to DRS, the plan includes promoting the application of circular economy for waste as a main task.[67]

4.0 Proposed DRS Design for Vietnam

The following subsections provide an overview of the key design elements of the proposed nationwide DRS for single-use beverage containers in Vietnam, along with rationale and further details about each design element. These design elements have been developed following desk-based research, stakeholder interviews, and a DRS design workshop and informal sector workshop, along with experience from Eunomia's project team and project partners. The key principles of the proposed DRS for Vietnam follow

[63] UNESCAP (N.D.). Vietnam's Major Commitments at COP26. Available at: link

[64] Global Methane Pledge (N.D.). Homepage. Available at: link

[65] UNEP (2024). Intergovernmental Negotiating Committee on Plastic Pollution. Available at: link

[66] European Commission (2024). EU regrets lack of conclusion on global plastics agreement. Available at: link

[67] Ministry of Industry and Trade, The Socialist Republic of Vietnam (2021). Vietnam National Action Plan on Sustainable Consumption and Production (2021–2030). Available at: link

those mentioned in Appendix A.1.0, which provides key design elements and considerations for designing and structuring an effective DRS.

4.1 Legal Status and Scope (Single-Use / Refillable)

A DRS can be mandatory (obliged via legislation) or voluntary (implemented by industry in the absence of a legal requirement). Furthermore, it can apply to single-use containers (which are recycled following their return) or to refillable containers (which are washed, refilled, and reused following their return). This study proposes a mandatory DRS for single-use beverage containers (specifically PET bottles and metal cans as explained in Section 4.2) for the following reasons:

- Mandating a nationwide DRS would ensure participation of the system by producers and retailers and allow consistent implementation across the country. This creates economies of scale to improve system efficiencies and maximise return location coverage. Voluntary systems, on the other hand, may lack uptake from producers and retailers, limiting the impact of a DRS in terms of return rates and consumer convenience for returns. A mandatory DRS would complement existing EPR for packaging legislation.

- Single-use PET bottles and metal cans are popular packaging items in Vietnam – sales of both doubled from 2010 to 2019.[68] They are also commonly used 'on-the-go', for example by commuters and tourists, and therefore can more likely be disposed of in general waste bins or littered. As a source of litter, they result in visual disamenity which can also negatively impact tourism, and are environmentally damaging especially when littered to rivers and oceans. DRSs consistently result in a major reduction in litter from beverage containers after implementation.[69] National mandated implementation is needed to achieve these benefits.

- Voluntary DRSs already exist in Vietnam for refillable beverage containers, operated by the beverage industry. These voluntary DRSs are reported to achieve high return rates, with one beer producer reporting return rates of almost 100%.[70] In this study, it is assumed that the voluntary DRS for refillable beverage containers would run in parallel with the proposed mandatory DRS for single-use beverage containers, i.e., they would not be integrated.[71]

[68] Reloop (2024). What We Waste Dashboard. Available at: link

[69] Eunomia (2017). Impacts of a Deposit Refund System for One-way Beverage Packaging on Local Authority Waste Services. No link.

[70] Heineken Vietnam (2019). Heineken Vietnam Leads the Sustainability Agenda in Vietnam with Circular Economy Approach. Available at: link

[71] There would be no foreseen impacts on the existing voluntary DRSs for refillable containers in Vietnam. While a DRS could be designed to integrate takeback of single-use and refillable containers, as seen in some European DRSs, and while the costs and benefits of such integration could be evaluated in future work, integration was not assessed in this study.

- A DRS can increase the quality of returned material. Since a DRS can capture clean, traceable, food-grade material, the used beverage containers can be recycled back into new beverage containers. Vietnam currently relies on imports of virgin and secondary materials for beverage container production and has low levels of closed-loop (container-to-container) recycling.[72] [73] In terms of plastic, several studies have noted the lack of traceability and low quality of plastic waste sourced in Vietnam, which are major barriers to recyclers in Vietnam using Vietnam's plastic waste as a feedstock.[74] [75] [76]

- A well-designed DRS can achieve return rates of over 90%, and similar recycling rates (losses at sorting and reprocessing stages are minimal, typically at around 1-2% for beverage containers collected through a DRS).[77] As discussed in Section 3.2, it is estimated that about 50% of PET bottles and 80% of aluminium cans are collected-for-recycling in Vietnam, reducing to a recycling rate of around 45% for PET bottles and 77% for aluminium cans due to material losses.[78] The majority of PET bottles and aluminium cans collected-for-recycling are currently downcycled. If Vietnam were to collect high quantities of high-quality PET bottles via a mandatory DRS, then this could provide an incentive to build closed-loop recycling facilities, as there would be a dependable source of feedstock.

- A nationwide mandatory DRS can create large numbers of green jobs, including roles in collection, sorting, and administration, with higher capture rates meaning higher numbers of jobs created.

4.2 Beverage Container Scope

Determining which beverage containers are in-scope and exempt is necessary to ensure that all stakeholders understand and comply with the DRS.

Table 4-1 proposes the container materials, sizes, and beverage types to be in-scope and exempt from a DRS in Vietnam. While certain materials, sizes, and beverage types are exempt from the design proposed for first implementation, various DRSs in other countries expand the scope over time (e.g., adding material types and beverage types to the DRS), and periodic system review is recommended.

[72] Roland Berger (2023). Aluminium Cans Market Assessment – Vietnam. No weblink available.

[73] P4G (2020). Market Report: Market Analysis for rPET Factory: Feedstock, competitors, Buyers. Available at: link

[74] Strady, E. (2022). Expectations and Constraints of Plastic Packaging Waste Recyclers Under the Future EPR Scheme in Vietnam. Results from an Online Social Survey. Available at: link

[75] World Bank Group (2021). Market Study for Vietnam: Plastics Circularity Opportunities and Barriers. Available at: link

[76] P4G (2020). Market Report: Market Analysis for rPET Factory: Feedstock, competitors, Buyers. Available at: link

[77] Based on confidential industry data sourced in previous Eunomia studies of sorting plants.

[78] Eunomia (2022). Beverage packaging in Vietnam: Recycling Rate & Recycling Cost. Final Report. Available at: link

Table 4-1: Recommended Beverage Container Scope of Proposed DRS

DRS Element	Recommendation	Rationale
Container materials	PET bottles and aluminium cans	As discussed in Section 3.2, beverage market data and insights from stakeholders suggests that around 98% of single-use beverage containers placed on the market in Vietnam are estimated to be PET bottles (33%) and aluminium cans (65%). While the collection rates of these containers are relatively high (about 50% for PET and 80% for aluminium), much of the material is downcycled. It is possible to capture high volumes and high-quality, food-grade recyclable material in a DRS. Due to comparatively low consumption levels of single-use HDPE and PP beverage bottles, single-use glass beverage bottles, and single-use liquid paperboard beverage cartons, these are deemed unsuitable at the initial stage of a DRS. The costs, logistics, and markets for including additional materials in a DRS at a later date could be explored in a future project (e.g., at a future system review point).
Container size	150ml – 3L (inclusive)	As discussed in Section 3.2, there was limited publicly available information regarding single-use container sizes. It is believed that the vast majority of single-use containers in Vietnam are between 150ml and 3L, with no known containers being below 150ml and a limited proportion being over 3L. The majority of containers over 3L are believed to be refillable containers, such as refillable plastic water bottles and refillable metal beer containers. Sales data from two major distributers on an island indicated that over 99% of beverage containers were between 250ml and 1.5L, of which 85% were between 250ml and 333ml.[79] Notably, reverse vending machines (RVMs) cannot typically accept containers larger than 3L, with lower limits of very small containers typically being around 100-150ml. 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.

[79] Site visit information provided by the Centre for Technology and Data on Environmental Pollution Control (CECT) as part of the DRS pilot research. The data was gathered between 2023 and 2024.

DRS Element	Recommendation	Rationale
Beverage types	Exemptions for wine, spirits, and milk-based drinks	It is recommended that the proposed DRS should include all beverage types, excluding wine, spirits, and milk-based dairy drinks. The scope of the DRS would therefore include beverages such as water, carbonated soft drinks, juice, beer, cider, iced tea, and many other drink types. Import complications associated with wine and spirits, plus a lack of identified wine and spirits in PET bottles or aluminium cans, has resulted in the recommendation to exempt wine and spirits from the proposed DRS. Storing empty containers for milk-based drinks at return points can lead to hygiene issues. As these drinks are also a staple product, they are often exempt from DRS in other countries. Furthermore, milk-based drinks are commonly sold in liquid paperboard beverage cartons. While they should not be exempt, homemade drinks such as "Birdnest", juices, and nut milks sold by informal producers to consumers (e.g., at markets) might resist DRS participation, due to registration, labelling, and administration requirements by the producer. It was not possible to quantify the numbers of informally produced homemade drinks in Vietnam. However, it is worth highlighting that producers of these beverage types in PET bottles and aluminium cans may pose challenges to participation.

4.3 Deposit Level

Setting a suitable, fully refundable deposit value for a DRS is also important, as the deposit level can influence consumer returns. Some DRSs in other countries vary the deposit level according to container material, size, and/or beverage type. In this study, a fixed deposit value is proposed for all in-scope PET bottles and aluminium cans. A fixed deposit is recommended for a number of reasons, including being simpler for consumers, promoting fairness since all container types and sizes would have a similar incentive for returns by consumers and waste reclaimers, it would simplify administration and processing of deposits, and it reduces fraud risk for higher deposit containers. However, a variable deposit approach could be considered at a later date, if required.

Setting the deposit level too low can result in consumers not being incentivised to redeem their deposit, while setting it too high could pose a barrier to consumers purchasing drinks. Modelling undertaken for this study suggests that a deposit value of between 1,000 VND and 2,000 VND per container could result in a return rate of between 80% and 90% (though this is also influenced by other factors, in particular the convenience of return routes for

used deposit containers).[80] A fully refundable deposit value of between 1,000 and 2,000 VND per container is therefore recommended, potentially starting with 1,000VND to allow the deposit value to increase if required. The effectiveness of this value should be monitored and potentially increased if required. For modelling purposes, a deposit value of 1,500VND per container has been used as a midpoint.

4.4 Return Methods and Locations

Ensuring there are convenient and accessible return locations for consumers to return their used beverage container in order to redeem their deposit is an important element of an effective DRS. In DRSs around the world, the return locations available for consumers vary. In some DRSs, consumers return containers to certain retailers and/or HORECA establishments (e.g., Lithuania, Finland, and Michigan); in others, consumers return containers to dedicated redemption centres operated by the System Operator (e.g., Western Australia, Nova Scotia, and Republic of the Seychelles); while some use a hybrid approach of retailers and redemption centres (e.g., Sweden, California, and Barbados).[81] In this study, a hybrid approach is recommended for a DRS in Vietnam, considering returns from consumers and waste reclaimers.

A hybrid approach would provide consumers with the option to return used beverage containers directly to participating retailers or to dedicated redemption centres (referred to here as "depots"), or via waste reclaimers to junkshops. A hybrid approach would maximise convenience and improve return location coverage, especially where there may be clusters of very small retailers that may be exempt from taking back containers from consumers. For all return methods, consumers would be refunded the full deposit value per returned used beverage container.

4.4.1 Return by Consumers

4.4.1.1 Retailers

In Vietnam, there are many retailers in the informal sector that operate, with stakeholder interviews highlighting that a large proportion of beverage containers are sold to consumers through retailers operating in the informal sector. Additionally, literature and stakeholder interviews highlighted that many retailers are very small in floor area/space. An abundance of informal and small retailers may therefore pose barriers to retailers providing sufficient return locations for consumers, limiting the coverage of return locations and thus accessibility and convenience for consumers to return their used beverage containers.[82]

[80] Power Purchase Parity (PPP) was used to estimate the deposit value required to achieve a return rate of 80-90%. This involved use of DRS performance and deposit value data from DRSs in other jurisdictions and accounting for the purchasing power in Vietnam compared with that in the other jurisdictions.

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

[82] Note: Although an option for waste reclaimers to claim collection fees when returning containers to junkshops is presented in Section 4.4.2, this should be restricted to waste reclaimers only and not permitted

The upcoming mandatory DRS for single-use plastic and metal beverage containers in Singapore, expected in April 2026, mandates retailers over 200m^2 in floor area to become a return location[83], with smaller retailers allowed to be return locations on a voluntary basis. In the proposed DRS for Vietnam, there is limited information available on retailer floor area across Vietnam to determine a suitable threshold for mandating retailers to become a return location. As such, further research is advised in future work to determine this floor area threshold (or any other threshold) for mandating retailers to become return locations. It is recommended that non-obligated retailers and informal retailers could be return locations on a voluntary basis. Modelling assumptions for the number of retailers included in the modelling are detailed in Appendix A.3.1.

At participating retailers, a mix of manual returns and automated returns (using Reverse Vending Machines; RVMs) might be used by retailers – i.e., large retailers (such as supermarkets with large numbers of customers and large floor area) may decide to install RVMs for speed and convenience, while smaller retailers may decide to manage the returned containers manually. For the avoidance of doubt, retailers could decide which return method (automated or manual) would best suit them. It is recommended that retailers would be paid a "Service Fee" per used beverage container that they receive. This would compensate them for receiving, scanning, and storing the containers. Retailers with automated returns (i.e., using Reverse Vending Machines) would receive higher Service Fees per container than those using a manual return approach. This is due to higher costs associated with Reverse Vending Machines – such as space and electricity. The estimated Service Fee values are provided later in this report from the modelling outputs.

4.4.1.2 Depots

Depots are dedicated standalone centres for consumers to return containers to (not for waste reclaimers to return and receive Service Fees[84]), either with manual collection or automated returns with high-speed RVMs. For the purposes of modelling, it was assumed that all depots employ manual returns, as these are expected to be more cost-effective, however both options would be available to a future System Operator. The purpose of depots is to supplement the network of retailers to provide more return options for consumers, particularly where coverage of retailers is scarce or where there are clusters of

for other actors (e.g. small or informal retailers). This is to ensure that there is sufficient volume of material available to waste reclaimers to aim towards no net loss in incomes. Small/informal retailers who are not formally part of the DRS can still choose to redeem containers for consumers which they would then redeem at depots, or sell containers to a waste reclaimer carrying out "separate collections". This would remove some barriers to their involvement - however this 'informal' role of small/informal retailers as a return point for the system is not something the system can assume will take place or plan for when considering coverage requirements.

[83] National Environment Agency (N.D.). Beverage Container Return Scheme. Available at: link

[84] Junkshops would be given exclusive rights to work with waste reclaimers (supported by the payment of Service Fee for waste reclaimer returns via this route), thus building on current relationships. Waste reclaimers are also likely to continue to collect/recover other materials alongside used beverage containers, so it is convenient to take all waste types to a single location (i.e., a junkshop). Including waste reclaimer Collection Fee payments at depots is not advised as this would also add significant complexity in terms of processing payments and checking registration.

small retailers unable to participate as return locations. Depots are also able to better accommodate the return of large quantities of containers in one visit, and so are commonly used by HORECA establishments with a large number of deposit bearing containers to return. No Service Fee is recommended for depots, since they would be operated and funded by the System Operator.

4.4.2 Waste Reclaimer Returns

As previously mentioned, the informal sector plays a major role in the collection, recovery, and recycling of recyclable material across Vietnam currently. The majority of PET bottles and aluminium cans that are collected-for-recycling are collected by waste reclaimers, who then sell the material to junkshops. These two key stakeholder groups (i.e., waste reclaimers and junkshops) are therefore vital to consider in the design of a DRS for Vietnam. Excluding the informal sector could negatively impact the workforce's livelihoods and may have negative knock-on impacts on the collection and recycling of recyclable materials – not just PET bottles and aluminium cans but other materials also. Such negative impacts could be due to the high value PET bottles and aluminium cans being returned directly by consumers to retailers and depots, with little to no financial incentive for waste reclaimers to buy the bottles and cans from consumers, due to the deposit value. This could have negative impacts on junkshops too, since the volume of PET bottles and aluminium cans could be vastly reduced. By providing a financial incentive for waste reclaimers and junkshops to be involved in a DRS, a DRS could benefit from additional coverage of return options for consumers and increased return rates, while waste reclaimers and junkshops would hopefully retain income from PET bottles and aluminium cans.

This section provides further information on how waste reclaimers and junkshops are recommended to be involved in a DRS in Vietnam, including some key risks and considerations.

4.4.2.1 Waste Reclaimers

In the proposed DRS in Vietnam, in addition to consumers returning used beverage containers to retailers and depots, used beverage containers could also be collected and recovered by waste reclaimers. There could be various benefits of utilising the expertise and activities of waste reclaimers in a DRS:

1. It could maintain their income and livelihoods;

2. It could improve accessibility and convenience for consumers to redeem their deposits; and

3. It could improve return rates of used beverage containers.

Waste reclaimers would register to a database of authorised waste reclaimers (managed by the System Operator) enabling them to obtain Collection Fees, and supporting a transition to formalisation.

There are two key routes for the collection and recovery of used beverage containers by waste reclaimers under the proposed DRS in Vietnam:

1. Waste reclaimers collecting used beverage containers from consumers door-to-door (e.g., householders and businesses). This return channel is herein referred to as “Separate Collections”.

2. Waste reclaimers recovering used beverage containers from bins, streets, dumpsites, and the wider environment. This return channel is herein referred to as “Sorted from Refuse”.

It is assumed that 43% of all returned used beverage containers may be through waste reclaimer “Separate Collection”, while 2% of may be through the waste reclaimer “Sorted from Refuse” route. These two routes were recognised as being similar to how waste reclaimers currently operate - hence maintaining these two routes. The majority of used beverage containers returned from waste reclaimers are assumed to be from “Separate Collections” since the deposit value will prevent many going to refuse, so essentially the waste reclaimers are the transportation of the containers directly from consumers. As such, the material quality should not be negatively impacted. Material that is “Sorted from Refuse” may include contamination as it is picked up from landfills, street litter etc. The quality of material would be challenging to control, but in other DRSs, the deposit is refunded to a consumer if the container DRS label is readable. Some degree of crushing can be permissible by the DRS, as long as the label is readable - this quality standard is a decision for the DRS. A DRS pilot would be useful in assessing the quality of the returned material.

In Vietnam, many waste reclaimers currently tend to pay households and businesses for high value recyclable materials, such as plastic, metal, and cardboard. These insights were identified in literature and from informal sector interviews. This practice may continue in a DRS, whereby waste reclaimers would pay consumers the full deposit value in order to obtain a used beverage container (part of the DRS). This would make it more convenient for consumers to redeem their deposits, and therefore maximise return rates and access to material for waste reclaimers. Landfill & street waste reclaimers (who currently recover recyclable materials without typically needing to pay consumers) would earn the full deposit value per recovered/picked in-scope container.

It is recommended that waste reclaimers take the collected and recovered used beverage containers to registered junkshops that participate in the proposed DRS. In order to participate in the proposed DRS, junkshops would need to register with a database of junkshops (managed by the System Operator). The used beverage containers would need to be uncrushed, so that the DRS label/barcode could be scanned and identified as being in-scope for the DRS.[85] At the junkshop, the waste reclaimers would receive the full deposit value, either electronically or as physical cash.

