



# Waste Characterization Study at the Perseverance Landfill

## Final Report: Development of a Waste Characterization Study at the Perseverance Landfill (Grenada)

### **Implementing Institution**

The Recycle Organics (RO) Program

**10th December 2025**

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### **Consultancy**

Waste Characterization Study at the Perseverance Landfill

## Executive Summary

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The 2025 Waste Characterization Study conducted at the Perseverance Landfill provides the most comprehensive assessment to date of Grenada's municipal solid waste (MSW) composition. Implemented by the Grenada Solid Waste Management Authority (GSWMA) in collaboration with the Recycle Organics Program, being implemented by the Center for Clean Air Policy (CCAP) and ImplementaSur, the study was executed in two phases, May 2025 and July–August 2025, to capture both “business-as-usual” and festive-season (Carnival) conditions. Sampling and sorting were performed in full accordance with European standards (EN 14899, EN 15002, CEN/TR 15310, EN ISO 17025, and XP X30-413), ensuring methodological rigor and international comparability.

Across both exercises, a total of 5,943 kg of waste was analyzed from 45 samples, supplemented by landfill weighbridge data on green waste (Material Code 200201). The combined results reveal a waste stream dominated by organic material (31%), followed by plastics (23%), paper and cardboard (15%), textiles (15%), and metals and glass (7%). Sanitary waste accounted for approximately 5%, while other categories, including composites, combustibles, and hazardous materials, represented the remaining 4%.

Spatial analysis by parish indicates that St George and St Andrew, the island's most densely populated and economically active areas, generate the highest waste tonnages. Rural parishes such as St John, St Mark, and St David produce smaller absolute quantities but a higher proportion of organic waste, consistent with land use and agricultural activity. Seasonal variation was observed in the textile and cardboard fractions, which increased during the Carnival period due to elevated consumption and packaging waste.

Comparative analysis shows that Grenada's waste composition is broadly aligned with that of other upper-middle-income Caribbean countries, though with notable distinctions. The share of plastics ( $\approx 22\%$ ) is approximately double the regional average ( $\approx 11\%$ ), while organic waste ( $\approx 31\%$ ) remains significantly lower than the Caribbean benchmark ( $\approx 52\%$ ). The study also identifies a marked increase in textile waste compared with previous assessments (2018), driven both by improved categorization and by changes in consumption behaviour.

At the global level, Grenada's profile reflects the transition of upper-middle-income economies toward more packaging-intensive and synthetic waste streams. Compared with the global municipal waste average (UNEP 2024), Grenada exhibits a lower proportion of biodegradable waste (31% vs. 53%) and a higher share of plastics (23% vs. 11%), underscoring the influence of tourism, import dependency, and evolving consumption patterns.

The study provides a solid evidence base for strategic waste management planning, particularly for:

- ▶ expanding composting initiatives to divert organic waste from landfill, building on existing small-scale biogas pilot projects, strengthening recycling systems for plastics, cardboard, glass and metals,
- ▶ developing collection and recovery solutions for textiles, and
- ▶ integrating seasonal and geographic variations into waste diversion strategies.

*Table 1: Summary of municipal solid waste composition quantities*

<b>Material Type</b>	<b>Total (kg)</b>	<b>Total%</b>
<b>Paper and paperboard</b>	106.10	2%
<b>Cardboard</b>	753.80	13%
<b>Glass</b>	254.70	4%
<b>Metal</b>	364.20	6%
<b>Composites</b>	108.95	2%
<b>Plastics</b>	1,375.60	23%
<b>Textiles</b>	698.70	12%
<b>Organics</b>	1,846.20	31%
<b>Unclassified combustibles</b>	64.50	1%
<b>Unclassified incombustibles</b>	9.40	0%
<b>Sanitary textiles</b>	352.60	6%
<b>Hazardous household waste</b>	8.70	0%
<b>Total</b>	<b>5,943.45</b>	<b>100%</b>

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## I. Background

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### A. National Context

Grenada relies primarily on the Perseverance Landfill for solid waste disposal. This site serves the majority of the country's population and is therefore central to national waste management practices. Over the past decade, improvements have been made to its operations, including a semi-aerobic filling system, enhanced stormwater and leachate controls, and structured terracing to improve stability. These measures have also supported better gas management and contributed to reduced greenhouse gas emissions.<sup>1</sup>

### B. Policy and Regional Frameworks

Nationally, Grenada has introduced important legislative and strategic tools. The Non-Biodegradable Waste Control Act (2018) phased out several single-use plastics and Styrofoam products, supporting waste reduction and environmental protection. The National Solid Waste Management Strategy and the National Adaptation Plan also identify solid waste as a sector where improved management can contribute to environmental sustainability and resilience.

Regionally, Grenada participates in the Recycle OECS Project, which strengthens recycling systems, supports circular economy opportunities, and promotes collaboration among OECS member states.

### C. Purpose of the Waste Characterization Study

Accurate data on the composition and volume of waste is essential for informed planning and management. The last waste characterization study in Grenada was completed as part of the National Waste Management Strategy in 2021, based on fieldwork carried out in 2020. Since then, more recent operational data shows an increase in overall waste quantities at the Perseverance Landfill, supported by improved data systems.

The present study will update and expand this information, with particular attention to the organic fraction of waste and recyclable materials. It will also consider seasonal variations, including differences between the high and low tourist seasons, to provide a more complete picture of waste generation patterns.

This work is being developed in collaboration with the GSWMA and the Recycle Organics Program, implemented by the Center for Clean Air Policy (CCAP) in partnership with ImplementaSur. The Recycle Organics Program in SIDS is undertaken with financial support of the Government of Canada through the Federal Department of Environment and Climate Change Canada (ECCC). The results will help shape strategies for waste

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<sup>1</sup> <https://climateresilience.gov.gd>

diversion, resource recovery, and long-term planning, and will also serve as a reference for similar initiatives across the region.

## **II. Methodology**

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### **A. Objective and Scope of the Characterization Exercise**

#### **i. Objective**

The main objective of the solid waste characterization exercise in Grenada is to provide an updated and detailed overview of the composition of MSW at the Perseverance Landfill, supporting the GSWMA in evidence-based planning and policy development. A key focus of the study is on the organic fraction of the waste stream, which represents nearly 31% of the total waste, and its relevance to ongoing methane reduction initiatives under the Recycle Organics program.

#### **ii. Study Area**

The Grenada Solid Waste Management Authority collects waste from various commercial and residential areas across the island, which is divided into six parishes—St. George, St. John, St. Mark, St. Patrick, St. Andrew, and St. David—and the two dependencies of Carriacou and Petite Martinique. All collected waste is disposed of at the Perseverance Landfill, the sole waste disposal site for the main island, while the Dumfries controlled dump serves the smaller islands. The Perseverance Landfill accepts a wide variety of waste types, including industrial waste from sectors such as light industry, manufacturing, construction, and demolition. It also accepts organic green waste, such as wood and vegetation, along with commercial waste from shops, hotels, restaurants, and garages, which includes materials like metal parts, plastics, and packaging. Household and institutional waste from offices, residential homes, schools, government buildings, correctional facilities, and hospitals (excluding hazardous healthcare waste) is also disposed of here.

