GOA STATE POLLUTION CONTROL BOARD

EU-REI
Creating a Resource Efficient India

Baseline Study Report

Deposit Refund System in Goa State

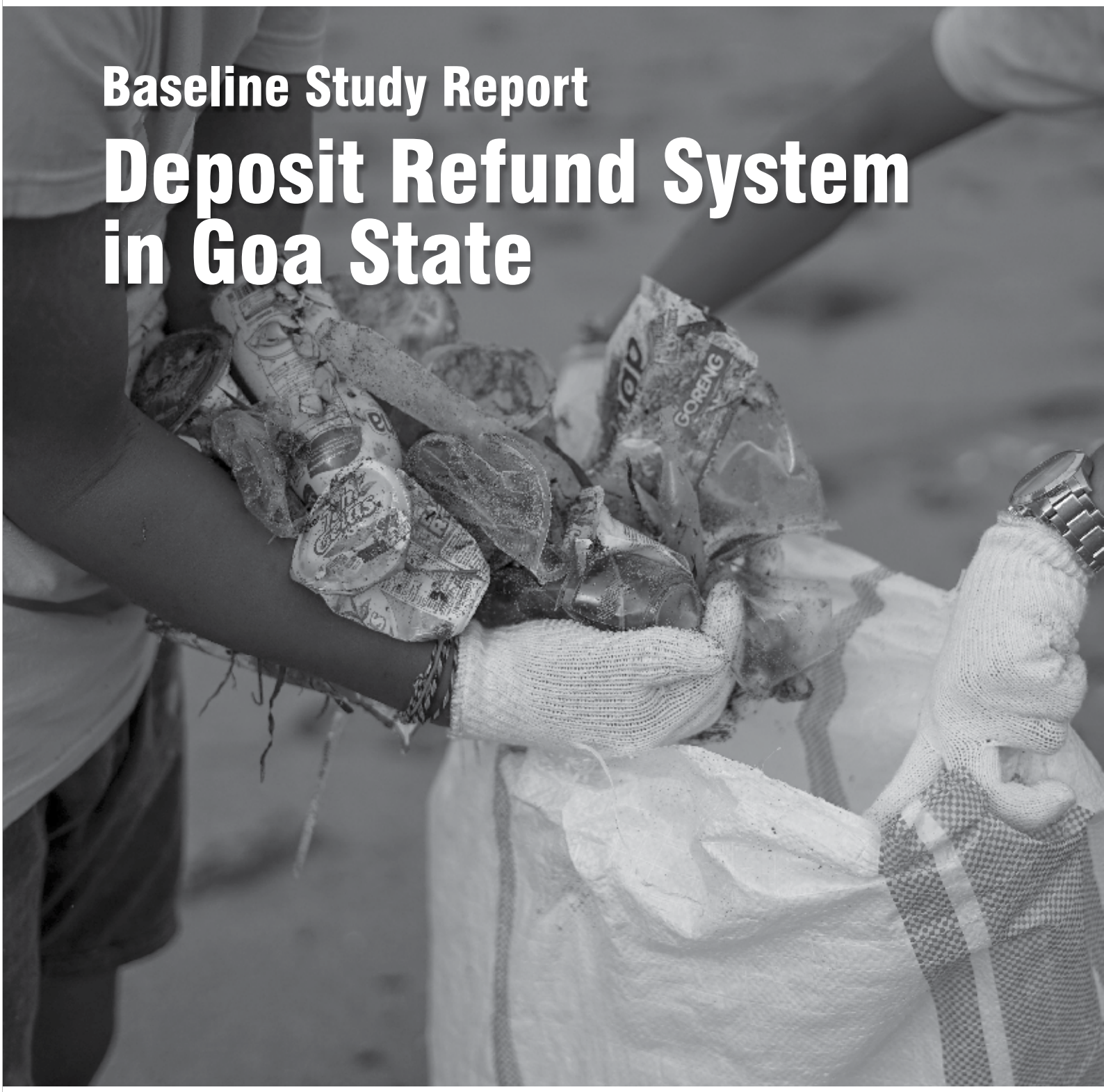


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Imprint

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Executive Summary

The present baseline study was conducted for the implementation and building ecosystem for a deposit refund system (DRS) in the state of Goa, India. Global case studies on DRS reveal varied methodologies for success, such as Norway incentivizing producer participation through tax reductions and rebates based on return rates, Sweden enforcing uniform packaging changes by producers, and Romania planning a consortium of private entities and the government for DRS implementation with ING bank's investment. The importance of government mandates is underscored by the example of low collection rates in California.

The present DRS baseline focused on plastic bottles, cans, and glass bottles, examining waste management systems, material and financial flows, and collection mechanisms. The methodology was a comprehensive approach, incorporating field assessments, surveys, interviews, consultation meetings, and secondary research for retail points, Hotels, restaurants and Cafes (HoReCa), citizens, bottling plant, tourists, waste picker, government officials, private companies, NGOs and informal sector (scrap dealer). However, there were certain limitations such as no data on the daily quantity of specific waste types in HoReCas. The study's scope was constrained by a limited sample size, focusing on only two talukas and conducting a restricted number of surveys for hospitality and retail establishments. Data unavailability in the informal waste sector, resistance from stakeholders to share information, and seasonal variations in waste generation added to the limitations.

It was found that products enter the market through a credit-based supply chain involving distributors, wholesalers, and retailers. Residents expressed readiness to participate in DRS with a deposit in contrast to tourists. Cafes and shacks generate the highest glass bottle quantities, sold to local aggregators. Supermarkets, equipped with space and amenities, can serve as potential collection centers along with other market areas and petrol pumps. Most recyclables are collected by aggregators in areas with minimal municipal services, involving migrants as waste pickers. The annual dry waste generation was 40,000 MT, managed formally by 145 MRFs (58%) while the informal sector managed 39% of dry waste through 280 scrap dealers and 3% was seen as leakage.

In the end, recommendations are provided at policy level, administration level, material type, consumer IEC, scheme operation, deposit value, inclusion of informal sector and Infrastructural requirements.

List of Abbreviations

BCRP	Beverage Container Recycling Program
BDO	Block Development Officers
CCAC	Climate and Clean Air Coalition
CCP	Corporation of the City of Panaji
CDS	Container Deposit Scheme
CRISIL	Credit Rating Information Services of India Limited
CRV	California Redemption Value
CZMA	Coastal Zone Management Association
D2D	Door to Door
DH	Domestic Hazardous
DMA	Directorate of Municipal Administration
DOP	Department of Panchayati Raj
DPG	Deutsche Pfandsystem GmbH
DRS	Deposit Refund System
EPR	Extended Producer Responsibility
GP	Gram Panchayat
GSPCB	Goa State Pollution Control Board
HDPE	High Density Polyethylene
HoReCa	Hotel/ Restaurant/ Cafe
IEC	Information Education and Communication
INR	Indian Rupee
IRCTC	Indian Railway Catering and Tourism Corporation
KCIC	Karnataka Commercial and Industrial Corporation

MC	Municipal Council
MLP	Multi Layered Plastic
MoU	Memorandum of Understanding
MRF	Material Recovery Facility
MRP	Maximum Retail Price
NGO	Non-Governmental Organisation
PET	Polyethylene Terephthalate
PP	Polypropylene
PPE	Personal Protective Equipment
PPP	Public Private Partnership
PS	Polystyrene
PWM	Plastic Waste Management
QR Code	Quick Response Code
RDF	Refuse Derived Fuel
ReCa	Restaurant Cafe
RVM	Reverse Vending Machine
SBM	Swachh Bharat Mission
SHGs	Self-Help Groups
SKU	Stock Keeping Unit
SUP	Single-Use Plastic
SW	Sanitary Waste
SWM	Solid Waste Management
TPD	Tonnes Per Day
ULB	Urban Local Bodies
UNDP	United Nations Development Programme
UPI	Unified Payments Interface
USI	Unique Serialized Identification code
VP	Village Panchayat

Chapter 1
INTRODUCTION

Chapter 1
Introduction

1.1 Background

India Generates over 62 million tons of waste annually, out of which only 30% of the waste is recycled[1]. The low recycling rates are typically due to lack of collection systems, littering of waste, contamination in collected material, and low incentives for waste collection and management. Coastal areas with floating populations such as Goa, Andamans, Kerala, etc. are impacted by high levels of littering especially around the coastline. Being a tourist attraction, the state of Goa is one of the highest per capita plastic waste generators in the country. It is estimated that for every meter of beach sand in Goa, ~25 g of plastics is found which equates to the highest quantity of plastic debris in India (Central Marine Fisheries Research Institute 2018, survey).

To tackle the plastic problem in India, the government imposed a complete ban on the production and use of plastic bags including single-use plastics (SUP). The issue has to be tackled at the source. To reduce waste at source and ensure its segregated collection, consumer behaviour plays a key role.

Amongst various waste management strategies to encourage recycling and proper disposal of waste, one of the mechanisms is a deposit refund scheme or system. In a deposit return system, a refundable deposit is paid along with the MRP of the product. In this context, the present baseline study was conducted to analyze the feasibility of a deposit refund system in the state of Goa. The process has been globally adopted in various countries where the following benefits were observed:

- **Increased Recycling rates:** due to return of beverage bottles or cans to the collection point
- **Reduced Littering :** due to value attached to material, it is less likely to be littered
- **Economic Benefits:** creation of job opportunities in the waste sector
- **Traceability:** product traceability through a unique serialized code ID and traceability of recovered material for reuse, refill, or recycling.
- **EPR targets:** brands can achieve their EPR targets via such schemes
- **Consumer behaviour:** consumers are responsible for proper waste disposal

The present baseline study was conducted with a focus on three waste streams i.e Plastic bottles, cans and Glass bottles for the state of Goa. The study analyzed waste management systems in Goa along with material flow, financial flows and collection mechanisms.

1.2 Area of Investigation

The area of investigation for the baseline study is the state of Goa, India. Goa is located in western part of India and shares borders with Maharashtra on the north and Karnataka on the east and south. The state consists of 2 administrative districts, i.e North Goa and South Goa. As of now, there are 13 municipal councils (MC), two Corporations and 191 village panchayats in Goa. Goa has been further divided into 12 talukas.

1. https://www.teriin.org/sites/default/files/2018-06/plastic-waste-management_0.pdf

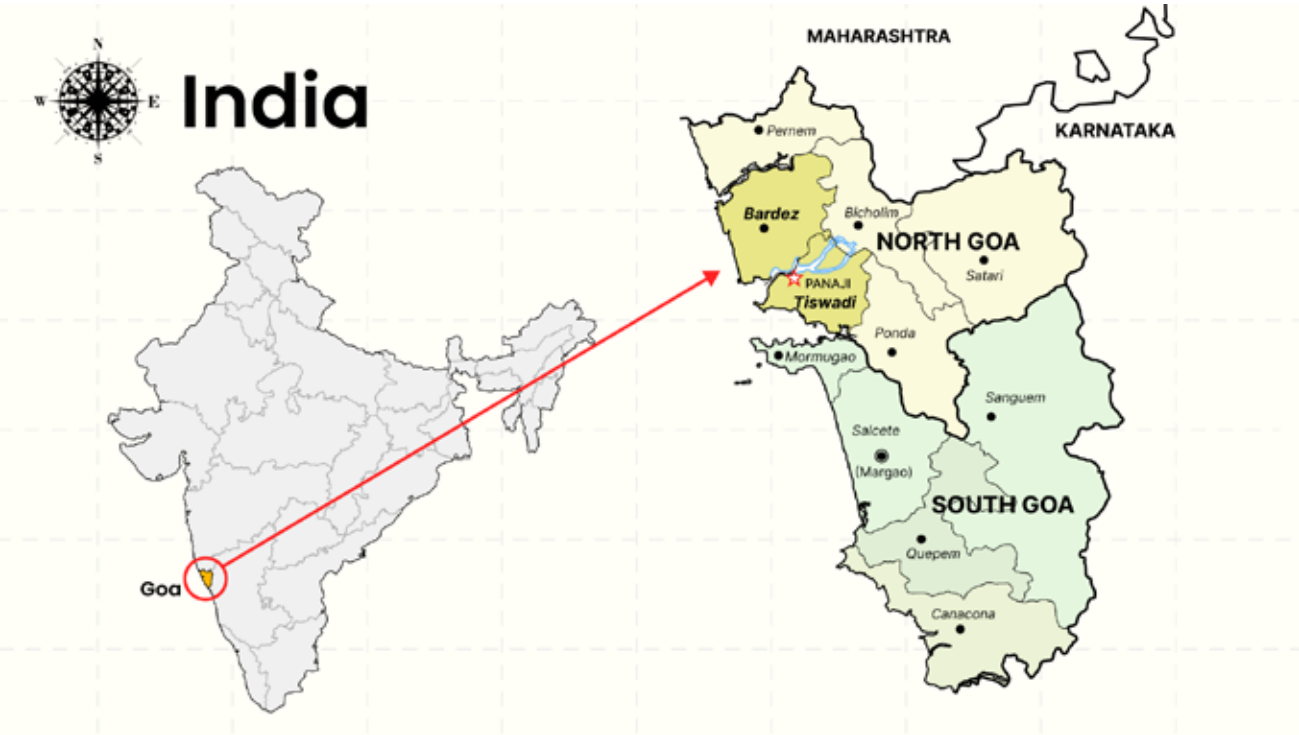


Figure 1.1 Area of investigation for the present study: Bardez and Panaji, Goa

North Goa is divided into five talukas: Tiswadi, Bardez, Pernem, Bicholim, and Sattari. South Goa is divided into seven talukas: Canacona, Mormugao, Salcette, Sanguem, Quepem, Dharbandora, and Ponda.

Selection Criteria for Area of Investigation:

Due to the limited duration of the study, representative locations: Panaji City and Bardez taluka were chosen for the study.

- **Panaji** was chosen as it is the state capital which covers coastal areas (Miramar beach, Dona Paula beach), riverine ecosystem (Mandovi river), institutions and commercial hubs. In addition, the crowd is a mix of residents and tourists which will help us in a distributed sampling.
- The study was extended to **Bardez taluka** due to its high tourist inflow. The taluka has a mix of local residents and tourist population. The coastal areas (Candolim, Calangute, Baga, Anjuna) have the highest tourist footfall (most popular beaches) which makes it a hotspot for waste generation and leakages. It also had residential areas such as Mapusa council.

Table 1.1: General information on the state of Goa (Source : GSPCB)

Geographical Information	Goa	North Goa	South Goa	Panaji	Bardez Taluka
Area	3702 sq km	1736 sq km	1966 sq km	8.27 sq km	264 sq km
Population	15.4 lakhs	8.1 lakhs	6.4 lakhs	1.57 lakhs	2.37 lakhs
Talukas (count)	12	5	7	In tiswadi	1
Panchayat	188	119	69	NA	43

Table 1.2: Popular Tourist spots in the state Goa

Area of Study	Beaches	Forest
North Goa	Anjuna, Candolim, Mandrem, Calangute, Morjim, Sinquerim, Baga, Vagator and Arambol	Dr. Salim Ali Bird Sanctuary, Madei Wildlife Sanctuary
South Goa	Cabo de Rama.Velsao, Majorda, Betalbatim, Colva, Benaulim, Varca, Cavelossim, Mobor and Betul	Mollem National Park Wildlife sanctuary: Bhagwan Mahavir, Cotigao, Bondla Netravali
Panaji	Miramar, Dona Paula, Vainguinim, Caranzalem, Bambolim Beach, Siridao	Bondla Wildlife Sanctuary, Cotigao Wildlife Sanctuary, Bhagwan Mahavir Wildlife Sanctuary
Bardez Taluka	Anjuna, Ozran, Sinquerim, Kegdole, Baga, Candolim, Calangute	Very thin forest cover, mostly unidentified private forests

Language: The locally spoken language in Goa is Konkani (the official language), apart from Hindi, English, Kannada, Urdu, and Gujarati which are also used for communication. Few elderly people were also fluent in Portuguese and French.

Geography: Goa is surrounded by Konkan Plain on the north and Kannad Plain on the south and has a coastline of 101 km. The state has 11 different rivers, namely Mandovi, Zuari, Mandre, Sal, Galjibag, Saleri, Colval, Talpona, Terekhol, Baga, and Harmal.

The topographical area of Goa is further divided into:

- **Coastal plains:** 22% (Bardez, Tiswadi, Mormugao, Salcete talukas)
- **Sub-mountainous regions:** 35% (Pernem, Bicholim, Ponda, Quepem, Dharbandora talukas)
- **Hilly regions or ghats:** 43% (Sattari, Sanguem, Canacona talukas)

Population projection:

As per the report published by CRISIL (Credit Rating Information Services of India Limited) for the Panaji Municipal Corporation, the anticipated population for the Corporation of the City of Panaji (CCP) in 2041 would be 1,51,367 citizens as compared to 88,892 citizens in 2021[2]. In addition, the report also suggests that the tourist population will grow by 32.7% from 2021 to 2041. A graphical representation of the population projection for CCP is presented in Figure 1.2.



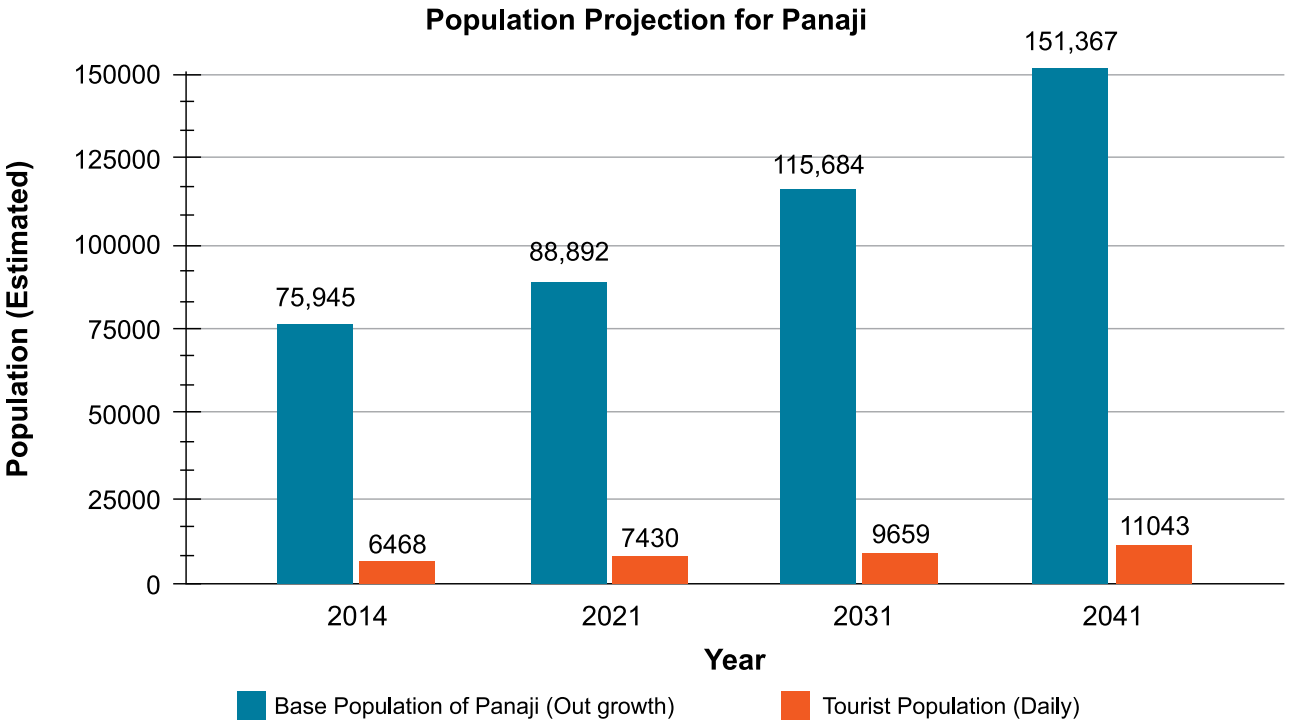


Figure 1.2: The population projection for Panaji (Data source: CRISIL analysis[3])

1.3 Scope of Work

The objective of the study were to:

1. To identify key stakeholders in waste management, including government authorities, brand - owners, waste management agencies including collection and disposal agencies, recycling facilities, hotels, restaurants, cafés and citizen groups.

2. To conduct interviews and meetings with stakeholders to understand their roles, responsibilities, and perspectives on waste management along with willingness or thoughts for participation in the DRS system.

3. To conduct on-ground surveys to estimate the types and quantities of waste generated by citizens and establishments (hotels, restaurants, cafés)

    a. Secondary literature review of studies with similar focus and objectives to gather proxy data, wherever possible

    b. Analyze the composition of waste materials (plastic, glass, cans, etc.) in the generated waste

    c. The composition analysis based on qualitative assessment shall also focus on hotels, restaurants, homestays and cafes

    d. Compile and validate the data to generate waste composition and waste flow diagrams for selected material streams;

4. Conduct waste management system analysis - for plastic, cans and glass containers; Evaluate the existing waste management players and study the various waste streams collected by the informal sector.

5. Organise consultation with key stakeholders including GSPCB, GWMC, brand owners, retailers and collect relevant data with respect to waste management.

3. https://docplayer.net/133193984-Revised-city-development-plan-for-panaji-2041.html

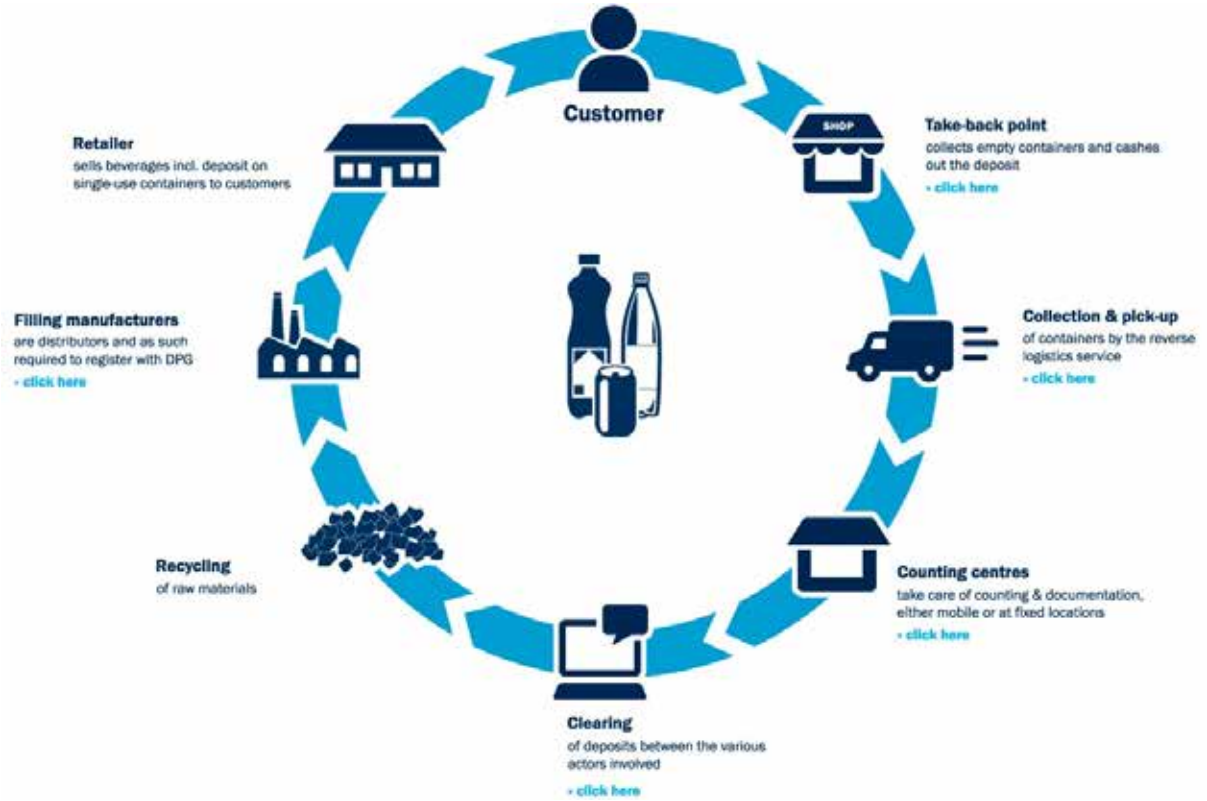


Figure 1.3: Representation of DRS on packaged products (image source: Interzero)

1.4 Deposit Refund Systems and Case Studies

A deposit refund system (DRS) is a mechanism in which a consumer pays a deposit when they purchase a product and receives a refund of that deposit when the product is returned[4]. This system is often used for items that are reusable and recyclable, such as bottles, cans, and other packaging materials.