In this study, the current buying and selling costs of materials collected and recovered by waste reclaimers in Vietnam has been researched and analysed. This was from literature,

[85] There might be instances where crushed or partially crushed containers would still have readable DRS labels that identify them as having refundable deposits. While these would not typically be accepted in automated returns (i.e., RVMs would not be able to rotate and scan the container), junkshops using manual returns might accept the containers if the DRS label is readable. As such, some degree of crushing could be permissible by the proposed DRS, as long as the DRS label is readable - this quality standard is a decision for the DRS. A DRS pilot would be useful in assessing the quality of the returned material.

data from previous surveys and studies in Vietnam, and from informal sector interviews. Since it is common for waste reclaimers to pay householders and businesses for their recyclable materials, it is assumed that waste reclaimers would likely pay consumers the full deposit value to receive used beverage containers. As such, an additional payment element was designed into the proposed DRS for Vietnam. This is referred to as a "Collection Fee". The Collection Fee is a fixed fee paid to registered waste reclaimers for each used beverage container returned to a registered junkshop. This Collection Fee is on a per-container basis, not by weight, with one Collection Fee set for both PET bottles and aluminium cans (i.e., the Collection Fee does not change based on container material, size, or beverage type).

The proposed rate of Collection Fee paid to registered waste reclaimers is 100 VND per returned used beverage container. This rate considers the equivalent estimated value of aluminium cans that waste reclaimers currently sell to junkshops in Vietnam, converting from VND per kg into a VND per container rate. The value of aluminium cans has been chosen since it has the highest net income value of PET and aluminium for waste reclaimers. The Collection Fee also accounts for the potential reduction in PET bottles and aluminium cans due to consumers returning them directly to retailers or depots. In doing so, the Collection Fee aims to maintain the current income levels achieved for waste reclaimers. There is a risk, however, that not all waste reclaimers would register with the DRS, meaning they would be able to redeem the deposit, but would not be eligible for the Collection Fee. Barriers facing registration from waste reclaimers would need to be addressed should this DRS design element be implemented.

By reviewing sources of information regarding waste reclaimer buying and selling prices for PET and aluminium, rough average net income rates (i.e., selling price to junkshop minus buying price from consumers) for waste reclaimers for PET bottles and aluminium cans have been estimated. These assume an average weight per PET bottle and aluminium can. Table 4-2 provides an overview of the current estimated net income rates for waste reclaimers. Under the proposed DRS, waste reclaimers recovering material from refuse would get the full deposit value since they would not be buying the containers from a consumer (plus a Collection Fee if registered). Using a midpoint of 1,500VND for the deposit value and a 100VND Collection Fee for registered waste reclaimers, 1,600VND would be far higher than the existing selling rate for a typical PET bottle (125VND) or aluminium can (285VND). Waste reclaimers collecting used beverage containers from consumers could achieve a net income rate of between 100 VND (if registered and paying consumers the full deposit value) and 1,600 VND (if registered and not paying consumers the deposit value) per container. Waste reclaimers not registered with the DRS would not receive the Collection Fee. It is important to note, though, that the quantity of used beverage containers available to waste reclaimers would likely be reduced under a DRS due to many consumers returning their containers directly to retailers and depots.

Table 4-2: Current and Potential Estimated Net Income Rate Per Used Beverage Container for Waste Reclaimers in Vietnam (VND per container)

Waste Reclaimer	VND per PET Bottle*	VND per Aluminium Can**
Current: Collecting from consumers	31	72
Current: Recovering from refuse	125	285
DRS: Separate collections	100 – 1,600 (registered) 0 – 1,500 (not registered)	100 – 1,600 (registered) 0 – 1,500 (not registered)
DRS: Sorting from refuse	1,600 (registered) 1,500 (not registered)	1,600 (registered) 1,500 (not registered)

Notes:

* Assuming 26.5g per PET bottle

** Assuming 13.5g per aluminium can

While the Collection Fee calculated in this study has accounted for current material prices and reduced material availability during a DRS, the value is prone to high uncertainty. Specifically, the current buying and selling rates for waste reclaimers vary a lot across Vietnam, varying by material quality/grade and changing over time and location, which can be related to market prices. A range of buying and selling rates were identified on junkshop websites, in literature and datasets, and from informal sector interviews. For instance, a study of waste reclaimers in Da Nang in 2020 reported average PET material selling prices to be around 3,000 – 4,000 VND per kg.[86] However, an informal sector interviewee referred to a previous study they conducted in Ho Chi Minh City in 2021, where PET was sold for 1,500 to 8,000 VND per kg. Survey responses from 29 waste reclaimers collecting from consumers and 6 waste reclaimers recovering material from landfill on Phú Quốc in 2023 suggested an average PET bottle selling price of 5,800 VND per kg and 3,700 VND per kg, respectively.[87]

Similar variations in selling prices were found for aluminium cans. For instance, a study of waste reclaimers in Da Nang in 2020 reported average aluminium material selling prices to be around 15,000 – 19,500 VND per kg.[88] However, an informal sector interviewee referred to a previous study they conducted in Ho Chi Minh City in 2021, where aluminium was sold for 13,000 to 33,000 VND per kg. Survey responses from the 35 waste reclaimers on Phú Quốc in 2023 suggested an average aluminium selling price of 29,900 VND per kg for waste reclaimers collecting material from consumers, with no aluminium reported by waste reclaimers recovering material from refuse.[89] Along with varying buying and selling rates,

[86] UNDP (2020). Mapping Informal Waste Sector in Da Nang. August 2020. Available at: link

[87] USAID (2023). Summary of Information on the Scrap Purchasing Facilities and IWC Questionnaire. [Translated Excel file.] No weblink identified.

[88] UNDP (2020). Mapping Informal Waste Sector in Da Nang. August 2020. Available at: link

[89] USAID (2023). Summary of Information on the Scrap Purchasing Facilities and IWC Questionnaire. [Translated Excel file.] No weblink identified.

the assumed reduction in material availability for waste reclaimers under a DRS is uncertain. As such, caution must be taken when considering the recommended Collection Fee, and so additional research on waste reclaimer buying and selling prices and consultation with informal sector representatives is strongly encouraged.

4.4.2.2 Junkshops

Given that waste reclaimers and collectors currently sell their materials to junkshops, and that junkshops currently handle large quantities of PET bottles and aluminium cans, it is recommended that junkshops should be return locations for waste reclaimers. To do this, junkshops would be required to register with a database of junkshops (managed by the System Operator) so that they can be paid the refunded deposits and paid Service Fees – both on a per-container basis (as well as enabling the payment of Collection Fees to waste reclaimers). Utilising existing junkshops considers the current material trading practices by waste reclaimers and also recognises the very strong trading relationships between waste reclaimers and junkshops in Vietnam. It is recommended that junkshops would not be mandated to be a return location, but would be encouraged to participate.

Utilising junkshops would also reduce additional travel for waste reclaimers compared with setting up separate return locations for used beverage containers. This should allow waste reclaimers to continue to sell other non-DRS materials (e.g., scrap metal, cardboard, other plastics) at the same location as redeeming deposits (and Collection Fees for registered waste reclaimers). Additionally, junkshops would be reimbursed for their participation in the proposed DRS, in the form of Service Fees – similar to retailers. There is a risk, however, that not all junkshops would register with the proposed DRS, meaning some waste reclaimers would need to travel to registered junkshops in order to redeem deposits (and Collection Fees for registered waste reclaimers), or would not be able to redeem deposits. This could have negative knock-on impacts on waste reclaimers, junkshops, and consumers. Support and awareness raising of the potential benefits of registering would be required to encourage participation from junkshops, and limiting the payment of Collection Fees only via registered junkshops would also encourage them to register (to prevent waste reclaimers from going elsewhere).

At the junkshops, it is recommended that all waste reclaimers would receive the full deposit per returned used beverage container. Registered waste reclaimers would also receive a Collection Fee per used beverage container. The way in which junkshops would identify registered waste reclaimers would need to be determined, but it could include use of an identification card or similar issued by the System Operator, which could be assessed by all junkshops participating as return locations in the DRS.

The junkshops would most likely manage the used beverage containers manually, by scanning the used beverage containers and storing them uncrushed in a storage container/bag.[90] The stored containers would then be collected by a logistics company as funded by the System Operator, and taken away to be counted and sorted (if required)

[90] As above, there might be instances where crushed or partially crushed containers would still have readable DRS labels that identify them as having refundable deposits. While these would not typically be accepted in automated returns (i.e., RVMs would not be able to rotate and scan the container), junkshops using manual returns might accept the containers if the DRS label is readable.

before being crushed, bulked and sent for recycling. Registered junkshops would be refunded all deposits they had paid out to waste reclaimers, paid for by the System Operator. Registered junkshops would also be paid an additional Service Fee on a per-container basis for their participation in the DRS, compensating them for the necessary costs associated with time and resources spent receiving, managing, and storing used beverage containers. The proposed Service Fee is derived from modelling the labour and space costs associated with an average junkshop achieving a specified throughput of returned containers per year. The value of the Service Fee is estimated as a modelling output in Section 5.4 of this report.

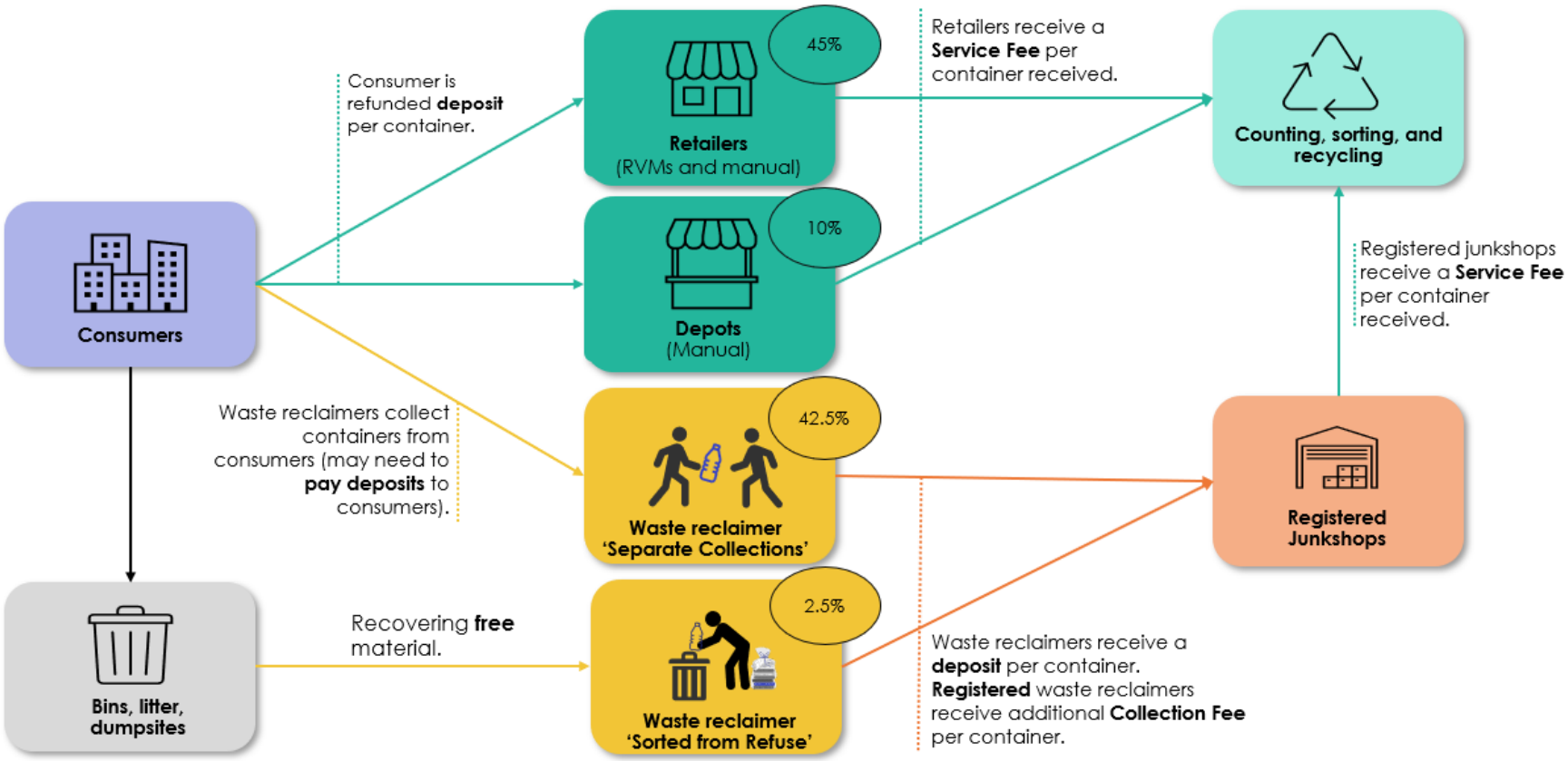
4.4.2.3 Potential Secondary Impacts on Waste Reclaimer Activity

Potential secondary impacts from the change in waste management are also considered here, in brief. While the modelling conducted within Section 5.0 (considered to have taken central case assumptions) calculates significant potential benefits to waste reclaimers, in a situation where the proportion of returns made by consumers to retail/depot are exceptionally high (and the proportion remaining in waste, in litter or handed to waste reclaimers is very low) then waste reclaimers could lose a major source of income from waste reclamation activities. Feedback within interviews conducted as part of this current study speculated that this could risk a reduction or cessation of informal sector waste reclamation activities, potentially leading to an increase in littered non-beverage container material. The point was also made that this could also result in reductions in junkshop activity, which – in the absence of other measures – could have a potential negative impact on the collection and recovery of waste. However, the design aspects proposed in the subsections immediately above seek to limit this risk by providing opportunities for waste reclaimers and junkshops to benefit from the DRS (e.g., from Service Fees, Collection Fees, and unclaimed deposits on containers sorted from refuse), and thereby to continue to operate. Furthermore, DRS is not envisaged or advised as the only waste management reform to be progressed, and mitigation of these risks can be further addressed through the wider waste and environmental policy; for example, EPR funds could be leveraged to fund waste reclaimer collection of packaging that is not included in a DRS.

4.4.3 Summary of Container Return Locations

Figure 4-1 provides an overview of the proposed DRS return routes and the estimated proportions of containers flowing through the return locations. These values are used in later modelling. These estimates are highly uncertain and represent only one possible set of return locations for Vietnam. The figure also sets out an overview of generalised material and financial flows for the “Separate Collections” and “Sorted from Refuse” return channels, and the proposed role of registered junkshops.

Figure 4-1: Simplified process chart of return methods and location types for consumers and waste reclaimers returning used beverage containers (PET bottles and aluminium cans) in the proposed DRS in Vietnam. The percentage values are estimated proportion of used containers returned/collected through the different return channels



It would ultimately be for the Government to decide how to manage the way in which waste reclaimers and junkshops would be integrated into a potential DRS in Vietnam, in terms of setting appropriate legislation. However, key issues for consideration by both the Government and the System Operator are likely to include the following:

- Registration of both waste reclaimers (to receive Collection Fees) and junkshops (to receive Service Fees) with the System Operator will need to be carefully considered, and further work will be required to understand the most appropriate methods of registration. Waste reclaimers and junkshops may require guidance, support, training, and encouragement to register with the System Operator. The process of registering with the System Operator should be transparent, clear, fair, and affordable. Consideration may also be needed on whether registration under the DRS is separate from, or integrated with, existing registration systems.

- Collection Fees would ideally be paid directly by the System Operator to the registered waste reclaimers via electronic transfer, after the junkshops have logged transactions. Alternatively, Collection Fees could be paid to registered waste reclaimers as physical cash, paid by junkshops to waste reclaimers on behalf of the System Operator. The junkshop would then be reimbursed by the System Operator for this payment. However, this poses a risk of fraud in the system.

- Reimbursing junkshops the refunded deposits, Collection Fees, and Service Fees would ideally be paid directly by the System Operator via electronic transfer, after the junkshops have logged transactions.

- Deciding the roles and responsibilities of waste reclaimer associations in a DRS. Such aspects to consider may include registration requirements, Collection Fee agreements with the System Operator, and DRS guidance and support to waste reclaimers. Learnings from Vietnam's EPR for packaging could support these decisions, considering the roles and responsibilities of waste reclaimer associations in Vietnam's EPR for packaging.

Further discussion of these points is provided in Appendix A.1.0, Designing a DRS for Success.

4.5 System Management

An effective DRS requires appropriate ownership and management of the system, including guidance through legislation and return rate targets set for the system to achieve. Table 4-3 provides an overview of the recommended system management design. Further details on system management are provided in Appendix A.1.0 on Designing a DRS for Success.

Table 4-3: Recommended system management of proposed DRS

DRS Element	Recommendation	Rationale
Legal status	Mandatory	The DRS should be mandatory, not voluntary. A voluntary DRS would risk limited participation from producers and retailers, likely resulting in low return rates from consumers. A mandatory DRS, on the other hand, would require obligated producers and retailers to participate in the system, which may achieve economies of scale to improve system efficiencies. A mandatory DRS would maximise participation rates from producers and retailers, maximise coverage of return locations, ensure fairness and consistency, and maximise return rates from consumers. A mandatory DRS would require legislation to be created, including the scope, deposit value, stakeholder responsibilities, targets, and penalties for non-compliance. A mandatory DRS could operate alongside and complement Vietnam's EPR for packaging legislation. A DRS can achieve synergies with EPR, as it can improve the quality and quantity of recycling and reduce litter from consumers, which EPR may not as effectively achieve. Care would be needed to avoid unnecessary duplication of reporting and fee payment requirements by producers for EPR and a DRS.
Ownership	Industry	The most effective systems are those run by the beverage industry (i.e. the obligated producers) with strong involvement of the retailers as return locations (return to retail). Industry ownership can act as a safeguard against high costs because system management will be accountable to those funding the system, via a board of directors. It also means that the beverage industry can use its expertise to improve the cost-effectiveness of the system. In Vietnam, the system ownership could be adapted with careful consideration of how retailers and the informal sectors are involved in the system governance to improve efficiencies. A Government-led DRS may be perceived by producers as a tax. It would also create additional work and incur costs for the Government, when it should be the responsibility of the industry. The initial setup costs and operational costs for a DRS can be very high, requiring investments into return locations and infrastructure (such as Reverse Vending Machines), logistics, administrative costs, and consumer education and awareness campaigns. However, these costs can be offset by the avoided costs of alternative/conventional waste management solutions (e.g., kerbside collections and litter picking) and revenue generated from unredeemed deposits and material sales. A cost benefit analysis of DRSs in parts of Europe, America, Australia, and New Zealand suggested

DRS Element	Recommendation	Rationale
		that the payback period for their implemented DRSs were between 2 and 10 years.[91]
System Operator	Single System Operator	A single System Operator has full visibility of all the flows of data, and this is essential in ensuring the DRS is well run and cost-effective. The System Operator will continually look for ways to improve the efficiency of the DRS. While the Government does not necessarily need to stipulate that there should only be one System Operator, the recommendation is to have a single System Operator in Vietnam. 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. This latter approach is preferred.
Return rate target	90% for PET bottles and aluminium cans	Setting a return rate target in legislation by a defined timeframe is recommended for any DRS. An ambitious yet achievable return rate target would ensure that the system is operating effectively, and would allow adjustments to be made should the target not be met – such as increasing the deposit level or infrastructural changes. Effective monitoring of the DRS would be required to achieve this. Many well-designed DRSs in Europe can achieve a return rate of 90% and higher. As mentioned previously, in the Republic of the Seychelles, a return rate of over 90% for PET bottles and aluminium cans was achieved through a combination of consumer returns and waste reclaimer returns.[92] While legislation may focus on the return rate target, additional targets could be considered, such as recycled content in the in-scope beverage containers. There can be various environmental, economic, and social benefits associated with setting and achieving a high return rate. These include the potential resource and greenhouse gas emission savings associated with the recycling of higher quantity and quality material, along with potential to reduce land and marine pollution associated with disposal and litter. Additionally, green jobs can be created from a DRS, with material throughput being a primary driver for the creation of jobs. Jobs include collection, sorting, and

[91] Lakhan, C. (2024). Evaluating the Effectiveness, Costs, and Challenges of Deposit Return Systems for Beverage Containers: A Meta-Analysis. *World Journal of Advanced Engineering Technology and Sciences*, 13(01), pp112–131. Available at: link

[92] Lai, A., Hensley, J., Krutli, P., and Stauffacher, M. (2016). Solid Waste Management in the Seychelles: USYS TdLab Transdisciplinary Case Study 2016. Available at: link

DRS Element	Recommendation	Rationale
		administrative roles – both directly and indirectly.[93] As such, a return rate target of 90% is recommended.