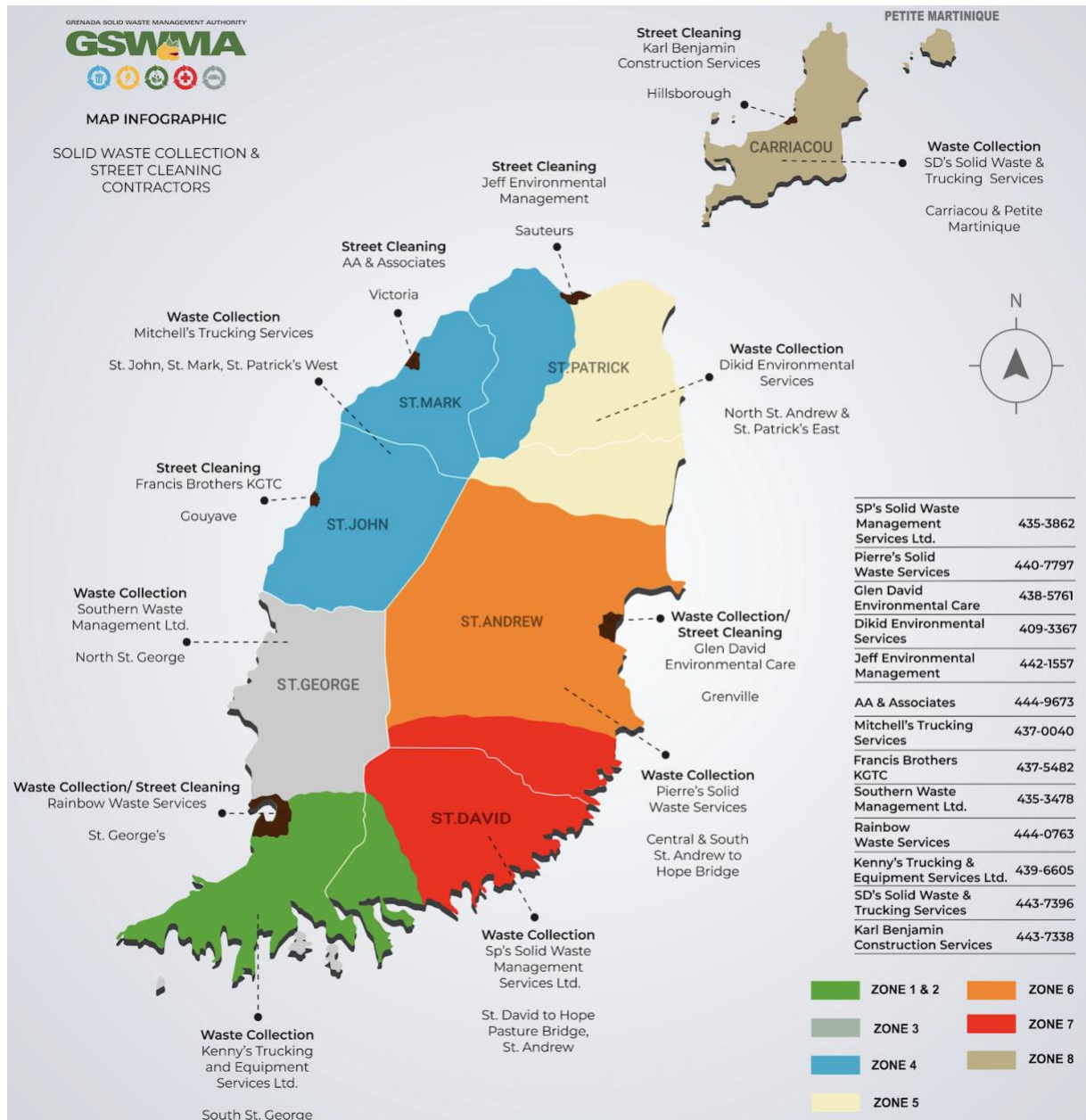


Figure 1: Collection zones for Grenada, Carriacou and Petite Martinique

## B. Procedures for Sampling Process

### i. Standards

The waste characterization campaign planned for Grenada was conducted in strict alignment with recognized European standards to ensure representativeness, reliability, and quality control of the results. The methodology combined technical requirements from standards such as EN 14899, EN 15002, CEN/TR 15310, EN ISO 17025, and the French protocol XP X30-413 for manual sorting of municipal waste.

The overall sampling and sorting process, including the collection of a 500 kg primary sample, quartering, and detailed manual sorting, was structured to meet the highest international benchmarks for waste analysis. Calibration of equipment, documentation,

and operational rigor will also reflect the principles of traceability and reproducibility outlined in these standards.

The table below summarizes how each standard was incorporated into the procedure to guarantee that the results produced was scientifically robust and suitable for supporting waste management planning and infrastructure development in Grenada.

*Table 2: Summary of standard references and their application in the sampling procedure*

Area	European Reference	Procedure Application
Sampling Plan	EN 14899	Defines objectives, confidence level, random sample selection.
Primary and Subsampling	EN 15002, CEN/TR 15310-2	500 kg collection + quartering down to ~120–140 kg sorting sample.
Field Practice	CEN/TR 15310-1, XP X30-413	Sampling from cross-section of vehicle load; oversize item notes.
Equipment Calibration	EN ISO 17025	Scales calibrated; tare and gross weights systematically recorded.
Sorting & Fine Fractions	XP X30-413, CEN/TR 15310-2	Manual sorting by defined fractions; visual assignment for fines.

## ii. Protocol for Sampling

The sampling plan involved the collection and manual sorting of waste samples across two sampling exercises: one in May 2025 and the other in July 2025, coinciding with the Carnival period. Each exercise spanned six days, from Monday to Saturday, and took place at the Perseverance Landfill site.

In accordance with prior research, it was recommended to utilize a sample weight of around 500kg for the study, as this sample size had been found to demonstrate comparable results to substantially larger samples collected from the same waste sources. The selection of 13 primary waste categories for sampling, which were further divided into 46 sub-categories, was suggested by the study. These 13 primary categories were:

1. Paper and Paperboard
2. Cardboard
3. Glass
4. Metal
5. Composites
6. Plastics
7. Textiles
8. Organics
9. Unclassified combustibles
10. Unclassified incombustibles
11. Sanitary Textiles
12. Household Hazardous Waste
13. Fine elements

The sampling method employed involved the examination of the contents within MSW trucks. To ensure precise characterization, a trained team manually sorted each waste

sample into dedicated containers for their respective waste components. The selected trucks were diverted from the tipping area to the designated sampling site. The primary methodological considerations will be as follows:

- The trucks were required to follow their regular routes to ensure representative sampling of waste from the community.
- The target for sorting samples was set at 25 samples, based on a weight range of 500 kg for each truckload, ensuring the sample size was large enough to represent the diverse waste composition and achieve a 95% confidence level with a 10% precision level.