The collection mechanism of the product may or may not use technology. The collected products are sorted, cleared, and segregated as per the categories and sent for recycling. From the recycling unit, the raw materials are sent to manufacturers and brands for the manufacturing of new products. In case of reuse or refilling, the products are washed and rinsed as per the standard requirement before refilling or reuse.

DRS has been implemented widely in 46 jurisdictions, including 10 federal US states, 10 European nations, Israel, a few Caribbean nations, and numerous provinces and states in Canada and Australia.[5] This brought a substantial behavioural change, making consumers responsible stakeholders and contributing to high recycling targets.

Examining the successful implementation of DRS in European countries, such as Norway, Sweden and Germany will provide an insight on how DRS operates and illuminates the real-world implementation[6]. Several countries have introduced DRS and efficiently implemented the system with high return rates. The details of the same are provided in Table 1.3.

4. https://en.wikipedia.org/wiki/Deposit-refund_system
5. https://www.renewablematter.eu/articles/article/making-empties-count-deposit-return-schemes-across-the-world
6. DEPOSIT-REFUND SYSTEMS IN EUROPE

Table 1.3: DRS in various countries and its Details

Country Details	Scheme Details
Norway[7] **Area:** 3,85,207 Sq. Km (104x Goa) **Population:** 54 lakhs (3.5x Goa) 	**Year of implementation:** 1999 **Materials applicable:** Plastic and metal **Scheme operator:** Infinitum (non-profit organisation equally owned by beverage producers and Norwegian grocery producers) **Return rates:** Plastic containers = 92%; Metal cans = 93% **Financial Flow:** The system gets money from material revenue, producer fee and unredeemed deposits.
Sweden[8] **Area:** 4,47,425 Sq. Km (120x Goa) **Population:** 106 lakhs (6.9x Goa) 	**Year of implementation:** 1984 **Materials applicable:** Plastic and metal **Scheme operator:** AB Svenska Returpack (private non-profit organisation, ownership-swedish Brewers Association [50%], the Swedish Food Retailers Federation [25%] and the Swedish Grocery Stores Association [25%]) **Return rates:** Plastic containers = 86%; Metal can = 89% **Financial flow:** The system gets money from material revenues, unredeemed deposits, producer fees, annual membership fees.
Germany[9] **Area:** 3,57,592 Sq. Km (96x Goa) **Population:** 833 lakhs (54x Goa) 	**Year of implementation:** 2003 **Materials applicable:** Plastic, metal and glass **Scheme operator:** Deutsche Pfandsystem GmbH-DPG (non- profit company; shareholders-German Retail Federation [50%] and the Federation of German Food and Drink Industries [50%]) Producers and retailers (in the case of private labels) **Returnrates:** Overall = 98% **Financial flow:** Annual membership fees cover costs related to label database. All other operational costs (redemption infrastructure or logistics) are covered by each party.

7. Norway
8. Sweden
9. Germany

California[10] **Area:** 4,23,967 Sq. Km (114x Goa) **Population:** 392 lakhs (25.5x Goa) 	**Year of implementation:** 1987 **Materials applicable:** Plastic, metal and glass **Scheme operator:** CalRecycle (Governmental organisation: a branch of the California Environmental Protection Agency that oversees the state's waste management, recycling, and waste reduction programmes) **Return rates:** Metal=78%; Glass = 64%; Plastic = 60% **Financial flow:** Unredeemed deposits (held in Beverage Container Recycling Fund)
Australia[11] **Area:** 76,92,024 Sq. Km (2077x Goa) **Population:** 264.4 lakhs (17x Goa) 	**Year of implementation:** 1977 (in South Australia), 2016 - 2023 (in other territories) **Materials applicable:** plastic, metal, glass, liquid paperboard **Scheme operator:** Australian Beverages Council Ltd. - ABCL (private includes large and MSME involved in the production of non-alcoholic beverages) **Return rates:** Overall = 84% in Northern Territory and 76% in South Australia. **Financial flow:** Unredeemed deposits
Romania[12] **Area:** 2,38,397 Sq. Km (4.4x Goa) **Population:** 392 lakhs (13x Goa) 	**Year of implementation:** 2023 (launch: 30th Nov 2023) **Materials applicable:** plastic, glass, and metal beverage containers **Scheme operator:** RetuRO, a consortium of private entities (associations of beverage producers and retailers) and a public body (the Romanian Ministry of Environment, Waters and Forests) **Return rates:** Not applicable (yet to be launched) **Financial flow:** Investment from ING bank- 426 million lei (784 Cr. INR)

10. California
11. Australia
12. Romania

From the above comparison of global case studies on DRS, it was found that different countries have adopted different methodology for DRS success. For example:

To encourage the producer's participation in the scheme: The government of Norway declared a reduction in the environmental tax (if return rate = 25%) and a complete rebate (if return rate = >95%).

To ensure uniformity of packaging and better collection: AB Svenska Returpack (Sweden) has demanded the producers to change the form and design of the containers.

Scheme operators: The Scheme operator in Romania is proposed to be a consortium of private entities and the Romanian ministry where DRS is yet to be implemented. The investment is from ING bank.

Further, it was seen that If the scheme is not mandated by the government, then the stakeholders will not be willing to participate and get involved in the system. For example: Low collection or redemption rates of containers were seen in California as DRS was not mandated by the government. The retailers had an option to opt out of the scheme by paying a minimal fee. Thus, government intervention is needed.

Chapter 2
METHODOLOGY

Chapter 2
METHODOLOGY

2.1 Stakeholder Identification

The stakeholder identification process is a crucial step in any baseline study. The process involves identifying and categorizing individuals, organizations, government departments and non-profit organizations. The stakeholders in the study were divided into three stages as shown in Figure 2.1

I. **Pre-consumption stage:** When the product is manufactured or produced and enters the retail supply chain through state-owned or private distributors, brands, bottlers, departmental stores, and liquor shops

II. **Consumption stage:** The products are purchased and consumed by the consumers. The consumption points can be households, shacks, hotels, restaurants, cafes etc.

III. **Post-Consumption stage:** When the products are consumed, the post-consumer goods enter the collection value chain. These goods enter the waste management chain and are disposed of through waste pickers, scrap dealers, material recovery facilities, or waste treatment facilities.

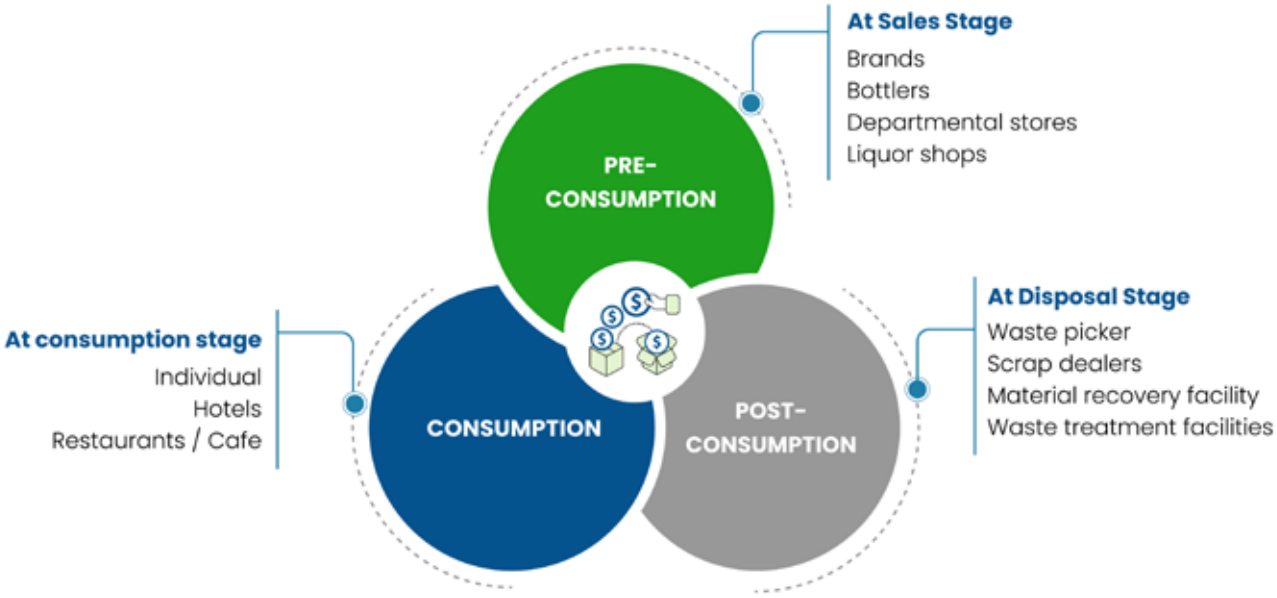


Figure 2.1: Stakeholder identified for the DRS baseline for Goa state

2.2 Methods and Purpose

To conduct the DRS baseline study for selected waste streams in Goa an approach combining various methodologies was adopted. This included field assessments, surveys, interviews, consultation meetings and secondary research. The details and purpose of method are provided subsequently.

2.2.1 Secondary research

Secondary research is referred to as the process of collecting and analyzing the existing data and information available in the public domain or collected previously by others. A variety of previous studies, research reports, articles and web-based documents were studied to understand the geography, current status, previous works and possible challenges with respect to waste management.

The information generated and data collected from secondary research were used to prepare questionnaires for primary data collection through field assessments, surveys, and consultations.

2.2.2 Field Assessment

A field assessment was conducted in Bardez taluka and Panaji city. The field assessment provides insights and observations that compliment the data/findings collected through consultation or secondary research. The purpose of the field assessment was to note observations and provide a perspective on the existing waste ecosystem. In the current study, pictures of geo-tagged locations were taken to keep track of locations covered. The assessment was done on-field to determine area-wise waste management, including an understanding of the waste management services provided by the aggregators and scrap dealers in the area and the types of collection vehicles used. The following areas were identified for field assessment:

- Bottling plants
- Consumption points
- Retail points - Liquor and departmental stories
- Material recovery facilities (MRF)
- Waste Aggregators and Scrap dealers
- Waste treatment facilities

2.2.3 Surveys and Interviews

A well-structured survey questionnaire was prepared for various stakeholders to gather quantitative and qualitative data covering the following aspects of waste generation patterns, collection mechanism, disposal patterns, willingness to participate in DRS schemes, attitudes and awareness of waste management. The survey was conducted through face-to-face interviews, telephonic interviews as well as online surveys. The survey and interviews were done under 4 segments:

I. Retail points

The survey focuses on understanding the pre-consumption stage or the source of the bottles. Retails were therefore the targeted survey audience for this survey to understand the sale patterns and the possibility of these retailers acting as collection points.

II. Consumers

The target audience set for the consumer survey was residents and tourists. The purpose was to understand the quantity, type of packaging and the content of the packaging (alcoholic and non-alcoholic) generated during the consumption stage.

III. HoReCa: Hotels, Restaurant & Cafe

Goa is a tourist destination, the floating tourists are the major consumers and users of packaged bottles, so it is important to understand their behavioral patterns.

IV. Informal Sector

The plastic and glass bottles are collected by waste pickers, kabadiwalas, aggregators and traders. Therefore, interviews and

interactions were conducted with the informal sector to understand their persona and determine the material flow.

2.2.4 Consultation Meetings

Stakeholder consultations (in-person meetings) were conducted with the government officials and organizations involved in waste management in Goa from October 2023 to November 2023.

Stakeholder consultation meetings were conducted with the government officials and organizations involved in waste management in Goa. The list of consultation meetings conducted are tabulated in Table 2.1.

Table 2.1: List of stakeholders consulted for baseline study

Name, Designation & Date of consultation	Department or Organisation
Mr. Sachin Ambe Municipal Engineer, Waste Management Cell, CCP; 20th Oct 2023	**Corporation of City of Panaji** manages the waste of Panaji city from households and commercial establishments along with MRF operations
Mr. Vivekanand Desai City Mission Manager, SBM - Urban 20th Oct 2023	**Swachh Bharat Mission (SBM) Cell in Urban Development Agency** has a mission officer who provides technical assistance and administrative support while monitoring the progress.
Mr. Nilesh B Naik Superintendent of Excise 20th Oct 2023	**Excise Department** controls the movement of liquor within the state and outside the state (for export) along with label approval for sale.
Mr. Richard Fernandes Assistant Manager, GWMC & Mr. Gajanan Kamat, Engineer, GWMC 19th Oct 2023	**Goa waste management corporation (GWMC)** looks after the treatment and disposal of waste collected at municipal, council or panchayat level from the entire state.
Mr. Rajat Sawant GSPCB 20th Oct 2023	**Goa state pollution control board (GSPCB)** acts as the governing authority for waste management along with other environmental divisions.
Parveen Farooqui Goa - Regional Head, KCIC 1st Nov 2023	**Karnataka Commercial and Industrial corporation (KCIC)** is a private company appointed by GWMC to manage waste from beaches and highways in the state.
Ganeshwar Bolivar Incharge, Panaji 16th Nov 2023	**Department of Panchayati Raj:** The department is responsible for the implementation of policies and programs related to panchayat governance level.
Ms. Tejashree Project Manager 15th Nov 2023	**Sampurna (E)arth Foundation** is a social enterprise working towards waste management, waste audit, capacity building, Awareness campaigns etc.
Mr. Aditya Kumar Co-founder 17th Nov 2023 (Virtual)	**Ayya waste management** is an organisation which provides waste management services and solutions. Ayya also provides a set of sustainable eco-products. Currently active in the state of Goa and Bihar.

The main objectives of stakeholder consultation were to understand the roles and responsibilities of each department and select organizations to retrieve possible data on waste management that can be availed from the departments and gather further insights on waste management in Goa from these interactions.

2.2.5 Sampling from Households

In the present study, a short dry waste sampling was conducted in housing societies in Panaji, along with brand mapping for the selected category of material. The purpose of the household sampling was:

- To understand the quantities of plastics, cans, and glass bottles generated by the households in Goa.
- The numbers obtained will be used to estimate quantities of selected waste streams for the state by the residents.
- Brand mapping of PET, Cans and Liquor gave an idea of the popular brands in the waste stream for Panaji.

A rapid assessment methodology was followed for household sampling due to the limited time duration. A total of 5 housing societies were selected for this study. These housing societies had a 16-way waste segregation method and a separate storage facility for sorting in the compound. The dry waste was picked up twice a week by CCP. The societies were visited every day from Monday - Wednesday (13th Nov, 2023 to 15th Nov, 2023) to ensure that waste is collected in a segregated manner. The society in charge responsible for sorting the residential waste was instructed to keep the waste separately. On Thursday (16th Nov, 2023), the dry waste characterization study was conducted for these locations.

The sampling was done early in the morning before the time of waste collection. The materials specifically PET bottles, cans and glass bottles were separated according to the brand and the count for each category was recorded. Brand mapping was also conducted at one of the societies where the maximum quantity of waste was observed, and segregation was most efficient.

2.3 Limitations of Study

The limitations of the study conducted from October to November 2023 were as follows:

i) **Lack of awareness:** The HoReCa's knowledge was limited to segregation of wet and dry wastes with no availability of data wrt to the quantum of waste generated (such as number of PET bottles or glass bottles or cans) on a daily basis.

ii) **Limited sample size:** Due to vast geography and limited time for the study, the area of study has been reduced to only two talukas. Further, limited surveys for Hotels, restaurants, and shops could be conducted.

iii) **Data unavailability:** Informal sector plays a major role in waste recovery, however, there is a lack of information on the number of waste pickers in the state.

iv) **Limited support from stakeholders:** Resistance from the shopkeepers, hotel owners, scrap dealers and some departments to share data with respect to quantities of sales and waste being handled by them.

v) **Seasonal variations in waste generation:** Since the study was conducted in the month of October and November, it may not have captured potential seasonal variation in waste generation in Goa.

Vi) Since data was captured at only one point of time – it cannot be extrapolated to model waste generation and management across Goa. Additional t**emporal-data collection and analysis**, over equal intervals of time, may be needed for a more robust analysis.

Chapter 3

CONSULTATION MEETINGS

Chapter 3
CONSULTATION MEETINGS

3.1 Consultation Meetings

Stakeholder consultation meetings were conducted with the government officials and organizations involved in waste management in Goa. The main objectives of stakeholder consultation were:

- ➔ To understand the roles and responsibilities of each department and organisation.
- ➔ To retrieve possible data on waste management that can be availed from the departments.
- ➔ Insights on waste management in Goa from these interactions.

3.1.1 Panchayat Raj Department

Meeting with Ganeshwar Bolivar, In-charge, Panchayat Raj, Panaji

Responsibilities of department: They look after all the administrative matters, accounting, financial allocation, scheme implementation, grievance, planning, SBM - Gramin, in the village panchayat. Each district has a deputy director (North and South), followed by the Block Development Officers (BDO) for each taluka.

Insights from meetings :

Overview: The meeting was initiated to meet the BDO and the directorate of Panchayat and collect consolidated data on the following:

- Waste generation statistics in the Grama Panchayats (GPs)
- Commercial and institutional entities in the state and their details
- Number of dry waste MRFs available (with location, established capacity and materials collected in quantity-average of month)
- List of Liquor shops and department stores in each panchayat.

Waste management: The SBM-Rural cell of Panchayat Raj handles the waste-generated data. The data of each panchayat was present with the respective panchayat heads in their respective talukas. The BDO in charge of the Panaji district only had the Total waste quantities of the Panaji district.

Outcomes: The SBM officer and the In-charge asked to send a letter addressed to the Director of Panchayat, Miles High Building, to obtain the above-mentioned data at every panchayat level. A consolidated data was missing in the portal and could be collated from the respective districts of separate talukas which would take time.

3.1.2 Consultation with Excise Department



Responsibilities:

To control liquor manufactured, sold, imported and exported in the state.

- To give permits and licenses to the manufacturers of liquor, distillery, bottling plants and wholesalers.
- To check the movement of liquor across the state, inspections etc.
- To approve the labels of all types of liquor to be sold in the state.

POC: Shri. Nilesh B Naik, Superintendent of Excise

I. **Labelling:** All the manufacturers have to apply for approval of labels with design, this process is called label recording. Any edit is considered a fresh recording. The labels are approved by the excise department within 7 days. The language required in Goa is only English, no other local language is needed. It must mention for sale in Goa, export label, health warnings, addresses, customer care number, alcohol %, Maximum Retail Price (MRP) etc. The label recording fee is based on the MRP of the product (slabs are set), hence different Stock Keeping Unit (SKUs) will have different labeling fees that have to be paid to the excise department. The approval has to be obtained annually from the excise department.

II. **Imports and Export:** The import of Liquor is done by registered wholesalers for which the permit is issued by the Excise department. This is not recorded at bottle level by the excise department. For an import permit, the duty has to be paid in advance, the wholesaler should have consent from the brand. For exporters, export permits are required.

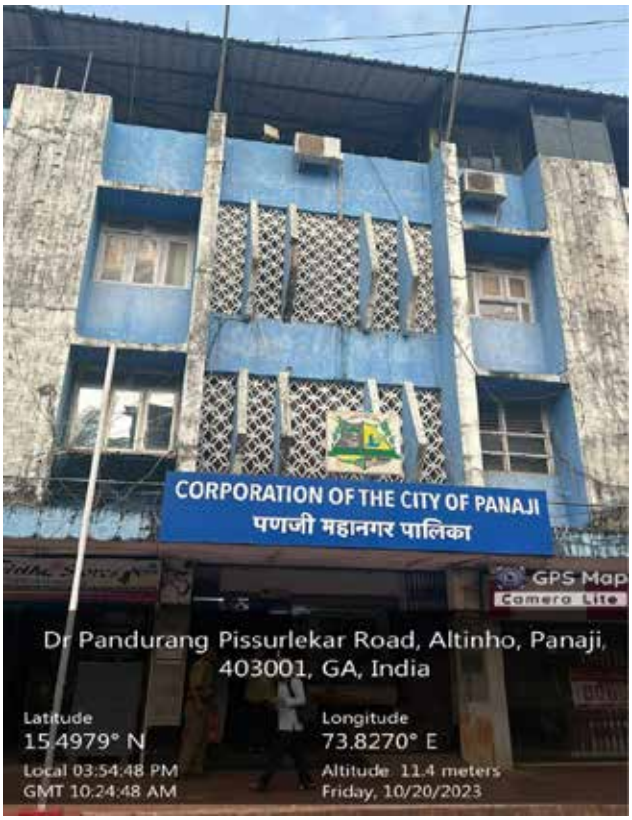
III. **Licenses** as on Oct 2023: Consumption licenses: Number of bars = 8964 Sale Permit: Number of retail outlets or wine shops = 3968 Import permit: Number of registered wholesalers = 324 Manufacturing license: Number of bottling units = 57

IV. **Bottling in Goa:** Any facility is inspected by the excise officer of the taluka. They inspect various aspects such as capacity and label approvals. They also monitor the production. The material is stored in a bonded warehouse from where the distributors can take the material after providing an authority letter by paying the duty to the excise officer based on the quantity taken.

V. **Sale of liquor:** Each taluka office has a nodal taluka excise officer (excise inspector) who inspects the stores and sale points. The Data of the sales from each store and bifurcation of sales made in PET, Glass, Tin in each taluka may be available with the taluka office. These inspectors regulate the flow of liquor and during election code strictly. However,

the actual data of the number of units coming out or put to market can be obtained from the commercial taxes office (POC: Additional commissioner). In the past (~2003), there was a collection scheme where glass bottles had deposits, post consumption they were collected and deposits were given back. A few beer companies have reported that they reuse their old beer bottles. However, the excise department does not have any legislative power to enforce the collection of bottle schemes.

3.1.3 Corporation of City of Panaji



Responsibilities:

- CCP looks after the payment of house tax, issue of trade licenses, issue of residential certificates and public grievances.
- They focus on Information Education and Communication (IEC) activities on various aspects such as health, waste management, and welfare of safai karmachari.

POC: Shri. Sachin Ambe, Municipal Engineer, Waste Management Cell, CCP

I. **Waste Collection:** Door-to-door collection (D2D) has been done since 2006. The wet waste goes to a wet waste processing facility near Hira petrol station or bio- methanation plant while the garden waste goes to a facility in Patto. In addition, CCP has set up composting pits in the societies.

II. **Sorting stations:** CCP has 4 sorting stations with a capacity of 2 TPD. Two of these are operated by Ayya while the other two are operated by Feedback India Foundation. The sorted materials from the sorting station are sold to private vendors for recycling. The sorting stations are also equipped for the sale and purchase of material from individuals. However, the individual depositors are very few. A rate card is maintained for this by the agency and monitored by CCP.

III. **Non-Recyclable:** The Refuse Derived Fuel (RDF)/ non-recyclable material is transported to the MRF at Talegaon. The MRF has a capacity of 18 TPD (maximum capacity = 25 TPD) and is operated by the Feedback India Foundation.

IV. **Sources of Waste:** Residential and commercial establishments in Panaji city. The waste from 6 casinos is also collected by CCP as they pay a user fee to CCP and is under CCP jurisdiction

V. **Bulk waste generators:** There are about 33 bulk waste generators recognized by CCP. The criteria for BWG is 25 kg or above.

VI. **Other Inputs:** They highlighted that any data they have is on collection and not generation and these two are not equivalent. They suggested that any informal worker is mostly bonded labor; they give material only to one person and no one else. The official spoke about the existence of the DRS scheme in Goa back in 2002 and was supportive of this scheme. However, they expressed concern on the IEC of this for the floating population.

3.1.4 Swachh Bharat Mission Cell in Urban Development Agency



Responsibilities:

- The main purpose of the SBM cell in a city is to implement strategies as envisaged in the guidelines for implementation of SBM 2.0.
- Health, hygiene and sanitation: Construction of household toilets, community toilets, public toilets.
- Management of waste: Capacity building and administrative support for biodegradable and non- biodegradable waste management IEC and public awareness as a key strategy of SBM.

POC: Mr. Vivekanand Desai, City Mission Manager

I. **Rural:** The rural areas manage the primary collection of waste in the 191 panchayats. The waste is sent to centralized facilities at Saligao and Cacora. The waste generation is about 100 g/capita/day. Most of the wet waste is used as cattle feed.