4.6 Roles and Responsibilities of Key Stakeholders

A DRS involves various stakeholders across Government, the beverage industry and retail, the formal and informal waste sector, and consumers, all with roles and responsibilities which contribute to its success. Figure 4-2 summarises the key stakeholders and their roles in the proposed DRS for Vietnam. Figure 4-2 and

[93] Reloop (2023). Fact Sheet: Deposit Return Systems Create More Jobs. Available at: link

Table 4-4 provide more detail on the key roles and responsibilities. Further details are provided in A.1.0 on Designing a DRS for Success.

Figure 4-2: Overview of key stakeholders and their roles

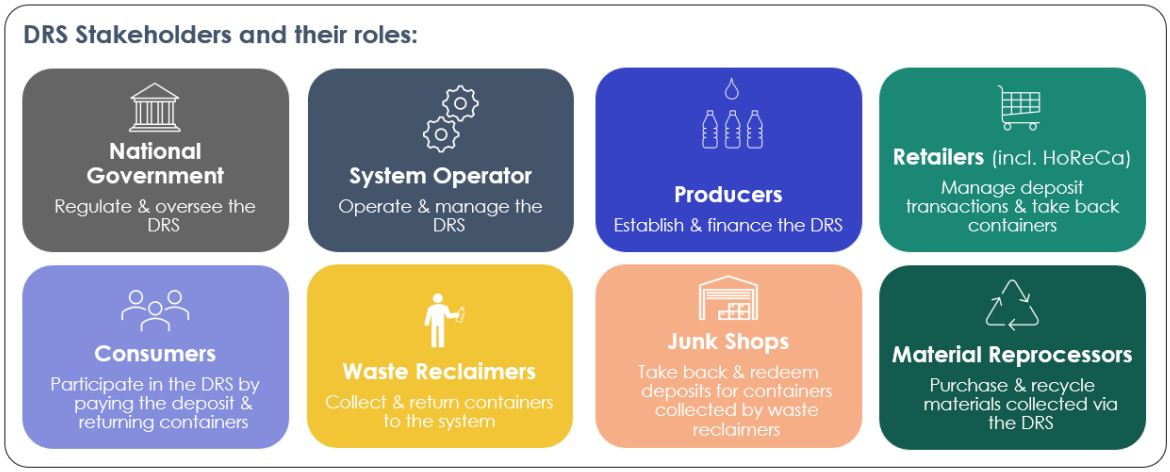


Table 4-4: Roles and Responsibilities of Key Stakeholders in a Vietnamese DRS

Stakeholder	Roles and Responsibilities
Government	● Creating legislation requiring a mandatory DRS to be implemented. ● Setting minimum standards and requirements of the DRS, to be met by the System Operator. ● Monitoring progress towards DRS targets (e.g., return rates, return location coverage), and using enforcement measures and financial penalties to incentivise producers to meet targets and comply with requirements if necessary. ● Ensuring that producers are complying with legislation. ● Promoting the DRS to the public.
System Operator	● Setting requirements for return locations, including RVMs. ● Operating and funding depots. ● Ensuring that DRS targets and minimum requirements are met. ● Ensuring that producers are complying with their requirements. ● Managing the system data. The system data would usually be managed independently by the System Operator, although Government could put in place data sharing agreements with the System Operator to access this data for specific purposes (e.g., the National Environment Database). ● Managing and monitoring deposit transactions, paying Service Fees to retailers and junkshops, paying Collection Fees to waste reclaimers, and receiving Producer Fees from producers. ● Organising the collection, transport, counting and sorting, processing, and sale of collected material (fulfilling producers' responsibilities for these activities). ● Marketing the DRS, including public communications.
Producers	● Initiating the deposit when placing in-scope beverage containers on the Vietnam market and charging the deposit in addition to the price of the beverage to their customers. ● Ensuring that in-scope beverage containers are appropriately labelled with relevant DRS information, artwork, and barcode verification to enable effective reporting on audited sales and units collected. ● Paying Producer Fees to the System Operator and registering their beverage products with the System Operator. ● Establishing / joining a System Operator, setting the System Operator's objectives and holding them to account, and appointing representatives to sit on the System Operator board. ● Reporting activities to the System Operator and Government.

Retailers	● Paying the deposit when purchasing in-scope beverages from their suppliers (e.g., direct from producer, through distributers, or from wholesalers), and charging the deposit to their customers at the point of sale. ● Receiving in-scope used beverage containers from consumers, storing received containers (which may include using RVMs), and refunding consumers their deposits. ● Maintaining collection infrastructure to the standards set by the System Operator, including cleaning RVMs. ● Reporting activities to the System Operator.
Consumers	● Purchasing in-scope beverage containers along with the deposit value, then returning the used beverage containers to a return location in order to redeem the deposit. Alternatively, selling or giving their used beverage containers to waste reclaimers through the "Separate Collections" return channel. ● Reporting instances of retailers failing to list the deposit separately, obligated retailers not providing the required take-back service, or producers applying a deposit logo to products that are not part of the system.
Waste reclaimers	● Registering with the DRS in order to receive Collection Fees. ● Collecting in-scope used beverage containers door-to-door from consumers. ● Recovering in-scope used beverage containers from bins, streets, dumpsites, and the wider environment. ● Taking used beverage containers to registered junkshops in order to redeem deposits (and Collection Fees for registered waste reclaimers).
Junkshops	● Registering with the DRS. ● Meeting minimum criteria in terms of quality control, processes and auditability in order to act as a return location for waste reclaimers. ● Refunding waste reclaimers the full deposit value per used beverage container (plus Collection Fee for registered waste reclaimers). ● Reporting activities to the System Operator.

5.0 Impacts of the Proposed DRS

Modelling outputs of the potential impacts of the proposed DRS are presented below. All results are presented in terms of impacts per annum, **once the proposed DRS has been fully implemented and has reached a steady state of operation and performance**.

5.1 Modelling Approach

Eunomia's proprietary DRS model was used to estimate the costs of a nationwide DRS in Vietnam for PET bottles and aluminium cans. This is based on a not-for-profit principle and reflecting local context, including Vietnam's large population, particular rural/ urban split, the beverage market, and the retailer and HORECA landscape.

While cost modelling indicates the financial feasibility of a DRS in terms of its affordability, a more holistic assessment requires that the financial costs be placed in the context of the benefits a DRS can deliver. To this end, the wider impacts that have been modelled include:

- **Carbon impacts** – the net change in greenhouse gas (GHG) impacts arising from:
    - Reduced incineration or landfilling of used beverage containers
    - The recycling process
    - Reduced use of virgin raw materials
    - Transporting used beverage containers from return locations to counting centres.

A damage cost was applied to the GHG impacts to provide a monetised value for the change in the tonnage of CO_2e (carbon dioxide equivalent).

- **Air quality** – Air pollution's impact on human health means that it is of increasing concern for both governments and the public. Transporting and recycling or disposing beverage containers produces pollutants that affect air quality, in addition to the GHG impacts. The modelling calculated the change in PM2.5 (small particulate matter), SO_2 (sulphur dioxide), NOx (nitrogen), NH_3 (ammonia) and VOC (volatile organic compounds), again applying a damage cost per tonne to provide a monetised value for the change (improvement) in air quality as a result of the increased recycling and reduced landfilling activity achieved by a DRS.

- **Litter reduction** – In addition to the direct financial costs of collecting litter, litter has indirect costs related to the impact on the aesthetic appearance of neighbourhoods, damage to belongings or injury to people as a result of broken beverage containers, reduced property values, and links with reduced mental wellbeing. Litter can, therefore, have a wider impact on the prosperity of a town or city. There is strong evidence that applying a deposit to beverage containers helps to reduce littering and these associated issues. The study estimated the reduction in litter 'disamenity', or 'welfare loss', as a result of the reduced litter in a DRS, using estimates of people's 'willingness to pay' for a less littered local environment to reflect their negative perception of littering and the effect on their sense of well-being. By estimating the change in beverage container littering in a year and applying a disamenity value, it is possible to model the associated wider societal benefits of a DRS.

- **Job opportunities** – A DRS can be a source of green jobs (both formal and informal), making the potential employment impacts of interest to governments and society more generally. The modelling estimated the number of jobs directly resulting from a DRS. It also assessed the impact of a DRS on the informal sector's revenue from collecting beverage containers.

5.2 Data Uncertainties

It is important to note that while this study has attempted to gather accurate and representative input data for the DRS impact modelling, there are data gaps and areas of uncertainty. These include:

- Data on the total numbers, weights, sizes, and types of beverage containers placed on the market per annum in Vietnam are variable. While the various data sources all suggest that PET bottles and aluminium cans represent the vast majority of single-use beverage containers in Vietnam, the reported quantities vary. Additionally, limited granularity on the container sizes and weights was available, resulting in average container weights being used. Such variation in quantities and use of average weights will reduce the accuracy of the DRS modelling outputs.

- There is also varying information available about the current waste collection, treatment (recycling, landfill, incineration), and mismanagement (litter, open dumpsite, open burning) of used PET bottles and aluminium cans in Vietnam. This includes formal and informal waste management information, such as collection rates, recycling rates, waste reclaimer buying and selling prices, and junkshop reclaimer buying and selling prices. It is understood that there will naturally be variations over time and location for buying and selling rates, due to material markets and other economic factors. However, for the variations of waste collection, treatment, and mismanagement the reasons are less clear. For instance, a 2019 study estimated that, on average, 27% (with an error margin of 15%) of PET bottles were collected-for-recycling in Vietnam. The report estimated 62% of PET bottles were collected-for-recycling in Ho Chi Minh City and 39% in Hanoi.[94] Notably, the 2019 study's PET bottles collected-for-recycling figures were disputed during a workshop in another study, in which attendees argued the values were far too low, with one attendee claiming 98% in Ho Chi Minh City.[95] During the interviews in this study, one interviewee in the waste management sector estimated that around 20% of PET bottles were collected-for-recycling in Vietnam. In this study, a national collected-for-recycling rate of 50% has been assumed for PET bottles, based on a 2022 study.[96] As for aluminium cans, while the variations of collected-for-recycling rates are smaller than that of PET bottles, there is still variation. A 2022 study reported that 93% of aluminium cans are collected-for-recycling in Vietnam.[97] During the interviews in this study, one interviewee in the waste management sector estimated that around 60-70% of aluminium cans were collected-for-recycling in Vietnam. In this study, a national collected-for-recycling

[94] GA Circular (2019). Full Circle: Accelerating the Circular Economy for Post-Consumer PET Bottles in Southeast Asia. Available at: link

[95] P4G (2020). Market Report: Market Analysis for rPET Factory: Feedstock, Competitors, Buyers. Available at: link

[96] Eunomia (2022) Beverage Packaging in Vietnam Recycling Rate & Recycling Cost Final Report. Available at link

[97] Roland Berger (2023). Aluminium Cans Market Assessment – Vietnam. Context, Quantitative Baseline, Options. Final Version. May 2023 – Updated August 2023. No Weblink Available.

rate of 80% has been assumed for aluminium cans, based on a 2022 study.[98] As these examples highlight, there are a range of reported information regarding beverage container waste management in Vietnam. Many of the sources of waste management data are based on urban areas, such as Ho Chi Minh City, Hanoi, and Da Nang. However, limited information is available for rural areas, which makes up a large area and population of Vietnam. As such, there is uncertainty associated with the current waste management data used in this study.

- Informal sector information was variable and limited, including the quantities and buying and selling prices of materials for waste reclaimers and junkshops. There were various studies and insights from stakeholders regarding the buying and selling prices for waste reclaimers, but these were mostly in urban areas. The most granular data identified was from a recent 2023 waste reclaimer and junkshop survey on Phú Quốc, including average weights and buying and selling prices, which were compared against other data sources. Although material prices and incomes will vary across Vietnam and over time, the 2023 Phú Quốc dataset was considered the most consistent, granular, and suitable for modelling many of the informal sector variables.

- Return location data for Vietnam is variable, with limited or inconsistent retailer and junkshop information being reported – such as varying total number of sites, limited information on geographic distribution, and limited information about floor area/sizes. During the stakeholder interviews, it was evident that informal retailers play a major role in the sales of beverages. Many of these informal retailers are unlikely to be documented, resulting in uncertainty on the total number and types of retailers in Vietnam. Similarly, there was no identified data on junkshop locations or total number of sites for Vietnam, with most data being for major urban areas or for Phú Quốc. Since retailers and junkshops would play a vital role in the proposed DRS, such uncertainty in their numbers, sizes, and distribution is a major sensitivity for modelling. As such, assumptions and estimates have been used for the total number of participating retailers and junkshops in the proposed DRS.

- As discussed in Section 4.4, the assumed distribution of containers returned via each return channel is highly uncertain. For the purposes of modelling the study has assumed an equal volume of returns through return to retail, and via waste reclaimers, with a minor proportion returned by consumers to depots. This estimate will not match the actual distribution of returns, if a DRS were implemented, which could vary significantly from the assumptions used in this analysis.

The modelling is based on the best available central case assumptions, meaning that where assumptions have a range of possible values, the assumptions used for modelling are based on midpoint values — positioned between the minimum and maximum potential outcomes. It is recommended that further investigation and sensitivity analysis is conducted on these uncertainties to better understand the range of economic,

[98] Eunomia (2022) Beverage Packaging in Vietnam Recycling Rate & Recycling Cost Final Report. Available at link

environmental and social impacts for a DRS. Uncertainties would be further reduced by running a pilot, while also allowing DRS design elements to be tested and refined.

5.3 Collection Rates

The potential impact of the proposed DRS on collection rates is presented in Table 5-1**.** An increase in collection rates is seen for both PET bottles and aluminium cans after implementation of the proposed DRS, which is assumed to achieve return rates of 90% or greater after reaching a steady state of operation. A 90% return rate (and higher) can be achieved in well-designed DRSs, such as in Croatia, Denmark, Finland, Germany, Iceland, Lithuania, and Norway.[99] As previously mentioned, a return rate of around 90% has also been achieved in the Republic of the Seychelles' DRS, which includes involvement of waste reclaimers (though not specifically designed into the system).

Table 5-1: Collection Rates Before (Baseline) and After Proposed DRS Implementation

	PET bottles		Aluminium cans	
	Tonnes	**Collection Rate**	**Tonnes**	**Collection Rate**
Baseline	82,150	50%	133,906	80%
DRS	147,870	90%	150,644	90%
Change in waste flows following DRS implementation	+65,720	+40%	+16,738	+10%

The collection rate for aluminium cans is already high at 80%, primarily due to waste reclaimer collections from the high economic value of aluminium, and the current return rate for PET is at 50%. Both return rates are higher than the recycling targets set out in Vietnam's EPR, which are currently (at the time of writing) set at 22% for aluminium and 22% for rigid PET packaging.[100] As discussed in Section 5.2, there is significant uncertainty around these current rates. Under a proposed DRS, return rates are likely to increase by 40 percentage points for PET bottles and 10 percentage points for aluminium cans.

5.4 Costs of the DRS

The costs and revenues of a mature DRS (once the proposed DRS has been fully implemented and has reached a steady state of operation and performance), which are paid for and accrue to the System Operator, include the following:

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

[100] The Socialist Republic of Vietnam (2022). Decree 08/2022/ND-CP. Available at link.

- **Administration** – Costs for managing the DRS and communications.

- **Container return costs** – Costs of returning containers through the different return channels, including Service Fees (paid by the System Operator to retailers and junkshops on a per-container basis), Collection Fees (paid by the System Operator to registered waste reclaimers on a per-container basis), and depot costs (for operating depots, as managed by the System Operator).

- **Transportation** – Logistics costs for transporting used beverage containers in trucks from return locations to counting centres, sorting centres, and recycling facilities.

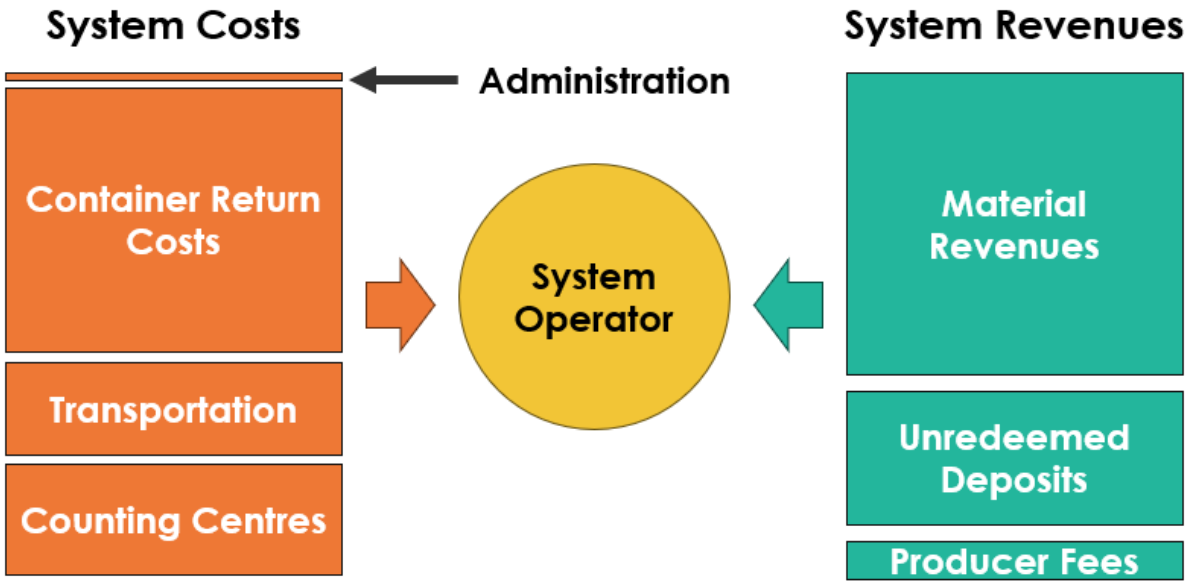
- **Counting centres** – Final consolidation, counting, sorting, and baling of used beverage containers at counting centres.

- **Material revenue** – The System Operator retains ownership of all used beverage containers that are returned, and so retains the revenue from the sale of PET bottles and aluminium cans to recyclers. The revenue helps to offset the operating and capital expenditure of the DRS.

- **Unredeemed deposits** – For used beverage containers that are not redeemed by consumers (or waste reclaimers), the unredeemed deposit is retained by the System Operator and therefore is a revenue to the DRS. Like material revenue, unredeemed deposits help to offset the operating and capital expenditure of the DRS.