*Table 3: Estimated waste sampling for each zone*

Zone	Recommended Samples	Estimated Waste (kg)	Cumulative Samples	Cumulative Waste (tonnes)
1 – Northern Grenada	4	2.0	4	2.0 t
Zone 2 – North-East Grenada	4	2.0	8	4.0 t
Zone 3 – East Coast	4	2.0	12	6.0 t
Zone 4 – Central Uplands	3	1.5	15	7.5 t
Zone 5 – South-East Urban	4	2.0	19	9.5 t
Zone 6 – South-West Tourism	4	2.0	23	11.5 t
Zone 7 – West Coast	2	1.0	25	12.5 t

The key procedural steps included:

- Discharging the contents of the truck onto a tarped area to prevent contamination and facilitate sorting.
- Randomly selecting containers from the truckload to obtain a sample weight of around 500 kg.
- Codifying each sample and documenting it for further analysis using the Waste Characterization Form (see Figure 2 below).

GRENADA SOLID WASTE CHARACTERIZATION SUMMARY FORM					
Location:			Date:		
Truck ID Number:			Waste Originating From:		
Time Started:			Time Finished:		
Weather Conditions:			Other Observations:		
Form completed by:			Signature:		
#	MATERIAL TYPE	Gross (kg)	Tare (kg)	Net (kg)	% of Total

<b>Paper and Paperboard</b>					
1	Paper packaging				
2	Newspapers, magazines, and journals				
3	Advertising flyers				
4	Office paper				
5	Other paper				
<b>Cardboard</b>					
6	Flat cardboard packaging				
7	Corrugated cardboard packaging				
8	Other cardboard				
<b>Glass</b>					
9	Clear glass packaging				
10	Colored glass packaging				
11	Other glass				
<b>Metal</b>					
12	Ferrous metal packaging				
13	Aluminum packaging				
14	Other ferrous metals				
15	Other metals				
<b>Composites</b>					
16	Liquid food packaging (e.g., Tetra Pak)				
17	Other composite packaging				
18	Small electrical appliances				
19	Electrical cables				
<b>Plastics</b>					
20	Polyolefin films (PE and PP)				
21	PET bottles and containers				
22	Polyolefin bottles and containers				
23	Other plastic packaging				
24	Other plastics				
<b>Textiles</b>					
25	Reusable textiles				
<b>Organics</b>					
26	Food waste (non-edible kitchen scraps)				
27	Unconsumed food products				
28	Other organic (putrescible) waste				
29	Garden waste				
<b>Unclassified combustibles</b>					
30	Wooden packaging				
31	Other combustibles				
<b>Unclassified incombustibles</b>					
32	Incombustible packaging				
33	Other incombustibles				
<b>Sanitary Textiles</b>					
34	Hygiene-related sanitary textiles				
35	Soiled paper-based sanitary waste				

36	Specific diffuse hazardous waste				
37	Fluorescent tubes and energy-saving bulbs				
38	Batteries and accumulators				
39	Sharp healthcare waste				
40	Mineral oils				
41	Printer cartridges				
42	Gas cylinders				
43	Unused medication				
44	Other household hazardous waste				
<b>Fine elements</b>					
45	Fines between 8–20 mm				
46	Fines smaller than 8 mm				

Figure 2: Grenada solid waste characterization summary form used for the both characterization exercises

### iii. Equipment Required

The following equipment was provided to successfully execute the waste characterization exercise:

#### Sampling & Sorting Equipment

- ▶ 2 Scales
- ▶ 6 Heavy-duty tarps
- ▶ 46 Labelled waste containers (1 per category/sub-category)  
PLUS 5–10 extra containers for overflow, unknowns, or broken ones.
- ▶ 2 Wheelbarrows
- ▶ Sorting table or mobile trommel with 100mm and 20mm screens  
(Optional: 8mm screen if fine sorting is required.)
- ▶ Screening bins to collect oversize and undersize materials during screening.
- ▶ 1 Rakes
- ▶ 1 Brooms
- ▶ 1 Cutters/utility knives
- ▶ 2 Strong magnets (for ferrous metals)

#### Safety and Comfort Equipment

- ▶ 1 Large canopy (shelter) for sun/rain protection over the sorting area.
- ▶ 10 Traffic cones to define safe perimeter around the sorting site.
- ▶ PPE for all staff:
  - Heavy-duty rubber gloves
  - Dust masks or P2 respirators
  - Safety goggles
  - Rubber boots
  - Hard hats (optional, but good if heavy equipment nearby)
- ▶ 1 Large Class A First Aid Kit
- ▶ Hand soap, disinfectant gel, cleaning wipes

- ▶ Drinking water supply and lunch boxes (daily for all staff)

### **Data Collection Materials**

- ▶ Data recording sheets (for weights, notes, weather, observations)
- ▶ Clipboards + pens + markers (waterproof if possible)
- ▶ Adhesive tape or plastic ties (to label containers if needed)
- ▶ Laptop and/or calculator for real-time checking of weighings
- ▶ Pre-printed category labels for the containers and sorting stations.

#### **iv. Sampling Area**

The waste characterization activities were conducted in alignment with European standards (notably Standard X30-413), to the extent permitted by local conditions and available infrastructure, in order to ensure safety, quality assurance, and methodological rigor:

### **Sampling and Sorting Area**

A designated area was utilized, featuring a chipped stone and earth surface covered with tarps, rather than a concrete platform. This setup was adequately sized to accommodate the unloading of a 500 kg waste sample and ensured sufficient stability for sampling and sorting activities. The location was positioned near the waste disposal facility to enable the smooth transfer of sorted and residual materials.

### **Shelter and Protection**

A small shelter was available on-site to provide shade and limited protection from the rain; however, the main sampling area where the waste was handled was not covered.

### **Area Demarcation and Safety Measures**

The site was clearly marked using high-visibility signage, barrier tape, and traffic cones to prevent unauthorized access and ensure a secure working environment for the sampling and sorting teams.

### **Preparation of the Working Surface**

Heavy-duty tarpaulins was installed on the concrete floor to prevent sample contamination and to facilitate cleaning operations after sorting activities.

### **Operational Setup:**

The layout allowed sufficient space for:

- ▶ Screening operations (e.g., trommel or manual sieving tables)
- ▶ Central sorting tables for manual separation by trained personnel
- ▶ Distribution of labelled collection containers around the sorting area
- ▶ Placement of weighing equipment, tables, and chairs for data recording

### **Utilities and Facilities**

All necessary facilities was made available to the team, including:

- ▶ Sanitary facilities (toilets, washbasins)
- ▶ Changing rooms or equivalent sheltered areas for personal protective equipment (PPE) management

### **Post-Sorting Waste Management**

Provisions was made for the temporary storage and subsequent removal of sorted waste fractions and residuals after the characterization activities.