II. **Urban:** At the urban level, the waste from 14 municipalities and 1 corporation (Panaji) is collected and sent for recovery at MRFs. There are 8 SBM coordinators. There are two Urban Local Bodies (ULB) in Goa with more than 1 lakh population (Madgaon & Mormugao). There is another MRF in Sada, Vasco. The street sweeping is done in CCP and market areas only.

III. NGOs (Non-governmental organizations) operating in Goa: YIMBY(Yes In My Backyard), Karo Sambhav (Bicholim), Recity, UNDP, Mineral Foundation, Sampurna Earth.

IV. **Informal Sector:** Most waste workers in Goa are migrants.

V. **Digital grievance portal:** Ponda and Panaji have a digital collection and grievances redressal portal.

3.1.5 Goa State Pollution Control Board (GSPCB)



Responsibilities:

- The main objective of GSPCB is to prevent and control the pollution of the environment at all levels.
- Monitoring of air and water quality, inspection of industries, establishing quality monitoring stations, testing labs and other facilities are a few functions performed by the Goa PCB.
- Provided consent to establish and operate
- Operation and management of a common sewage treatment plant.

POC: Mr. Rajat Sawant, GSPCB

Waste Collection and management: Panchayats do primary collection or D2D collection at the panchayat level and then the waste is sent to GWMC. For Panaji, CCP looks after waste collection and disposal. Any complaint on littering goes to the panchayat or municipality, it can also come to the GSPCB. Centralised waste is managed at Two facilities, one in North Goa (Saligao) and one in South Goa (Cacora). Hotels: GSPCB issues constant to establish and consent to operate where a variety of information is collected.

MRFs in the state: As per the high court order, all the panchayats in Goa have to establish their own MRFs for dry waste where manual segregation has to be done. The panchayat has been provided with various machines such as a composter, baling machine etc.

Data Management: The inspection reports and analysis reports are put up online through OCMMS software. The data is stored in OCMMS software in GSPCB post-2018, hence that data can be much more easily available.

Aggregators: Recently, aggregators have also started registration at GSPCB for operation. These aggregators have to pay a registration charger of ~Rs. 10,000/-

Sampling and monitoring: Samples of wastewater, ambient air, and stack emissions are monitored and analyzed in the Board laboratory. They ensure the waste and wastewater quality such as pH, biochemical oxygen demand, chemical oxygen demand, suspended solids, and oil/grease of industrial effluent. GSPCB has set up ambient air quality monitoring systems and stations for parameters like SPM, SO2, and NOx.

3.1.6 Goa Waste Management Corporation (GWMC)



Responsibilities of Corporation:

- Operation and management of centralized Waste Treatment plant in Saligao and Cacora for wet & dry waste, Common biomedical waste treatment facility (WTF) at Kundaim IDC, Common hazardous waste treatment storage and disposal facility at Pissurlem.
- Collection, segregation and transportation of solid waste from National and state highways (400 KM)
- Remediation of waste dump sites in Goa.

POC: Mr. Richard Fernandes, Assistant Manager, GWMC & Shri. Gajanan Kamat, Engineer, GWMC

Municipal Waste Treatment Plants: The Saligao Waste Management Facility was initially (in 2016) designed for 100 TPD but now has been enhanced to 250 TPD (+20% TPD). The facility caters to 27 local bodies along the coastal belt of North Goa. In 2023, another facility was completed at Cacora, South Goa for a capacity of 100 TPD (+25% TPD). Both the facilities can manage wet waste (by biomethanation & composting) and dry waste. Both of the waste treatment plants were built on a dumping site after remediation of the same. Both the plants are operated by a private agency but looked after by the GWMC. The operational model is public public-private partnership.

Biomedical Waste Treatment Plant: The capacity of the bio-medical waste treatment plant is 28 TPD. It comprises an incinerator (300 kg/ hour) and a 6-stage pollution control scrubbing system. It is operated by Biotech Waste Solution. The land is provided by the Government. The operational model is a public-private partnership.

Upcoming Facilities: Waste to Energy plant (capacity: 250 TPD) at Verna, a pre–feasibility study has been completed for the same. Construction & demolition waste management facility at Bicholim are planned. A possible tender for recyclers for low-value plastic material may be released soon.

Waste Management in State: as per one of the reports in 2018, the total quantity of waste generated in Goa was estimated to be 766 TPD. The per capita waste generated was estimated to be 450 g/capita/day. Only grit is landfilled at Saligao or Cacora plants, the rest of the material is recovered. To maintain the pickup GWMC has launched an application where panchayats can schedule a pickup. During the tourist season, the waste increases by 20%. The littering on the highway is managed by a private company - KCIC on behalf of GWMC.

The D2D collection is done by the Department of Panchayat Raj (DOP) or the Directorate of Municipal Administration (DMA). The beach cleanup is managed by the Tourism department.

Policies & Memorandum of Understanding (MoU): The GWMC has signed an MoU with cement companies for the co-processing of non-recyclable waste/RDF. They provide pick up of baled non-biodegradable non-recyclable waste from corporations, councils or village panchayat. In addition, the panchayat MRF can send the bailed non-recyclables to GWMC which is sent to these cement companies. There will be a Goa scrap waste recycling policy by the end of the year where all scrap dealers will have to register and they will be asked to shift to allocated land.

3.1.7 Sampurn(e)arth Environment Solutions Pvt. Ltd.

Meeting with Tejashree - Project Manager

- Sampurn(e)arth is into capacity building of waste pickers and scrap dealers, establishing MRFs, and also holds a recycling unit for recycling of plastics
- It has contributed in capacity building of over 500 waste pickers in 30 village panchayats of Goa
- The project is sponsored by Godrej for a period of 3 years, one year out of which has been completed
- It has conducted a detailed survey of

more than 70 scrap dealers with an aim to understand the scrap dealer ecosystem; highlights of the report are captured in the section 4.4.5 : scrap dealers and aggregator section

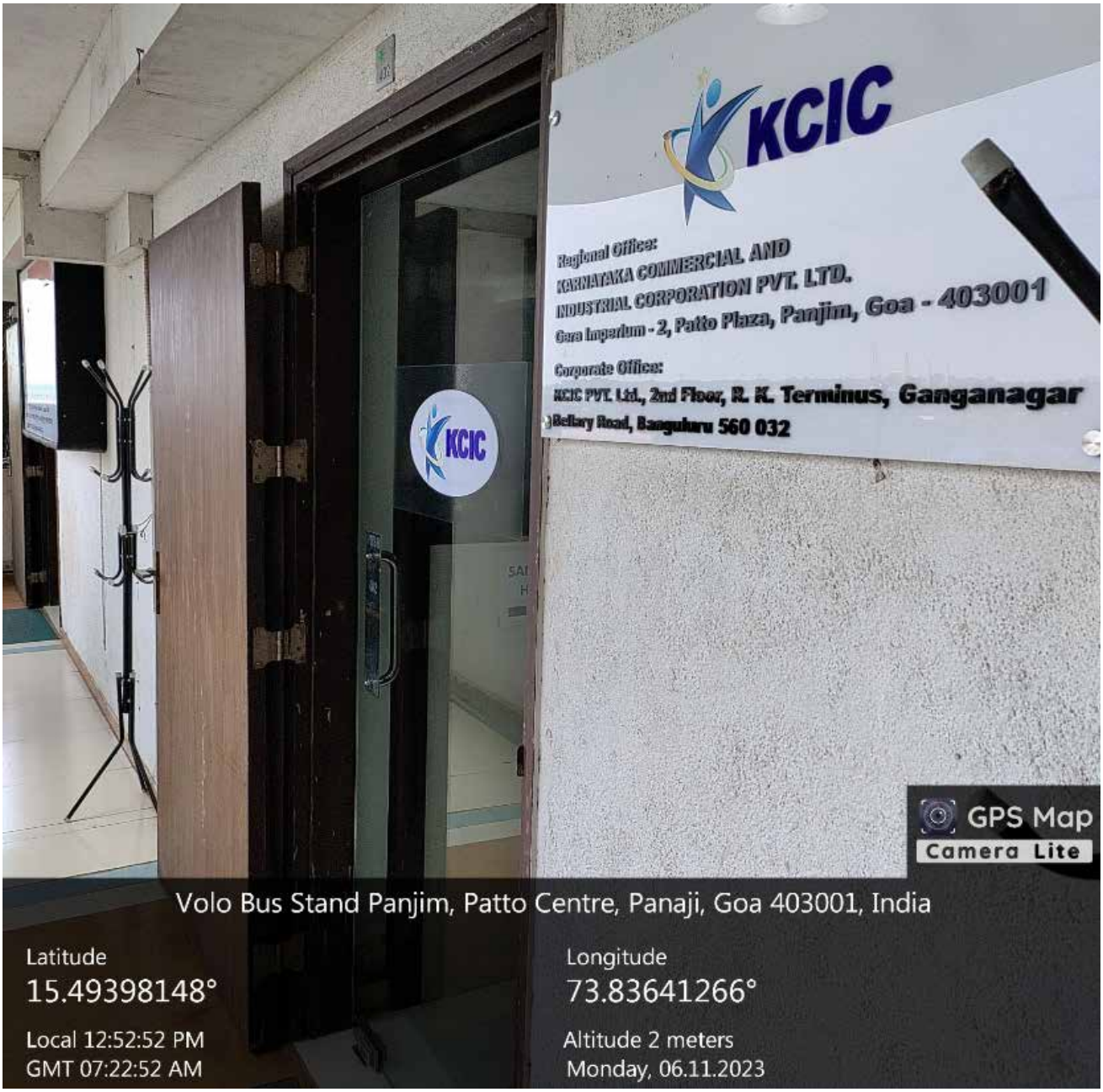
- Sampurn(e)arth has engaged with the informal sector by offering them a online platform, capacity building and also helping them for a formal recycler association also known as Panaji Recycler Association
- Sampurn(e)arth has engaged and empowered two self-help groups (SHGs) per MRF and operating two MRFs in Bicholim and Harvelem
- The waste that is segregated at the MRF is further processed at their self-operated facility in Pesulim, Goa

3.1.8 Ayya Waste Management and One Earth Foundation Meeting with Aditya Kumar, Co-Founder (Virtual)

- The company started in 2021 and provides solutions for government, ULB and BWG
- They are currently working for two years in CCP and Patna. In Goa, there are around 16 employees.
- In the past, they tried Waste management collection in the panchayat but it did not work out economically for the company.
- **Goa :** They channelise 80-90 ton of dry waste per month. Their centre was around 4 KM away from the sorting station where 60-70 MT material can be stored. They are operating 2 sorting centres in Panaji from 5 wards residential, 1 casino and BWG (hotels). From sorting stations, only PET goes to the central facility. Waste from hotels is collected by them in their vehicle (3 vehicles). The material also comes from a purchase model scheme in Panaji where individuals can bring the material.
- **Waste management:** The collected glass is sent to aggregators who segregate as per color and brand, there are 4-5 such aggregators in their network. For PET, it is directly sent to recyclers in Gujarat and Andhra Pradesh and Extended Producer Responsibility (EPR) credits are generated for PET. The aluminum cans collected in the center are sent to a vendor in Maharashtra for making Aluminum.
- **Challenges in Panchayat:** They highlighted that there exists no ecosystem of waste collection or segregation or material recovery. The quantities are low and the funds lower which makes it difficult to operate the same. They suggested that IEC is needed for tourists and the floating population on new policies and guidelines.
- One Earth Foundation: The IEC activities are being done by one earth foundation on a circular city, zero waste, etc. These are self-funded activities. Further, cleanup activities, community building, society IEC, Awareness and plastic pirate movement are done through One Earth Foundation.

3.1.9 Karnataka Commercial Industrial Corporation Pvt. Ltd. (KCIC) Meeting with Parveen Farooqui, Regional Head, Goa

- The KCIC is a Karnataka-based organization that is engaged in the beach and highway cleaning for the state of Goa.
- The Department of Tourism has awarded the contract of comprehensive beach cleaning to KCIC in October 2019 across 37 major beaches in Goa
- There are 300 employees employed at KCIC that are involved in beach cleanup. 120 people are employed for highway cleanup.
- It was mandated to install bins at every 50 m at the beaches. Further, the Coastal Zone Management Association (CZMA) rejected the idea of placing the bins on the beaches as it hampered the aesthetics of the beaches. Therefore, the bins were placed at a 100 m distance, however, there are many bins that



are lying obsolete at the beaches. The bins placed at the beaches are removed during monsoon season to avoid washing away bins on the beaches.

- Manual beach cleaning activity is tough due to changes in weather conditions and a variety of waste is seen including footwear, dead fishes and animals.
- Mechanical cleaning of these beaches is a challenge due to the ecological sensitivity of these beaches such as turtle nesting and starfish breeding, etc.

3.2 Key Findings from Consultation Meetings

The major findings and insights from the consultation meeting with government, private and non-government organisations are summarised below:

➔ Door-to-door collection is observed in Goa. The wet waste is sent for biomethanation, and the collected dry waste is sent to sorting facilities from where it is sold to recyclers. The state also has a facility dedicated for non-recyclable materials or RDF.

- In rural areas, the dry waste is sent to waste facilities while the wet waste is used as cattle feed. While, in urban areas, there are ULBs, MRFs, and informal workers
- Plastics are generated in the highest quantities in households
- Glass bottles are generated in the highest quantities in HoReCa through liquor.
- The labels on liquor bottles have to be approved by the excise department annually for each SKU.
- The import of liquor is allowed for registered distributors (with import license).

In the consultation meeting, the following challenges and gaps were identified with respect to the baseline study:

- In most of the departments, the required data for the study was not readily available and had to be extracted from documents and taluka offices which required additional time.
- For the quantities of waste, only wet and dry waste data was recorded and further characterization for PET, cans, or glass could not be found.
- Many departments and organizations were hesitant to share any information and requested official letters from their respective organization heads.

Chapter 4
STAKEHOLDER ANALYSIS

Chapter 4
STAKEHOLDER ANALYSIS

4.1 Pre-consumption stage

4.1.1 Bottling Plants

As a part of the stakeholder analysis, a visit to Reybier Alco Bev Private Limited (RAB), Bicholim, Goa was done on 16th Nov, 2023. The bottling plant has a capacity of filling 15000 bottles per day. Currently filling for the locally famous Goa's craft beer, **Peoples**.

The visit was conducted to understand the liquor manufacturing process. The process of liquor manufacturing varies on the type of liquor which is not the focus of the study. The focus was to understand various processes involved in bottling such as filling bottles, capping, sealing, labeling, quality control and packaging. However, the common steps for the bottling process are presented in ***Figure 4.1.***

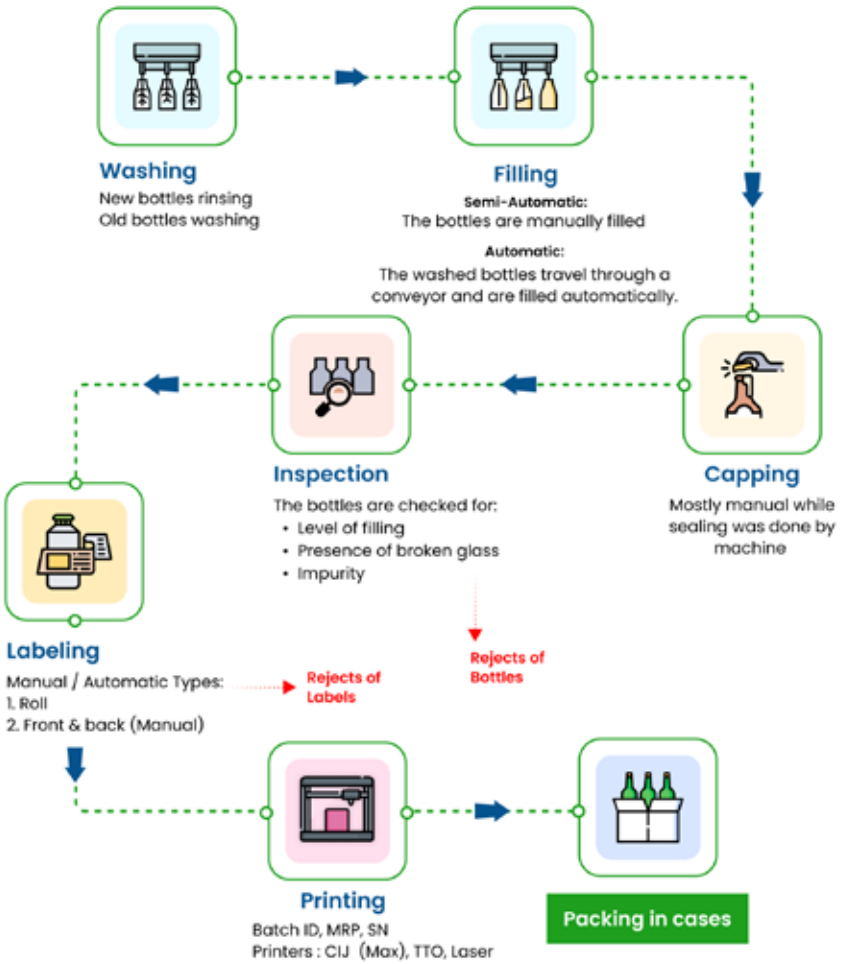
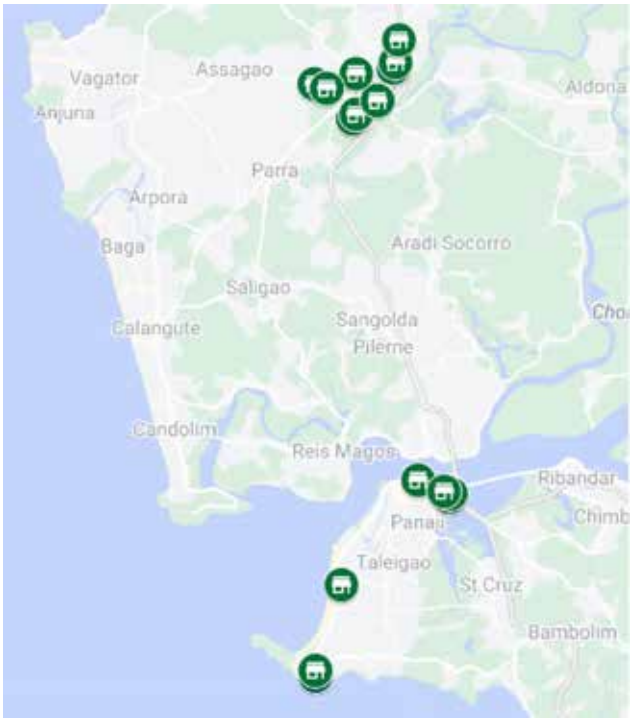


Figure 4.1: Process flow of a typical alcoholic glass bottling units

4.1.2 Retail points

Another important area of focus for the study was the sale point which comprises supermarkets, general stores, liquor shops and others. The survey was conducted for19 shops in Panaji, Mapusa and Dona Paula region to understand the demand and consumption pattern of beverage containers (plastic, metal and glass).



19 stores →
- 8 departmental stores (not selling liquor)
- 2 supermarkets (selling liquor + daily use products
- 9 stores sold liquor exclusively

a) Category of Waste: It was observed that only dry waste was generated in the stores. Carton waste was common dry waste in the exclusive liquor stores, glass waste was also generated in a few of them. While, plastic bottles and bags are majorly generated waste in the general stores and supermarkets.

b) Materials Sold: In the exclusive liquor stores- wine, beer, whisky, rum, vodka, brandy etc. were majorly sold products. While in the supermarkets and general stores, all the daily requirements like hygiene products (soaps, shampoo, etc), food products (chips, biscuits, etc), and other necessities were sold.

c) Waste Disposal: The disposal of generated waste in exclusive liquor stores was mostly through scrap dealers. They sell the carton and glass wastes (when generated) to local scrap dealers.

The waste in the supermarkets and general stores is taken by the municipality.

Key Findings: *It was observed that the wet waste was not generated at the sale point. Carton waste, glass bottles, and plastic waste are the highly generated dry waste categories. 42% of the shops were selling the generated dry waste, while the rest were giving it to the municipality.*

4.2. Consumption stage

The main objective is to understand the user's shopping, disposal, and willingness to participate in the system. Thus, it is also crucial to understand the user's lifestyle pattern and the behavioural patterns of the people residing in or visiting Goa. A total of 100 surveys were conducted among the residents (48 %) and tourists (52 %). In addition, surveys were also conducted for Hotels, Restaurants and Cafe (HoReCas). The results of these are presented in the subsequent sections.

4.2.1 Resident Survey

The resident's survey results are summarised below:

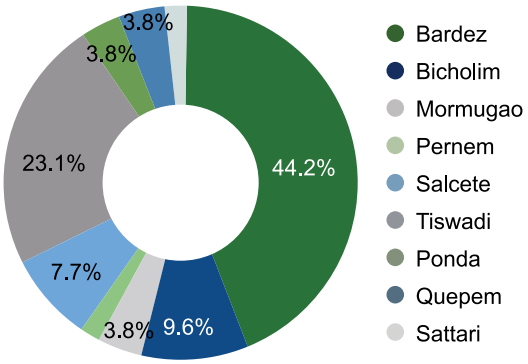
a) **Location:** Out of the total residents surveyed: 44.2% of the residents were from Bardez taluka (Figure 4.2 a), while other residents were from Tiswadi (23.1%) and remaining residents (32.7%) from Bicholim, Mormugao, Pernem, Salcete, Ponda, Quepem, Sattari respectively.

b) **Drinking Habits:** Among the total residents who responded (Figure 4.2 b), 38.5% consume at home and 19.2% prefer drinking

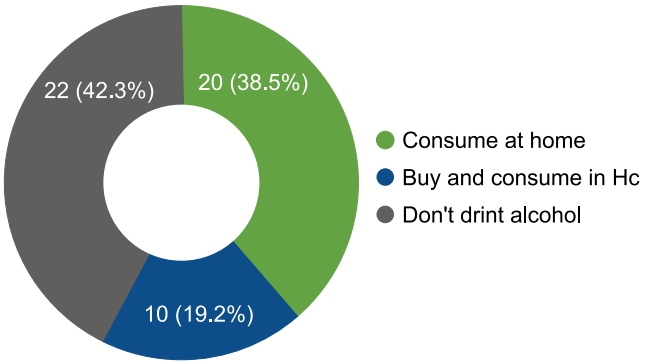
in HoReCas. In addition, 42.3% of residents do not consume alcohol at all.

c) **Beverage shopping Patterns (7 days avg):** From the responses it was observed that 51% of people have not purchased any beverage bottle in the last 7 days while 21.6% people purchased 1-2 bottles, 13.7% people purchased 3-4 bottles, 7.8% people purchased 5-6 bottles and ~6% people purchased more than 7 bottles (Figure 4.2 c).