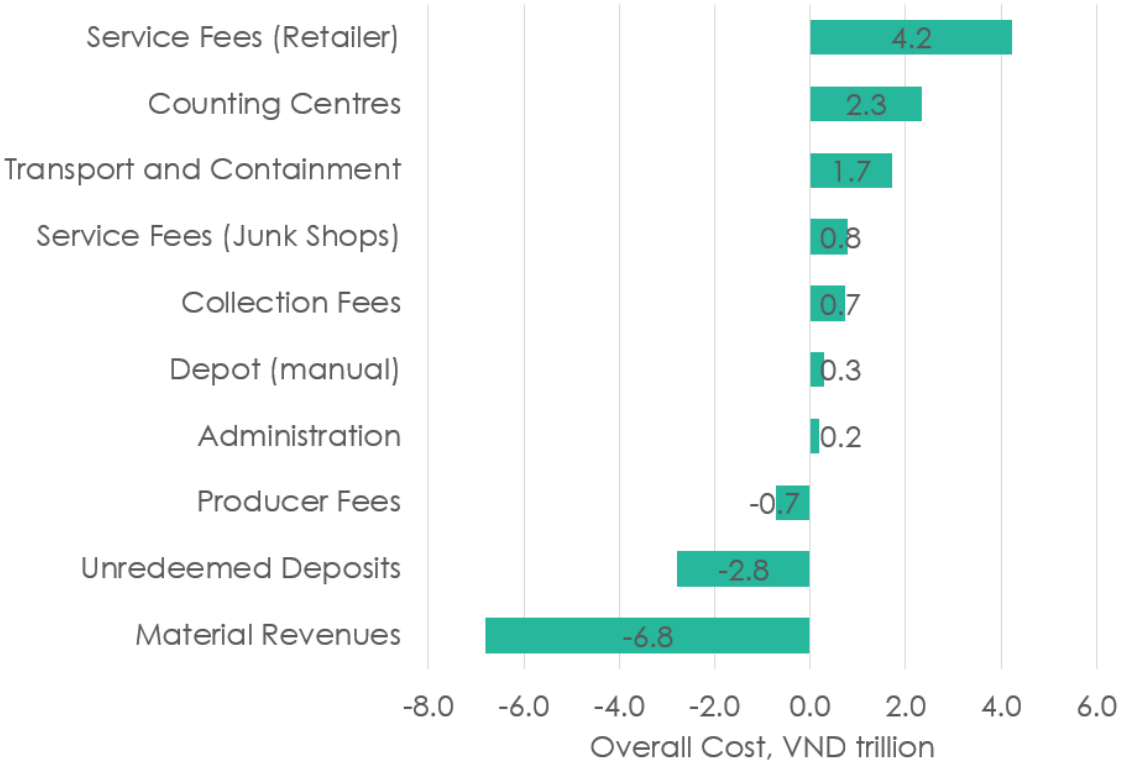
Beverage producers pay Producer Fees to the System Operator for every in-scope beverage container placed on the market in Vietnam, with these payments covering the remaining costs not covered by other sources of revenue (i.e., material revenues and unredeemed deposits). As in many other DRSs around the world, it is recommended that Producer Fees in the DRS would replace Producer Fees for beverage containers under the current EPR for packaging system. Different Producer Fees are commonly charged for PET and aluminium, based on the costs and revenues for each material type. The approximate proportion of costs and revenues in the DRS modelled for Vietnam are shown in Figure 5-1.

Figure 5-1: Approximate proportion of costs & revenues in the Vietnam modelled DRS



Estimated annual System Operator costs and revenues for the proposed DRS in Vietnam are shown in Figure 5-2. The total revenue from Producer Fees in the proposed DRS in Vietnam is estimated at 720 VND billion per annum. Producer Fees are estimated to cover approximately 15% of the costs of a DRS, with the majority of costs covered by material revenues (59%) and unredeemed deposits (26%).

Figure 5-2: Overall Costs and Revenues per Annum of a Proposed DRS, VND Trillion



A detailed breakdown, by container material, of System Operator costs and revenues for the proposed DRS is presented in Table 5-2. These are the same costs as those presented in Figure 5-2, but shown in terms of a cost per container PoM, rather than overall cost.

Table 5-2: Annual DRS Costs and Revenues Per Container Placed on the Market, VND[101]

	PET bottles	Aluminium cans	Average
Administration	10	10	10
Service Fees (Retailer)	257	213	235
Service Fees (Junk Shops)	52	37	45
Collection Fees	39	39	39
Depots	17	16	16
Transport and Containment	144	66	105
Handling Centres	126	126	126
Gross Annual Operating Costs	643	508	577
Material Revenues	267	414	341
Unredeemed Deposits	150	150	150
Net Cost / Producer Fee	228	-56	86

These net costs are compared to current producer fees for existing DRSs in Europe in Figure 5-3**.** While EPR fees for packaging have not yet been finalised in Vietnam, the draft Decree on recycling cost norms (Fs) proposes the following EPR fees: 3,222 VND/kg for PET bottles and 6,180 VND/kg for aluminium cans.[102] Considering the packaging unit weights for PET bottles and aluminium cans respectively, these fees are equivalent to 85 VND/container and 83 VND/container. This would be lower than the proposed DRS Producer Fees for PET bottles (228 VND/container), but higher than the proposed (negative) Producer Fees for aluminium cans (-56 VND/container).

[101] Costs represent system costs and revenues once the DRS is mature. For unredeemed deposits, the 150VND value was calculated based on a deposit of 1,500VND and 10% of containers not being returned (assuming a 90% return rate).

[102] Nguyen, H. (2024). Personal Communication. 17 December 2024. No link available.

Figure 5-3: Estimated Fees for Vietnam DRS and Producer Fees for Existing European DRSs, VND per Container

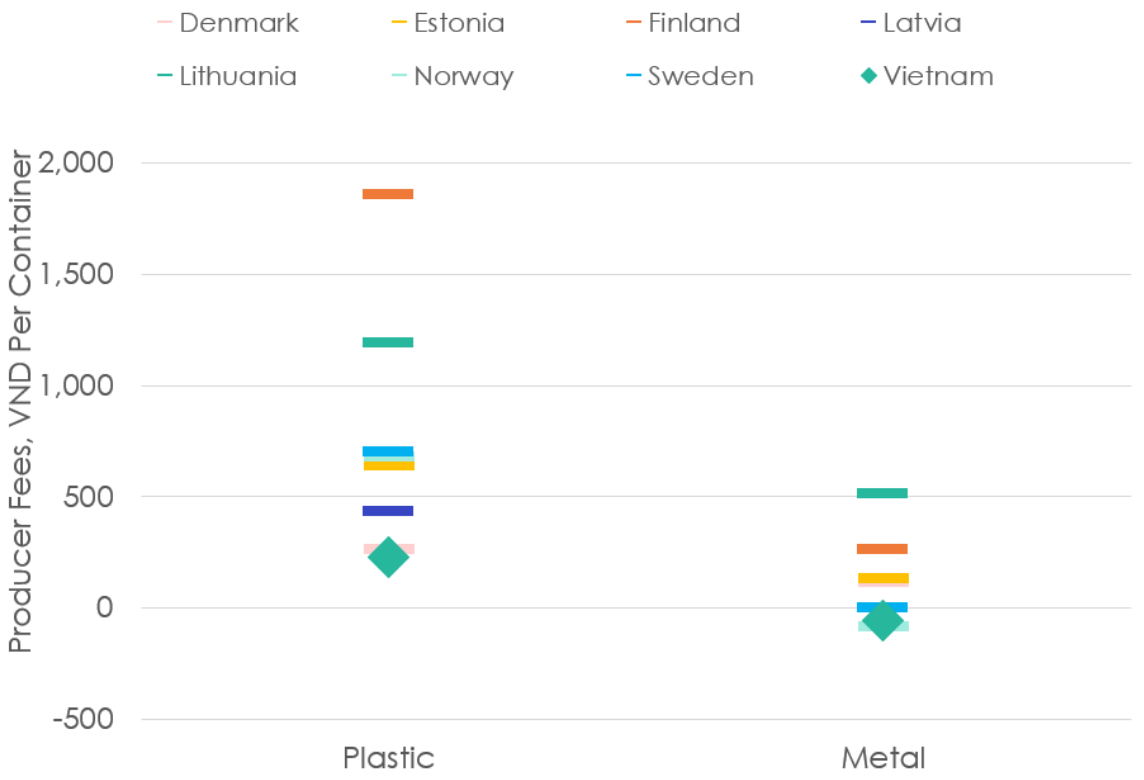


Table 5-3 sets out the estimated costs for returning and transporting containers through each return channel – costs are in VND per container returned. Further details and assumptions are provided in Appendix A.3.0.

Table 5-3: Costs of Handling and Transportation by Return Channel, VND per Container

	Service Fee	Collection Fee	Transport	Total Cost
Retailer (RVM) [1]	716	-	49	765
Retailer (Manual)[1]	168	-	141	309
Waste Reclaimer Returns (Separate Collections)	105	100	125	330
Waste Reclaimer Returns (Sorted from Refuse)	105	20 [2]	125	250
Depot (Manual)[3]	181	-	127	308

Notes

1. Service 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 service fees are higher due mainly to the additional cost of installing and maintaining RVMs.
2. Collection fee is lower as only 20% or returns via this route are assumed to be paid a collection fee.
3. This is an internal cost to the DRS (rather than a Service Fee, as depots are built and operated by the DRS). The cost shown here is a cost per container and is comparable to a service fee.

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

- The modelled net costs of a DRS (i.e., the Producer Fees) in Vietnam are significantly lower than DRSs in various European countries.[103]
    - For PET bottles, the net cost per container is less than half the average cost of European DRSs.
    - Aluminium cans are lighter and smaller than PET bottles, and thus take up less storage space and are cheaper to transport. Moreover, as aluminium has a high material value, it brings in substantial material revenue. Like many European DRSs, the estimated Producer Fee is close to 0 VND – in Vietnam it is estimated that a negative Producer Fee may arise (-50 VND per aluminium can), while in Europe a 0 or slight positive Producer Fee is more common. In Norway's DRS, negative costs are mitigated by reducing the amount that producers of aluminium cans pay when first paying the deposit per container. This avoids the System Operator from paying producers of aluminium cans. It would be for the System Operator and Government to determine how best to manage any negative net costs in a DRS.

[103] Ranges based on lower / upper quartiles of producer fees for DRSs in Denmark, Estonia, Finland, Latvia, Lithuania, Norway and Sweden.

- It is estimated that roughly two-thirds of in-scope beverage containers placed on the market in Vietnam are aluminium cans, which weights the DRS towards a system that is overall cost neutral.

- The majority of Producer Fee contributions will be primarily borne by producers of beverages in in-scope PET bottles. As an illustrative example, if the average price of a 500ml bottle of Coca-Cola in Vietnam is ~10,000 VND, Producer Fees would make up ~2% of the product selling price (based on a net cost of 230 VND per container).[104]

- Service Fees are the largest cost of the proposed DRS, as is commonly the case in other DRSs around the world. The modelled Service Fees per container, on average, are lower in Vietnam than in European DRSs. This is driven by very low manual return Service Fees, which are approximately half the European average. In contrast, Service Fees for used beverage containers returned through RVMs (automated returns) are similar to lower costs seen in European DRSs.[105] The Service Fees differ for the following reasons:

  - The modelled Service Fees for retailers using RVMS (automated returns) are slightly lower than 'typical' costs in European DRSs. The largest determinant of RVM Service Fees is the cost of an RVM, which is fixed and does not vary between countries. Space/floor area cost is another major factor. Other costs, such as labour/wages for emptying RVMs, are only a small proportion of service fee costs compared to the cost of an RVM.

  - The modelled Service Fees for manual returns are particularly low in Vietnam due to comparatively low labour/wages and space costs in Vietnam compared with countries in Europe. The largest cost difference is labour/wages - average annual earnings in Vietnam are ~85% lower than in the European Union, but space/floor area is also substantially cheaper in Vietnam. [106] [107]

  - In European DRSs, most used beverage containers (~90%) are returned through RVMs. In the proposed DRS in Vietnam, it is assumed that the majority of used beverage containers would be returned manually (68%), with the remainder returned through RVMs (32%).

  - Total costs associated with waste reclaimer returns, consisting of Collection Fees paid to registered waste reclaimers and Service Fees paid to registered junkshops, are estimated to be ~20% higher than Service Fees for manual

[104] Global Product Prices (2024). Vietnam – Coca Cola – price, May 2024. Available at link.

[105] Statistics based on average service fees for DRSs in Denmark, Estonia, Finland, Latvia, Lithuania, Norway and Sweden.

[106] Statista (2024) Average annual net earnings in the European Union from 2013 to 2023. Available at link.

[107] Statista (2024) Average monthly salary for paid workers and employees in Vietnam from 4th quarter 2020 to 1st quarter 2024. Available at link.

returns to retailers. This suggests that waste reclaimer returns is an affordable and cost effective return channel for a DRS in Vietnam.

- Counting centre costs in Vietnam are comparable to those for European DRSs. This is driven by the high proportion of used beverage containers that are assumed to be manually returned in the DRS in Vietnam, all of which require subsequent counting in high-speed counting machines. This means that, relative to the number of beverage containers placed on the market, more counting machines and associated operational costs are required in the proposed DRS in Vietnam. However, the cost impact is balanced out by lower cost of space and labour/wages.

- Transport costs are much lower, on average, in Vietnam than in European DRSs, and unusually for a DRS, are a lower cost than counting centres. In the proposed DRS in Vietnam, transport costs per used beverage container are estimated to be ~55% and ~70% lower than in Lithuania and Norway, respectively. This is due to lower costs of vehicles, labour/wages, and fuel in Vietnam. For example, the cost of diesel was almost 50% lower in Vietnam than in Lithuania and Norway in 2023.[108] Additionally, and as mentioned before, labour/wages in Vietnam are ~85% lower than in the European Union.

Overall, it is estimated that total operating costs of a proposed DRS in Vietnam could be much lower than a typical European DRS. However, revenue could also be lower in Vietnam than in a typical European DRS, due to the relatively low deposit value and the impact of this on revenue from unredeemed deposits. **Overall, the costs and revenues add up to a system that is roughly half the cost of a typical European DRS.**

5.5 Environmental Impacts

The environmental impacts of introducing a proposed DRS are presented below, and the methodology for this assessment further described in Appendix A.3.7.

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. 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 is presented in Table 5-4. This table shows the *change* in emissions, which is compared to estimated emissions from waste management and related transport emissions in Vietnam currently.

[108] Global Petrol Prices (2024) Diesel prices (one year ago). Available at Vietnam (link), Lithuania (link) and Norway (link).

Table 5-4: Change in Environmental Externalities (GHG and AQ) per Annum after Introduction of Proposed DRS, CO2e and VND Trillion

	GHG emissions, thousand tonnes CO2e	Environmental ext. (GHGs + AQ), VND trillion
Recycling	-308.2	-1.5
Disposal	-40.7	-0.2
Transport	83.8	0.3
Net Change	**-265.0**	**-1.4**

GHG savings from recycling and disposal are higher than the additional transport emissions from a DRS, resulting in total savings of 265 thousand tonnes CO_2e per annum. The estimated financial benefit of this change in environmental externalities (GHG emissions and AQ) is 1.4 trillion VND.

Another important environmental benefit of introducing a DRS is reducing the amount of land and beach 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.[109]

The environmental impacts of litter pollution are not limited to Vietnam. Plastic pollution is recognised as a serious global problem, especially in the marine environment[110], which is likely to be the end destination for plastic litter that is not recovered. Notably, the Global Plastics Treaty will require measures to be taken to reduce plastic pollution. Failure to do so will incur direct and indirect costs for the country.

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 seen as 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 are seen as the largest component of damage costs relating to litter (see Appendix A.3.7.6 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.

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 Vietnam. There are no specific disamenity studies conducted for Vietnam and little data on the quantity, nature, and distribution of litter throughout Vietnam. The

[109] Eunomia (2013). Contributed to a Zero Waste Scotland report *'Scotland's litter problem: quantifying the scale and cost of litter and flytipping*'. No longer available online.

[110] WWF (2022). Towards a Treaty to end Plastic Pollution. Available at link

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 Vietnam regarding littering.

The study's best estimates are an **overall reduction in litter disamenity of VND 10.1 trillion per year following DRS implementation.** These estimates include an adjustment to account for Vietnam's gross domestic product (GDP) at purchasing power parity (PPP) per capita.

5.6 Social Impacts

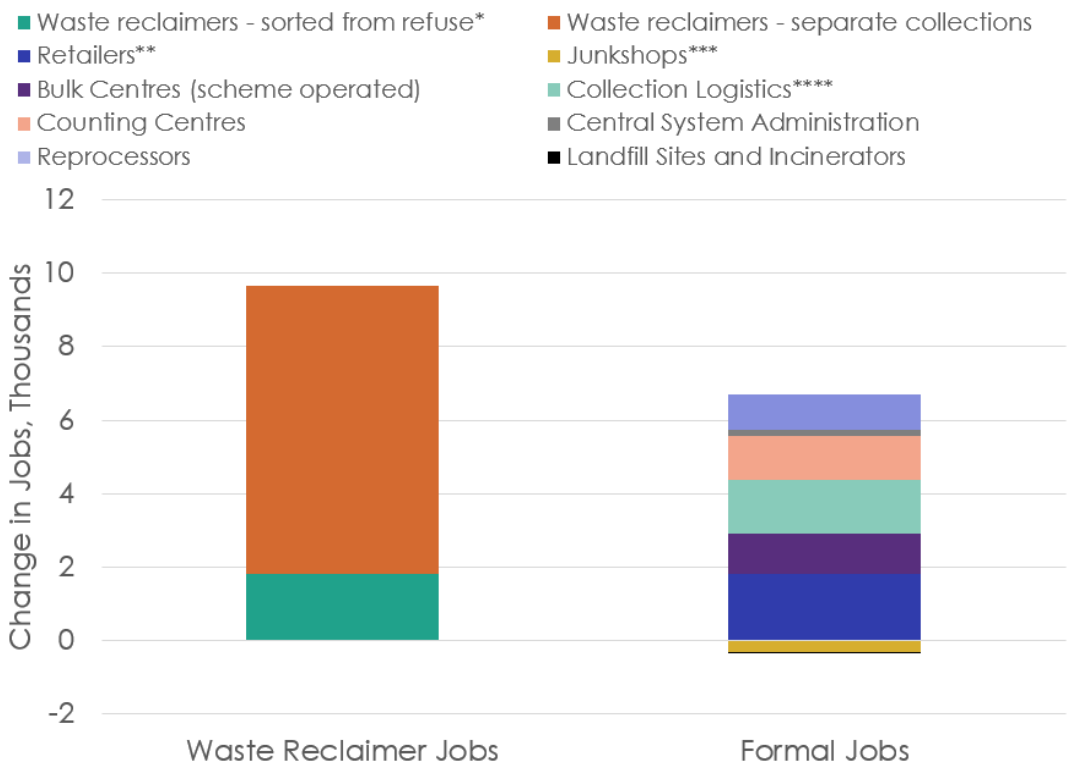
5.6.1 Jobs

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.[111] The estimated impacts of a proposed DRS on the number of jobs in Vietnam, both waste reclaimer and formal jobs, are presented in Figure 5-4. All job impacts are reported in number of full-time equivalents (FTEs) (see Appendix A.3.8 for further details and assumptions).[112]

[111] Reloop (2023). Fact Sheet: Deposit Return Systems Create More Jobs. Available at: link

[112] 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 5-4: Change in Jobs from Proposed DRS Implementation, Thousands FTEs



Notes:

** This includes all current waste picking activities (primarily landfill workers, and picking from litter etc.), and, under a proposed DRS, continued picking of non-beverage material, and picking of deposit bearing material.*

*** 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 junkshops 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. It is estimated that a total of 9.6 thousand additional jobs could be created. Of these jobs, 1.8 thousand jobs are for waste reclaimers carrying out 'sorted from refuse' activities, and approximately 7.8 thousand waste reclaimer jobs carrying out 'separate collections' of DRS containers. These increases in jobs are in addition to baseline estimates for current jobs for waste reclaimers.