### **v. Sampling Process**

The waste characterization exercise followed the methodology outlined in European Standard X30-413, with adaptations to maintain methodological rigor and sample representativeness. The following steps was implemented:

#### **Labelling and Setup:**

Forty-six (46) waste storage containers, corresponding to the selected waste categories and sub-categories, was labelled and positioned around the perimeter of the sorting area. Their placement was aligned with the categories identified in the Solid Waste Characterization Summary Form.

#### **Weighing and Calibration:**

The tare weight of each storage container was recorded prior to use and periodically verified. A hand scale was used for better precision. The accuracy of the scale was checked regularly using a certified reference weight to ensure precise measurements throughout the exercise.

#### **Sampling Procedure:**

Waste samples was randomly selected from incoming waste collection vehicles, ensuring that no selection bias (such as bag appearance, color, or cleanliness) affects sample integrity. The sampling process consisted of having the collection trucks discharge their waste loads, from which approximately 500 kg of material was visually estimated and selected, as no large-scale weighing equipment was available on-site. Waste loads were chosen at random, and the selection process followed the principles outlined in the relevant standard, using buckets or equivalent means to extract representative samples. The objective was to constitute an initial gross sample of approximately 500 kg.

#### **Documentation:**

All relevant information — including the date, time, vehicle identification, waste origin, weather conditions, and operator details — was recorded systematically on the Solid Waste Characterization Summary Form.

#### **Homogenization and Quartering:**

From the 500 kg sample a representative sub-sample of approximately 120 kg was extracted.

#### **Pre-sorting and Emptying Containers:**

All containers (e.g., capped jars, paper bags, plastic bags) within the waste sample was opened and emptied to ensure that their contents are correctly integrated into the sorting process.

#### **Sorting by Material Type:**

Waste materials were sorted manually by trained personnel into the appropriate containers according to the 46 identified waste types. Composite items were separated into their constituent materials whenever practical; if impractical, items were classified as composites.

#### **Recording and Weighing:**

Each full container's gross weight was recorded, and net weights (after tare deduction) was calculated for each waste category and sub-category.

#### **Post-Sorting Management:**

Upon completion of the characterization, sorted waste materials were appropriately stored and transported to designated disposal or recovery facilities, following local environmental and occupational health regulations.

## **C. Procedures for the Sorting Process**

### **i. Protocol for Sorting**

#### **Preparation of Sorting Area**

- ▶ A flat, horizontal, stable, and clean surface was secured for unloading the sample.
- ▶ The surface was covered with a tarp to prevent contamination.

#### **Weighing Equipment and Calibration**

- ▶ A hand scale that was calibrated, verified, and periodically recalibrated in accordance with EN ISO 17025 was utilised.
- ▶ The scale's accuracy was checked using certified reference weights before use.
- ▶ All empty storage containers were weighed, and tare weights recorded.

#### **Sampling Design and Target Sample Size**

- ▶ The sampling plan targeted a 95% confidence level with  $\pm 10\%$  precision.
- ▶ One primary sample of approximately 500 kg were collected per selected vehicle load, to ensure sufficient material for representative sub-sampling.

- ▶ A total of 45 samples were collected during the sampling campaign, with about 1-4 samples per day across each six-day period.
- ▶ Vehicle selection occurred to be representative of each zone in Grenada

### **Sample Collection from Vehicles**

- ▶ The selected vehicle were directed to discharge its load in a single, contiguous pile on the prepared clean surface.
- ▶ Necessary vehicle and load information (origin, type, collection time) were recorded using standard sampling forms.

### **Homogenization and Quartering**

- ▶ One quarter (~120–130 kg) was randomly selected as the sorting sample.
- ▶ If oversized items (e.g., water heaters) was present, they were separated, weighed individually if possible, and noted on data sheets.

### **Manual Sorting of the Sorting Sample**

- ▶ Storage containers labelled according to the European Waste Catalogue (EWC) fractions were positioned around the sample.
- ▶ The waste material was manually sorted into pre-defined categories, ensuring all waste items, including contents of containers and plastic bags, are opened and emptied during sorting.

### **Weighing and Recording**

- ▶ Net weights of the storage containers (waste without container) were recorded immediately after sorting.
- ▶ If moisture affects container weight, the containers were emptied and reweighed to correct the tare weight.
- ▶ All weights and observations were documented on standardized sorting data sheets.

### **Site Clean-Up**

- ▶ After completion, the sorting area and discharge surface was cleaned of all waste materials.
- ▶ Waste from sorting activities was disposed of or handled in accordance with environmental regulations.