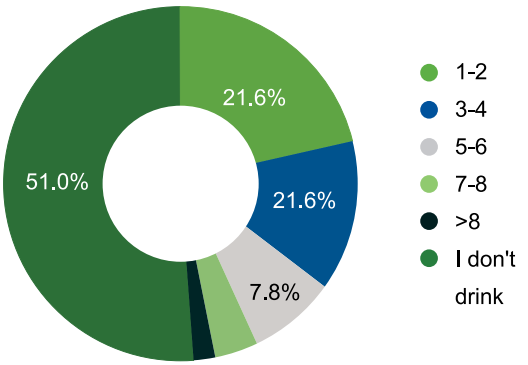
d) **Disposal Patterns:** According to the received responses (Figure 4.2 d), ~50% of



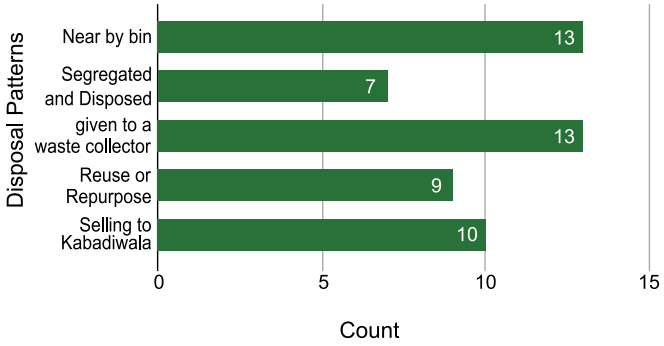
a) Distribution of residents respondents



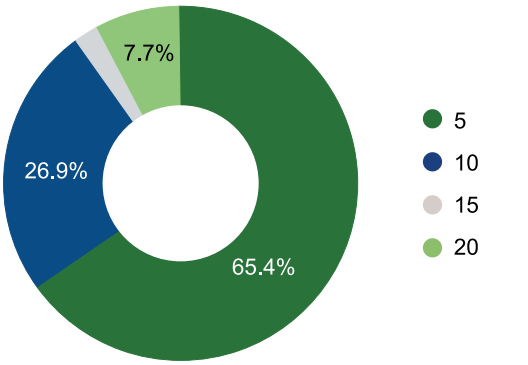
b) Drinking habits of Residents



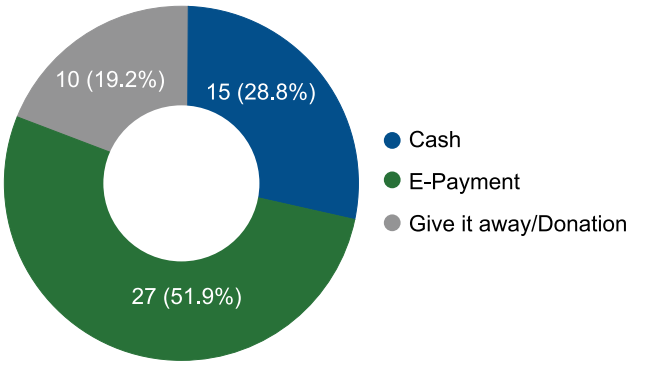
c) Beverage shopping Patterns (7 days avg)



d) Disposal Patterns of PET



f) Preferred Deposit value (INR)



h) Preferred mode of refund

Figure 4.2: Analysis of Resident survey for DRS baseline

people prefer to dispose of their waste in a bin or give it to a waste collector, 13.5% of responded segregate the waste while 17.3% reuse the waste. Around 19% of respondents were selling their waste to kabadiwala.

e) **Awareness of DRS and participation:** (Figure 4.2 e) Around 80% of residents were aware of the glass return scheme in the year 2000s and were willing to participate in this system. The other 20% population was not aware of this system.

f) **Consumer readiness to pay the deposit amount (INR):** based on the participation of the survey (Figure 4.2 f), 65.4% of residents were willing to pay Rs. 5 while 25% people were willing to pay Rs. 10. Around ~ 10% resident was also willing to pay upto Rs 15-20 as a deposit.

g) **Preferred distance to deposit the empty bottle:** Out of the responses received from Residents, 53.8% of individuals chose to deposit the empty bottle if it is near the market, 40.4% prefer to deposit the bottle at a distance less than 1 km, and ~6% prefer if it is near the petrol station (Figure 4.2 g).

h) **Preferred mode for receiving the deposit:** Among the responses received (Figure 4.2 h), 52% of residents preferred an electronic mode of payment, 28% preferred cash transactions, and 19% were okay to donate the money.

Key Findings: *From the survey, most of the residents werefrom Bardez and Tiswadi. Residents prefer to consume alcohol at home and 51% of those prefer to deposit empty bottles in a nearby collection point. ~80% of residents were aware of the DRS scheme in the 2000s, and among them, they are willing to pay the deposit amount of Rs. 5 - 10.*

4.2.2 Tourist Survey

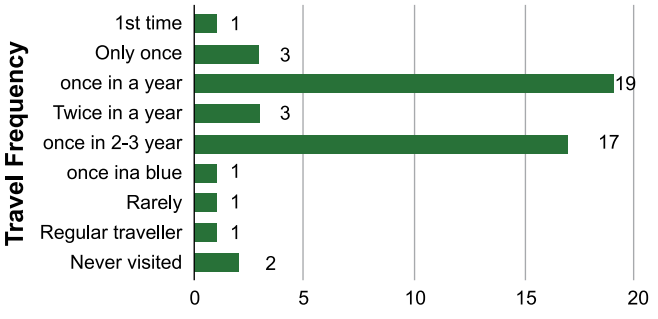
The responses from the tourists survey are summarized below:

a) **Travel Frequency:** Among the responses received from the tourists (Figure 4.3 a), 33.6% of individuals travel once a year while 35.4% travel once every 2-3 years.

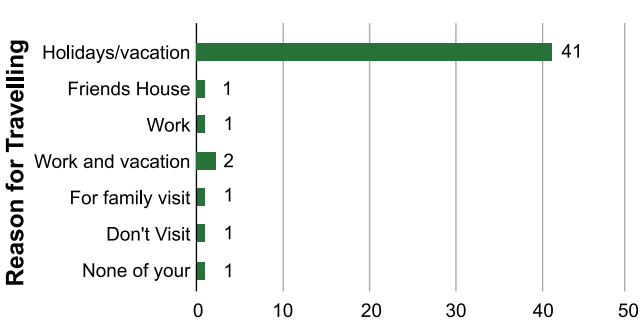
b) **Reason for Travelling:** Out of the responses, 85.4% of tourists visit Goa for holidays/ vacations while ~15% visit Goa for work, friends, and family purposes (Figure 4.3 b).

c) **Preferable stay:** From the survey, it was found that 50% of tourists prefer to stay in hotels, 25.0% prefer Airbnb, and the remaining 27% prefer homestays and backpackers (Figure 4.3 c).

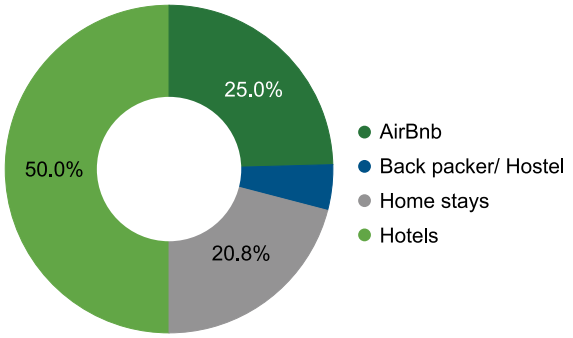
d) **Drinking Bottle shopping patterns:** From the responses (Figure 4.3 d) it was found that 87% of people purchase bottles in stores, 10.9% of tourists consume in restaurants, and 2.2% purchase from the hotel.



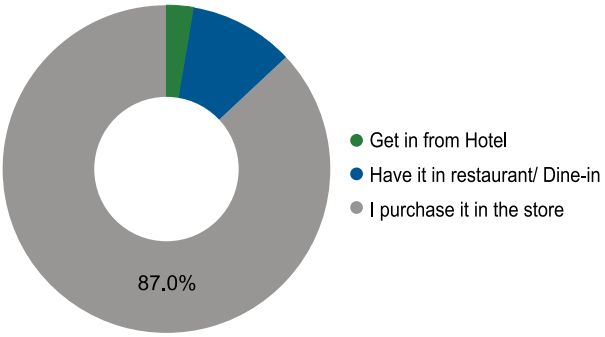
a) Travel Frequency to Goa



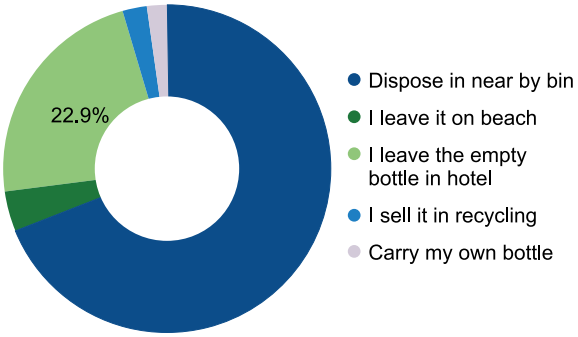
b) Reason for Travelling



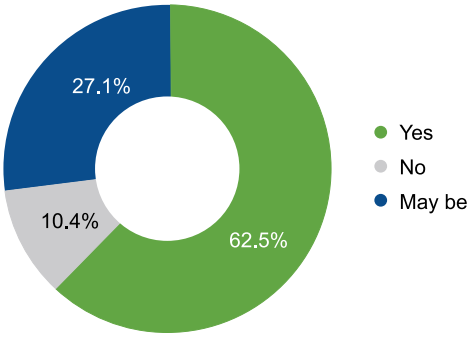
c) Preferable stay



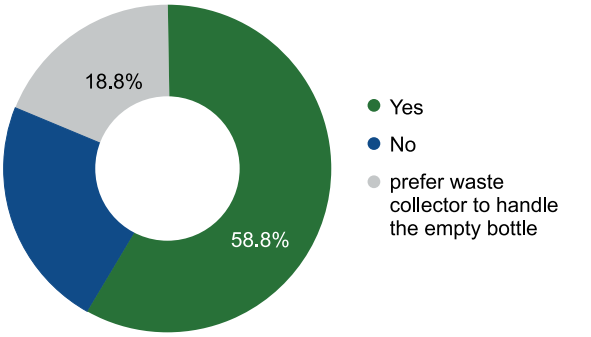
d) Beverage water bottle shopping



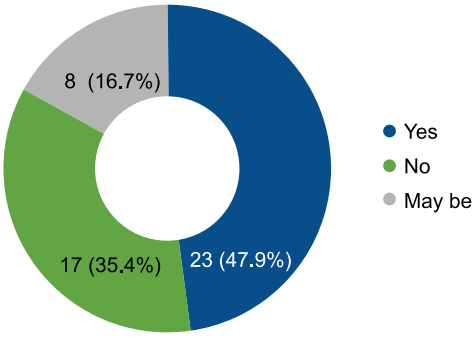
e) Disposal behaviour of bottles



f) Awareness of DRS and participation



g) Willingness to return the consumed bottled



h) Interested to pay deposit amount

Figure 4.3: Analysis of Tourist survey for DRS baseline for Goa

e) **Disposal behaviour:** From the survey, it was observed that 68.8% of tourists drop their bottles in a nearby bin, 22.9% people leave their empty bottles in hotel, and the remaining 8.3% people leave them unattended on the beach. A small fraction, also segregates and carries their own bottle (Figure 4.3 e).

f) **Awareness of DRS and participation:** Based on the survey, ~62% tourists were aware of DRS and willing to participate in this system while 10.4% were not aware of this system (Figure 4.3 f).

g) **Willingness to return the consumed bottle:** According to the survey, 58.3% of people were willing to return the bottles, 22.9% were not willing to give the empty bottles, and the remaining 18.8% preferred pickup from their location (Figure 4.3 g).

h) **Deposit amount:** Based on the survey, it was found that 47.9% of the respondents would pay the deposit amount and 35.4% were not interested in paying the deposit (Figure 4.3 h).

i) **Preferred mode for Refund:** Among the responses received, 54.2% of tourists preferred E-payments, 18.8% preferred offline transactions, and 27.1% preferred to donate the deposit.

Key Findings: *It was observed that the city is well known for its beaches and scenic beauty, which attracts more tourists and generates more litter. From the survey, ~85% of people visit for holiday or vacation purposes, among them, 50% prefer to stay in hotels. Around 87% of tourists purchase drinking water bottles and consume them in their stay which suggests high quantities from Tourists. It was observed that ~62% of people are aware of DRS and ~57% are willing to return the empty bottle after consumption. preferred mode to receive the deposit was E-Payment.*

Behavioral patterns comparison for tourists and residents:

The majority of the residents were found to not drink regularly and therefore the quantities of liquor purchased were low. The tourists were the main consumers of glass or PET bottles. Most of the residents wished to participate in DRS by paying a deposit of Rs. 5-10 while the same interest was not observed in the tourists.

4.2.3 Hotels

In the present study, hotels in Panaji, Bardez, and a few in south Goa were surveyed to understand their waste generation and collection mechanism. A total of 20 hotels/homestays were interviewed in the study. The following observations were made from the interaction in the Hotels.

Locations: The hotels/homestays surveyed were located in the city area of Panaji, Mapusa, Dona Paula, Caranzalem, Miramar, and Benaulim.

Size: The hotels surveyed mostly had an average floor ranging from 2 floors to 6 floors.

Occupancy: Most hotels and homestays had an average occupancy of more than 80% per day as Goa is a tourist destination.

Services: All the hotels surveyed usually served Plastic drinking water, beverages, and alcohol for their guests. However, a few small homestays were not serving alcohol and providing filters for drinking water purposes.

Staff: The Total staff strength of these hotels ranges from 30 - 250 staff, excluding the restaurant staff. The high staff count was seen in 5 star hotels.



Waste Generation: The average dry waste generated in these hotels was around 5 kgs - 15 kgs for small occupancy hotels and 80 kgs for large occupancy 5-star hotels with dine- in facilities.

- Wet Waste: The average wet waste generated in these hotels was around 3 kg - 8 kg for small occupancy hotels and 75 kg for large occupancy 5-star hotels. They segregated this waste and stored it in the back storage facility on the premises.
- Waste Collection: The waste is usually collected by the municipality, corporation, or panchayat while some hotels sell their paper and glass waste in bulk to private vendors for a fixed rate.

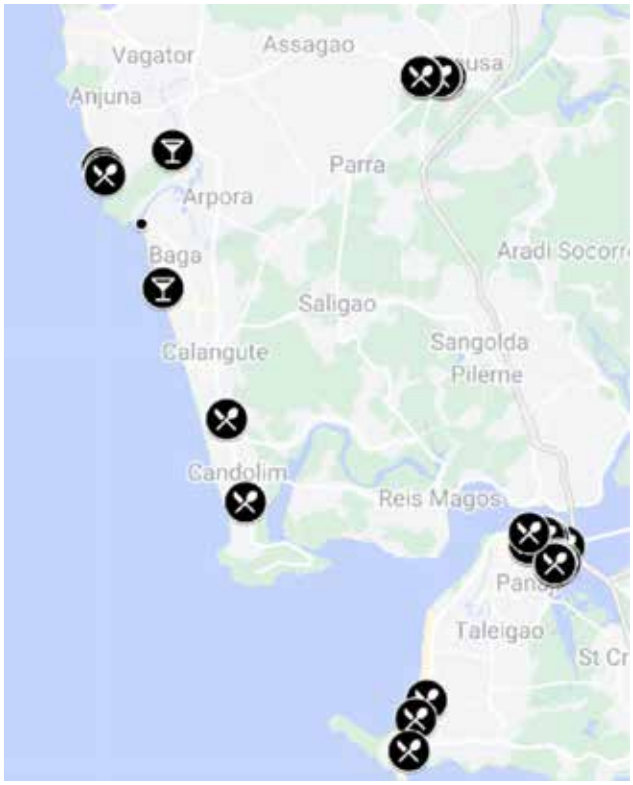
4.2.4 Restaurants and Cafe

In the present study, restaurants and cafes (ReCa's) were surveyed to get an insight into the waste generation, quantities of waste generated, and their current disposal pattern (overall flow of waste). The objective was to understand the feasibility of these establishments as collection centers in the future. A total of 35 ReCa's have been surveyed for the study. The survey was conducted for a variety of establishments comprising shacks (14%), restaurants (28%), restaurant & bar (23%) and cafes (34%), represented in [Figure 4.4(a)]. The establishments were mainly from Tiswadi (60%) and Bardez (40%).

Waste Generation and Collection Trends in ReCa: The wet waste was being given to the municipality or collected by the factory (in the case of the franchise). The dry waste generated was plastic bottles, cartons, glass bottles, and metal cans. Varied collection patterns were noticed within the establishments in the focus area, i.e., formal collection (Corporation/ Municipality/ Panchayat), informal collection (waste collectors/ scrap dealers) or collection by a combination of both (formal and informal sectors).

It was observed that the dry waste restaurants/ cafes in Panaji were being collected by the CCP (42.9%). For the rural area, collection by Panchayat, Informal sector or by a combination of both (Panchayat+Informal) was observed [Figure 4.4 (b)]. The details of waste generation and collection for selected categories are provided below:

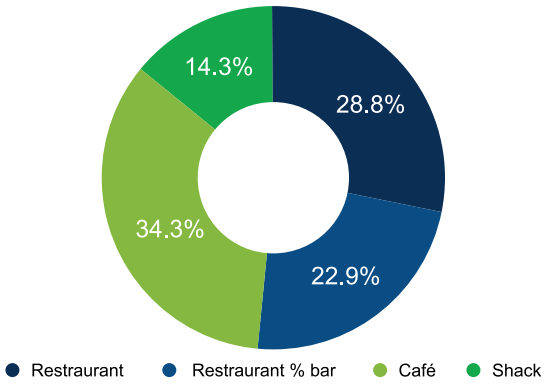
a. **Plastic waste:** The plastic waste generation was not high in the ReCa's. One of the reasons might be that the consumers tend to carry the purchased bottles with them. It was observed that a majority of restaurants & cafes (53%) had low plastic bottles generation (1-50 bottles) while ~28% of ReCa generated 50-100 plastic bottles [Figure 4.4 (b)]. Since the plastic bottle generation was low, they were giving them to panchayats or municipalities for collection instead of selling them. Also, it was seen that many consumers carry the water bottles along with them if they have paid for the bottle at any restaurant.



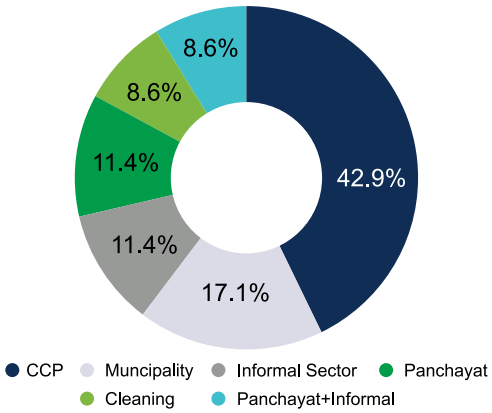
b. **Glass waste:** Highest generation of glass bottles was seen in large shacks or restaurants (5.7%). Most of the restaurants generated glass waste from soft drinks. Only the restaurants serving alcohol and shacks were generating glass waste from alcohol bottles[Figure 4.4 (c)]. The glass bottles in shacks were being given to the informal sector for low prices. The owner sells the material to keep their premises clean. In the case of a smaller restaurant, it was found that the glass bottles were stored separately and were being managed by cleaning staff.

c. **Can waste:** It was observed that the quantities of metal cans generated at cafes were low as compared to plastic and glass bottles. It was observed that most of the ReCa had very low metal waste generation (43%) and metal waste was not at all generated in a few of them (14.3%) as they were not selling cans or liquor [Figure 4.4 (d)]. Due to low quantities, they were either collected free of cost by the glass collector vendor or given to formal collectors.

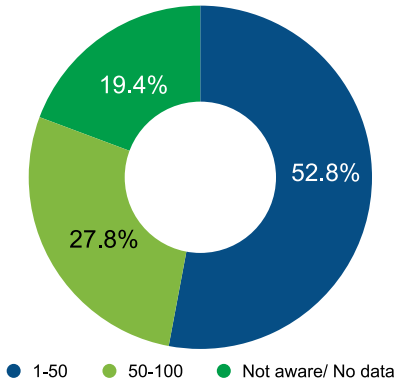
Wifi provisions: The establishments were also assessed for the provision of wifi. It was found that 57% had no wifi provisions; 37% of the



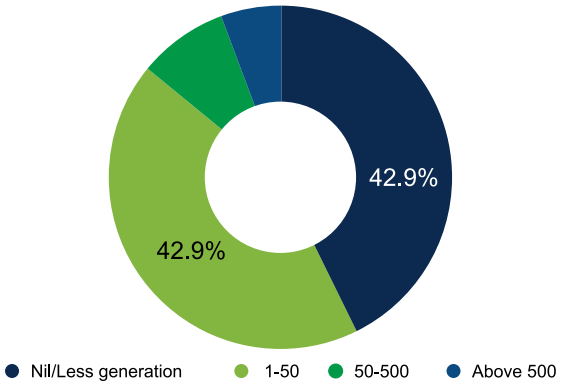
a. Type of ReCa's visited



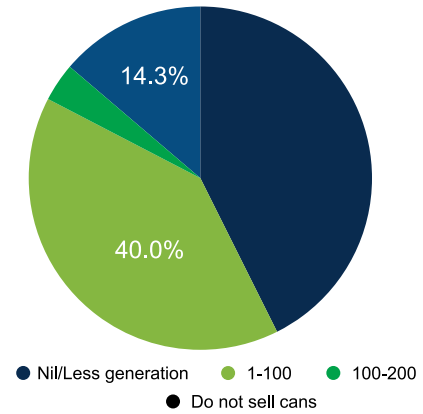
b. Waste collection mechanisms



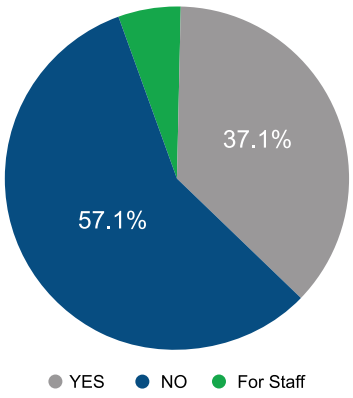
c. Daily plastic bottle generation



d. Daily glass bottle generation



e. Daily metal can generation



f. Wifi Provisions availability

Figure 4.4: Analysis of restaurant and cafe survey for DRS baseline

establishments had open wifi provisions and 5.7% had provisions for wifi limited to staff [Figure 4.4 (f)].

Electric backup: It was found that 60% of the establishments had electrical backup and 40% of them had no backup provision.

Key Findings: *It can be observed that the city had a variety in the type of restaurants, i.e., cafes, restaurants (food-based), pubs, restaurants & bars, casinos and shacks. The waste generated was in moderate amounts and all the establishments had fixed methods for collection of the generated waste. High quantities of glass bottles were observed only in large shacks. The formal and informal sector, both are involved in the collection and disposal of waste from these places.*

4.3. Post consumption stage

4.3.1 Municipal Waste Collection

I. **Waste Generation:** In the state of Goa, the waste generated in each Village Panchayat (VP), Municipal Council (MC), and City Corporation, Panaji (CCP) is divided into three categories:

   i. Wet waste: Kitchen waste, Garden waste, dead animals, coconut shells and husk, soiled paper, etc.

   ii. Dry Waste: paper and cardboard waste, plastic, glass & metal.

   iii. Domestic hazardous(DH) & sanitary waste(SW): paint and pesticide containers, light bulbs, medical waste, expired medicines, used batteries The total waste generation in Goa is ~219 TPD (2019)[13] and the waste generation in CCP is ~42 TPD(2023).[14]

II. **Source Segregation:** Goa State encourages source segregation by collecting waste in two bins dry waste (black bin) and wet waste (green bin). Panchayat and CCP staff are involved in the D2D collection. CCP further follows a 16-way waste segregation system for managing biodegradable and non-biodegradable waste.

   The process flow of waste collection is pictorially represented in Figure 4.5.

III. **Waste Collection:** A D2D waste collection mechanism was observed in the state of Goa. The primary collection from households is managed by the village panchayat. The collected material is then sent to MRFs within the panchayat boundaries. For Panaji: CCP with the help of the formal sector (D2D) collects the waste into separate categories i.e., biodegradable and non-biodegradable waste. Biodegradable waste is collected daily and non-biodegradable waste is collected twice a week.[15] The waste collected within Panaji goes to the sorting station in Panaji.

IV. **Waste Transfer:** The waste from the MRF is collected by Goa Waste Management Corporation (GWMC). The dry waste from Village Panchayat is segregated in the integrated solid waste management (SWM) facility where recyclable fractions are recovered and sent for recycling while non-recyclables are sent to cement plants for Co-processing. As per the annual report (2021-2022), the amount of waste received at the bailing station in verna was 6207 Tonnes while at Cacora it was 3176 Tonnes, respectively[16].

V. **Waste Composition:** The composition of waste generated in Panaji was presented in a study in 2020. As per the report, ~54% was non- biodegradable and 46% was biodegradable waste. The percentages of glass, plastic, and metal were 13.3%, 13.2%, and 1.5%, respectively, which are the major focus of the current study. The percentages of waste material collected data is tabulated in Table 4.1.

Table 4.1: Composition of waste generated in Panaji, (Source: CCAC (2020) SWM City Profile Waste Initiative, Panaji, India)

Type of waste material	Quantity (%age)
Biodegradable waste	46.3
Paper waste	7.3
Plastic waste	13.2
Metal waste	1.5
Glass waste	13.3
Rag waste	7.2
Inert waste	5.7
Others	5.6

13 https://cag.gov.in/webroot/uploads/download_audit_report/2019/Report_No_2_of_2019_Government_of_Goa.pdf

14 https://www.undp.org/india/stories/16-ways-segregating-waste-panajis-innovative-model-solid-waste-management#:~:text=Panaji%20generates%20around%2042%20tonnes,RDF)%20for%20co%2Dprocessing.