The current number of waste reclaimer jobs (which these estimated changes are relative to) is not well understood in Vietnam. Available data, including estimates made in this study, based on scaling of waste collector numbers reported for Ho Chi Minh City and Da

Nang suggest that the total number of waste reclaimers in Vietnam could be in the region of 70 to 125 thousand.[113,114,115]

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. High productivity, i.e. assuming more containers are collected per waste reclaimer per day/ month would mean higher incomes per waste reclaimers, 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. These assumptions, and the overall methodology for considering incomes and job numbers for waste reclaimers, are discussed further in Appendix A.3.8.2.

Formal Jobs

Formal jobs are estimated to increase by 6.4 thousand under a proposed DRS. Around a quarter of these additional jobs are in retailers, and a similar but slightly smaller proportion are in collection logistics. Formal jobs are also created in counting and sorting centres, depots, recycling facilities, and in administration. A minimal reduction in jobs at junkshops and landfill sites and incinerators is likely with a total reduction of approximately 300 jobs.

Job Impact Summary

Overall, the assessment above indicates formal jobs are estimated to increase by 6.4 thousand under a proposed DRS, while it could also create opportunities for an additional 9.6 thousand informal jobs.

5.6.2 Waste Reclaimer Incomes

Figure 5-5 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.3.8.2. There is uncertainty and risk associated with the level of income under a DRS, since it would be dependent on the availability of beverage containers from consumers and in refuse (i.e., consumer behaviour), the speed of recovering and selling containers (i.e., visually checking for a DRS label to indicate the container carries a deposit and transaction process at the junkshop), and the extent to which waste reclaimers and junk shops registered with the DRS in order to receive the collection fee per returned DRS container.

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':

[113] ENDA (2022) Integration of the informal sector into the implementation of the Extended Producer Responsibility scheme for plastic packaging. Technical report under the project "Rethinking Plastics – Circular Economy Solutions to Marine Litter" funded by the European Union and the German Federal Ministry for Economic Cooperation and Development (BMZ).

[114] UNDP (2020) A peek into the life of informal waste workers in Viet Nam during COVID-19. Available at link.

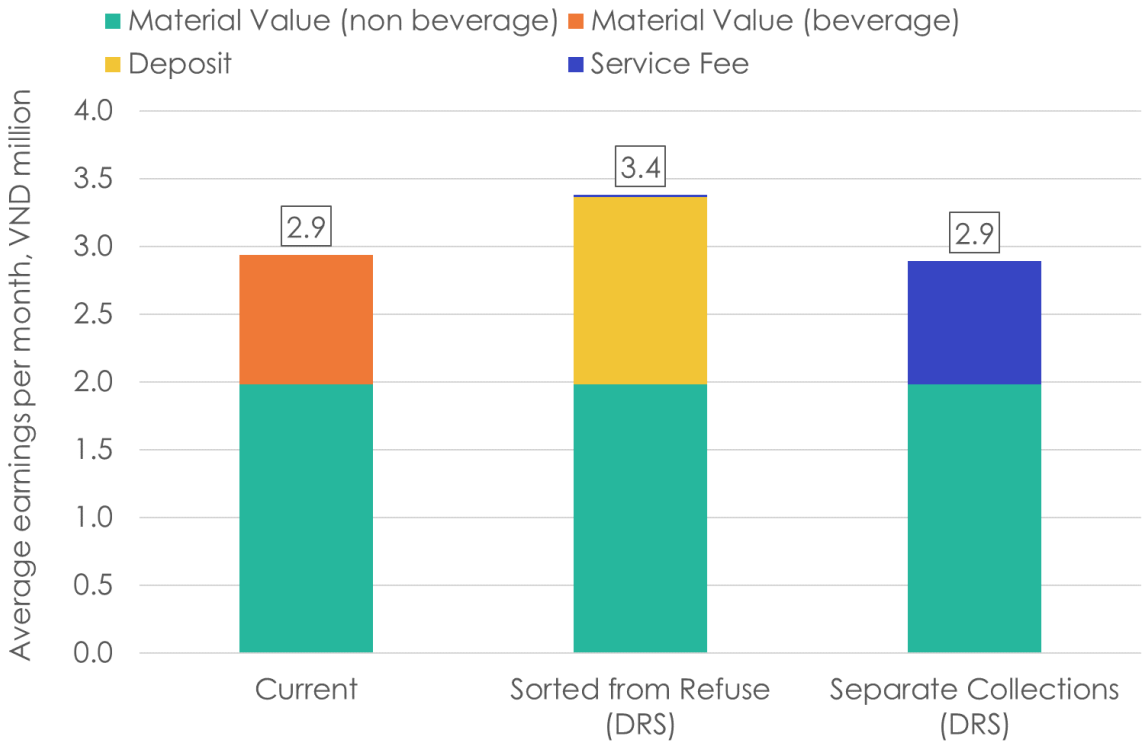
[115] Roland Berger (2023) Aluminium Cans Market Assessment – Vietnam.

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) from landfills, bins, or litter; and

2. 'Separate collections' of beverage containers (direct from consumers, HORECA etc), similar to door-to-door collections of material which take place currently.[116]

Further details of these proposed roles for waste reclaimers in a DRS are set out in Section 5.6.1.

Figure 5-5: Average Monthly Earnings of a Waste Reclaimer, VND Million



This analysis indicates minimal change in earnings on average for waste reclaimers undertaking separate collections. With a DRS, earnings for 'sorted from refuse' activities are approximately 0.5 million VND higher than the baseline – these workers tend to be the higher earners already hence the change in earnings is unlikely to be significant. 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.

As discussed, there is considerable uncertainty with these estimates, not least due to variable data on current earnings (which studies suggest can vary from 600,000 VND to 5.2 million VND per month), and assumptions on the productivity of waste reclaimers.

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

6.0 Key Findings and Next Steps

This study has explored design options for, and assessed the costs and impacts of, a Vietnam-wide DRS. The results suggest that **it is possible to design a bespoke mandatory DRS for single-use beverage containers in Vietnam to increase collection and recycling rates of used beverage containers**, both delivering environmental benefits and creating jobs.

The DRS is proposed for all PET bottles and aluminium cans used for beverages, sized between 150ml and 3L (inclusive), excluding wine, spirits, and milk-based dairy drinks. The DRS should be mandatory, in the sense that new legislation obliges all producers of in-scope beverages to enrol in the system, pay fees to support the operations, and mark their containers with agreed labelling that facilitate success of the system, and for retailers to particulate as required. A fully refundable deposit value of between 1,000 and 2,000VND per container is recommended. For modelling purposes in this current study, a deposit value of 1,500 VND has been used.

It is feasible and highly likely that that **a well designed and implemented DRS could achieve collection rates of 90% and above**. This is higher than current performance, and higher than the existing EPR targets for PET bottles and aluminium cans.

Major environmental improvements are estimated from a DRS in Vietnam as modelled, including:

- **An additional 21,000 – 77,000 tonnes of used beverage containers could be recycled per year**, diverting some of the waste away from landfill, dumpsites, open burning, and/or litter.
- **A reduction in GHG emission of roughly 265,000 tonnes CO_2e per annum**.
- **A reduction in environmental externalities** (considering GHG emissions and localised air pollutants) **of 1.4 trillion VND per annum**.
- **A reduction in litter disamenity of approximately 10.1 trillion VND per annum**. This is an estimate based on a 'willingness to pay' methodology.

A DRS could also result in an increase in formal employment, throughout the beverage supply chain, of **around 6.4 thousand additional jobs**.

The central case modelling in this study suggests there would be no loss of income for waste reclaimers under the proposed DRS. Meanwhile, **an estimated 9.6 new waste reclaimer jobs could be created.** 7.8 thousand new jobs could be created for waste reclaimers through 'separate collections' (which are similar to current 'door to door' collection methods in Vietnam) of used beverage containers, with incomes similar to current average earnings. An additional 1.8 thousand jobs could be created for landfill and street waste reclaimers in sorting DRS containers from refuse.

The total cost of Producer Fees (i.e., the cost paid by beverage producers to the System Operator per beverage container placed on the market) in the proposed DRS is estimated at 720 billion VND per annum. These **Producer Fees are less than half the cost of fees in typical European DRSs**.

While EPR fees for packaging have not yet been finalised in Vietnam, the draft Decree on recycling cost norms (Fs) proposes 3,222 VND/kg for PET bottles and 6,180 VND/kg for aluminium cans, equivalent to 85 VND per PET bottle and 83 VND per aluminium can. This would be lower than the proposed DRS Producer Fees of 228 VND per PET bottle, but higher than the proposed (negative) DRS Producer Fees for -56 VND per aluminium can. However, the proposed costs of (non-DRS) EPR under the draft Decree reflect a lower level of performance compared to DRS, which is the only system for beverage container waste management which consistently achieves very high return rates of 90% or greater.

Retailers and junkshops would play a key role in the proposed DRS. Retailers would not only sell in-scope beverage containers to consumers, but many would also be return locations. Many junkshops would also be return locations for waste reclaimers. Both retailers and junkshops would be paid Service Fees on a per-container basis by the System Operator. Estimated Service Fees per container returned appropriate for a Vietnam DRS are as follows:

- Retailer (RVM) – 716 VND per container
- Retailer (Manual) – 168 VND per container
- Junkshop – 105 VND per container

It is recommended that waste reclaimers would be refunded the deposit value per used beverage container taken to registered junkshops. Registered waste reclaimers would also be paid an additional Collection Fee on a per-container basis. A fee of 100 VND per container returned is considered appropriate for Vietnam.

While this study has designed a DRS to limit its negative impacts on junkshops, and provide benefits and opportunities, there would be risks. These include availability of beverage containers and the extent to which waste reclaimers and junkshops register with the DRS to receive Collection Fees and Service Fees, respectively. Furthermore, while not investigated in this study, craft recycling villages would be impacted by a DRS. Specifically, a large proportion of used PET bottles and aluminium cans would likely be diverted to formal recycling facilities for closed-loop (container-to-container) recycling. If a DRS is implemented, any negative impacts would need to be considered, monitored, and mitigated.

The modelling undertaken for this study is based on based available central case assumptions; however, there are significant areas of uncertainty in the analysis conducted (see Section 5.2). This includes: (1) data on the total numbers, weights, sizes, and types of beverage containers placed on the market in Vietnam, and collection rates for these containers; (2) informal sector information, including the number of workers, quantities of material collected, estimates of productivity after introduction of a DRS, average earnings (and how these vary by type of worker and location), buying and selling prices for materials,

and working patterns; (3) return location data, including the number and sizes of retailers and junkshops; and (4) return behaviours (direct consumer returns vs. informal sector assisted returns).

This study considers only one possible outcome of a DRS and does not include multiple scenarios and or sensitivities. The range of outcomes resulting from changes in key variables is not quantified and actual impacts could vary significantly from the results presented. The uncertainties warrant further investigation and sensitivity analysis to be conducted, in order to improve understanding of the risks affecting the economic or social case for a DRS; the environmental case, however, is considered robust.

The next steps towards a DRS in Vietnam are proposed to include further consultation with stakeholders (i.e., Government, producers, retailers, junkshops, waste reclaimers, and consumers) to refine and further specify the DRS design, alongside further work around the economic, social and environmental impacts. Additionally, to fulfil the National Action Plan on Circular Economy proposals to pilot and scale up circular waste management initiatives, this could include running a pilot. A pilot would test key design elements, as well as provide a better understanding of the response of consumers, waste reclaimers, retailers, junkshops and other stakeholders to a DRS. In addition to providing opportunities for learning and any necessary refining of system design parameters, these steps could address uncertainty in the data and mitigate risks identified in this study.

It is also proposed that consultation should consider how EPR implementation can cover any gaps not addressed by the DRS – in particular disposal, littering, collection and management of other packaging. Working together, these two initiatives can serve in addressing Vietnam's waste problems, while providing opportunities for environmental protection and social improvement. Overall, alongside other measures that address Vietnam's wider waste issues, a nationwide DRS for beverage containers offers a highly effective tool to support the transition to a circular economy.

Appendix

A.1.0 Designing a DRS for Success

A.1.1 Reloop Essential Requirements

Reloop provides guidance on 10 essential requirements that should be met to ensure that a DRS for single-use beverage containers operates effectively for the entire value-chain.[117] These are:

1. **Meaningful targets and penalties**

   Targets can be set on a variety of metrics, including return rates, levels of recycled content, public awareness, and geographic coverage. These targets should be set in legislation and clearly and defined for producers, retailers, and regulators. Enforcement of penalties on stakeholders is also important for encouraging compliance.

2. **Access to return points**

   Consumers should have easy and convenient access to locations where they can return their empty containers and redeem their deposits in full. Return points should be accessible to all consumers, including both those in urban and rural areas, consumers without vehicles, consumers with disabilities, and marginalised citizens. Return points should offer a consistent, easy, clean, and safe experience for consumers.

3. **Transparent official reporting**

   Stakeholders (such as producers, retailers, and recyclers) should report their activities to the DRS system operator to allow effective monitoring of the DRS. This also allows government to monitor progress towards targets (e.g., on return rates and return point distribution) and identify any issues with the DRS that mean improvements need to be made to parts of the system. Reporting can also identify fraudulent activity within the DRS. Results should be communicated with the public to raise awareness, share progress, and further promote consumer participation.

4. **Oversight and enforcement**

   Government can use enforcement measures and financial penalties to incentivise producers to meet targets and comply with requirements. Legislation can also include mechanisms that change certain features of the DRS if certain requirements and targets are not met – e.g., increasing deposit values if certain return rate targets are not met. To achieve this, good oversight of the DRS is required. This can be achieved using annual reporting, with audits being carried out if there is doubt over the reported information. Where certain requirements of the DRS are not complied with, financial penalties and prosecution may be required.

[117] Reloop (2023). A Guide to Modern Deposit Return Systems: 10 Essential Practices. Available at: link

5. Design, marking, and registration for containers

A standardised container design, deposit label marking, and registration system can improve the overall performance of a DRS. Beverage containers should be designed in a way that maximises their recyclability, considering aspects such as materials used and the shape of the container. The deposit label marking on the containers should also be universal. Barcodes can also allow containers to be scanned and their details (such as brand, deposit value, and material type) recorded and monitored. Using deposit label markings and barcodes can also minimise fraud. Finally, producers should register their beverage range with the DRS system operator, allowing the flow of material to be tracked from producer to recycler, which again can minimise fraud.

6. Collection standards

Convenience and consumer experience of container returns are important factors for a successful DRS. Setting minimum collection standards in legislation can ensure ease and accessibility for consumers while also reducing fraud and building system accountability. Standards should be set for both manual and automated return points. General standards applying to both include: maintaining clean, safe, and well-lit sites; providing return points inside buildings or closed shelters; providing recycling bins for rejected containers; ensuring storage is separate from retail areas; clear signage to designate the return point as part of the DRS; and ensuring accessibility for those with reduced mobility. Criteria for RVMs include, for example, installation by authorized RVM suppliers, front screen display of clear customer instructions, reliable internet connectivity, and the ability to issue a deposit slip with relevant information. Standards specific to manual return should focus on preventing fraud, for example, accurate reporting and compacting returned bottles and cans to prevent double redemption.

7. Infrastructure for large volume returns

There should be appropriate return locations and systems in place for different volumes of containers being returned – e.g., manual returns at small convenience stores, multiple RVMs at supermarkets, and take-back systems for commercial consumers (i.e., bars and restaurants). Infrastructure capable of handling bulk returns is needed to prevent long queues for consumers and lessen burdens on businesses. Minimum requirements for high-volume return are needed to ensure accuracy and prevent fraud.

8. Optimised logistics

The use of vehicles for transporting containers from return locations to counting facilities and recycling facilities should be efficient. Careful route planning can minimise the distance travelled by vehicles. This can reduce the carbon emissions associated with a DRS. Fuel-efficient and alternative fuel vehicles (e.g., electric vehicles) can also reduce carbon emissions.

9. Material processing and service fees

Return locations, such as retailers and redemption centres, are typically paid a service fee to compensate them for receiving, processing, and storing returned containers. The amount paid to return locations is usually based on the number of containers received. The service fee should consider the way in which containers are returned (manual or automatic), the container types, labour costs, space used, maintenance required for the return location, and utilities used (e.g., electricity). Additionally, processing fees are typically paid to facilities that aggregate and prepare the returned containers for recycling. Processing fees are usually based on the weight and type of containers processed.

10. Management of material flow and financial data

The process of "clearing" container deposits involves matching up returned container information with the record of it first being placed on the market. This information tends to be stored on a secure online database. Once the record is matched, it allows the deposit to be refunded. This also allows the performance of a DRS to be monitored, tracking the number and type of containers returned to return points. Additionally, it allows service fees to be calculated for return locations and can help to prevent fraud.

While these 10 essential practices will be relevant for a DRS for single-use beverage containers in Vietnam, it is recognised that there are other aspects that will also need to be considered. For example, Vietnam's informal sector is highly active and important in waste collections, litter picking, and recycling. Additionally, the involvement of informal retailers and junkshops as return locations will need to be considered. These and other aspects relevant to Vietnam are considered in this study.

A.1.2 System Governance and Structure

A.1.2.1 Mandatory Producer Participation in the System

The DRS recommended in this study is 'mandatory' in order to require all beverage producers of in-scope beverage containers to be part of the system, cover the system costs, and collectively meet the obligations set for the system (e.g., collection rate targets). Creating an effective mandatory system would require government to set out legislation for a DRS. Government would need to produce some further legislation in addition to the existing EPR legislation to mandate a DRS for beverage containers. A mandatory DRS is a type of Extended Producer Responsibility (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.

A.1.2.2 Profit/Non-Profit

The System Operator can operate as for-profit or non-profit entity. However, it is recommended that the System Operator is non-profit. The primary purpose of a DRS is to increase the volume and quality of recyclables to achieve environmental benefits. In line with the EPR principle, the costs of the system would be borne by beverage producers, who

would typically prefer not to incur additional costs that contribute to another organisation generating profit.

Consumer support would be critical to the success of a DRS, and it would be important for consumers to understand that the goal of a DRS is to improve recycling rates rather than create profits for an organisation or tax revenue for the government. Finally, a DRS relies on cooperation between different stakeholders, which could be undermined by any profit-seeking or other rent-seeking objective. A non-profit DRS offers greater transparency and accountability, as well as the ability to reinvest any surplus funds into further improving the system and other environmental initiatives.

A.1.2.3 System Ownership

The most effective systems are those run by the beverage industry (i.e. the obligated producers) with strong involvement of the retailers as return locations (return to retail). By allowing industry to run and govern the system, obligated producers can run the system to minimise producer fees, while delivering on the requirements that are set on the System Operator by law.

In the case of Vietnam, it may be appropriate to consider how other key stakeholders, such as the retail industry, could be included in the governance and potential ownership of the System Operator.

A.1.2.4 Number of System Operators

The majority of DRSs have a single System Operator per political jurisdiction. A notable exception is Germany's DRS, which has multiple discrete System Operators. Some countries also have DRS laws and System Operators at the provincial or state level, such as Canada, Australia, and the USA.

It is likely that having a single System Operator in Vietnam could reduce complexity and may well be more efficient than dividing resources across several System Operators.