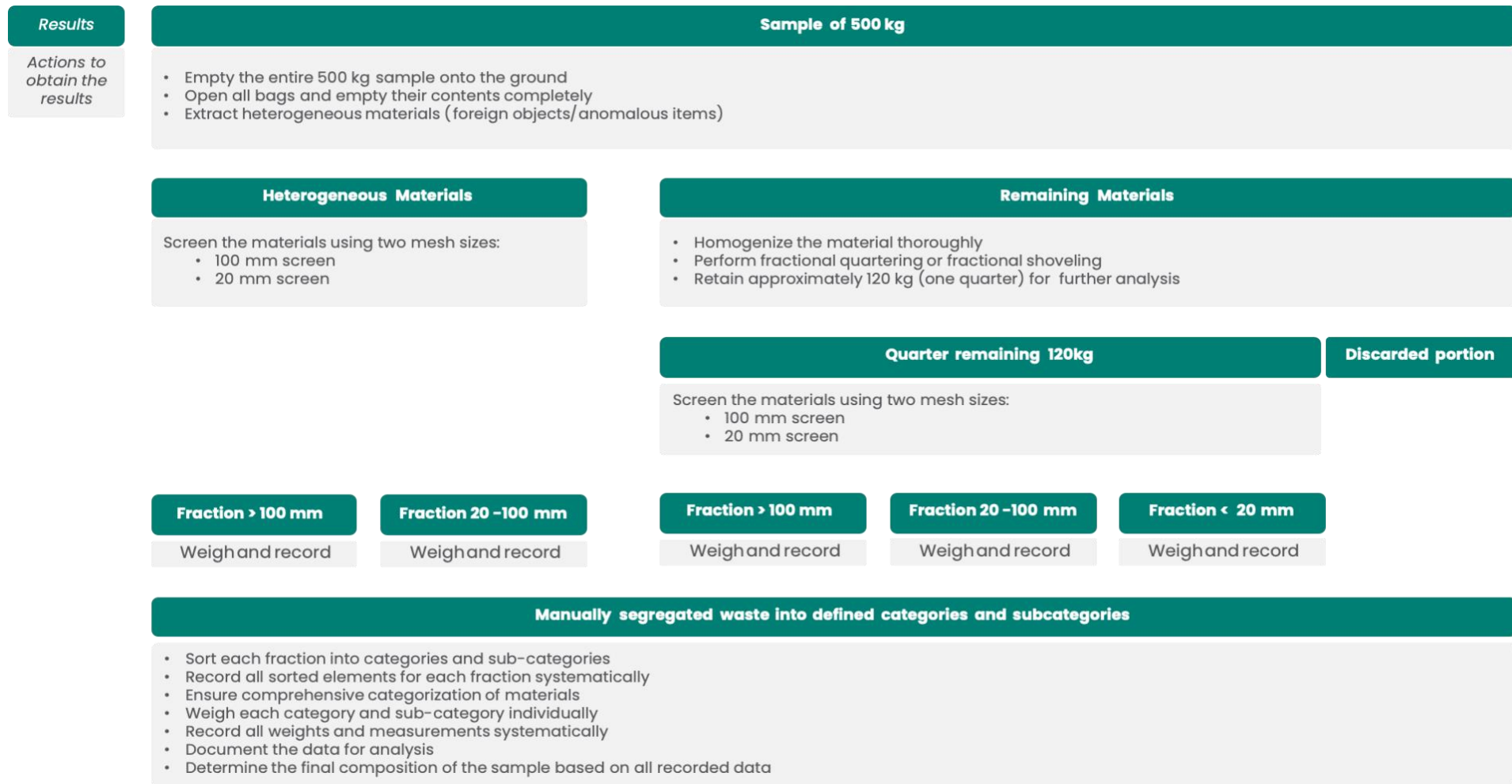


Figure 3: Waste sorting process according to standards X30-408 and X30-466

## D. Procedures for Safety and Security

The Health and Safety Officer at the Landfill Site was responsible for ensuring adherence to safety and security protocols. Given the health and safety hazards associated with handling solid waste management, specific health and safety precautions was implemented to minimize the risks involved.

To ensure the health and safety of the sampling and sorting teams, PPE was provided, along with training prior to the sampling and sorting processes. The PPE included,;

- N95 dust masks
- Safety glasses to prevent eye damage from projectiles
- Safety reflective vests when operating around vehicles
- Safety gloves to protect against puncture wounds from sharp objects in the waste stream

The team was made aware of the potential hazards associated with different waste components, including airborne materials from glass, metal, and plastic containers, as well as sharp objects such as nails, razor blades, hypodermic needles, and pieces of glass. Supervisory staff enforced adherence to health and safety measures, including the use of PPE, and monitored and minimized risks such as heat stress, dehydration, and fatigue by providing drinking water, food, shade, and regular rest breaks. Hygiene practices was also emphasized, including access to water, soap, and disinfectant for rest breaks, before eating, and at the end of each working day.

### III. Implementation

#### A. Fieldwork Challenges

##### **Weather impact on the consistency of waste samples**

During the first characterization exercise, certain samples contained both wet and dry fractions, which created inconsistencies in the recorded weights. This limitation was addressed by systematically noting the presence of wet waste on the sample sheets to ensure accuracy in the data collection process.

##### **Scheduling constraints with collection operations**

Another major challenge was the difficulty in accessing the collection company's truck schedule in advance, which limited the ability to plan sampling activities effectively. Collection trucks generally operated in the morning and ceased activity around 2 p.m., which meant that in the first days of the first characterization exercise only a small number of samples could be collected due to the absence of afternoon operations. Initially, the approach consisted of requesting a sample from one truck, completing its analysis, and only then requesting another, which reduced efficiency. To address this, the working space was reorganized by dividing the characterization space into three distinct sections. This reconfiguration allowed up to three samples to be received and prepared simultaneously, while still analysing them sequentially to maintain accuracy.



Figure 4: Reorganization of the sorting area into three zones for waste samples

##### **Safeguards to preserve sample integrity**

Particular care was required to avoid the inadvertent mixing of drinking water bottles with waste samples, particularly during collaborative work with the waste authorities,

Resource Recovery Technicians<sup>2</sup> (RRTs) and Unite Caribbean personnel. These safeguards were essential to maintaining the integrity of the samples, ensuring that the characterization remained representative of actual waste streams and free from contamination by unrelated items.

### **Challenges in appropriation of European standard characterization**

At the outset of the characterization exercise, both RRT and GSWMA staff faced some challenges in appropriating the level of detail required by the European standard, which involved 46 distinct categories. This was more detailed than the characterization systems they had previously applied in Recycle OECS characterization exercises. As a result, there was some initial difficulty in distinguishing certain material types, particularly between PPE, HDPE, and PET plastics, between coagulated and flat cardboard, as well as between iron and aluminium fractions. In this early stage, additional verification and closer supervision of both the characterization and weighing processes were required to ensure consistency. With continued practice, however, staff progressively became more confident with the methodology, and the accuracy of identification improved.

### **Limitations in sampling and weighing procedures**

Obtaining a representative 500 kg collection sample and subsequently reducing it through quartering to a sorting sample of approximately 120–140 kg proved difficult to apply in practice, primarily because the characterization site was not equipped with materials adapted to weigh such quantities. As a result, the first samples were somewhat approximative. With practice, however, the team developed a clearer understanding of how the sample size should be represented, which improved both consistency and reliability during the exercise.

In addition, certain items such as individual batteries, light bulbs, or medical needles were too light to be measured accurately with the weighing equipment available on site. The first scale was soon replaced with a digital model, which provided greater precision, though still not sufficient for extremely lightweight materials. In these cases, the items were recorded by count rather than by weight, ensuring that their presence was nevertheless reflected in the dataset.

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<sup>2</sup> The terminology 'Resource Recovery Technician' is used here instead of waste pickers, in recognition of the technical skills involved in waste recovery operations, and aligns with the development objective of formalising and professionalising recovery roles.



*Figure 5: Waste weighing equipment: waste scale for items above 1 kg on the left, and precision scale for items under 1 kg (up to 200 g)*

## **B. Training Programme**

The objective of the training programme was to build the capacity of GSWMA staff and local contractors and specifically to:

- Understand the importance and value of waste characterization studies
- Share knowledge of the processes and procedures required to deliver waste characterizations
- Build awareness of the history of waste characterizations in Grenada
- Introduce the tools necessary for delivering waste characterizations.

The training component of the project was designed to capitalize on the learnings from the first waste characterization exercise, ensuring that the training programme would be tailored to the needs of the participants. During the first waste characterization study, the project team provided instruction to the GSWMA staff and RRTs and observed how they implemented the processes. Following the completion of the first study, these learnings were taken into consideration when designing the training programme which consisted of both a theoretical session and a practical session.

## i. Theoretical Training



Figure 6: Theoretical training session participants

The theoretical training session took place on Monday 28<sup>th</sup> July 2025 from 09:00 – 12:00 at the National Athletics Stadium with 26 persons attending including GSWMA staff, RRTs, and private waste collection contractors. The full list of participants can be found in Appendix A. The training session incorporated interactive elements using the online tool Mentimeter to engage participants and gain an understanding of their confidence and existing knowledge. At the beginning of the session, there was an average confidence score of 2.5 out of 5 regarding knowledge of waste characterization studies indicating, most persons in the room were starting with a basic understanding or even no knowledge at all.