15 WASTE-WISE CITIES Best practices in municipal solid waste management

16 GWMC Annual Report (2021-22)

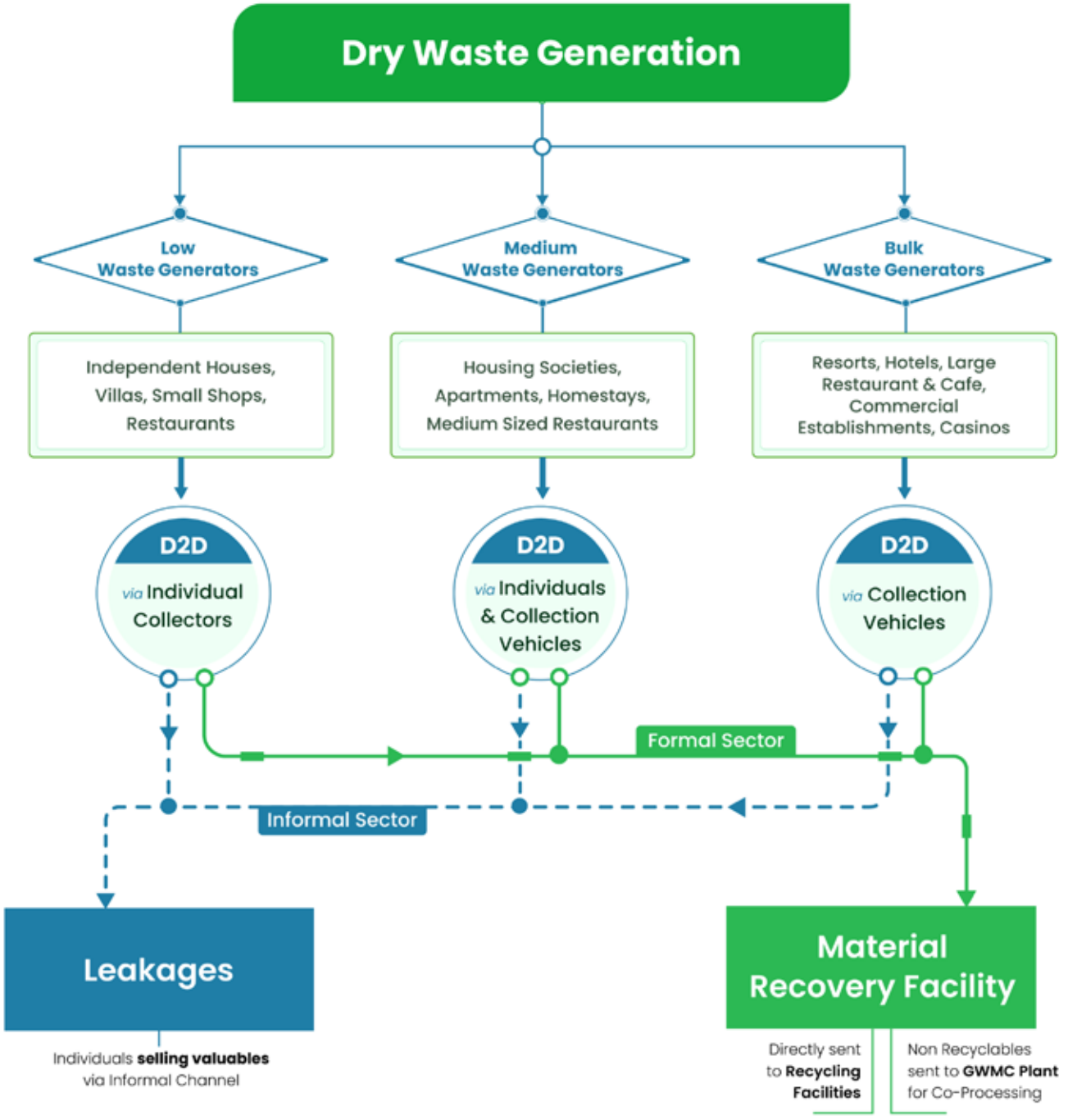


Figure 4.5: Flow of dry waste in the state of Goa

4.3.2 Waste Pickers

Waste pickers are a critical part of the waste management as they are involved in collection of waste which is the first step towards waste management. During the study, 7 waste pickers were also interviewed which helped to understand about the waste flow and gave an insight into the lifestyle/ routine of the waste pickers and the hardships faced. The waste pickers can be broadly classified into two categories, formal waste pickers and informal waste pickers.

Formal Waste Pickers

The formal waste pickers can be described as people who are appointed by the government to collect waste from households. In Goa, the

formal waste pickers were appointed by the CCP, Municipalities, and Panchayats. The formal waste pickers in Goa were mostly the locals with a few exceptions. As a part of the study, 3 formal waste pickers were interviewed. The information is summarised in the table 4.2.

Informal or Private Waste Pickers

They are not appointed by the government, but play an important role in collection of the waste. The informal waste pickers can be either working individually (collect material and sell it to any nearby kabadiwala) or associated with a private scrap dealer/ company (collect material and send it to a particular collection center). For the current study, four informal/private waste pickers were also interviewed. Workers in the informal sector often handle waste without proper protective gear or training, exposing themselves to health hazards, including infections, respiratory issues, and injuries. The details of the same are provided in table 4.3 below.

Table 4.2: Details of Formal Waste pickers or collectors

Location	Distance and source	Origin and role	Earning & payment	Additional information
Nerul Panchayat	Houses to main road (~500 m) by foot	Male, Originally from UP, collects all material D2D	Fixed salary (Rs. 8000 - 10000/ per month)	Do not sell waste and there is no kabadi nearby. Glass is stored separately.
CCP, Panaji 	Panaji vegetable and fish market	Female Goan, Works in 2 shifts (7am-11am & 2pm-6pm) for waste collection and sorting	Working with CCP for past 15 years, current salary Rs.16000/-	Education: 3rd class and has a son studying in 12th standard.
Taleigao, Panaji 	Covers 700-1000 houses from D2D	Male, Bihar, D2D collection in panchayat area from 3:30 AM	As per panchayat norms hesitant in answering	Source segregation from households was not observed. He was segregating plastic, can, glass etc.

Background

It is a male-dominated workstream where the waste pickers aged from 15-65 years. Women workers were seen in the waste segregation stage. People who originally belong to UP, Bihar, West Bengal, Karnataka, and have migrated to Goa. They typically send earnings to their families. There is varied adoption of technology and digital payment methods (based on age, gender, and income).

Income and alternate occupation

Monthly compensation of Rs. 8000 - Rs. 16,000 (if on payroll) for formal waste collectors while for the informal sector a daily earning of Rs.600 - Rs. 800/- per day was recorded. Materials like plastic, metal, paper, and glass are sold by the kilo or dozen. The alternate occupations are watchmen, drivers, or cleaners.

Pain Points

A few don't prefer to collect glass as it adds to the weight they need to pull around. They are on foot most of the time and a few have cycles/ carts/tricycles that need manual effort to be driven. This proves to be difficult especially on steep slopes and in scorching heat. They get a meager Rs. 600 for 8-10 hours of work.

Table 4.3: Details of Informal/Private Waste picker or collectors

Location	Distance and source	Materials & rates	Earning & payment	Additional information
Saligao (individual collector) 	2-3 Km by foot	Only PET & Glass materials are collected Glass: Rs.2/-per bottle Plastic- 20/kg	Selling to nearby kabadiwala based on quantity	Working with his wife for waste collection, Picking material from streets and shops
Panaji (Individual collector) 	Covers approximately 10 Km area in his tricycle	Collects plastic bottles,glass bottles and metal cans Plastic: Rs.10/ kg ; glass: Rs.10/kg; Can : Rs.90/kg	Takes waste to Ribandar, is 15 min away from panaji	Belong to Patna (came to work in Goa post- covid); Doesn't have mobile phone Tale
Caranzalem (works with private contractor for beach cleanup)	2 km beach stretch by foot: Stores the waste in containers provided by the contractor for 2-3 days	Only PET, Metal & Can Plastic- 20/kg; Glass- 5/kg, Cans- 90/kg	Based on quantity Per kg (~12000 per month)	Quantity : 5-6 kgs on some days and upto 100 kgs sometimes
Miramar: Helper (private company) 	They covered only commercial spaces - The fern residency (other locations not revealed)	Collected wet waste	Did not share the information	The wet waste was being taken to Patto Only wet waste was being collected.

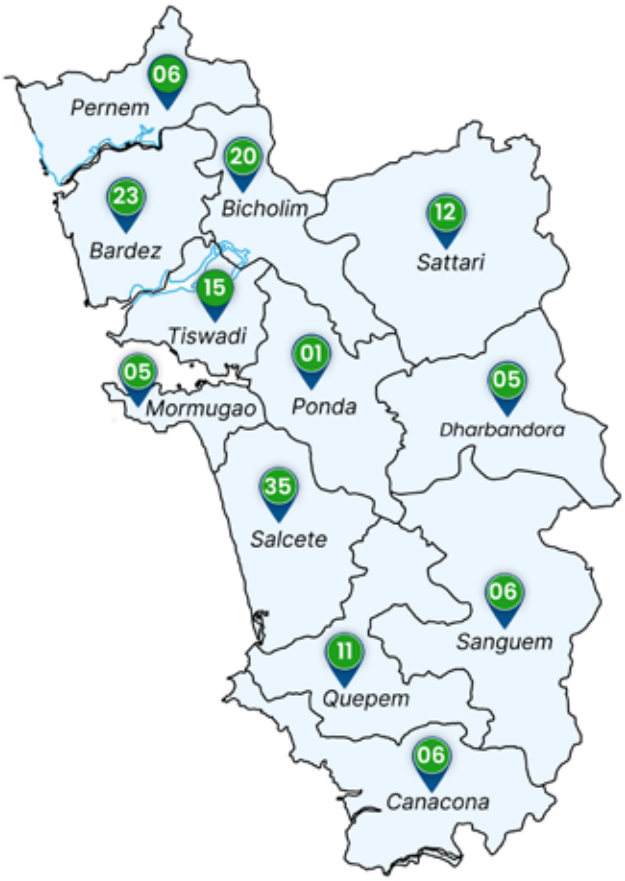
Key Findings: *It was found that most of the waste pickers were migrants working as bonded labourers. The formal waste pickers were on the payroll and got monthly compensation. It was observed that even formal waste pickers in Panchayat were cherry- picking valuables from households. None of these workers were seen wearing PPE.*

4.3.3 Material Recovery Facilities

Material recovery facilities play a crucial role in the waste management of any state. These facilities help in the recovery and recycling of valuable materials from the waste stream. Typically, paper, plastics, cardboard, glass and metals are received from municipal MRFs. There are 14 MRFs under SBM-urban. Further, a list of 145 MRFs was obtained from GSPCB based on their field inspections. These MRFs are being operated either by village panchayat or organisations or individual or private companies such as Envirowise Services, Verna Industrial Corporation, V-recycle waste management services, Centre for Development Communication, Sai enterprises, Eco-green co-operation, Garbage disposal management and technology, Mr. Saroj Kumar Chaudhary, S.B. Management, Eco solutions and C-farm & products.

Table 4.4: Count of MRFs, Panchayat and average quantity of waste generated in each taluka.

Taluka	Panchayats	MRFs	Average quantity of waste/ month (Kgs)
Bardez	33	23	12,20,616
Bicholim	18	20	26,447
Canacona	7	6	11,478
Dharbandora	5	5	8,766
Mormugao	7	5	5412
Pernem	20	6	118523
Ponda	19	1	33.4
Quepem	11	11	8547
Salcete	33	35	1,35,284
Sanguem	7	6	5,428
Sattari	12	12	14215.2
Tiswadi	19	15	2207160
Total	**191**	**145**	**2406009.6**



Panaji Material Recovery Facility

Operated by	Feedback India Foundation
Capacity	25 TPD (operating at 18 TPD)
Manpower	Supervisor: 2 Labour: 48
Machinery	Baling Machine: 5 Conveyor Belts : 3 (non-working)





a) Plastic Bale



b) Carton Bale



c) Conveyor Belt



d) Baling Machines

Figure 4.6: Material recovery facility in Panaji under CCP

Key Findings: *There manpower in the Panaji MRF or sorting station was found to be migrants and no Local/Goan labourers were seen. The sorting station has no provision for electricity, water or toilets for the employees. The material collected at the sorting station is sent to Panaji MRF for baling. It was also observed that the citizens visit the Panaji MRF for depositing their recyclables. There is a rate card displayed at the Panaji MRF for maintaining transparency in the rates offered to the waste pickers as well as residents.*

4.3.4 Scrap Dealers and Aggregators

Scrap Dealer Association visit Location: Near Ribandar Ferry

Total Scrap Dealers: 22

Materials collected: Mixed waste, E- waste, electronic equipment, wires, plastic bottles, glass bottles

To understand the mechanism of waste picker, a scrap dealer association was interviewed where 22 scrap dealers were present. Each one of them were managing a different category of dry waste. The President of the association was interviewed. He manages all the scrap dealers and decides the buying/selling rates for all the materials.

Background of the Scrap Dealer's Association

- **President's Name:** Venkatesh
- **Family size -** 2
- **Age of the President -** 36
- **Average Age range of the waste pickers:** 30-56
- **Total Workers -** 270 waste pickers in 22 scrap yards, 10 workers under each scrap dealer
- **Place of Origin:** Mostly from Karnataka, UP, Kolkata, Bihar
- **Languages spoken -** English, Kannada, Marathi, Hindi

Observations from scrap dealer visit:

- ➔ Waste is collected from all areas of South and North of Goa, mostly from Panaji Miramar, Doana Paula, Piswadi, Bambolim as roadside pickup of glass and plastic waste.
- ➔ The waste pickers collect the waste in the morning and bring their material to the scrap dealers by evening. The materials were sorted in the yard and sold to respective buyers.



- ➔ Each scrap dealer has 10 waste pickers under him, who buy the materials from them.
- ➔ The glass bottles are segregated at the scrap yard as per brands and sold back to the manufacturers at a per kg rate. Other bottles were broken down and sold separately.
- ➔ 24 tonnes of broken glass rejects are retrieved every week.
- ➔ Tricycle carts were provided by the scrap dealers to the waste pickers for collection.
- ➔ Cash / UPI payment mode is used for buying and selling.
- ➔ The waste pickers get a weekly or monthly salary, based on the quantity of material collected.

Insights from Sampurna Earth Report:

- ➔ Scrap dealers assessed in the report have been in the business from 5 years to 44 years
- ➔ Material handling capacity of these scrap dealers range between 5 Tonnes to 120 Tonnes per month
- ➔ Each scrap dealer has manpower of minimum one to 20 employees deployed at the site
- ➔ Scrap dealers collect waste from multiple sources such as bulk waste generators, residential colonies, urban local bodies, and also some small scrap dealers
- ➔ Most scrap dealers have their own fleet of rag pickers and ferry walas who collect waste from these sources

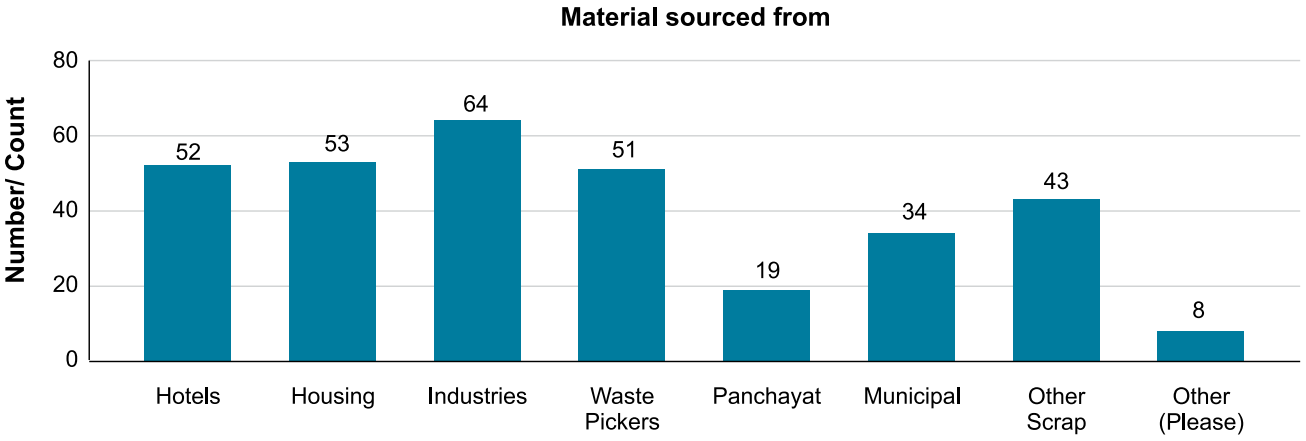


Figure 4.7: Source of material for waste collection by the scrap dealers (taken from Sampurna earth survey)

- The material collected by the scrap dealers is shared by the end-recyclers based in Goa as well as outside the geographical boundaries of the state
- The scrap dealers based out of Panaji have been empanelled with the Panaji Recycling Association

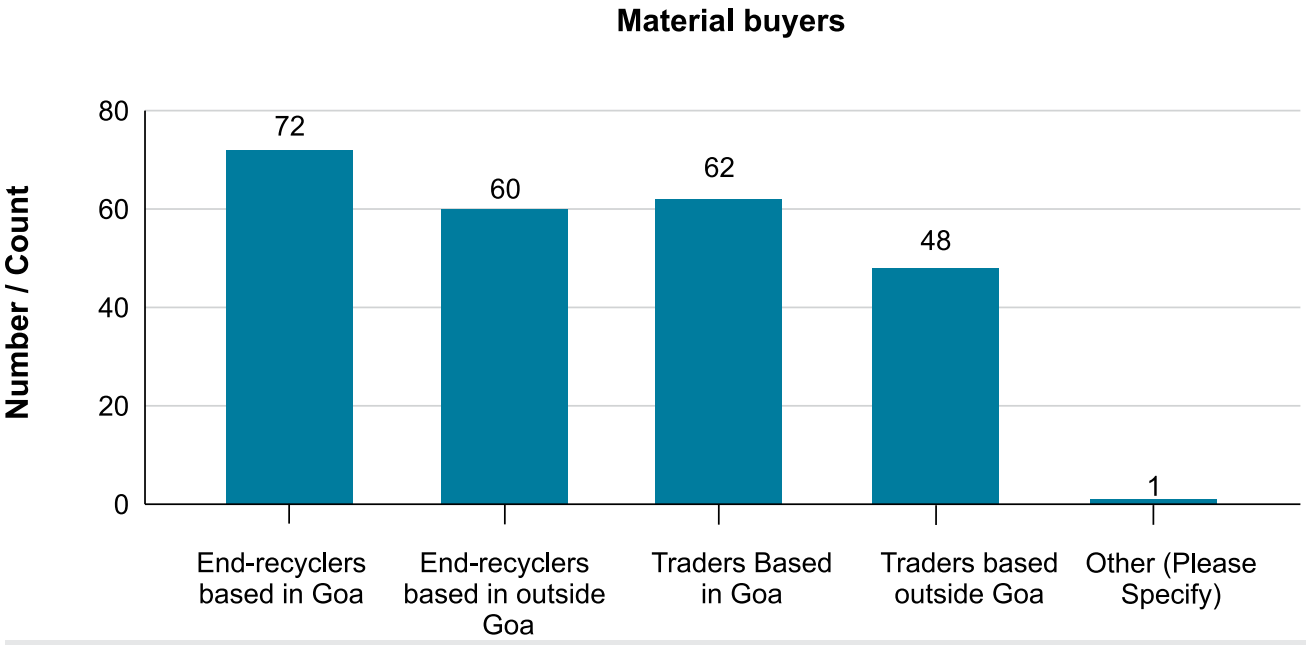


Figure 4.8: End usage of material collected (taken from Sampurna earth survey)

- Various categories of material that the scrap dealers deal with are paper and cardboard, hard plastics, PET bottles, glass, metals (Iron and aluminium), E- waste.
- Majority of scrap dealers collect all the categories of dry waste
- Most scrap dealers have their own vehicle for the collection of this waste from the point of generation

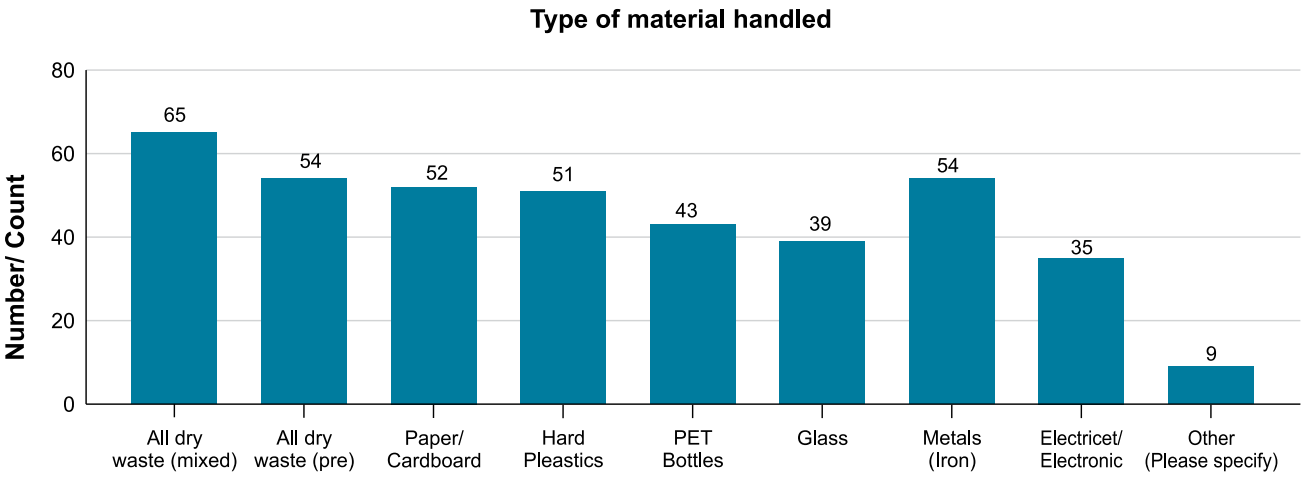


Figure 4.9: Categories of material collected by Scrap Dealers

For the purpose of understanding the channel of the waste flow (especially plastic like Polypropylene (PP), PET, metals, and glass), various aggregators and scrap dealers have been visited in the state. The details of the same are provided below in Table 4.5.

Table 4.5: Scrap Dealers/ Aggregators and the materials handled
(BR: Buying rate per Kg and SR: Selling rate per Kg)

Scrap Dealer	Plastic	Metal/Aluminium Cans	Glass
Hussain Traders, Sancoale, Mormugão	✓ PP (gunny bags) BR : Rs. 8-10/- per Kg	☐	☐
Shama Enterprises, Sancoale, Mormugão	✓ PET (price not revealed)	☐	☐
Nagaya Scrap Dealers, Sancoale, Mormugão	✓ PET, HDPE, mixed plastic (price not revealed)	✓ Metal cans BR : Rs.50-60/- per Kg SR : Rs.80-95/- per Kg	✓ Glass bottles (price not revealed)
Uncle Ji Scrap Dealers, Panaji	✓ PET BR : Rs.10-15/- per Kg SR : Rs.20/- per Kg	✓ Metal cans BR : Rs.40-50/- per Kg SR : Rs.60/- per Kg	✓ Glass bottles (price not revealed)
Ribandar Scrap Area, Ribandar	✓ Plastic bottles BR : Rs. 10/- per Kg	✓ Beer cans BR : Rs. 50/- per Kg	✓ Glass bottles BR : Rs. 2/- per Kg
Bavish Waste Management Facility, Vasco	✓ PET, HDPE, mixed plastic (price not revealed)	✓ Metal cans (price not revealed)	✓ Glass bottles (price not revealed)

Scrap yard details obtained from GSPCB for Bardez & Tiswadi

Taluka	Name of the facility	Name of the owner	Quantity (TPD)
Bardez	- M/s. Saroj Kumar Chowdhary - M/s. Lucky Scrap Traders	Mr. Saroj Kumar Chowdhary Mr. Rajendra Panday	2.5 2.0
Tiswadi	- M/s. Bharat Plastic, - M/s Accurate Associates - M/s Bharat Plastic - M/s. 21st Century Polymers, Located - M/s Ashish Enterprises, - M/sUppasana Manas Sewa Social Society, - M/s Eco Solutions	Mr. Daval M.Shaikh Abhijit Lolage Daval Sheikh Rajesh Pahwa Mr Ajay Kashyap Triloknath Jha Sanjay Marathe	4.5 9 4.5 14 3 12,000 4

In addition to the visits and interview, a list of 289 scrap yards was obtained from GWMC. The highest scrap yards were reported in Salcete taluka

(98) followed by Ponda with 54 scrap yards. Bardez and Mormugao had 41 scrap yards each. However, it should be noted that these may be handling material which is not in the scope of DRS such as flexible plastic, rubbers, tyres, electronics, metals (iron) etc. This detail was not available in the data provided by GWMC.