Service fee negotiations between return points and a single System Operator are a sensitive and complex issue. If there were multiple System Operators, there may be competition between them to reduce their producer fees in order to attract producers to join/become a member of their system. However, reducing producer fees would require cost savings in the DRS, which could involve reducing service fees to return points and also collection fees to waste reclaimers – among other possible cost saving measures. This could have negative impacts on stakeholders in the system and limit system performance.

There would also be complications relating to data management, reporting, and enforcement associated with having multiple System Operators. It would be more difficult for regulatory authorities and System Operators to check that all producers are part of a DRS. Multiple System Operators would also create separate annual reports, effectively duplicating effort, and would entail more work for the regulator receiving and reviewing these reports.

A.1.2.5 Role of the Government

It would be the government's role 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. It would be important to avoid any conflicts and confusions between existing EPR and a DRS, ensuring that existing EPR and a DRS could coexist. Ultimately, it would be for the government to decide how to manage the transition of in-scope DRS containers from existing EPR to a DRS, the potential role of EPR PROs, and to ensure conflicts and confusions between EPR and a DRS are avoided.

DRS legislation should set out collection rate targets and a requirement to monitor the system's performance on at least an annual basis. Collection rate targets should be specified for each material type (to avoid a low collection rate for one material type) and by a set date (three years is typical). This would allow the System Operator to develop the system to meet the ultimate targets, with interim targets for the initial years of operation. The collection targets should be supported by financial penalties and potentially incentives for the System Operator to meet/exceed the specified targets. A minimum collection rate target of 90% is recommended, which should be achieved once the DRS has been operating for several years. Well-designed DRSs in Europe (most of which have similar governance arrangements to the proposed Vietnam DRS) achieve over 90%. While legislation should focus on the collection rate targets, additional targets could be considered as part of the licensing process. Along with collection targets, DRS legislation also typically includes the following obligations for producers (usually discharged through a System Operator):

- A minimum deposit value.
- The minimum scope of beverage containers in-scope for the system.
- A minimum coverage of return points.
- An obligation for return points to take back all used beverage containers and pay back the associated deposits to consumers.
- Any mandatory requirements for retailers to provide a take-back service.
- Administration of the system, along with reporting requirements.
- A requirement that the System Operator operates as a non-profit.
- Sanctions (including financial penalties) for failures and non-compliance for 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 collection fees applicable across the country.
- Fair terms and conditions for accessing junk shops, redeeming deposits, and receiving collection fees.
- Obligations on the System Operator to communicate, provide guidelines, and otherwise support waste reclaimers.

To give the beverage industry an added incentive to make sure the system is working effectively and capturing high-quality material, legislation could set recycled content targets for plastic and metal beverage containers that are in-scope for the DRS. This is a proven method of increasing demand for recyclate by recyclers. Recycled content targets would encourage the DRS to capture high-quality recyclable materials that could be recycled back into new containers (closed-loop recycling).

The more practical details of the system could then be left to beverage industry itself to manage, with strong involvement from the retailers as return points (return to retail). This could include monitoring and evaluation of performance, which would involve various stakeholders to identify and address areas of improvement. The government may also consider adopting a low-threshold complaints function for highlighting and addressing irregularities and concerns by waste reclaimers and junk shops, and other stakeholders, in a DRS.

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.

Finally, municipalities would likely have minor roles and responsibilities in a DRS. These may include granting permissions for certain activities and infrastructure, matters surrounding compliance, and involvement in discussions surrounding the infrastructural and political changes required for a DRS.

A.1.2.6 System Operator Targets

A key objective of a DRS relates to the quantity and quality of material collected for recycling. Hence, an essential parameter to include in the legislation would be collection rate targets. As mentioned previously, collection rate targets should be specified for each material type and by a set date. The collection rate targets should increase over time, with an ultimate collection target of 90% being recommended. A 90% collection rate should be achievable once the DRS has been fully operational for several years.

The System Operator also has financial obligations such as payment of deposits, Service Fees, (and Collection Fees for Vietnam's proposed DRS), and timely provision of data. Targets could be applied to these (such as timeframes for paying Service Fees), however, they are also likely to be key performance indicators set by the System Operator management board and/or included in contracts with return locations.

A.1.3 System Operator Structure and Obligations

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

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

A.1.3.1 Procurement and Set-up of Collection Infrastructure

The System Operator would sign contracts with return points (i.e., retailers and junk shops), committing them to provide a specified level of service for receiving used beverage containers and refunding deposits (and collection fees for registered waste reclaimers). The System Operator would be responsible for ensuring that return points comply with specified requirements (accreditation and monitoring would be funded through the DRS, as part of the System Operator's responsibilities to monitor and manage the DRS).

The System Operator would be responsible for arranging the provision of various parts of the collection infrastructure. In some cases, this might be through procuring the services of third parties, and in some cases, it might be through direct service provision from the System Operator. Where it would require direct service provision, the System Operator would need to source buildings, equipment, and provide the operational resources.

The following arrangements might be appropriate for a DRS in Vietnam:

- Junkshops – Services could be procured by the System Operator.
- Depots – This would likely be direct service provision but could also include procured services by the System Operator.
- Counting centres – Likely to be direct service provision by the System Operator.

It would be the System Operator's responsibility to set and pay service fees to retailers and junkshops for each used beverage container they take back. Service fees would compensate return points for the costs associated with the take-back of used beverage containers (e.g., electricity, labour costs etc.). The System Operator would also be responsible for payments of collection fees to registered waste reclaimers, also on a per-

container basis. Rather than pay service fees to HORECA (hotels, restaurants, cafes/catering) establishments, the System Operator should provide bags/bins for storing the used beverage containers ready for collection.

The System Operator would need to decide, in consultation with return points, how deposits would be refunded to consumers by RVMs (e.g., via online accounts, in cash etc.). Cash refunds might be more practical at retailers, where the consumer would take the RVM receipt to a check-out, rather than at alternative return points without a staffed cashier. However, legislation may specify that a consumer has a right to a cash refund at all return points. This would need to be decided by government.

A.1.3.2 Communication and Education

Behaviour change would be required for consumers to participate in a DRS. Consumers would need to know where and how they could return their used beverage containers to redeem their deposits, and to be motivated to do so by understanding how the DRS works and why it was introduced. An engaging awareness and communications programme with clear messages on the benefits of the DRS and how it works in practice would be essential. Awareness campaigns would be needed prior to the launch of a DRS and in the first months of operation, and on a continuing basis after launch. Other system features like DRS labelling/markings, and the visibility of RVMs in retailers, would also be important behavioural prompts.

The responsibility for public communications usually lies with both the government and the System Operator. Communication responsibilities would also include informing all stakeholders of their responsibilities within a DRS.

It is recommended that the System Operator appoints a professional public relations company to lead its communication strategy, both prior to launch and going forward. A criterion for accreditation of the System Operator should be allocating a pre-launch budget for communications. DRS legislation could additionally include an obligation for the System Operator to allocate a percentage of its turnover on communications. A larger budget would be required in the first two years of a DRS, which may be reduced as the DRS becomes more established. The Estonian and Lithuanian legislation, for instance, specifies a minimum public education budget of 1% of annual turnover.[118] This ensures that the System Operator continues to invest in environmental awareness – which has benefits beyond the DRS – even if it is achieving a high collection rate.

A.1.3.3 Enforcement Actions for Non-Compliance

Enforcement would be the joint responsibility of the System Operator (ensuring the system is not losing money through fraudulent returns and/or free-riding) and the government (ensuring that collection rates and recycling rates are not over-reported, that competing producers and retailers are treated equitably, and that consumers are treated fairly).

[118] Republic of Lithuania (2014). The Law on Amendment to the Law on Packaging and Packaging Waste Management, No. XII-864, 8 May 2014.

All essential requirements for the DRS should be supported by the possibility of legal sanctions from the relevant regulatory authorities. There should be an option to apply such sanctions to:

- Individual producers (e.g., those selling products without a deposit and/or deposit markings);
- Individual retailers (e.g., those selling products without a deposit, obligated retailers not taking back used beverage containers or refunding consumers their full deposit); and
- The System Operator (e.g., inaccurate reporting).

In most DRSs, there is a legal option to revoke the System Operator's licence, which should only be applied if there are severe and sustained breaches of the regulations/licensing conditions over a longer period.

The System Operator would seek to ensure that all obligated producers comply with legislation, particularly where any breaches or incidents of free-riding may increase the System Operator's costs. However, there would also be a critical role for the government in supporting producer compliance. The role of the government – usually an environmental inspectorate – in enforcement would be particularly important during the initial years of a DRS. During the initial years of a DRS, producers and retailers may not be fully aware of their obligations, so would need to understand that obligations would be strictly enforced and that non-compliance would not be tolerated. Government authorities should have the legal right to audit individual companies, so that producers understand that the System Operator may resort to this in the most severe instances of non-compliance (this may be in addition to the System Operator's contract with producers, which typically stipulates that the System Operator has the right to request third party audits).

There would also be a role for a consumer protection board. For instance, consumers may report retailers that fail to show the deposit separately, that do not provide a take-back service, or if producers apply a deposit marking to a product that is not part of the system (although this would be a legal matter for the System Operator responsible for deposit markings).

A.1.3.4 Other Safeguards to Ensure System Operator Performance and Data Confidentiality

DRS legislation should address what would happen if a System Operator ceased to operate. Without a System Operator to organise collections, reimburse refunded deposits, pay service fees and collection fees, and manage the data, it would be unclear how producers would fulfil their legally binding targets. Additionally, retailers, junkshops, and waste reclaimers would be concerned about payment of their service/collection fees and deposits. Therefore, it should be made clear to producers, retailers, and junkshops that it would be in their interests to ensure the System Operator remains a viable and successful entity, because they would ultimately have legal responsibilities in the absence of a System Operator.

One of the System Operator's essential tasks would be related to data management. One of the requirements would be that all obligated producers report their sales data, typically by material type and product. This would involve confidential information and so should not be made accessible to any other market participants. The same would apply to take-back data, involving commercially sensitive information. As it would not be practical to regulate all these issues in legislation, they should – in accordance with the EPR model – be left to producers, retailers, and junkshops to solve.

Data confidentiality is a cornerstone of trust in a System Operator. It should be governed by the System Operator's company statute, which should provide clarity and a framework regarding data confidentiality.

A.1.4 Producer Obligations

Producers (including importers) would be ultimately responsible for the collection and further management of their beverage containers for recycling. Most producers would likely nominate a System Operator to fulfil their obligations on their behalf. If government were to combine collection rate targets with financial penalties for non-compliance, producers would have an added financial incentive to ensure the DRS would be capable of meeting the targets.

Producers would initiate a deposit for each in-scope beverage container placed on the market. Producers 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, which, along with unredeemed deposits and material revenues, would cover the costs of a DRS. Producer fees for the DRS would replace any EPR fees payable now or in the future for in-scope DRS beverage containers.

Producers would also be required to ensure that their beverage containers were appropriately labelled/marked with relevant DRS information and artwork. Beverage containers should also have barcode verification to ensure effective reporting on audited sales and units collected. The basic principle is that no beverage container (specified in DRS legislation) can be placed on the Vietnamese market without a deposit. Deposits should also be applied to beverages sold via online or distance sellers. This would include beverage containers formally imported into Vietnam from other countries.

Certain aspects of a DRS, such as logistics, are typically part of producers' core business practices, so involving producers in a DRS would utilise their existing skills, experience and, potentially, logistical operations to improve the efficiency of the system. Producers would aim that they (and their customers) would not pay more than necessary for an efficient system. Producers would not want the deposit to perceived as a price increase, as it would be a fully refundable deposit.

The main roles and responsibilities of producers (including importers) in a DRS 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 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 required deposit markings and any agreed codes;
- Report to the System Operator monthly on placed on the market information;
- Report to the government annually on placed on the market information.

For beverage containers not in-scope for a DRS – such as glass, liquid paperboard cartons and composite pouches – the government should consider modifying EPR fees for packaging upon implementation, so that hard to recycle beverage containers are subjected to a minimum malus/penalty charge using an eco-modulation of EPR fees mechanism. This minimum malus/penalty charge should be at least at a level of the DRS producer fees for in-scope beverage container materials to ensure that these beverage container types do not derive an unfair advantage. This should discourage producers from switching to container types to avoid DRS obligations. Government should ensure that producers of beverage containers not in-scope of the DRS also contribute to the end-of-life management of their beverage containers.

All producers should be treated equally in a DRS, and information on producer fees should be publicly available. Producer fees should be differentiated by material type and potentially by other container characteristics such as colour, volume, and/or recyclability. Producer fees should be applied according to the number of units placed on the market.

A.1.5 Return Channel Roles and Obligations

A.1.5.1 Retailers

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. The deposit should be listed separately to the price of the beverage, and be a separate line on customers' receipts to highlight that a deposit has been paid.

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. DRSs in other jurisdictions often place legal obligations on retailers over a certain floor size threshold, commonly in the region of 200m^2, above which retailers are

mandated to be return points (take-back used containers from consumers). Below the threshold, retailers can 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 service fees. Service 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 Vietnam. They should, however, have the option to voluntarily opt-in to be return points, provided they meet certain criteria. This would only likely possible for larger informal retailers with more sophisticated processes and systems, and those who have sufficient storage capacity for used beverage containers.

There should be a legal requirement for all retailers that sell beverage containers in-scope for a DRS to display signs advising customers on how they can claim a refund and where their nearest return point is, if the retailer was not a return point (e.g., too small, informal etc.).

Regardless of collection obligations set in legislation, retailers should be able to decide how they take-back used beverage containers – either through manual or automated (RVM) methods. The decision would be dependent on factors such as return volumes, geographical location of the retailer, and the commercial advantage to the retailer. Depending on the retail structure of a country, the number of manual and automated return points may vary significantly and are a result of individual decisions rather than targets.

If a System Operator was to outsource the retail take back logistics operation (as is often the case in a DRS), some supermarket chains may participate in the tender process, since their bids can be competitive as they can combine used beverage container haulage with deliveries of new stock. However, these would be decisions for the supermarkets and System Operator to make, and would not be compulsory for supermarkets to provide a logistics service. If a supermarket chain was to provide logistics for a DRS, they should be paid by the System Operator for their services.

Smaller retailers (including informal retailers) with no legal obligation to take-back used beverage containers may voluntarily become a return point for their customers to avoid losing customers to other retailers. These retailers could either reach a voluntary agreement with the System Operator, so that they are paid service fees and their used beverage containers are collected, or they may take the used beverage containers to another return point to avoid having to request a collection, and/or so that they are reimbursed for the deposit payments more quickly.

Retailers are commonly represented on a System Operator board to make sure their interests are considered, which may be appropriate for a DRS in Vietnam. Retailers would likely want the deposit to be an appropriate value that takes account of their cashflow and that does not deter customers. Retailers – and their trade associations – might also want to influence decisions on service fee calculations and negotiate payment terms with the

System Operator. Larger retailers, especially chains, may want to influence the types of RVMs that the System Operator would approve. Typically, the System Operator would set minimum criteria for RVMs, with retailers then procuring RVMs based on these criteria. Only RVM models approved by the System Operator can be installed. This would be subject to RVMs meeting specifications, with the accreditation process complying with competition law.

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;
- Reporting to the System Operator on their take-back activities, as required.

A.1.5.2 HORECA

Like retailers, all HORECA establishments would be obliged to pay the deposit to their suppliers for each in-scope beverage container they purchase. Whether HORECA establishments pass on the deposit to their customers varies in DRSs in different jurisdictions – in some DRSs, the deposit is included in their receipt and so the customer may ask for the deposit to be removed if they are leaving their used beverage containers on the premises; while in other DRSs, it is left to the discretion of HORECA establishments to manage deposit reimbursements for their customers.

HORECA establishments with large volumes of beverage containers would likely have a formal arrangement with the System Operator for their used beverage containers to be collected. However, HORECA establishments would not be paid service fees because they would only be handling the containers sold and consumed on their premises. Commonly, System Operators in other DRSs provide HORECA establishments with bags or bins for storing the used beverage containers for collection, which could be considered in Vietnam. Smaller HORECA establishments (both formal and informal) would need to return their used beverage containers to a return point to redeem the deposits.

A.1.5.3 Junkshops

Existing junkshops are proposed to be the main return points for waste reclaimer returns in a DRS in Vietnam. Similar to retailers, junkshops would be paid a Service Fee per container returned, reimbursing the junkshops for the costs associated with the time and resources used for receiving and managing the used beverage containers from waste reclaimers.

It is proposed that, while junkshops should be allowed to become return points for the DRS on a voluntary basis (i.e., not mandated), service fees for junkshops 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 junkshops, used beverage container returns would operate alongside the existing trade in other non-beverage container materials. The used beverage container revenue model for junkshops would therefore change from one which is based on material sales to a service fee revenue model.

Junkshops would need to register with the DRS and meet minimum criteria in terms of quality control, processes, and auditability to act as a return location. Other junkshops that do not register, or which are unable to do so, may still act as accumulation points for beverage containers, operating as part of the informal recycling economy.

Further consultations with junkshops are recommended to understand their responses to a DRS and subsequently refine the level of economic (and other) incentives required for high levels of engagement and participation. Where existing coverage of junkshops is not sufficient (e.g., in more rural areas), the System Operator may build and operate 'return depots' and/or provide mobile return capacity to improve return point coverage for waste reclaimers.

A.1.5.4 Waste Reclaimers

It is recommended that waste reclaimers would take used beverage containers to participating junkshops (and any other 'return depots' operated by the System Operator). The junkshops would pay waste reclaimers the full deposit value for each used beverage container, and registered waste reclaimers would also be paid an additional collection fee per container.

Registration of waste reclaimers will need to be carefully considered by a System Operator, and further work will be required to understand the most appropriate methods of registration. For example, the System Operator will need to consider whether registration under the DRS is separate from, or integrated with, existing registration systems. The process of registering should be clear, transparent, fair, affordable, and uniform across Vietnam. This may require legislation to ensure the registration process would not be abused, which would 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.

Collection fees would ideally be paid to registered waste reclaimers directly by the System Operator using an electronic payment transfer system, after the junkshop has logged the transaction. It might be that physical cash would be paid by junkshops to waste reclaimers as a collection fee, on behalf of the System Operator (with the junkshop reimbursed by the System Operator). However, this could be prone to risk of fraud, as detailed in Appendix A.1.6.

There would almost certainly be potential to use smartphone payment applications ("apps") and/or electronic payment transfer systems for collection fee payments. Apps could also be used to facilitate payments through the supply chain of deposits, such as junkshops paying waste reclaimers deposits and waste reclaimers paying consumers their deposits when undertaking 'separate collections'. It would be for the System Operator to review and commission an appropriate payment system.

The System Operator should also consider how to manage potential cashflow issues faced by waste reclaimers under this proposed system. Waste reclaimers undertaking 'separate collections' would likely pay consumers the deposit value for each used beverage container, prior to being reimbursed the deposit at a junkshop. This would require upfront funds. There are various ways the System Operator could deal with this, including providing an up-front 'float' to waste reclaimers, which the use of electronic payments and apps might facilitate. This would be prone to risk, so such funding solutions would need to be further trialled prior to implementation.

A.1.6 Fraud Management and Prevention

In the stakeholder interviews conducted for this study, many stakeholders believed that there is a high risk of DRS fraud in Vietnam. Specific risks mentioned included:

- RVMs being at risk of vandalism or theft – some stakeholders suggested using guards or monitoring for RVMs (additional costs would need to be considered) or using manual returns to prevent fraud.
- Counterfeit containers and fraudulently redeemed deposits – some stakeholders and literature suggested that DRS labels and barcodes should be used to prevent redeemed deposits from counterfeit (non-deposit bearing) containers.
- An increase in fraud risk if the deposit value is set too high.