How familiar are you with waste characterization studies

10

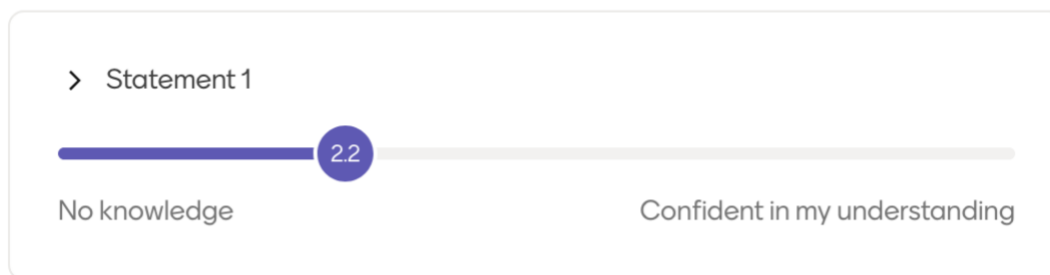


Figure 7: Mentimeter results demonstrating existing knowledge of waste characterization studies among training participants

Before, sharing information about why waste characterizations are important, the project team asked the training participants as to what their existing impressions may be

regarding the topic. The results of this question can be seen in the Mentimeter word cloud below.

## Why do you think waste characterizations are important?



*Figure 8: Mentimeter word cloud on why waste characterizations are important*

The training then proceeded to cover key topics including:

- Why are waste characterizations important
- Waste characterization methods
- Sampling procedures
- Required equipment
- Previous waste characterization exercises

By the end of the theoretical training, it was clear that participants were feeling more confident and this was reflected in the responses to the feedback questions at the end of the session. However, participants were not yet fully confident to deliver waste characterizations themselves which is understandable given many of the participants had not yet participated or witnessed putting the theoretical knowledge into practice.

Please indicate on the scales to what extent you agree with the statements

8

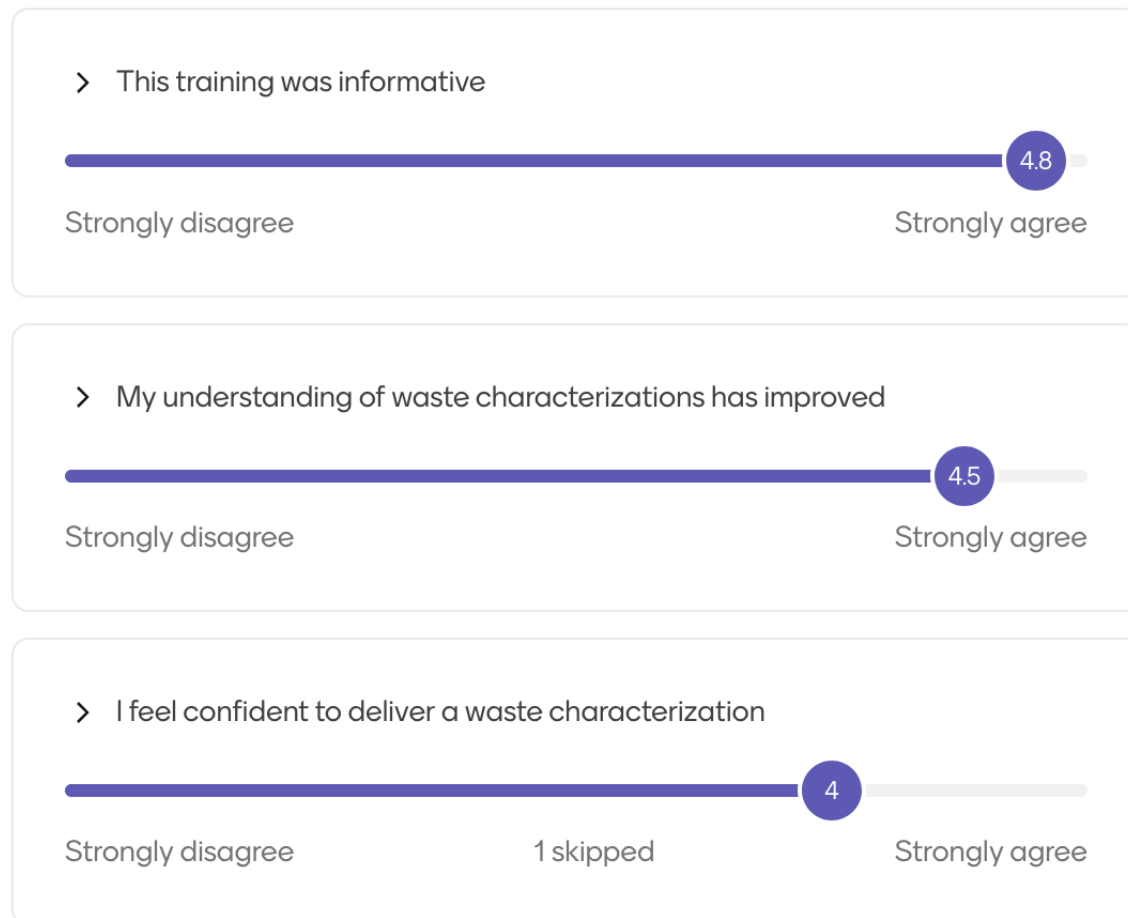


Figure 9: Mentimeter feedback on theoretical training session

## ii. Practical Training

A session for the participants to see the theoretical knowledge put into practice was organized for the afternoon of Monday 28<sup>th</sup> July. However, the site was not prepared in time to demonstrate the practical elements and it was rescheduled for the morning of Wednesday 30<sup>th</sup> July at the Perseverance landfill site where the characterization exercise was taking place. Despite this change of date, there was still good attendance with 12 representatives from private waste collection contractors attending the training. This was an increase from the 10 representatives who attended the theoretical training.

The practical training comprised of an overview of the items discussed during the theoretical session for those that were not in attendance and while the group waited for a truck to arrive. Once the first collection truck of the day arrived at the site, the training participants were walked through the various steps of the process to witness how the waste is unloaded, separated, sorted, weighed and recorded. The participants were

invited to ask questions and to stay as long as they liked to continue observing the waste characterization exercise.



*Figure 10: Practical training session at Perseverance Landfill*

## IV. Waste Characterization in Grenada – 2025 Exercise

### A. Caribbean Waste Context of Grenada

#### i. Grenada’s Socio-Economic Positioning

Grenada is classified by the World Bank as an upper-middle-income country, based on its gross national income (GNI) per capita, which falls between USD 4,466 and USD 13,845. This positioning reflects the country’s relatively strong performance compared to many other small island developing states, supported largely by its tourism sector, education services, and remittances. While Grenada has achieved higher levels of income and service coverage than lower-income peers, it remains vulnerable to external shocks, natural disasters, and import dependency, which limit its capacity to fully match the infrastructure and institutional maturity of high-income economies.