Key Findings: *Waste scrap dealers have been found to be working in this sector for 5 - 44 years. An interesting observation was that all the owners were able to communicate in English. The scrap dealers have their own collection system for collection of material from their source such as trucks, cycle carts, etc. Majority scrap dealers are not localities and have migrated from their native locations along with their families for their business.*

4.3.5 Waste Treatment Facilities

The state of Goa has set up two integrated SWM facilities, one in north Goa and the other one in South Goa. Both facilities are designed for material and energy recovery. Both the facilities were visited as a part of the study and the details of them are provided in the subsequent section.

I. Integrated solid waste management facility, Saligao

The SWM facility is located in Saligao (North Goa), works on the PPP (Public Private Partnership) model. The plant is a material segregation and recovery facility for wet and dry waste. It is a fully automated facility, only sorting is being done manually. The wet waste is treated by bio-methanation and composting. General information about the facility is given below: (Source: GWMC Annual Report (2021-22) and TERI Report):

Operator	Hindustan Waste Treatment Pvt. Ltd.
Capacity	250 TPD (can treat up to 275 TPD)
Area	Total Area: built up of 18,000 sq. m
Material treated	Approximately 2,50,000 Tonnes (May 2016- December 2022)



In the Saligao plant, the segregated dry waste is baled and sold by the operators to recycling facilities. The non-recyclable waste is baled separately and sent to cement kilns (ACC Cement factory and JK Super, Karnataka)to be used as RDF. The calorific value of RDF is ≥ 4500 Kcal/kg. The wet waste collected in a segregated manner from the panchayat is sent for biomethanation within the plant. The biogas produced has been used for electricity production (1,15,00,000 units of power is generated (Aug 2016-March 2022). The fibrous material in wet waste is sent for composting, the final compost is sundried.



a) Unloading point for Wet Waste



b) Unloading point for Dry waste



c) Biomethanation facility for wet waste



d) Manual sorting of Dry waste



e) Sun drying bed for compost



f) Horizontal baling of material

Figure 4.10: Saligao treatment plant in North Goa

II. The integrated solid waste management facility, Cacora

The SWM facility located in Cacora (South Goa) started its operation in May 2023 (Pilot) and is still running in the pilot stage. The segregated dry waste from the neighboring wards is dropped into the dry waste collection point. The waste is moved in conveyor belts and passes through bag riper/ bag opener. Further, the waste is segregated based on the density of the material, the heavy-density material is typically wet-contaminated waste while the lighter fraction goes for RDF. The material is segregated manually into different fractions and the material is bailed for sending to RDF or recycling plants. (Source: GWMC Annual Report (2021-22), interaction with GWMC staff and GWMC Website)



a) Inlet: Wet Waste for biomethanation and composting



b) Inlet: Dry waste for segregation based on size & type



c) Movement of waste on conveyors



d) Manual sorting of dry waste



e) Fractions from manual sorting



f) Horizontal baling of the sorted material

Figure 4.11: Solid waste treatment facility in South Goa

4.4 Waste Sampling at Source of Generation

The dry waste collected at housing societies, Panaji with 16 way waste segregation were sampled. Dry waste sampling was conducted in the selected 5 housing societies under the jurisdiction of CCP along with CCP staff. On monday and tuesday, all the housing societies were visited in person for site inspection. They were asked not to discard their dry waste, so that sampling can be conducted. The weight of each category of dry waste (PET, multi layered plastics(MLP), tetra pak, Glass bottles, aluminium cans) was weighed on site by the team. However, the days for which the waste was collected in the societies varied from 2-7 days. The details of the waste generated in each housing society is summarised in Table 4.6.

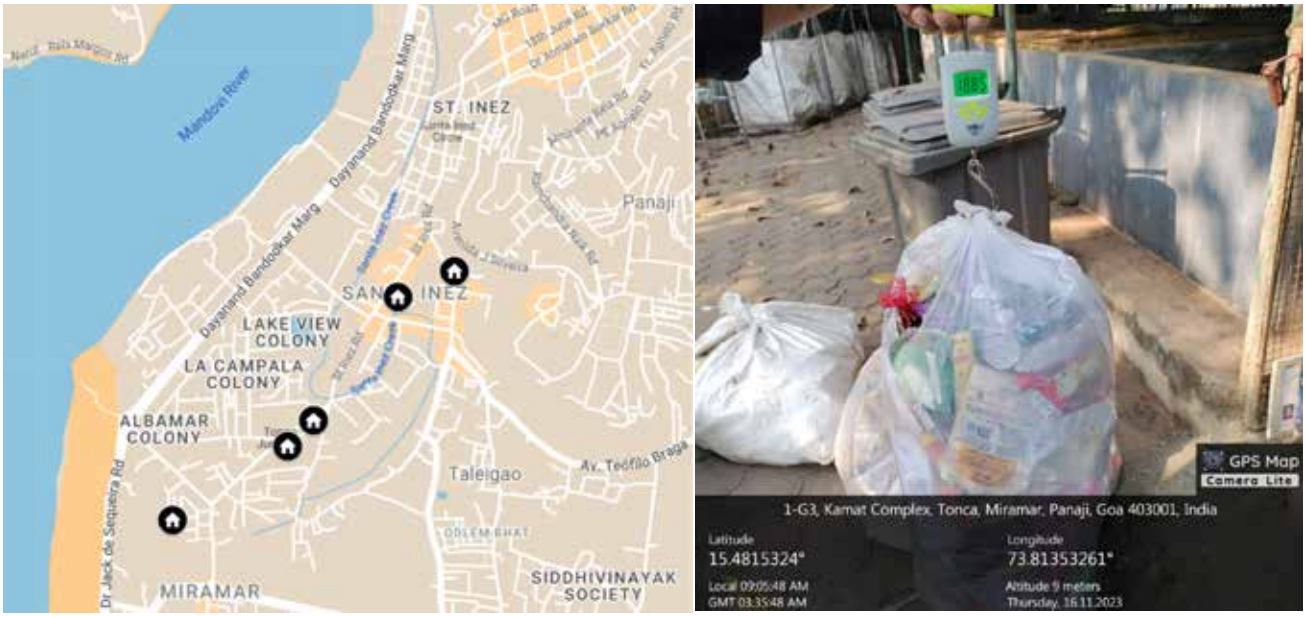


Figure 4.12: Location of housing societies (left) and sampling activities for dry waste (right)

Table 4.6: Details of dry waste sampling at housing societies in Panaji

Housing society name	Total flats	Waste categories (3 days)						
	Number of flats/ houses	Plastic waste (kg)				Aluminium Cans (kg)	Glass Bottles (Count)	Others (kg)
		PET	Hard plastic	Flexible & MLP	Tetra packs	Beer/Beverage cans	Beer bottles	
1. Nandanvan Complex	**65**	**3.3**	**7.07**	**9.06**	**0.85**	**0.15**	**75**	**4.98**
2. Model's paradise	**43**	**6.25**		**14.6**	**1.2**	**0.25**	**35**	**-**
3. Kamat's Estate	**105**	**1**	**0.8**	**0.7**	**-**	**0.15**	**36**	**-**
4. Model's Exotica	**100**	**11.6**				**0.7**	**15**	**-**
5. Kamat Plaza	**105**	**1.8**				**0.7**	**20**	**-**

Table 4.7: Count of PET, Cans and Glass bottles generation in a month per HH

	No of HH	Estimated population	Count of PET per HH /per month	Count of Cans Per HH/ Per Day	Count of Glass bottles Per HH/Per day
1. Nandanvan Complex	**65**	**260**	**25.38**	**1.65**	**11.54**
2. Model's Paradise	**43**	**172**	**72.67**	**4.15**	**8.14**
3. Kamat Estate	**105**	**420**	**4.76**	**0**	**3.43**
4. Model's Exotica	**100**	**400**	**23.2**	**5.36**	**3.49**
5. Kamat Plaza	**105**	**420**	**3.43**	**5.44**	**4.65**

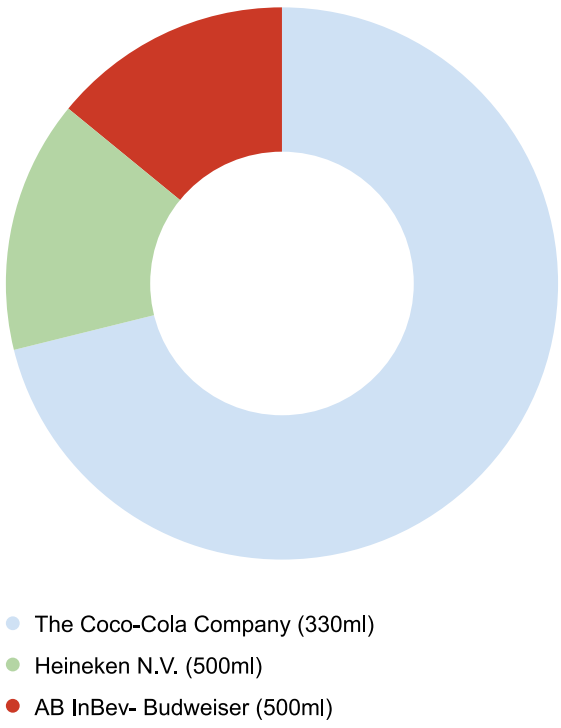
Brand Mapping

In addition to waste characterisation at the source in Panaji, a brand mapping activity was also conducted at Kamat Estate, St. Inez, Miramar. With a total of 105 flats, the complex has a 16 - way waste segregation. The dry waste is collected twice a week i.e. on Mondays and Thursday (morning 9:30 a.m) by CCP waste collection vehicles. The brand mapping activity was conducted on 16th Nov 2023 (Thursday) before the pickup by CCP. The mapping was done only for Plastic, Glass and Cans based on the different brand categories. The plastic and cans were sent to the municipality trucks, whereas the glass bottles were sold to a local vendor.

For Cans, it was observed that 70% of the total cans collected were beverage cans (Coca cola) of 330 mL volume. Apart from this, 490ml beer cans were also seen. Only 7 cans were collected over a period of 3 days.

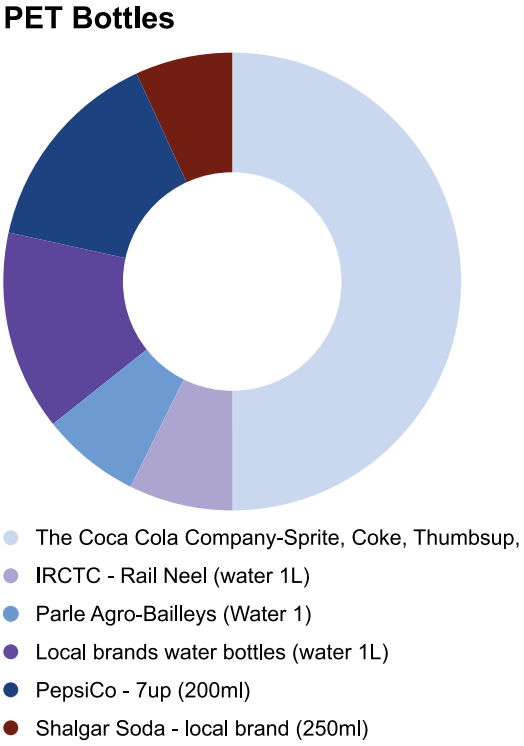


Cans



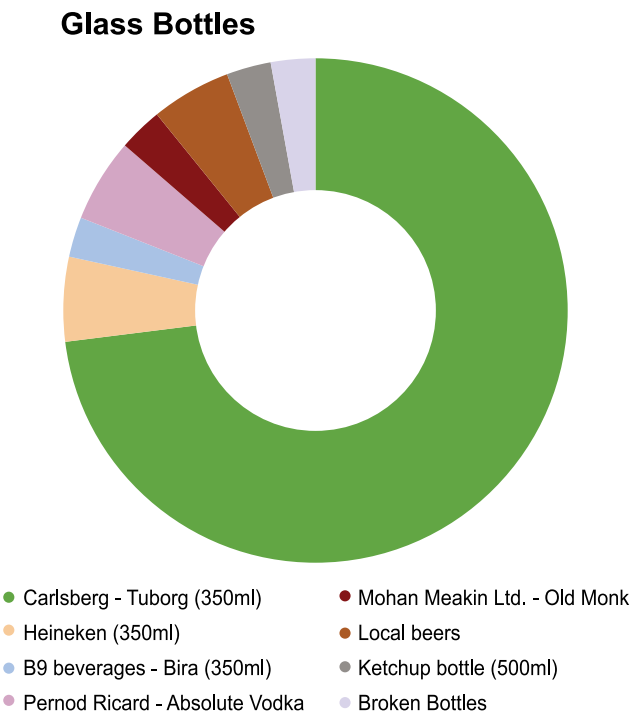
For PET bottles, It was observed that 50% of the plastic bottles were from The Coca Cola company beverage products like Sprite, Coke, Thumbsup, Limca. A lot of 1 L drinking water bottles from companies like Indian Railway Catering and Tourism Corporation (IRCTC) (Rail Neer) and Parle Agro (Baileys) were also found. The bottle sizes were seen to be varying from 50 ml to 2L bottles. A total of 14 PET bottles were collected over the period of 4-5 days.





For Glass bottles, it was observed that more than 75% bottles were of Carlsberg brand (Tuborg) beer bottles of 350 ml size. Other alcohol brands like Pernod Ricards (Absolute), Mohan meakin Ltd (old monk) and other local brands were found. A total of 36 bottles were collected over the period of 4-5 days.





Beach cleanups data obtained from Secondary Literature

The beaches in Goa were found to be relatively cleaner with lower littering (except a few). It was found that GWMC and the Tourism department have initiated beach cleanup activity for 37 beaches in Goa[17]. A private agency (KCIC) is involved in the beach cleanup of these beaches along with highways. The collected waste is sent to Hindustan waste treatment facility at Saligao for processing.

Table 4.8: Quantities of waste collected from beaches (data obtained from GIZ report)

Material Category	Colva Beach	Vagator Beach	Miramar Beach
PET bottles	32 Kgs	15 Kgs	35 Kgs
Glass	35 Kgs	25 Kgs	70 Kgs
Food wrappers/ chips packets	12 Kgs	6 Kgs	20 Kgs
Hard plastic/plastic containers	16 Kgs	3 Kgs	30 Kgs
Single use plastic (SUP)	13 Kgs	-	-

Further, KCIC could provide the cumulative data of material collected from Beach (Jan 2023 - Nov 2023):

Dry waste = 5,58,620 kgs (558 MT) Wet Waste = 5,09,250 kgs (509 MT)

Trees = 1, 27, 200 kgs (127 MT)

4.5 Waste Estimation Analysis

To understand the waste collected by formal channels vs the waste collected by informal sector, the waste collected in MRF was analyzed. GSPCB had provided the quantities of waste collected by each MRF for the last three months. This was organised taluka-wise. The data used is summarized in Table 4.9.

The estimation of dry waste collected by formal sector, informal sector and leakage is presented in Table 4.10.

17 The Special Secretary (Law), Government of Goa interpreted (March 2009) that Municipal Solid Wastes (Management and Handling) Rules, 2000 was also applicable to the VPs of Goa, apart from ULBs

Table 4.9: Quantities of waste collected by MRFs Taluka wise

Name of the Taluka	Number of Panchayats	Number of MRFs	Average quantity of waste per month (Kgs)
Bardez	33	23	12,20,616
Bicholim	18	20	26,447
Canacona	7	6	11,478
Dharbandora	5	5	8,766
Mormugao	7	5	5412
Pernem	20	6	118523
Ponda	19	1	33.4
Quepem	11	11	8547
Salcete	33	35	1,35,284
Sanguem	7	6	5,428
Sattari	12	12	14215.2
Tiswadi	19	15	2207160
Total	**191**	**145**	**2406009.6**
Total waste collected Annually (MT)			**28872.1152**

Table 4.10: Estimation of dry waste collected by Formal and informal sector

Waste	Annual Quantity (MT)	Remarks
Total waste in Goa (FY: 22-23)	77015	Data taken from annual CPCB report (22-23)
Total dry waste	40048	Wet waste is ~48% of total waste
Waste collected in MRF	28872	Data taken from GSPCB (A few MRFs were also collecting wet waste)
Tota dry waste collected by Formal sector in MRF	23097 (58%)	Assumption: 80% of total waste collected is dry
Waste managed by informal sector	16950 (39%)	Total dry waste - total dry waste in MRFs
Waste as leakage	1116 (3%)	Based on KCIC data for beach & highway

The data from waste treatment plant at Saligaon was extracted for last 1 year to understand the seasonal variation in various categories of material. The extracted data is plotted in Figure 4.13. Based on the data, the PET waste collected at Saligaon (~255 MT) was found to be 0.6% of the total dry waste in the state while glass waste (~440 MT) was 1.1% of dry waste. The aluminum waste collected at saligaon plant was 0.03% of the total waste.

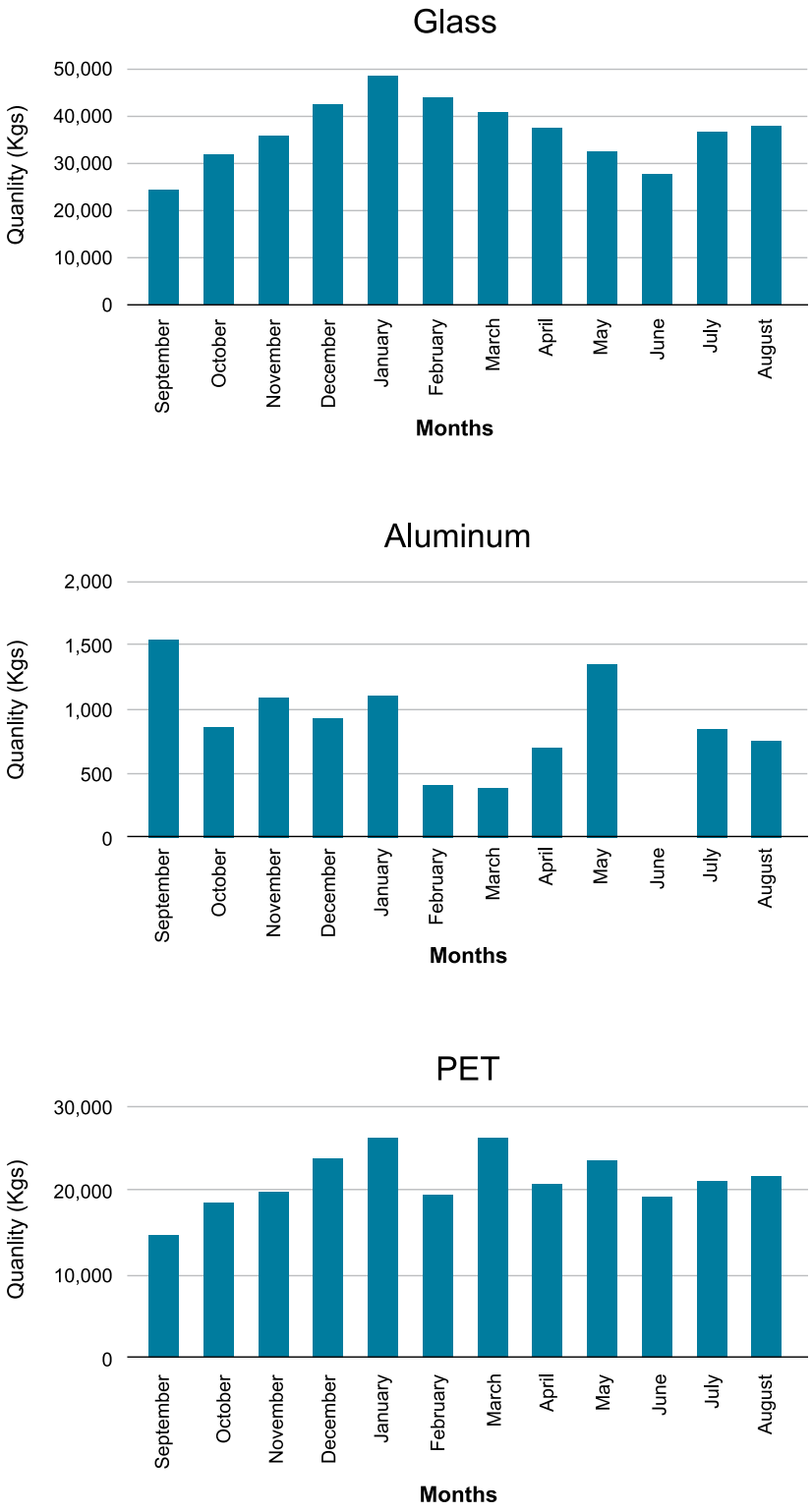


Figure 4.13: Seasonal variation of quantities collected at Saligaon waste treatment facility for glass, PET and Aluminium (data obtained from GWMC)

4.6 Key Findings

- Brands have to obtain an approval from the Excise department for the use of labels for a particular product by paying a recording fee.
- These products are put to market by the supply chain that consists of distributors, wholesalers and retailers and extended network on a credit base.
- The retail stores typically generate carton waste and sell it to the local aggregator.
- The hotels have dedicated and regular vendors for sale of carton waste, glass and plastics generated at their premises. The highest quantities of glass bottles were seen in cafes and shacks. The material from the shacks and cafes was being sold to local aggregators.
- The large stores such as supermarkets have adequate space, electricity backup and wifi provisions and can therefore act as a potential collection centre.
- It was found that the residents prefer giving away their post-consumption goods to the local MRF center in Panjim. In a survey conducted, the residents showed their willingness to participate in DRS by paying a deposit of Rs.5-10/-, on the other hand the tourists who were surveyed displayed less willingness towards participation in DRS.
- Most recyclables are collected by small to big aggregators at nominal cost in the areas of low or minimum municipal services.
- Most informal waste pickers are migrants and interested in alternate sources of income. Total dry waste Generated: 40,000 MT annually where 145 MRFs are managing 80 TPD dry waste. The formal collection was 58%, while the informal collection was 39 and 3% was seen as leakages for dry waste.
- Around 280 Scrap yards are reported by GWMC
- Incoming waste at the Saligaon plant is 29,000 MT per year (72%) out of which 87% is recovered and disposed off as RDF while only 13% are recovered as recyclables.

Chapter 5
DEPOSIT REFUND SYSTEM ANALYSIS

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DEPOSIT REFUND SYSTEM ANALYSIS

In a Deposit Refund System (DRS) the brands deposit a “green deposit” for their packaging such as glass or pet bottles or MLP in which their products are packed and sold. Further, the packaged products are supplied to the distributors in the same supply chain, which are further supplied to the retailers. The consumers purchase these packaged products with an additional green deposit from the retailers. Post consumption of these packaged products the consumer gets his refund after successfully depositing the post-consumption products at the nearest collection centre. A DRS thus ensures maximum recovery along with safe disposal of post-consumer products

5.1 Global Distinct models of DRS[18]

Prevent Waste Alliance has proposed 3 types of DRS models, including

(i) The Direct DRS

(ii) DRS organized through bottlerand

(iii) DRS with clearing, detailed below

5.1.1 Direct DRS

The simplest model of DRS, where the consumer and retailer interact directly without any outside intervention is the direct DRS.

Participants: Consumer and retailer

Material handling: The retailer collects and sends the reusable and single-use material (reusable and single-use) to washing and recycling units respectively.

Fee handler: The retailer handles the deposit fee.

Redemption: The consumer can redeem the money at the time of returning the bottle.