However, stakeholders and literature suggested that effective monitoring, enforcement, and penalties for non-compliance are effective preventative measures.

A.1.6.1 Overview of Types of Fraud and Mitigation Measures

Generally, there are two types of fraud in a DRS: one on the supply-side, in which case there is not enough money going into the system, and one on the returns-side, in which case the system is paying out more money that it should. Table A-1 lists the broad types of fraud in a DRS and the range of measures available to reduce the risk.

Fraud can reduce revenue from unredeemed deposits, increase producer fees, distort the market (e.g., if rival companies do not incur the same compliance costs) and/or result in inaccurate collection rates being reported. Ultimately, fraud is a concern for producers, the beverage industry and the government, and it is the System Operator's responsibility to minimise the risk of fraud. While unfeasible to eliminate fraud, it should be reduced as far as possible in a practical and cost-effective way.

Table A-1: Types of Fraud in a DRS and Potential Mitigation Measures

Type of Fraud	Reasons	Mitigation
Supply-side		
Producers/ importers failing to register with the System Operator	They do not comply with system design rules; do not pay producer fees or initiate the deposit. Producers might charge a deposit to their customers (wholesalers/retailers) to make money, or use the absence of a deposit to gain a competitive advantage with customers.	Legal requirement, with penalties, for all producers to initiate a deposit for each in-scope beverage container placed on the market. Legal requirement, with penalties, for retailers and wholesalers to ensure a deposit is applied to each in-scope beverage container. RVMs and counting machines reject used beverage containers that do not have a registered barcode (with associated deposit). Industry and System Operator market surveillance.
Producers/ importers under-reporting sales	Producers do not pay their fair share of producer fees or deposits. Producers might charge a deposit to their customers (wholesalers/ retailers) to make money, or use the absence of a deposit to gain a competitive advantage with customers.	Legal requirement, with penalties, for all producers to initiate a deposit for each in-scope beverage container placed on the market. Legal requirement, with penalties, for retailers and wholesalers to ensure a deposit is applied to each in-scope beverage container. Border checks (e.g., for containers without deposit logos or invoices with no mention of deposits). Contractual agreement, with penalties, between the System Operator and producer, obligating them to accurately report sales. SKU sales and returns counted by unit – System Operator identifies unusually high (and/or above 100%) collection rates.

Type of Fraud	Reasons	Mitigation
Retailers buying/ importing un-registered beverages (for which the System Operator has not been paid producer fees or deposits)	Retailers might profit when they apply the deposit to the beverages that they sell and/or reduce the cost of their beverages to gain a competitive advantage.	Legal requirement, with penalties, for retailers to ensure a deposit is applied to all in-scope beverages. Return-to-retail systems mean the System Operator has a contractual relationship with the majority of retailers – supports transparency and compliance. Border checks. Barcodes for beverage containers that are unique to Vietnam and its DRS, so RVMs/counting machines reject imported used beverage containers that are not part of the DRS. SKU sales and returns counted by unit – System Operator identifies unusually high (and/or above 100%) collection rates.
Return-side		
Individuals importing beverage containers from another country (where there is no deposit)	Individuals might claim a refund on a deposit that was not initially paid.	Border checks. Barcodes for beverage containers that are unique to Vietnam and its DRS, so RVMs/counting machines reject imported used beverage containers that are not part of the DRS. SKU sales and returns counted by unit – System Operator identifies unusually high (and/or above 100%) collection rates.
Individuals return containers that are not in-scope of the DRS (such as a liquid paperboard beverage carton or a milk bottle)	Individuals might claim a refund on a deposit that was not initially paid.	RVMs/counting machines reject used beverage containers that do not have a registered barcode. Awareness raising with manual return points about what is in scope. Counting centres identify out-of-scope manual returns and the responsible return points.

Type of Fraud	Reasons	Mitigation
Multiple redemption (i.e., redeeming deposits multiple times from a single container)	Individuals might use one used beverage container to redeem more than one deposit, which has already been refunded.	RVMs compact the containers so they cannot be scanned again (containers have to be intact with a readable barcode for a refund to be issued). RVMs equipped with anti-fraud measures to disable payment before the used beverage container reaches the compactor. Redeemed used beverage containers to be stored securely, with access only to authorised personnel.
Return points over-reporting returns	Return points might want to claim additional deposit refunds and service fees.	System Operator issues automated returns payments based on RVM data. Manual returns payments based on counting centre data. Contractual arrangements between System Operator and return points.
Counterfeit DRS markings (e.g., stickers) attached to unregistered used beverage containers	Individuals might claim a refund on a deposit that was not initially paid.	Precise container specifications (weight, shape, colour) registered with RVM / counting machine so can cross-reference with registered barcode. SKU sales and returns counted by unit – System Operator identifies unusually high (and/or above 100%) collection rates. Special security ink could be used for the deposit logos (as in Germany), but this is not recommended due to the higher costs.
Returned used beverage containers stolen	Individuals might steal returned used beverage containers to sell for the material value.	Used beverage containers to be stored securely in accordance with System Operator requirements. Secure chain of custody for sealed bags during transportation. Random spot-checks on bags from RVMs. Manually returned used beverage containers counted at counting centres.
Payment of collection fees where waste reclaimers are not registered	Junkshops could potentially record containers as returned by registered reclaimers, and then profit from this collection fee which is not passed on to a reclaimer.	A waste reclaimer has to be registered and demonstrate their identity with a discrete account. Junkshops authorise collection fee payments to registered waste reclaimers, but the money is paid directly by the System Operator via electronic transaction to the registered waste reclaimer (not via junkshops).

A.1.6.2 Labelling

A DRS relies heavily on monitoring beverage container sales and returns using barcodes, along with other DRS markers/logos. 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 **Vietnam and its DRS. Essentially, the combination of barcodes and other DRS markers would identify beverage containers that are in-scope for the DRS in Vietnam and that are deposit bearing.**

A.1.6.3 Return Location Requirements

In order to minimise fraud, the System Operator would need to set out detailed return point requirements, including RVM requirements, with all return points needing to be approved by the System Operator. In a DRS, typically the System Operator would set minimum criteria for RVMs, with retailers then procuring RVMs based on these criteria. Return point requirements would need to be established following DRS legislation approval by government and once a System Operator had gained government approval.

Contractual agreements between the System Operator and retailers (and other return points) must also be in place for service provision and financial arrangements. The contracts should clearly set out both parties' obligations in terms of collection logistics, the provision of data, and financial interactions. The System Operator should also agree contracts with approved RVM providers. RVM requirements may include:

- Only RVM models accredited by the System Operator can be used (the System Operator must make clear which RVMs can be used by return points). This would be subject to RVMs meeting specifications and the accreditation process complying with competition law.

- RVM suppliers must apply to the System Operator to certify their products. This process could take up to six months and would involve the System Operator trialling the suitability of the RVM.

- Return points must be accredited by the System Operator as a return point. Criteria for accreditation would include customer convenience and security (such as back-rooms only being accessible by authorised personnel to reduce fraud and theft risk).

- The System Operator should have the right to withdraw the accreditation of a return point due to non-compliance with the terms and conditions of the contract.

A.1.6.4 Data Management

Data management and reporting would be a key role of the System Operator. A DRS is a national system with many stakeholders. Transparent data would be required to give confidence to all stakeholders that the DRS was a fair, well-managed system that was achieving the desired goals.

There are two main DRS data types: beverage container sales and used beverage container returns. This data would be connected to fraud management. Fraud risk would be reduced by creating a proper control framework and data management system that would monitor and analyse potential anomalies. The System Operator's data management systems would not need to be specified in legislation but would be developed by the System Operator.

Fraud risk associated with sales data could be managed through the control of producers and beverage containers placed on the market. The following are examples of data system features that could minimise the risk of sales data fraud:

- **Timely reporting of sales data** – regular notifications/reminders to producers to submit sales data.

- **Regular sales and returns reporting** – a sales and returns report could be sent twice per year to each contracted producer. The report would cover all of the producer's reported SKUs. SKUs with a collection rate of more than 100% (indicating fraud or data error) would be highlighted.

- **Cross-referencing different data** – relevant data could include information on sales, returns, types of beverage containers, beverage categories and container sizes, geographic location etc. The structure of cross-reference analytics would depend on the specifics of the regional and consumer habits. For example, it might be possible to investigate a specific beverage (e.g., water) in a specific container (e.g., 1.5L PET bottle) and analyse in more detail those SKUs with a significantly different (higher) collection rate than average.

- **Cross-border control** – cross-border risk would mainly arise when consumers would buy beverage containers from abroad. A major reason for this would be the difference in the tax on different beverages (e.g., alcohol excise duty, soft drink tax) in other countries. This situation might be analysed with analytics to indicate if the returns in border counties/areas for certain beverage container types exceeded the normal proportion. However, it would be much more difficult to detect cases of parallel imports of some products sold countrywide, and where the (full) quantities were not declared to the System Operator.

Fraud risk associated with returns data could be managed through controls related to used beverage container collection and return points. One of the primary tasks related to return points would be the RVM certification and accreditation process: to provide transparency and prevent fraud, each RVM model would need to be certified, and each return point would need go through a System Operator accreditation process. The RVMs would need to meet the requirements established by the System Operator to ensure that they were compatible with the System Operator's IT system and that the data from the RVMs would be reliable. The following are examples of data system features that could help to minimise the risk of returns data fraud.

- **Return points controlling** – the System Operator monitors the number of used beverage containers returned to each return point (either using RVM data or counting machines data).

- **Bag contents control** – even with used beverage containers returned to an RVM, there would be a risk that return point employees might take some of the used beverage containers to sell them for material, meaning that not all of the used beverage containers would be sent to the System Operator counting centre. This risk increases with increasing material prices (although there are usually some safeguards at return points, such as CCTV cameras). Depending on the RVM model, the compaction ratio of the used beverage containers may vary significantly, so it could be difficult to judge how many used beverage containers are in a bag collected from an RVM return point (used beverage containers counted and compacted by an RVM are not normally counted a second time at the counting centre). However, it may be possible to analyse the change in the average contents of the bags of used beverage containers arriving at the System Operator counting centre over a longer period. This would help to identify possible suspected fraud at return points.

Given the large volume of data managed by the System Operator, the commercially sensitive nature of the data, and the risk of fraud in a DRS, robust and comprehensive IT systems are required. The main tasks of the IT system include:

- To create a virtual environment for all DRS critical processes.
- To provide a data exchange platform for various DRS related technology (RVMs, industrial counting machines, industrial scales, etc.).
- To be a large and secure data warehouse for all DRS related data (sales data, returns data, etc.).
- To create convenient contact points and customer portals for relevant stakeholders (e.g., web-solutions for producers, retailers, and other return points).
- To accommodate sophisticated Business Intelligence analytics tools for various types of reporting (e.g., annual reporting to government) and above all for fraud mapping and prevention.

Finally, another challenge of data management within a DRS would be tracking quantities of containers returned by waste reclaimers. There are examples of digital solutions being developed in other markets, including Kabadiwalla Connect[119] in India and BVRIO[120] in Brazil. It would be necessary to consider how these or similar solutions could be applied and further refined in a Vietnamese context.

[119] Kabadiwalla (N.D.). Homepage. Available at: link

[120] BVRIO (N.D.). Homepage. Available at: link

A.2.0 Stakeholder Engagement

A.2.1 Methodology

A total of 24 stakeholders across a range of industries and stakeholder groups were interviewed, including:

- 1 container manufacturer.
- 3 drinks producers.
- 2 retailers (both written responses due to limited interviewee availability).
- 5 waste collectors and/or recyclers (2 written responses due to limited interviewee availability).
- 9 technical experts, government, and non-governmental organisations (NGOs).
- 4 representatives of informal sector researchers or organisations.

Stakeholders were selected following a shortlisting exercise, identifying suitable candidates with relevant knowledge of aspects relevant to a DRS in Vietnam. This involved gathering suggestions of organisations and contacts from the steering group. The final stakeholder list was approved by Innovation Norway. Subsequently, stakeholders were contacted via email and/or telephone, inviting them to participate in the study.

The interviews were conducted over Microsoft Teams, which asked questions about the current beverage containers market and waste management activities. They also covered design aspects of a DRS for single-use beverage containers, including finances, scope of the DRS, system management, used beverage container returns, informal sector practices, and opportunities and barriers. The questions were tailored to each stakeholder group, based on their involvement with beverage containers – such as production, sales, or waste management. Throughout the process, interviews were adapted to accommodate the varying levels of DRS knowledge among stakeholders. The responses and feedback supported various aspects of the study's design, modelling, and overall understanding.

A.2.2 Summary Results of Stakeholder Investigation

Stakeholder representatives from a range of industries and stakeholder groups were interviewed to understand opinions on key aspects of DRS design, with those interviewed selected following a shortlisting exercise to identify suitable candidates with relevant knowledge. The results of this engagement exercise have helped to inform the DRS design recommended in this report, along with desk-based research, workshops, discussions with project partners, and expert insights from the project team. A summary of the trends and notable points arising from the stakeholder interviews is presented in Table A-2.

Table A-2: Summary of responses from the stakeholder interviews

Aspect of DRS Design	Stakeholder Suggestions for DRS Design
Deposit Value Per Container	Stakeholders proposed a range of deposit values of between 500-2,500 VND per container. For reference, 1,000 VND represents about 10% of the cost of a typical 1.5L plastic bottle of water or a 500ml plastic bottle of a carbonated drink.
Fixed or Variable Deposit Values	Most stakeholders suggested using variable deposit values, based on the size or value of the containers. Some stakeholders suggested using a fixed deposit value. Those that suggested a fixed deposit value believed it would be simpler for consumers. The deposit value could diversify into variable deposit values over time for a nationwide DRS.
Container Size	Only four stakeholders suggested container sizes in-scope for a DRS, ranging from around 100–200ml to 3L.
Container Material	Stakeholders proposed various container material types in-scope for a DRS. These included high-value materials only that are commonly collected by the informal sector (PET bottles and aluminium cans), low-value materials only that are not commonly collected by the informal sector (beverage cartons, composite pouches, and glass bottles), plastic bottles only (PET, HDPE, and PP), and all beverage container materials (plastic, metal, glass, carton, and composite). The most common suggestions were plastic bottles and aluminium cans. Notably, some stakeholders suggested expanding the material types in-scope for a DRS over time for a nationwide DRS.
Beverage Type	Stakeholders proposed various beverage types, including water, soft-drinks, tea, beer, wine, milk-based drinks, bird's nest, and all drinks. Some stakeholders suggested excluding milk-based drinks due to odour and hygiene concerns. Additionally, some stakeholders suggested excluding informally produced (homemade) drinks, commonly sold at traditional markets.
Return Locations	Most stakeholders highlighted that convenience would be vital for the success of a DRS. A combination of retailers (using RVMs where possible or manual returns where not), existing junkshops, and installed redemption centres were suggested. This would maximise convenience for consumers in urban and rural locations. Some novel suggestions, such as RVMs on streets, in public parks, and in residential buildings (apartments) were also provided. Most stakeholders also suggested utilising the informal sector, such as for transporting containers from return locations to counting/sorting/recycling facilities, or for collecting containers from residents and businesses to transport to return locations.
Return Infrastructure	Some stakeholders explained that many retailers in Vietnam are small, with limited storage space for an RVM or for storing manually returned containers. Solutions for small retailers with limited space will need to be considered.

Aspect of DRS Design	Stakeholder Suggestions for DRS Design
Service Fees	Most stakeholders believed that return locations (e.g., retailers, junkshops, and redemption centres) should be paid a service fee for receiving, managing, and storing containers from consumers. This would ensure participation from return locations and would reimburse them for their space, time, and labour.
Legislation	Some stakeholders shared opinions on legislation for a DRS, with most believing that central and local government guidance and enforcement would be important. This would ensure that producers, retailers, and consumers participated and complied with a DRS. Some stakeholders also suggested that DRS legislation should align with Vietnam's Law on Environmental Protection and its EPR for packaging requirements.
Recycling Capacity	There were mixed opinions from stakeholders on Vietnam's recycling capacity. Some stakeholders believed that Vietnam had sufficient capacity for additional materials from a DRS, whereas other believed that investment into additional recycling facilities and collection infrastructure would be required. Some stakeholders also believed that a DRS could encourage additional recycling facilities to be installed.
System Operator	Very few stakeholders had a suggestion on this. Those who did have an opinion believed that the system operator should be industry-led, non-profit, and guided by legislation.
Labelling and Fraud Prevention	Most stakeholders believed that fraud is a risk in Vietnam, with RVM manipulation and counterfeit containers being concerns. Effective labelling, system monitoring, and other anti-fraud measures will need to be considered.

A.2.3 Return for Reuse Beverage Bottle Schemes Operating in Vietnam

Although single-use beverage containers are popular in Vietnam, there is a high consumption rate of refillable glass bottles. Specifically, the majority of glass beverage bottles consumed in Vietnam are refillable (6.3 billion in 2019) as opposed to single-use (0.1 billion in 2019). Of this, beer and cider make up 5.6 billion (89%) of the refillable glass bottles consumed in 2019. For beer and cider, 55% of containers consumed in 2019 were refillable glass bottles, with 44% being single-use aluminium cans, 1% being single-use glass, and <1% being refillable PET bottles.[121] As such, beer and cider play a major role in the consumption of refillable glass bottles in Vietnam.

There are various beverage producers that offer their beverages in refillable glass bottles, such as Hanoi Beer, Sai Gon Beer Co, and Pepsi.[122] However, as mentioned previously, beer and cider are the main beverages in refillable glass bottles. Beverage producers offering beverages in refillable glass bottles tend to use a refundable deposit to incentivise

[121] Reloop (2024). What We Waste Dashboard: What We Buy > Vietnam. Available at: link

[122] Glass Worldwide (2017). Focus on ASEAN. Issue 72, 2017. Available at: link

consumers to return their glass bottles to participating retailers. The bottles are then returned to the producer to be washed, refilled with a beverage, and sold to consumers.[123] One stakeholder interview with a leading beverage producer claimed that return rates for their refillable glass bottles are about 90%. Another stakeholder interviewed (container manufacturer) referred to the high return rates achieved for refillable glass beer bottles, claiming almost 100% for one beer producer.[124]

[123] Glass Worldwide (2017). Focus on ASEAN. Issue 72, 2017. Available at: link

[124] Heineken Vietnam (2019). Heineken Vietnam Leads the Sustainability Agenda in Vietnam with Circular Economy Approach. Available at: link

A.3.0 DRS Modelling Technical Appendix

A.3.1 Return Channels

A.3.1.1 Return Locations

The model assumes that there are 0.3 return points (retailers and depots) per 1000 inhabitants. However, it is important to note that significant returns are made by waste reclaimers (to junkshops) – a particularly convenient mode of return for consumers – not represented in the 'return point per inhabitant' figures. In total, there are 42,278 locations for containers to be returned to, broken down by type of return point in Table A-3. Further, Table A-4 outlines the number of retail locations (includes beverage selling retailers only; other retailers, e.g. electronics sellers, are not included in these figures) in Vietnam and percentage included in the system.