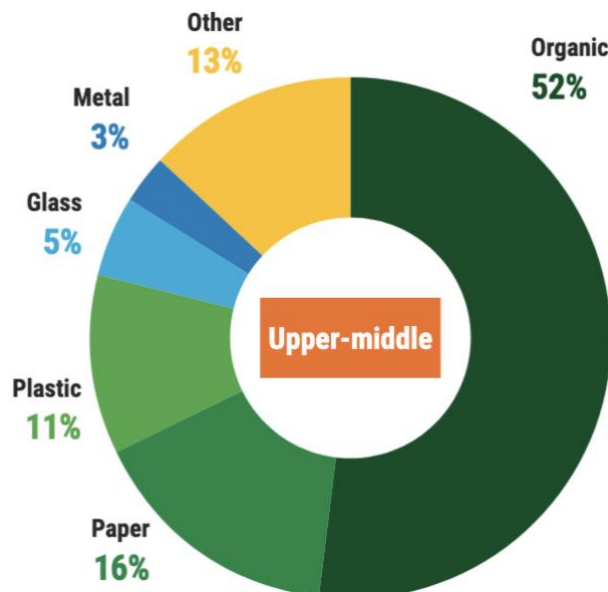


Figure 11: Municipal solid waste composition in upper-middle-income countries

From a waste management perspective, Grenada’s upper-middle income status is significant. The Waste Management Outlook for Latin America and the Caribbean (UNEP) highlights that countries in this income group typically generate more waste per capita and face more complex waste streams, with higher proportions of plastics, composites, and packaging materials, compared to the organic-dominant waste profiles of lower-income countries. At the same time, while waste collection coverage is generally strong, treatment, recycling, and circular economy systems remain underdeveloped compared to high-income contexts.

## ii. GSWMA Collection Zones

The zonal analysis presented in this report follows the official collection zones used by the GSWMA. These zones reflect the structure of waste collection services across the island and its dependencies, ensuring that the results are directly comparable with operational realities.

- ▶ Zone 1 & 2 – St. George’s urban core and immediate surroundings (densely populated residential and commercial catchments served by daily collection).
- ▶ Zone 3 – Southern Corridor (Grand Anse, Calliste, Frequente, Morne Rouge) – the island’s main tourism, hospitality, and retail hub.
- ▶ Zone 4 – Western Corridor (St. John and St. Mark) – semi-urban and agricultural collection areas with mixed residential growth.
- ▶ Zone 5 – St. David’s parish – primarily rural and agricultural, with scattered settlements and lower collection density.
- ▶ Zone 6 – St. Andrew’s parish – Grenville and its hinterland, representing the largest rural collection area.
- ▶ Zone 7 – Northern Grenada (St. Patrick, Carriacou, Petite Martinique) – low-density rural and outlying islands, where collection is more challenging due to distance and transport logistics.

## B. Waste Characterization Exercise 1

The first waste characterization exercise was conducted between the 5th and the 10th May 2025. Over the course of six days, 20 samples were analysed out of the targeted 25, representing a total of 3,081.5 kg of waste material. This was slightly above the intended 3,000 kg.

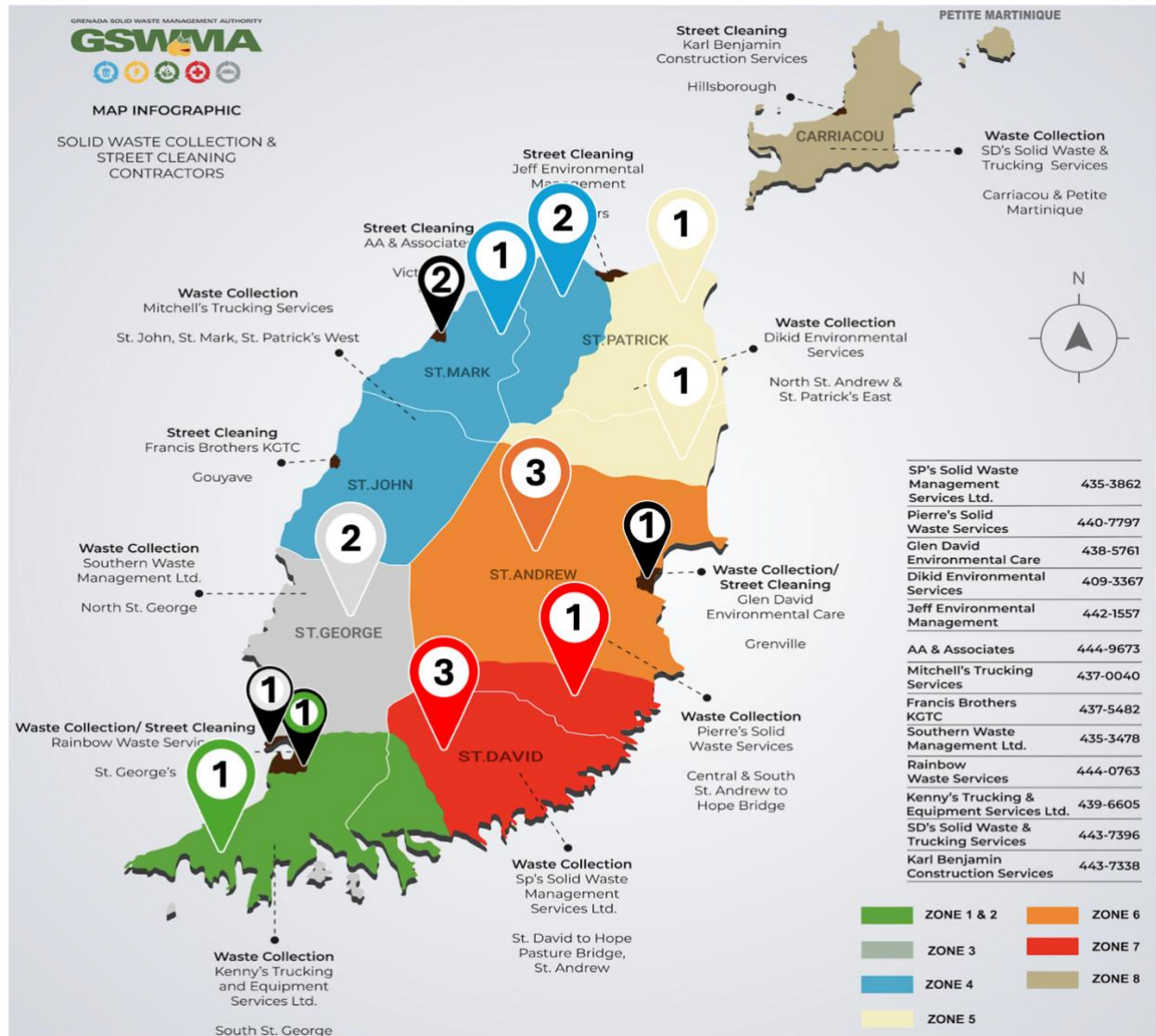


Figure 12: Waste characterization sample results by zone

i. Overall Solid Waste

Table 4: Waste characterization exercise 1 results

Material Type	Total (kg)	Total%
Paper and paperboard	35.00	1.14%
Cardboard	344.70	11.19%
Glass	135.30	4.39%
Metal	201.30	6.53%
Composites	67.05	2.18%
Plastics	741.90	24.08%
Textiles	240.70	7.81%
Organics	1,057.70	34.33%