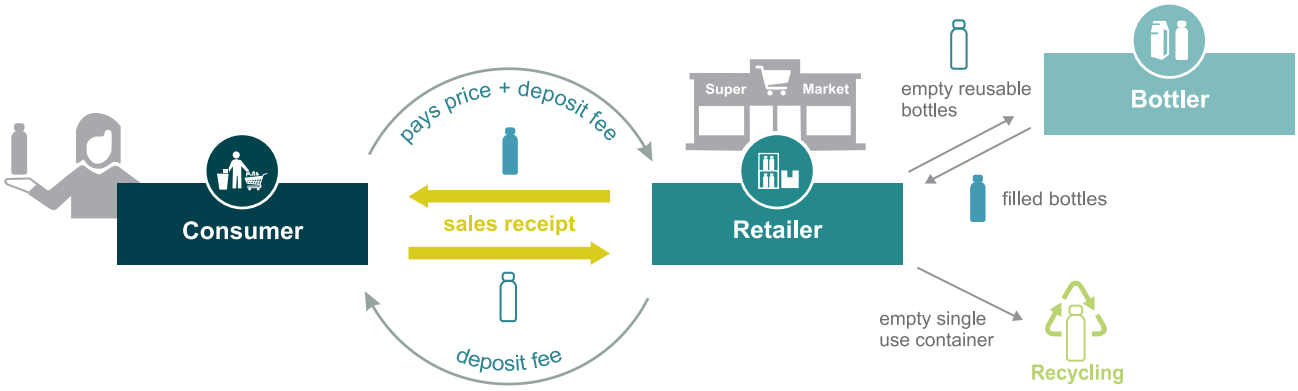


Figure 5.1: Schematic representation of Direct DRS

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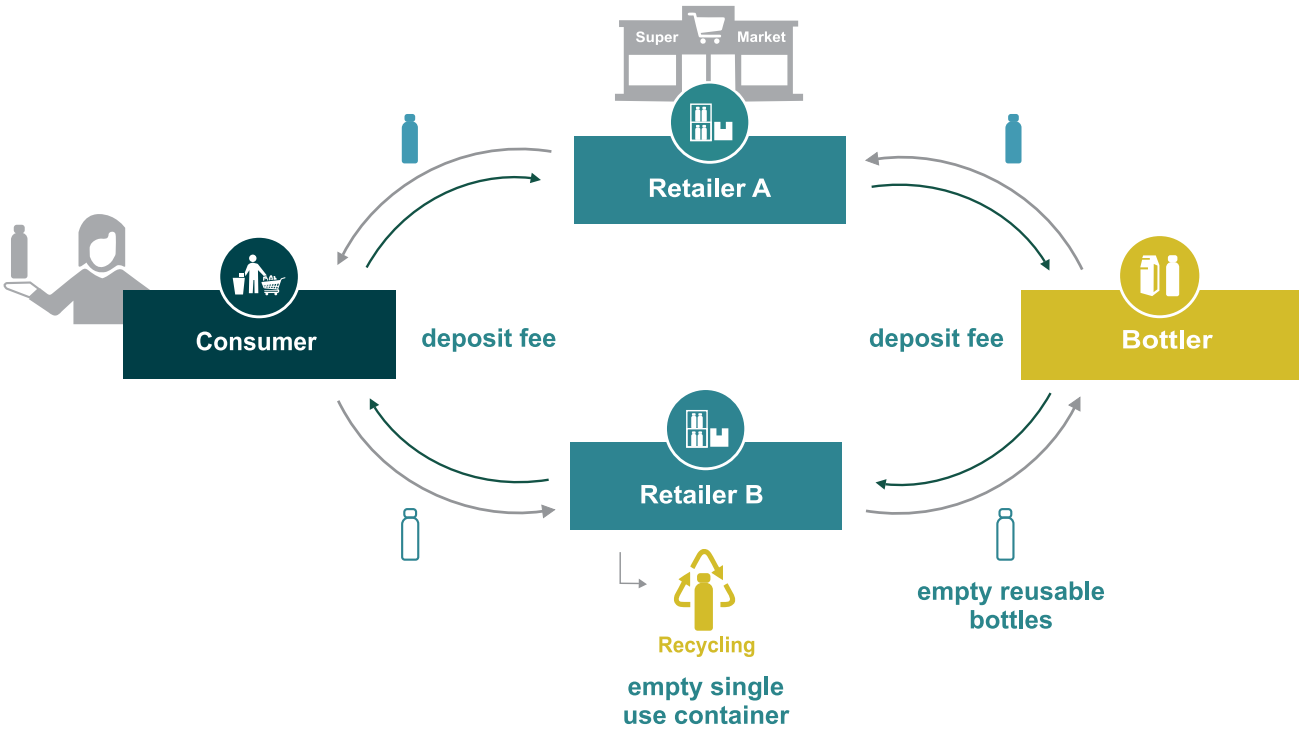


Figure 5.2: Schematic representation of DRS bottler mechanism

5.1.2. DRS organised through a bottler

Here the company initiates the DRS scheme and appoints the retailers for collection.

Participants: Bottler, consumer and retailer

Material handling: The retailer collects and sends the reusable and single-use material (reusable and single-use) to washing and recycling units respectively.

Fee handler: The bottler and retailer handle the deposit fee.

Redemption: The consumer can redeem the money at any of the retail shops associated with the bottler and collect a refund after returning the bottle.

5.1.3 DRS with clearing

In this model, the bottler pays deposit money to a cleaning organization which oversees the collection of the bottles.

Participants: Consumers, retailers, bottlers, clearing organisations

Material handling: The retailer collects and sends the reusable and single-use material (reusable and single-use) to washing and recycling units respectively.

Fee handler: The bottler and retailer handle the deposit fee.

Redemption: The consumer can redeem the money at a range of retail shops (irrespective of whether they sell the product) and collect a refund after returning the bottle.

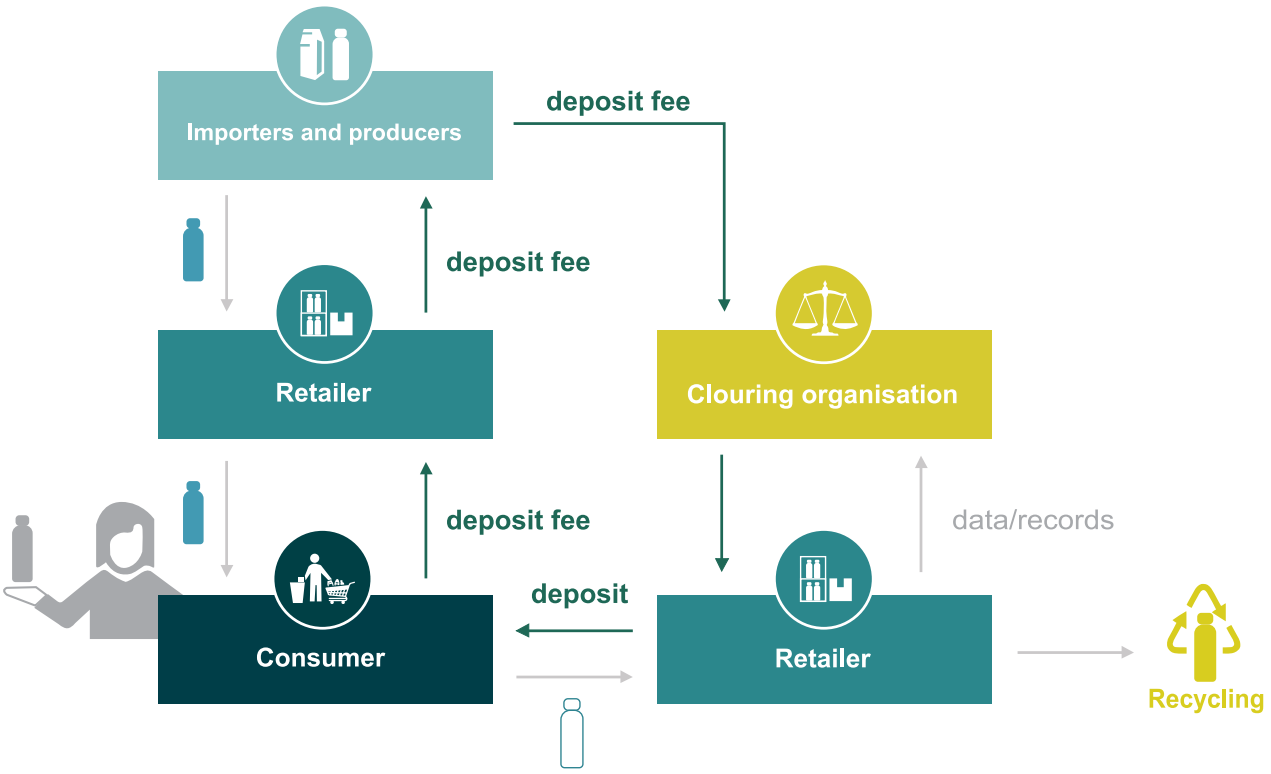


Figure 5.3: Schematic representation of DRS with clearing mechanism (Source : United Nations Development Programme (UNDP[19]))

The secondary research on global DRS studies revealed that these schemes have been widely implemented globally. However, the area and local population of these countries cannot be compared with the state of Goa.

Key Findings: *The following are a few takeaways derived from the study of DRS operations across different countries:*

- *It is important that the scheme is mandated by the government. Without a mandate, likely, the stakeholders will not be willing to participate / get involved in the system. Further, it is likely that the return rates will be low as there would be no guiding force for the collection of the containers. Thus, government intervention or a mandate is needed.*
- *The scheme operators are mostly private entities and are often established or appointed by bottling and other related industries.*
- *The deposit rate for the containers is either set according to the volume of the container or fixed uniformly for all the containers.*
- *The higher the deposit value, the higher the return of the container. This is because the consumers are likely to return bottles to collect the deposit value.[20]*

19 Factsheet 10 |How can deposit refund systems be set up?

20 Deposit

5.2 Existing obligation for potential participants

5.2.1 Extended Producer Responsibility (EPR) for Plastic Packaging

DRS is supported by Indian legislation under the EPR guidelines and can be implemented with no investment from the government. The scheme is usually financed by brands under take back obligation of Plastic Waste Management (PWM) (Amendment) Rules, 2022.

Under **Section 10.5** of **Schedule II** in the **Guidelines on EPR for Plastic Packaging** published on 16th Feb 2022, the CPCB states that *To develop a separate waste stream for the collection of plastic packaging waste for directly fulfilling EPR obligations, the Producers, Importers and Brand-Owners may operate schemes such as DRS or buy back or any other model. This will prevent mixing of plastic packaging waste with solid waste.*

5.2.2 Labelling Requirements for Excisable Article Manufacturers

Labels are the stickers placed on liquor bottles that contain the information such as name and address of the Distillery or manufacturing unit where the product is being manufactured. The labels bear the specifications of the product manufactured such as nature, quantity, strength, batch number, date of manufacturing, MRP, etc. The label also specifies whether the product is for sale within the state of Goa or for any other state.

Labeling in each state is guided by the respective State Excise Policy and Goa exercises powers under the Goa Excise Duty Act 1964 and Rules[21]. Every financial year the department records or renews the labels so that the brands sell in the State of Goa or can be exported from the State to any other State of India or outside India for that financial year only. The labels are recorded or renewed by the license holder of the Distilleries, Breweries, Wineries, Country Liquor units, wholesalers Importers, and stockists to import or export in the State of Goa. As per Rule 16 of the Goa Excise Duty Act 1964 and Rules. The Commissioner of Excise approves the recording or renewal of labels on payment of prescribed fees. The labels that are recorded or renewed shall be valid for one year ending 31st March of the next financial year.

5.3 Proposed DRS Model for Goa

5.3.1 Current Flows

The current waste management system in Goa is handled by the GWMC and CCP. It is divided into three stages, **manufacturing, sales and disposal**. Bottlers are involved in the filling of liquor or beverages in the bottling plant. Post bottling, the liquor or beverage is packed and sold to distributors who further sell it to retailers.

Sale point is where retailers or distributors sell liquor or beverages to individuals or to HoReCa in bulk. Once the liquor or beverage is consumed, the empty bottles are collected by the formal and informal sector directly from the households or the HoReCas. The material collected through formal channels such as CCP or panchayat is sent to MRFs where the major sorting takes place and bottles are recovered. Some fractions of non- recyclables and recyclables are also sent to the waste treatment facility where further recovery takes place. The recyclables recovered at the waste treatment facility are further sent to traders or scrap dealers or recyclers. In the informal sector, the individuals or waste collectors pick up the discarded bottles and sell it to kabadiwala who further sell it to aggregators. The current financial flow for the selected waste stream is presented in Figure 5.2.

21 https://www.indiacode.nic.in/bitstream/123456789/6816/1/goa_excise_duty_act_and_rules.pdf

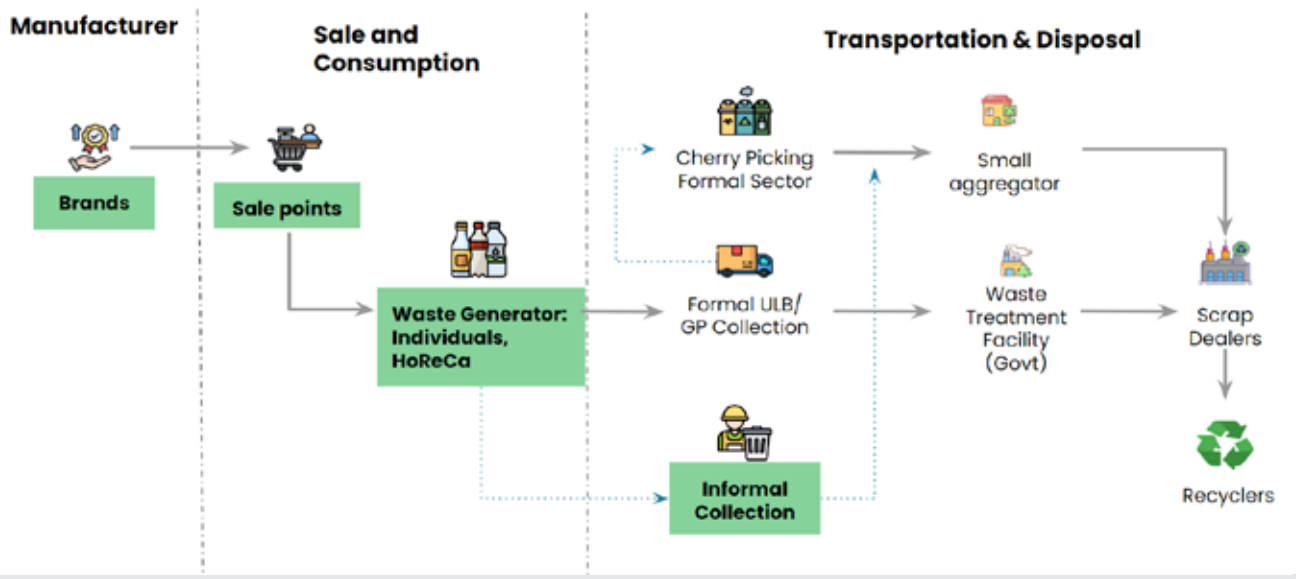


Figure 5.4: Current material flow for Dry Waste (bottles) in Goa

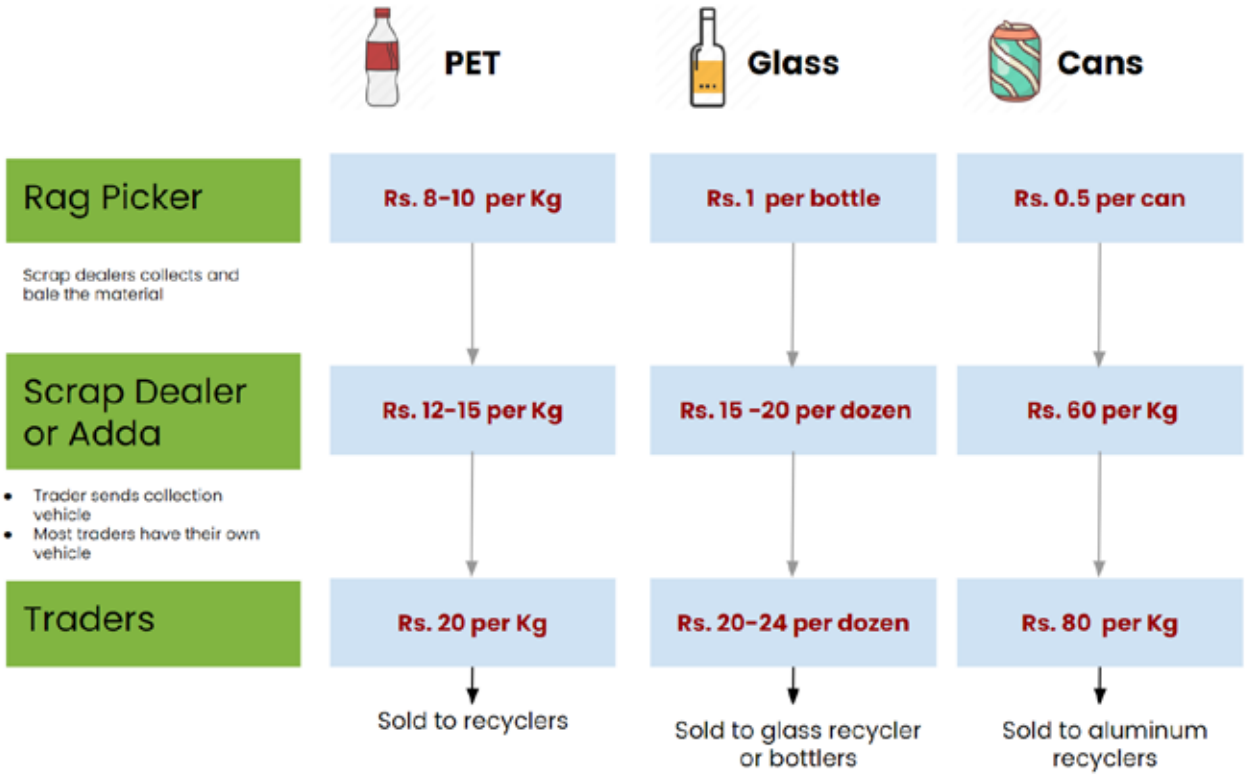


Figure 5.5: Current financial flow of PET, Glass and aluminium cans for the state of Goa

5.3.2 Proposed DRS Model for Goa

The proposed model for DRS in Goa is modified as per the existing obligations, policies and consumer behaviour in the state. It is proposed that there will be a **scheme administrator (a government body)** who will set the guidelines for the successful implementation of DRS in the state, including the appointment of a scheme operator.

A scheme operator will develop a technology that enables brand, bottlers and manufacturers to modify their existing packaging to enable

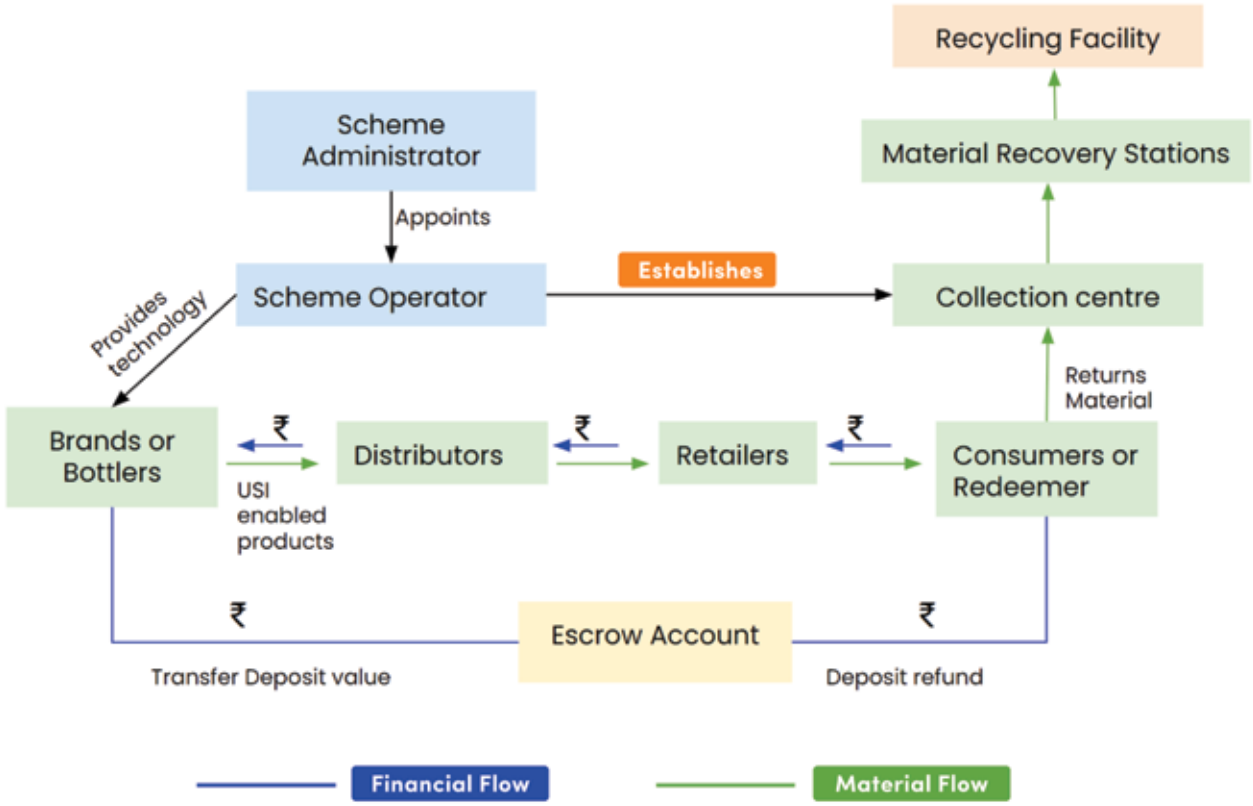


Figure 5.6: Proposed DRS process flow for Goa State

DRS. The operator will establish a collection center and provide technological solutions for a tech-driven / traceable DRS for consumers.

The deposit value will be deposited in an ***Escrow account*** which is a global practice, from where the deposit will be refunded to consumers. The escrow is managed by the scheme administrator and operator. It is recommended that a deposit is paid in advance by the distributor to the brand or bottlers and be collected from the retailers who will further collect it from the consumer during sales. The proposed model for DRS in Goa state is presented in Figure 5.6.

Escrow Account: Escrow Account is a financial arrangement where a Bank account is opened and operated by the Bank independently on behalf of Two or more parties whereby money is held pursuant to the agreed terms between such parties.

Scheme Administrator: Scheme Administrator shall be the owner and administrator of the program, responsible for project permissions, project notifications, stakeholder consultations, and project implementation. The Scheme Administrator shall decide all the matters unanimously.

Scheme Operator: The Scheme operator is responsible for the implementation of the scheme, and shall Provide complete digital technology and modalities required for the implementation of DRS. Scheme Operator shall be responsible for establishing the collection centres and channelisation and proper disposal of the DRS products to the recycler.

Brands: Brands would be required to modify their packaging to include USI code in all products sold in the DRS notified area. Brands will be required to deposit the refundable deposit amount in an Escrow Account opened for the scheme.

Distributors: Distributors will need to supply only the products with USI code to the retailers as mandated by the scheme.

Retailers: Retailers need to sell only products

with USI codes. Retailers will collect the deposit fee from the consumer at the point of sale and also educate the consumers about the scheme and how it works, motivating them to participate in the scheme.

Consumer or redeemer: Consumers need to return the empty container at the collection point without contaminating it, and collect back their deposit from various collection points setup in the region. Goa being a tourist state, It is possible that a consumer may not return the bottle at a designated collection center. Therefore, the role of waste picker (formal or informal) plays an important role. In such a scenario, a waste picker will be benefited with deposit value upto returning the material. This will enhance the current income of the waste picker community.

Collection centre: Collection centers will be responsible for collecting the empty packaging material from the consumer post-consumption and refund the deposit amount to the consumer. They need to safely handle and return products to the scheme operator in line with the laid-out requirements. These can be establishments closer to a user located in commercial hubs. Further, the existing recognized scrap yard can participate in the scheme by becoming a collection center or a material recovery station. However, the guidelines of health, safety and child labour should be met by the scrap dealer or traders.

Process flow for Consumer or Redeemer

1. At the point of purchase, the consumer pays a prescribed additional deposit amount (typically added to the total price of the product).

2. The packaging is printed with a unique serialised code that corresponds to the deposit amount.

3. Post consumption of the product, the consumer returns the product at a collection centre by scanning the serialised code on the product.