Table A-3: Total number of return points included in the DRS

Return Point	Total Number of Return Points
Retailers	32,834
Junkshops	8,830
Depots (manual)	614
Total	**42,278**

Table A-4: Number of retail locations in Vietnam and % included in the DRS

Retail Type	Number of Locations	% included in DRS
Hypermarket	88	100%
Supermarket	334	100%
Small Supermarket / Convenience Store	7,412	100%
Informal Retail	500,000	5%

A.3.1.2 Container Return Distribution

Assumptions for the proportion of used beverage containers (plastic and aluminium) returned through each return channel are presented in Table A-5. 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-5: Distribution of Beverage Container Returns Between Return Locations

Return Location	Return Type	PET	Aluminium	Total
Return to Retail	Formal (RVMs)	32%	32%	32%
	Formal (Manual)	4%	4%	4%
	Informal (Manual)	9%	9%	9%
Waste Reclaimer Returns	Separate Collections	42.75%	42.75%	42.75%
	Sorted from Refuse	2.25%	2.25%	2.25%
Return to Depot	Manual	10%	10%	10%

A.3.2 Return Channel Costs

Data and assumptions for the costs of returning containers through each of these return channels are detailed in the subsections 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 10% based on average current commercial loan rates.[125]

A.3.2.1 Retail Service Fees (RVM)

The Service 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 Service Fee calculations – in reality, retailers will have variable throughputs, and many smaller retailers will have lower throughputs than this. Assumptions used for calculating Service Fees for automated returns (RVM) are summarised in Table A-6.

[125] Based on data provided by the client on 04/06/2024.

Table A-6: RVM Service Fee Assumptions

Costs	Data	Assumptions
RVM Capital Costs	750 million VND cost per RVM (RVMS vary in cost significantly from approx. 200 to 1,000 VND) 110 million VND installation and storeroom adaptations 115 million VND compactor replacement after 4.5 years	For the purposes of modelling, Service Fee calculation are based on the costs associated with a front/backroom RVM, as commonly used by larger retailers. The retailer can choose appropriate RVMs based on their requirements, RVMs vary in cost depending on their specification i.e. overall size, speed of throughput of containers, number of separate streams etc.
RVM Maintenance	70 million VND service costs per year	Including any IT update costs.
Time requirement per month per RVM (labour cost)	17 hours/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	20 m^2	Includes all backroom space requirements, including a total of 5m^2 storage for containers, and queuing space for the front of the RVM.

Table A-7 summarises assumptions for calculating retail unit costs.

Table A-7: Retail Unit Costs

Costs	Data	Source
Retailer Staff Annual Salary, VND	84 million VND	Based on data provided by the client on 04/06/2024.
Retail Space Cost, VND/m^2/month	790,000 VND	Based on average prices of retail rental space across Vietnam, data triangulated from various sources including client data and Eunomia research.

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 lowest per container for aluminium, which compacts very effectively.

A.3.2.2 Retail Service Fees (Manual)

For the purposes of the Service Fee calculation, the values below are associated with a manual store profiled to take back 10,000 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-8 summarises assumptions for calculating manual service fee.

Table A-8: Manual Service Fee Assumptions

	Data	Assumptions
Time Requirement per Month (labour) per Store	10 hours	Includes handling containers and attending pickups. Based on 30 seconds per return of each 10 containers, 1 minute per transfer to storage and 6 minutes per pickup.
Space Requirement per Store	1.4m^2	Based on 1.2m^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.3.2.3 Waste Reclaimer Returns

Key assumptions for the two components of fees paid by the System Operator for this return channel (Service Fees for junkshops and Collection Fees for waste reclaimers) are detailed in this section.

A.3.2.3.1 Junkshop Service Fees

For purposes of Service Fee calculation, it is assumed that a junkshop handles 80,000 containers per month. Other assumptions for calculating Service Fee for junkshops are listed in Table A-9. Monthly unit costs for a junkshop are summarised in Table A-10**.**

Table A-9: Junkshop Service Fee Assumptions

	Data	Assumptions
Time Requirement per Month (labour) per junkshop	75 hours	Includes handling containers and attending pickups. Based on 5 minutes per return of an average of 100 containers, and approximately 40 minutes per pickup.
Space Requirement per junkshop	31m^2	Includes storage space and front counter space for handling beverage containers.

Table A-10: Junkshop Unit Costs

Costs	Data	Source
Retailer Staff Annual Salary	84 million VND	Based on data obtained from the client on 04/06/2024.
Junkshop Rental Cost, VND/m^2/month	110,000 VND	Based on data obtained from the client on 04/06/2024.

A.3.2.3.2 Waste Reclaimers Collection Fee

The rate of collection fee for waste reclaimer returns is 100VND per container (also detailed in Section 4.4.2.1 of the report).

A.3.2.4 Depots (Manual)

Assumptions for the costs of depots with manual return are provided in Table A-11 and Table A-12: Operating Costs of Manual Depot per Annum. It may be that automated returns are required at some depots. However, in this study, it is assumed that all depots will use the manual return method.

Table A-11: Capital Expenditure per Manual Depot

Capital Cost	Costs	Assumptions
Infrastructure cost	1.1 billion VND	Based on costs from similar centres in North America, adjusted for Vietnam.

Table A-12: Operating Costs of Manual Depot per Annum

Operating Cost	Costs	Assumptions
Labour	216 million VND	Based on average wages of a manual operator in Vietnam, raw data obtained from the client on 04/06/2024.
Electricity	6.5 million VND	Based on average energy prices across Vietnam, raw data obtained from the client on 04/06/2024.
Rent	38 million VND	Based on average prices of industrial/warehouse rental spaces across Vietnam, raw data obtained from the client on 04/06/2024.
Overheads	52 million VND	20% overheads, based on comparable centres.

A.3.3 Transport Costs

A.3.3.1 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-13.

Table A-13: Containment Cost Assumptions

Containment Type	Cost per item	No. of uses	Cost per Use	Notes on Assumptions
Large Bag	7,300 VND	1	7,300 VND	Used for plastic and aluminium (RVMs and manual).

The assumed number of used beverage containers per containment item is listed in Table A-14.

Table A-14: Containment Capacities (Containers per Bag / Bin)

Containment Type	Compacting	Plastic	Aluminium
Large Bag (270L)	Compacted	367	1000*
	Uncompacted	180	352

A.3.3.2 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-15 lists the assumptions for estimating unit costs for transport.

Table A-15: Unit Costs for Transport

	Costs	Source
Collection Driver Annual Salary	160 million VND	Average annual salary for heavy haulage truck drivers.[126]
Fuel cost, VND / litre	20,000 VND	Based on average price of diesel in Vietnam between June 2023 and June 2024, raw data obtained from the client on 04/06/2024.

Table A-16 lists the assumed bulk densities of containers.

Table A-16: Bulk Densities (kg/m^3)

Container type	Compacted	Uncompacted	Sources
Plastic	36	18	Data from RVM manufacturer adjusted for average containers weights / volumes in Vietnam.
Metal	80	18	

A.3.4 Counting/Sorting 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-17**.**

Table A-17: Counting Centre Operational Assumptions

	Value
Counting machine throughput capacity, containers per annum	27 million for plastic and aluminium (assuming two shifts operated per day – 16 hours per day).
Downtime per day	8 hours
Number of days operating per annum	364
Number of counting centres assumed	7
Space required per Counting Machine	100 m^2
Number of counting machines	447

[126] Salary Expert, Heavy Truck Driver Average Base Salary. Accessed 30/09/2024. Available at link.

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

Table A-18: Counting Centre Cost Assumptions

	Value	Notes
Counting machine capital cost	5.4 billion VND	Purchase and installation cost per counting machine.
Additional cost per counting centre	310 billion VND	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	47 per container VND	Counting is required for manually returned (uncompacted) container only.
Overall operating cost of sorting and bulking	59 per container VND	Cost applied to all containers sent to counting centres.

A.3.5 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 (VND Billion)	Assumptions
IT – Capital investment	138.1	Based on IT set up costs for comparable systems, adjusted for size of beverage container market in Vietnam.
Office Equipment	4.6	
Project Management	18.4	
Communication	92.1	
Total Capital Expenditure	**253.3**	

Table A-20: System Operator Operational Costs

Operational Cost	Annual Cost (VND Billion)	Assumptions
Staff Costs	30.2	Estimated staff budget for management, database, and customer service.
Office Space	12.4	Based on 1603 m^2 office space requirement at central office rents.
Administration costs	32.2	Administration, IT operational cost, legal, utilities, approximate budget based on other system data.
Communications	67.9	1% of material revenues.
Total Operating Costs per Annum	**142.7**	

A.3.6 Material Revenues

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

Table A-21: Material Revenues

Material	Revenue, VND per kg	Source
PET bottles	11,200	Data based on material revenues calculated in a Eunomia report on beverage packaging recycling in Vietnam.[127]
Aluminium cans	34,000	

A.3.7 Environmental Impacts

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

- Recycling of additional beverage containers;
- Reduction in disposal of beverage containers;
- Additional collection and transportation of containers to recyclers; and
- 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

[127] Eunomia (2022). Beverage Packaging in Vietnam Recycling Rate & Recycling Cost Final Report. Available at link

Appendix A.3.7.1 and Appendix A.3.7.2. 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 Appendix A.3.7.6.

A.3.7.1 Greenhouse Gas Valuation

The monetary value placed on avoiding climate change, i.e. avoiding future emissions of greenhouse gases (GHGs) 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.[128]

Vietnam has not implemented a carbon tax. However, the Government is working on a roadmap to bring in such a tax either as part of the country's environmental tax or as a separate standalone tax.[129] A 2021 academic study exploring carbon pricing options for Vietnam modelled a carbon tax of VND43,068 (US$1.85) per tCO_2e, which is relatively low, finding that if starting from 2022 and increasing at a real rate of 10% per year, this would have the potential to reduce 2030 fossil fuel emissions by ~5.5% relative to a business as usual scenario, in line with Vietnam's Nationally Determined Contributions (NDC) target for its energy sector.[130]

Vietnam is among the world's top five countries most vulnerable to climate change.[131] The World Bank ranks it first in the world (alongside Bangladesh) for exposure to flooding, due to its 3,260 km long coastline – which is densely populated – low-lying cities and river delta regions.[132] Climate change also impacts Vietnam's economy, and the World Bank has further estimated that the country lost ~US$10 billion in 2020 due to climate impacts, and that climate change could cost ~12%–14.5% of annual GDP by 2025 in the absence of appropriate adaptation and mitigation measures.

Climate change impacts are further compounded by inequality, and while Vietnam has made and continues to make significant economic progress, it is still a lower-middle-income country in which poverty remains a key concern among the population.[133] 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

[128] Climate Portal (2022). Carbon pricing. Available at link

[129] King & Wood Mallesons (2023). Navigating the Net Zero Transition – Chapter 4: Vietnam. Available at: link

[130] Thang Nam Do, Paul J. Burke (2021). Carbon pricing in Vietnam: Options for adoption. Available at: link

[131] USAID (2022). Vietnam Climate Change Country Profile. Available at link

[132] King & Wood Mallesons (2023). Navigating the Net Zero Transition – Chapter 4: Vietnam. Available at: link

[133] World Bank Group (2022). From the Last Mile to the Next Mile, 2022 Vietnam Poverty and Equity Assessment. Available at: link

installing air-conditioning systems in houses, workplaces and education centres, can reduce some of the damage costs related to climate change. [134]

The European Union advises 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.[135] As damage costs are likely to be comparable, if not greater, in Vietnam than in EU countries, 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 (4.6 million VND) per tCO_2e for damage cost modelling.

A.3.7.2 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.

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 study's 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.[136,137]

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 Greece, 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.

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

[135] Eunomia 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

[136] Eunomia (2016). Support to the Waste Targets Review, Report for DH Environment, July 2016

[137] 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

Table A-22: Air Damage Cost Assumptions

Compound	Damage Cost, VND Million per Tonne
$PM_{2.5}$	235
SO_2	208
NO_x	110
NH_3	146
VOCs	9

A.3.7.3 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.[138] Otherwise, however, the main source of information in this respect is life cycle databases such as Ecoinvent[139], 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.

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

Material	Tonnes of emissions per tonne of recycling[140]					
	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
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.3.7.4 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

[138] Eunomia (2010). Landfill Bans Feasibility Research, Final Report for WRAP, March 2010. Available at link

[139] Ecoinvent (2021). https://ecoinvent.org/

[140] 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.

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.[141] 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
Metal Cans (Al)	0.004	3.73E-06	7.96E-06	1.74E-04	4.95E-10	4.30E-05

A.3.7.5 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 associated with diesel fuel were calculated based on EURO 6 standards, assuming new trucks purchased in Vietnam will have a similar level of emissions performance.[142]

Emission factors (tonne-km) used in this study were estimated from real-world data based on a 2016 study[143] 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.

[141] 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.

[142] International Council on Clean Transportation (2016). A technical summary of Euro 6/VI vehicle emission standards. Available at link

[143] 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

This was done by applying the average conformity factor to the EURO6 limits[144] 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[145] data set was used. This value was found to be 0.21 kg CO_2e/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_2e/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.[146]*

2. Converted from ppm to mg/kWh using BREEAM technical manual.[147]

3. Calculated by multiplying Euro VI limits with average conformity factor of 0.31.

A.3.7.6 Disamenity Impact of Litter

Litter, including the illegal dumping of waste, is a significant and growing concern in Vietnam. For example, an illegal dump site in the Yen Hoa Ward, Cau Giay District of Hanoi was reported to have been left to grow for over a year.[148] In general at a national level, due to a rapid rise in the amount of plastic, in particular, being imported, produced and used in Vietnam, local governments have struggled to properly manage growing waste streams.[149] Subsequent mismanagement of plastic waste has resulted in Vietnam being among the top five ocean polluters globally.[150]

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

[144] Transport & Environment (2021). Euro VI trucks still don't meet emission limits on the road. Available at link

[145] BEIS (2023). Conversion factors 2023: condensed set (for most users) – updated 28 June 2023. Available at link

[146] Transport & Environment (2021). Euro VI trucks still don't meet emission limits on the road. Available at link

[147] BREEAM International New Construction (2021). Pol 02 NOx emissions (Version 6). Available at link

[148] Tuoi Tre News (2023). Illegal dumping persists in Hanoi, March 2023. Available at: link

[149] World Bank Group (2022). Toward a National Single-use Plastics Roadmap in Vietnam: Strategic Options for Reducing Priority Single-use Plastics. Available at: link

[150] Ibid.

- 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.[151] 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.[152] [153] 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.[154]

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.[155] It would be preferable to use WTP values relevant to the national context; however, there are no litter disamenity studies for Vietnam. Therefore, the present study cautiously applied the Wardman values.

A potential difficulty in applying European figures in a Vietnamese context is a difference in incomes, which ultimately affect people's WTP. Vietnam had a relatively small middle

[151] The association between a littered environment and perception of public safety / fear of crime is an example.

[152] Eunomia (2013). Exploring the Indirect Costs of Litter in Scotland. Available at link.

[153] Eunomia (2013). Quantifying Direct Costs of Litter to Scottish Local Authorities and Other Duty Bodies. Available at link.

[154] UNEP, Trucost, and The Plastic Disclosure Project (2014). Valuing Plastic. The Business Case for Measuring, Managing and Disclosing Plastic Use in the Consumer Goods Industry. Available at link.

[155] Wardman et al. (2013). Estimating the Value of a Range of Local Environmental Impacts, Report for Dept. for Environment, Food and Rural Affairs. Available at link

class as of 13% as of 2023, although it is growing fast and is expected to increase to 26% by 2026.[156] However, that would still leave a large proportion of the population at a lower income level. While individuals from middle- or upper-income 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 Vietnam the litter problem is also characterised by illegal dumping of waste and a lack of municipal collections. While litter is a larger issue in Vietnam, 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 Vietnam.

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 Vietnam'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).[157]

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.[158] 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

[156] Vietnam Briefing (2024). Understanding Vietnam's Middle Class: Size, Spending Patterns, and Opportunities for Business, July 2024. Available at: link

[157] Eunomia (2017). Impacts of a Deposit Refund System for One-way Beverage Packaging on Local Authority Waste Services. No link.

[158] Eunomia (2013). Exploring the Indirect Costs of Litter in Scotland. Available at link

- Apply the monthly WTP figures, adjusted to Vietnam 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 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.3.8 Social Impacts

A.3.8.1 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.[159] 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**.**

[159] The studies reviewed are summarised in: Eunomia (2016). A Resourceful Future – Expanding the UK Economy: Technical Appendix. No link

Table A-26: Employment Assumptions for Non-DRS Waste Management in Vietnam

Employment Type	Average Jobs per 1000 tonnes annual throughput
Reprocessors	10.3 (plastic), 11 (aluminium)
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 junk shops 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.

A.3.8.2 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 reclaimers. Estimates of the average monthly income of waste reclaimer in Vietnam vary significantly, from 600,000 VND to 5.2 million VND per month thousand per month. A value approximately equivalent to the mean of 2.9 million VND per month was assumed, based on estimates of the weight collected per day by waste reclaimers and average earnings, This choice of assumption is a source of uncertainty, as the true average earnings of waste reclaimers in Vietnam is not clear, given the difficulties noted in various studies (e.g. the heterogenous nature of waste reclaimers, lack of certainty by waste reclaimers 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 reclaimers and prices paid by junk shops was taken from the Phú Quốc waste reclaimers and junkshops survey data[160], and was used to calculate the typical tonnage of

[160] USAID (2023). Summary of Information on the Scrap Purchasing Facilities and IWC Questionnaire. [Translated Excel file.] No weblink identified.

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 Vietnam to calculate the number of waste reclaimers in Vietnam in the baseline, estimated at ~ 104 thousand. This figure compares with available data, based on scaling of waste collector numbers reported for Ho Chi Minh City and Da Nang, and data from Roland Berger, which suggest that the total number of informal waste workers in Vietnam could be in the region of 70 to 125 thousand.[161,162,163]

The working hours of waste reclaimers are not well understood; if there were significant numbers of waste reclaimers 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., middlemen). Furthermore, there are uncertainties associated with all input data – including average prices paid by junk shops (which fluctuate daily, and vary across Vietnam), and the total tonnage of material currently collected by waste reclaimers in Vietnam.

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 known 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, it was assumed, as discussed in Section 4.4.2, that under the DRS waste reclaimers would take on one of the following roles:

- Collecting used beverage containers from consumers door-to-door (e.g., householders and businesses). Referred to as “Separate Collections”.

- Recovering used beverage containers from landfill, bins, street litter and the wider environment. Referred to as “Sorted from Refuse”.[164]

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

[161] ENDA (2022). Integration of the informal sector into the implementation of the Extended Producer Responsibility scheme for plastic packaging. Technical report under the project “Rethinking Plastics – Circular Economy Solutions to Marine Litter” funded by the European Union and the German Federal Ministry for Economic Cooperation and Development (BMZ).

[162] UNDP (2020). A peek into the life of informal waste workers in Viet Nam during COVID-19. Available at link.

[163] Roland Berger (2023). Aluminium Cans Market Assessment – Vietnam. No link

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

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. **Separate collections** – It is not clear, for waste reclaimers undertaking *separate collection* activities, how productivity would change relative to current door to door collections undertaken by waste reclaimers. Future productivity is likely to be lower at present, as each container is handled one by one, both at households, and when redeeming at junk shops, rather than weighed. Furthermore, availability of beverage containers is lower than at present, so increased competition may reduce the number collected per waste collector.

2. **Sorted from refuse** – for beverage material, it is assumed that waste reclaimer productivity will reduce roughly in proportion to the availability of DRS containers in litter, bins and landfill sites. 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 when there are very few containers available.

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 5.6, are extremely sensitivity to productivity assumptions. Using higher productivity assumptions will calculate higher incomes per waste reclaimers (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.


Norway