4. These are some proposed collection mechanisms used for the collection of empty containers: manual collection points, semi-automated collection points, and automated collection points.

5. The scanning of the serialized code triggers the deposit refund process, with deposit amount credited back to the consumer's account linked or through digital payment gateways.

6. The collected packaging is then sent for recycling and recycled material is used back in manufacture of products of same initial use.

Material Process Flow

1. A Unique serialised Identifier (USI) is printed on each packaging unit by the brands or Bottles, in case the material comes from another state each packaging unit should have a USI.

2. The product with USI will be passed on to the distributor and then to the retailer

3. The retailer will sell the product with USI to the consumer and will collect the deposit amount

4. The consumer post consumption will return the empty packaging in the designated collection centers

5. The scheme operator will collect the empty packaging from the various collection centers for segregation, aggregation and transfer it to designated Recyclers.

The detailed recommendations for DRS are provided in section 6.2.

5.4 Anticipated barriers and challenges for Goa

Through the study, it was determined that if DRS is introduced in the state, the implementation should happen in a phase wise manner for various product categories. As a variety of ecosystems would be required such as collection centers, in the case of digital DRS, unique codes need to be printed in each packaging container and then put

to market for sale. Further, the local population of Goa is estimated to be around 1.5 million but the population density varies across urban and rural areas. The state attracts both domestic and international tourists estimated to be nearly 10 million which is six times the local population. The following challenges are expected for the state of Goa based on the study:

5.4.1 Geographical Variation

Goa being one of the smallest states in India is known for its unique heritage, stunning beaches, vibrant culture, and lush landscapes. Within Goa, the lifestyle and cultural practices between urban and rural areas show a huge difference. Urban centers like Panaji and Margao are more cosmopolitan and modern, while rural areas maintain a closer connection to traditional practices and lifestyles. The northern part of Goa tends to be more commercialized and bustling with tourists, featuring popular beach destinations like Calangute, Baga and Anjuna. In contrast, the southern part is relatively quieter and has more serene and less crowded beaches like Palolem and Agonda. Tourism is a primary economic driver in Goa, where most of the tourists reside along the coastal regions of the state and hence the major occupation of local residents revolves around the same region. Due to the density and economy of the state is not evenly distributed throughout the state it will be a huge barrier for the implementation and DRS should be planned considering these variations.

5.4.2 Consumer Behaviour

Every individual is entrenched in habits and routines. The idea of convincing them to adopt new behaviors and pay an additional deposit may require significant effort to break established patterns. Emotions, perceptions, economic status and psychological factors also play a role especially when it comes to waste and paying the deposit, as waste is never considered to be stored or touched. For example, in Australia, consumer raised complaints about increased beverage prices and lack of sufficient drop-off points. Tourists, the major consumer in Goa, are the floating population who might not come from the mindset of storing waste. Hence, sensitizing and educating this group about such a scheme is a challenge. Regular IEC would be required to ensure successful implementation.

5.4.3 Governance for State

India's diverse political landscape often leads to coalition governments at the central and state levels. While this represents India's democratic nature, it can sometimes result in challenges in policy formulation and implementation due to differing agendas. Lengthy bureaucratic procedures, complex regulations, and administrative hurdles may hinder swift decision-making and efficient implementation of policies in India. Indian governance has always been focused on Infrastructure and development, poverty and regional matters while Environment and waste management have lower priority. In addition, every state in India has different bylaws and regulations with respect to sale of materials, labeling, and excise. For example, the Government of Assam has prohibited the manufacture, import, stocking, distribution, sale and use of all plastic water bottles up to 500 ml capacity. Similarly, every state has different laws for the sale of Liquor in the state which is governed by the Excise department of the state. These differences will affect the operations of DRS for the scheme operator.

5.4.4 Informal Sector

The informal sector plays a significant role in waste management in developing nations like India. Informal waste workers are not formally recognized or integrated into municipal waste management systems. Informal sector is excluded from social security benefits, minimum wages, and medical benefits. Formalising the informal sector into the DRS system is a huge challenge as information about the number of these informal sectors is unknown, their revenue source is unknown and the methodology of waste channelization remains unclear. Many of these informal sectors are also migrants and have no fixed area of collecting waste. Educating these sections of people will be a challenge in terms of language and technology.



5.4.5 Printing and Labelling

In many countries of Europe the DRS materials are identified by specific markings indicating they are eligible for the deposit refund, some bottles also carry specific labels or marks indicating their inclusion in the system. In Germany, a variety of symbols are used for identification of DRS material, these variations in symbols would confuse the residents as well as tourists. Hence, the same labels should be used for all the products with a deposit.

These days digital DRS with Unique Serialized Identification code (USI) has gained popularity. In this, a USI code has to be printed on each container containing information of the deposit value. This can be scanned and redeemed only once. The USI code printing can be a barrier as bottlers may or may not have the printing technology. In some bottling plants, labelling may be manual. This aspect should be tested during the scheme design.

5.4.6 Collection Centers

As the geography, and density of the state is very diverse, setting up collection points for DRS in Goa will be a challenge as the collection points should be set up in such a manner that it is accessible for both local and tourist populations, also each collection centre should have the capacity to collect and store the material. In many countries of Europe the collection centres are majorly mechanised whereas in India the major problem for a mechanised collection centre will be space and educating the users on how to use the machine. Whereas for manual collection centres the time and effort for the collection centres will be huge. Unless a proper incentive is given to these collection centers, Retails points will not be encouraged to become a collection centre for the material, without adequate collection centres the success of the DRS is a challenge.

5.4.7 Identification of DRS vs Non-DRS materials

Once DRS is introduced by the government, there will be existing material on which marking or USI codes will not be printed. It can be expected that consumers may bring non- DRS material (without marking or USI codes) to the collection centres to redeem the deposit value. Since there is non-DRS material, there exists no deposit value to be redeemed. In addition, there is a possibility that a deposit may be charged by the seller on the existing non-DRS stock available with them, creating fraud in the market. Such a situation will create mistrust among the consumers on the scheme.

5.4.8 Disposal

The ultimate goal of DRS is to enhance material collection at source and proper channelization of high-quality material through authorised recyclers. A successful DRS will reduce littering of waste and increase recycling rates. The channelizing of large quantities of these materials through authorised recyclers is a very crucial task for any scheme operator. Considering there are very few recyclers in the state of Goa, all the material collected needs to be transported to other recyclers in neighbouring states like Maharashtra, Gujarat and Karnataka. For successful DRS, the logistics cost for transporting the material should balance out the material value for the operator, so that they continue to work. If needed, operator fees or handling fees should be provided either by brand owners or the government so that the organisation wishes to be the operator.

Chapter 6
CONCLUSIONS AND RECOMMENDATIONS

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CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

The present study was conducted to establish a baseline for the implementation of a Deposit Refund System in the state of Goa. Although DRS is a new concept in waste management supported by multi-level source segregation; the Indian scenario of lower source segregation, and geo-economic variations should not be a limitation for the adoption of DRS. The existing EPR obligations for plastic packaging do not consider consumer participation and inclusivity of the informal sector. Further, the obligations for the use of recycled content under EPR can be fulfilled only with a continuous supply of high-quality non-contaminated materials. In this regard, DRS ensures that the material is collected in Total dry waste Generated: 40,000 MT annually where 145 MRFs are managing 80 TPD dry waste. The formal collection was 58%, while the informal collection was 39 and 3% was seen as leakages for dry waste.a closed and clean loop directly from the consumer post-consumption.

As DRS introduces deposit value to packaging, it has the potential to drive a mass consumer behavior change in the state. A digital DRS will further enable traceability and reduce possible fraud concerning the deposit values. India has proven to adapt to technological interventions such as UPI payment, online banking, GST filing, social media, and E-commerce. Therefore, an Indianized DRS can be perceived as one of the solutions to ensure the collection of packaging materials beyond plastic (such as cans and glass) which are not covered under the present EPR regulation.

6.2 Recommendations

The baseline assessment in the two locations (Tiswadi and Bardez) helped in understanding the existing manufacturing, sale, consumption, and collection mechanisms followed in the state. The key stakeholder consultations strengthened the study by providing inputs that are key in designing the possible DRS model for the state. For a successful adoption and Indianization of DRS in Goa, the below recommendations are forwarded for consideration.

6.2.1 Policy Level

A balanced model that fulfills the existing statutory obligation coupled with innovation addressing the anticipated barriers is proposed through this baseline study. A policy for the state that cements the proposed inclusive model is the requirement for the adoption and implementation of DRS in the state.

The statutory body of the state for drafting the rules that enable DRS is the Department Of Environment & Climate Change (DoE&CC). The enabling policy that is available with the state is the Goa Non-Biodegradable Garbage (Control) Act, 1996 and the amendments further. In addition, recently the Goa legislative Assembly on Wednesday passed an amendment to the Goa Non-Biodegradable Garbage (Control) Act, 1996, to enable manufacturers of single or reusable plastic to “collect a deposit on the sale of items that are sold in plastic packaging which is to be refunded if the buyer returns the packaging”[22]. The present baseline is being

22 https://www.hindustantimes.com/cities/others/goa-assembly-passes-amendment-to-encourage-return-of- plastic-packaging-for-refund-as-recycling-efforts-fail-101691594235904.html

conducted to understand the implementation of the DRS scheme in Goa.

6.2.2 Administration Level

The responsibility of waste management in the state of Goa is distributed between the Urban Local Bodies, Village Panchayats and administered by the Department of Science, Technology and Waste Management. Since the implementation of DRS cuts across all the administrative bodies, it is suggested to form a unified body which is headed by both statutory (DoE&CC) and regulatory (Goa State Pollution Control Board) bodies. The body can be termed as DRS Scheme Administrator, which would be responsible for formulation the guidelines for implementation of DRS in Goa. The Scheme Administrator is deemed to be an independent, not-for-profit organisation with representation from all the line government departments and major stakeholders of DRS in the state (manufacturers, civil society organisations, and industry bodies).

6.2.3 Type of Material

To avoid confusion among the sellers and consumers it is very important to identify the type of material in which DRS will be implemented. From secondary research it was observed that DRS in most of the countries was applied on beverage containers. It is seen that commodities like milk based products, pharma products are excluded from DRS as they contaminate the other products affecting the cleaning process. For Goa, DRS should be applicable to Glass, PET, Cans and Tetrapack (Liquor or Beverage. FMCG products like chips, biscuits, cooking oils packets and hair oil based products etc. can be included at a later stage in DRS as their collection mechanism would need to be built.

6.2.4 Deposit value for material

Though the concept of the DRS implemented across the countries is the same, the deposit value is not constant. Different countries follow varied mechanisms for setting the deposit value (table 6.1). The deposit mechanisms followed around the world are as follows:

- Deposit based on type of material (plastic, glass or metal)
- Deposit based on category of material (HDPE, PET, Glass, Wine, Beer)
- Deposit based on volume of the container (<0.5 L, 0.5-1 L, 5 L)
- Flat Deposit: May have flat deposit (fixed) across all the containers

For the state of Goa, it is recommended that a flat deposit based on material category can be set. The suggested deposits for various categories based on resident, tourist interaction and material value (pre-consumption and post consumption) are mentioned in Table 6.2.

6.2.5 Scheme Operations

DRS cannot be an added financial and operational obligation of the state, so it is advised to appoint an operator to implement DRS through a coordinated approach with all the stakeholders. The entity identified for implementation of DRS in the state can be termed as scheme operator. The guidelines formulated by the scheme administrator will include the operator identification metrics and evaluation indices and ensure proper administering of DRS. The operator should be appointed through a tendering process with legal binding by means of expression of interest (EOI) or Request for Proposal (RFP). The allotment for scheme operators should be executed through a public private partnership (PPP) model. The modality of PPP model can be either Build Own Operate (BOO), Build Operate Transfer (BOT) and Build Own Operate Transfer (BOOT)29. As the investment and operating cost is expected to be high in DRS, a BOO model with minimal risk is recommended for the scheme administrator.

The scheme operations should be planned in a phased manner to ensure collection and inclusion of various stakeholders. It is also recommended that the brands should pay a participation fee / registration fee (similar to excise recording fee) for technology support, data management, reports and supporting the DRS policy. This practice is followed globally.

Table 6.1: Deposit value in the different countries

Country Name	Deposit for Plastic (INR)	Deposit for Glass (INR)	Deposit for Metal (INR)
Norway[23]	<0.5 L : 16.22 >0.5 L : 24.34	Not Applicable	<0.5 L : 16.22 >0.5 L : 24.34
Sweden[24]	<1 L : 7.83 >1 L : 15.65	Not Applicable	Flat deposit : 7.83
Germany[25]	Flat deposit : 13.62	Flat deposit : 13.62	Flat deposit : 22.70
California[26]	Flat deposit : 4.11	Flat deposit : 4.11	Flat deposit : 4.11
Australia[27]	Flat deposit : 5.00	Flat deposit : 5.00	Flat deposit : 5.00
Romania[28]	Flat deposit : 9.20	Flat deposit : 9.20	Flat deposit : 9.20

Table 6.2: Suggested deposit value for the state of Goa

Type of Material	Materials	MRP Range (in INR)	Suggested Deposit Value per piece (in INR)
Plastic	PET, HDPE	10 - 300	5-10
Glass	Glass Bottles (alcoholic and non-alcoholic beverages)	60 - 10,000	10-20
Metal	Aluminium/ tin cans	30 - 250	5-10

23 Norway
24 Sweden
25 Germany
26 California
27 Australia
28 Romania

Considering the financial muscle required to develop, enable and monitor technology, in a digital DRS, it is suggested that a technology driven private entity from waste management should be appointed as Scheme operator.

6.2.6 Consumer IEC

Consumer IEC activities are required to communicate the policy, purpose and benefits of DRS. Further, IEC is required to communicate the process for redeeming the deposit value. Any communication material should be easy to understand and in regional language along with English to ensure that all the consumers are aware. A mix of communication channels such as newspapers, social media, government websites, radio and television should be used to reach a diverse audience. In addition, IEC can be conducted at public events, through workshops, partnership with NGOs and brands.

6.2.7 Inclusion of Informal Sector

The inclusion of the informal sector in a DRS will require thoughtful planning and collaboration. The informal sector - kabadiwala or aggregators can be onboarded as collection points by scheme operators involving minimum paperwork and administrative work. However, the scrap dealers were found to be hesitant towards getting formalised. DRS would act as an additional source of income for the informal sector, especially the waste picker community. Incentives for participation can encourage their active participation and integration into the formal waste value chain.

6.2.8 Infrastructure Requirement : Collection Centres

With the introduction of DRS, A collection centre should be easily accessible to the public, possibly in locations with high footfall such as shopping centres, supermarkets and public transportation hubs. During the baseline, it was observed that the generation of packaging is higher at the consumption points and the recurring points of visit such as retail stores might act a s collection points. It is suggested that the retail points with space available to collect and store material are mandated to become collection centres. For instance, sale points with a range of 350 - 400 sq ft of sale area can be mandated. A similar practice is observed globally, under the return to retail model. An economic incentive is suggested as a driving force for these sale points to become collection centres. The small kabadiwalas can participate to become a collection centre. To encourage participation, they would be incentivised for material handling by the scheme operator or administrator.

The collection centres should be operated at convenient operation hours to accommodate the diverse schedules of consumers. There should be clear signage to make a collection point along with a well-trained staff. An integration of technology would make the process even more efficient, transparent and accurate. A combination of staff run and machine- driven systems should be adapted. This could include capturing consumer data, USI code scanning and digital record keeping.

ANNEXURES

ANNEXURES

A. Survey questionnaire for Restaurant and Cafe

Question	Responses
General Questions	
Name and type of establishment (Hotel, Restaurant, Cafe, Pub, Casino etc.)	
Type	
Name of the person being surveyed	
Designation (manager/ sales/ staff/ waiter)	
Survey Date	
Location and Taluka	
Area of the establishment (SFT) : < 100, 100-500 ; 500- 1000; 1000-2000; 2000-3000; 3000-4000; > 4000	
No. of floors (GF; GF + 1; GF +2)	
Total no. of guest footfall per day (seasonal / off seasonal)	
Operational hours	
Total staff in the facility along with their type (<5; <10; <15; <20)	
Do you pay any charges towards waste collection to the government? If yes, how much?	
For Restaurants and Cafes	

Question	Responses
Does your Restaurant or Cafe serve alcohol? (Yes or No)	
Does your Restaurant or Cafe serve packaged drinking water? (Yes or No)	
What is the total seating capacity of your restaurant?	
Waste management	
What is the average quantity of wet waste generated in a day (in KG)?	
What is the average quantity of dry waste generated per day?	
Who is taking the dry waste and what frequency (Private/ CCPL/ Municipality/panchayat/scrap dealer)	
How does the collection work - Door to door collection or drop off mechanism ?	
Where do you store all this waste ? (Paper, Glass, Cans)	
What is the total quantity of glass bottle waste generated per day in your restaurant ? (in count)	
What is the total quantity of cans generated on a daily basis? (in count)	
What is the total quantity of plastic bottles generated on a daily basis & storage? (in count)	
Are you selling your waste? If yes, same or different vendor	
What type of Billing mechanism is used by your restaurant or cafes ? (software if any)	
Are there any provision of open Wifi inside the restaurant? (Yes/No)	
Is there any electricity backup provision in the cafe/restaurant?	
What is the rate at which waste is being sold and payment method (cash/ UPI)	

B. Survey questionnaire for Hotels and Homestays

Question	Responses
Location and Taluka	
General Questions	
Name and type of establishment (Homestay / Hotel)	
Designation (manager/ sales/ staff/ waiter)	
Area of the establishment and No. of floors	
Total number of rooms	
Occupancy (out of total rooms)	
Total no. of visitors visiting Hotel restaurant other can occupants (seasonal / off seasonal)	
Operational hours	
Total staff in the facility along with their type	
Do you pay for waste collection to the government? If yes, how much?	
Does your Hotel serve alcohol? (Yes or No)	
% Glass bottle vs Plastic vs Cans	
Does your Hotel serve packaged drinking water ? (Yes or No) (Mention number of Cases)	
What is the average quantity of wet waste generated per day?	
What is the average quantity of dry waste generated per day?	
Who is collecting the waste?(Private/CCPL/Municipality/panchayat/scrap dealer)	

Are you being compensated - Glass, Plastic, Carton	
Approximately, what is the total quantity of glass bottle waste generated per day in your restaurant ? (in count)	
Approximately, what is the total quantity of cans waste generated per day in your restaurant ? (in count)	
Approximately, what is the total quantity of plastic bottle waste generated per day in your restaurant ? (in count)	
What type of Billing mechanism is used by your restaurant or cafes (software if any)	
Are there any provision of open Wifi inside the restaurant? (Yes/No)	
Is there any electricity backup provision in the cafe/restaurant?	
What is the rate at which waste is being sold and payment method (cash/ UPI)	

C. Survey questionnaire for consumer

Question	Responses
General Questions	
Name	
Are you a Resident/ Tourist in Goa ?	
LOCAL CITIZENS	
In which area do you stay in Goa? (Locality name)	
Please select your age ? (<18 to >55)	
How many people reside in your house ? (Family size)	
Where do you generally buy or consume alcoholic drinks/ beverages? (stores/online/i don't drink)	
How many bottled beverages did you buy/consume in the past 7 days ? (Approx value)	
What do you do with the empty water bottles/beverage bottles/liquor bottles, after consuming?	
Are you familiar with the system in the 2000s where you return empty glass or cola bottles to the store? (If yes , next question)	
If yes, will you be willing to do the same thing now and return all your empty bottles to the store?	
Would you be willing to pay a small refundable deposit at the time of purchase of Liquor, water and beverages in Goa?	
If you're willing to participate in the Deposit return system, How much deposit are you willing to pay ? (5,10,15,20)	
After consuming the packaged bottled water, are you willing to go to a collection point to deposit your empty bottle? (IIf yes , next question)	
If yes, at what distance will you return that empty container?	

Question	Responses
When you return empty beverage containers, In which mode would you like to get the refund? (Cash/ E-Payment/ Vouchers/ Donate it)	
TOURIST	
Please select your age ? (<18 to >55)	
How often do you travel to Goa?	
Reason for travelling to Goa?	
In which months of the year do you visit Goa?	
Where do you prefer to stay in Goa?	
Do you often buy packaged bottle water/beverage/liquor bottles from the store?	
Where do you purchase packaged drinking water? Where do you purchase packaged bottle water/beverage/liquor bottles ?	
After consuming Beverage/ Alcohol Bottles, what do you generally do with the empty container?	
Do you carry any liquor bottles from Goa to other states? If yes, how many ? If yes, how many?	
Are you familiar with the system in the 2000s where you return empty glass or cola bottles to the store? (If yes , next question)	
If yes, will you be willing to do the same thing now and return all your empty bottles to the store?	
After consuming the Beverage/ Alcohol Bottles , are you willing to go to a collection point to deposit your empty bottle?	
Would you be willing to pay a small refundable deposit at the time of purchase of Liquor, water and beverages in Goa?	
When you return empty beverage containers, how would you like to refund? (Cash/ E-Payment/ Vouchers/ Donate it)	

D. Questionnaire for Sale Points : Retail and liquor store

Question	Responses
General Questions	
Name of the person being surveyed	
Survey Date	
Store Name	
Store Location (with pincode) : Take geotag picture	
Area or Talukas	
Type of store (Retail Point/ Liquor store/Refreshment/ tobacco shops)	
Total area of store (in sq.ft)	
Operations related Questions	
When do you open and close the shop ? (timing)	
How many days is the shop open in a week ? (No. of days , excluding which day)	
Do the staff carry any smartphones or feature phones ?	
Do they have access to mobile data/wifi ?	
Is there Electricity provision or charging facility in the store? (Yes/No)	
Power cuts happen frequently in the area!	
Is there any power backup in the store?	
Who collects the waste from the store ? (Ragpicker, Municipal waste picker)	
Do you sell your dry waste? (If yes, how much for each category), if yes to whom?	

Question	Responses
At what time does the waste collector pick up the waste?	
Does the waste collection happen once or twice a day ? (once a day/twice a day)	
Do you have separate bins in the store for different wastes? (Yes/No)	
Which types of waste is generated in the store ? Where do you store it? (plastic , paper- cardboard boxes, glass , cans, crates,)	
Are you willing to store extra empty bottles collected from your customers in the store ?	
Will you be willing to keep a deposit vending machine in the store and help customers deposit empty bottles ! (Yes/No/ Other opinion)	
Customer Footfall and Sales data points	
How many customers visit your store in a day ? (Approx No.)	
What is the average no. of customers that have visited the Store last month ?	
(Approx No.) - If available	
Which hour of the day do you receive the most no. of customers ? (peak footfall timings)	
Which is the busiest month of the year ? (peak footfall month)	
What is the most sold item in the store?	
(E.g. water bottles/cans/packets/liquor bottle)	
Sales data - No of Plastic containers sold (per day)	
Sales data - No. of Cans sold (per day)	
Sales data - No. of Liquor bottles sold (per day)	
Most sold liquor - Brand (KF, Feni, Beer) (% distribution)	

Question	Responses
What is the Mode of payment that is accepted in your store? (cash/paytm/ card)	
What type of bill do you provide to the customers ?	
(Billing mechanism - machine or computer, Automatic, No bill, VAT, Rough)	
Would you be willing to add a QR code to the bottles and ask customers to deposit the empty bottles back in the store ?	
Observational Questions	
Shop is in which floor ?(Basement/Ground/1st floor/2nd floor)	
Shop is present on the main road or inside a complex?	
Is there additional space (base area) for bin setup? (If yes, shaded or open ; inside store or outside)	
Staff can talk in which languages? (Hindi, English, Marathi ,Konkani)	
Staff's ability to read and write?(read in english/write in hindi)	
Internet speed (cellular/wifi)	
Observation: Lighting	
Observation: Noise Level	
Other Observations	

Data Received from consultations:

1. Imported liquor data from Excise Department
2. Landbell GFS Zeloop Goa Plogging Report from GiZ
3. List of MRFs in the state from GSPCB
4. Taluka-wise list of scrap dealers from GSPCB
5. Waste collected data for Saligao plant from GWMC
6. Summary for waste characterization report from GWMC
7. Projects and initiatives of GWMC from GWMC
8. Number of operational scrapyard and list of registered scrap dealers from GWMC
9. Scrapyard survey forms from Sampurn(e)arth foundation
10. Details of waste treated at Garbage Treatment Plant_1 from Urban Development cell- SBM

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