<b>Unclassified combustibles</b>	<b>40.70</b>	1.32%
<b>Unclassified incombustibles</b>	<b>0.70</b>	0.02%
<b>Sanitary textiles</b>	<b>207.60</b>	6.74%
<b>Hazardous household waste</b>	<b>8.40</b>	0.27%
<b>Fine elements</b>	<b>0.00</b>	0,00%
<b>Total</b>	<b>3,081.05</b>	100.00%

The analysis found that the waste stream in Grenada is dominated by organic waste (34.3%), followed by plastics (24.1%) and cardboard (11.2%). Secondary fractions included metals (6.5%) and sanitary textiles (6.7%), with smaller proportions of composites, textiles, glass, and hazardous materials.

When compared with the average MSW profile of upper-middle-income Caribbean countries, the results for Grenada first exercise show notable differences. In particular, plastics and metals are almost double the regional average, while paper and organics are significantly lower. "Other" categories – including cardboard, textiles, sanitary textiles, composites, and hazardous waste – are also substantially higher in Grenada, accounting for nearly 30% of the total compared to 13% in the regional benchmark.

Table 5: Waste characterization exercise 1 comparison

Material Type	Total (kg)	Total%	Grenada vs Caribbean	Upper-middle Caribbean average of MSW
<b>Metal</b>	<b>201.30</b>	6.53%	↑	3%
<b>Glass</b>	<b>135.30</b>	4.39%	→	5%
<b>Plastics</b>	<b>741.90</b>	24.08%	↑	11%
<b>Paper and paperboard</b>	<b>35.00</b>	1.14%	↓	16%
<b>Organics</b>	<b>1,057.70</b>	34.33%	↓	52%
<b>Other</b> (Cardboard, composites, textiles, unclassified combustible waste / unclassified incombustible waste, sanitary textiles, hazardous household waste)	<b>909.85</b>	29.53%	↑	13%
<b>TOTAL</b>	<b>3,081.05</b>	<b>100%</b>		<b>100%</b>

The geographic distribution of waste composition revealed distinct patterns. Plastics were most concentrated in Zone 4 (27%), followed by Zones 6 (St. John) and 7 (St. David) at ~16–17%. Organic waste peaked in Zones 1 & 2 (St. George's, 21%) and Zone 3 (St. Andrew,

25%). Cardboard and glass showed strong clustering in Zones 3 and 4 (St. Andrew and St. Patrick), together accounting for nearly half of their total weights. Textiles and sanitary textiles were more evenly distributed but had notable peaks in Zone 3 (St. Andrew: 35% textiles; 25% sanitary textiles). Hazardous waste was relatively rare, though Zone 3 (St. Andrew) contributed 43% of the total.

Overall, Zone 3 (St. Andrew/Grenville) and Zone 4 (St. Patrick) carried the heaviest fractions of most recyclable and combustible categories, while Zones 1 & 2 (St. George's) had the highest concentration of organics.

Table 6: Waste characterization sample results by zone

Zone	Actual number of Samples	Actual weight of Samples
Zone 1	2	456.30
Zone 2	3	498.20
Zone 3	6	882.30
Zone 4	2	272.40
Zone 5	4	513.00
Zone 6	3	458.85
Zone 7		
<b>TOTAL</b>	<b>20</b>	<b>3,081.05</b>
Target	25	3,000.00

## ii. Organic Waste

Organic waste was confirmed as the largest single component of the MSW stream at 34.3%. However, this figure is considerably lower than the regional average of 52%. The lower proportion of organics in Grenada may be explained by household practices such as diverting food scraps for animal feed, as well as the exclusion of certain commercial and industrial sources from this assessment. The results nonetheless highlight the potential for expanded composting or biogas initiatives to reduce the amount of organic material reaching landfill.

Zones 1 and 2, which cover St. George's urban and peri-urban areas, recorded the highest share of organic waste at 21%. Zone 3, corresponding to St. Andrew and the town of Grenville, followed with 18%, while Zone 4 in St. Patrick accounted for 25%. Lower proportions were observed in the more rural Zones 5 to 7 – St. Mark, St. John, and St. David – which together represented about 36% of the total. This distribution indicates that although organic waste is widespread across the island, households in the urban and peri-urban centers of St. George's and St. Andrew generate proportionally higher amounts, reinforcing the idea that food scraps are not consistently diverted from disposal.

Operational data from the Perseverance landfill (Appendix B) provide further context: between the 5th and the 10th May 2025, the facility received 489,250 kg ( $\approx$ 244.6 tons) of

biodegradable waste under material code 200201. This figure underscores the magnitude of organic flows entering the landfill each week. When related to the waste-characterization proportions, it indicates that organics constitute not only the largest fraction by percentage but also one of the most significant contributors by weight to overall landfill inputs.

*Table 7: Green waste registered by GWSMA from 05/05/2025 to 10/05/2025*

<b>GSWMA Zone</b>	<b>Main Collection Areas / Municipalities (Contractor)</b>	<b>Identified Trucks (from tickets)</b>	<b>Estimated Tonnage (tonnes)</b>	<b>Share of Total (%)</b>
Zone 1 & 2	Southern Grenada – Grand Anse, St. George’s Town, St. David (Kenny’s Trucking & Equipment Services Ltd.)	TW378, TR848, TG825, TAZ897	44.3	18%
Zone 3	St. Andrew (Grenville area) – Southern Waste Management Ltd.	TH606, T7912, T4082	37.9	15%
Zone 4	St. George Urban Core – Mitchell’s Trucking Services	SL377, SL119, SL58	66.9	27%
Zone 5	St. John and St. Mark – Jeff Environmental Management Ltd.	SL208, SL231, SL271	41.0	17%
Zone 6	St. Andrew and St. Patrick – Pierre’s Solid Waste Services	SL390, SL444, TS533	32.4	13%
Zone 7	St. David – Glen David Environmental Care	SL184, TB773, T8127	22.2	9%
<b>Total</b>	–	–	<b>244.6 t</b>	<b>100%</b>

Table 8: Waste characterization exercise 1 results by zone

Material Type	Total (kg)	Total%	Zone 1 & 2	%	Zone 3	%	Zone 4	%	Zone 5	%	Zone 6	%	Zone 7	%
Paper and paperboard	35.0	2.5%	4.1	11.7%	1.1	3.1%	21.5	61.4%	2.0	5.7%	0.0	0.0%	6.3	18.0%
Cardboard	344.7	14.3%	50.3	14.6%	49.9	14.5%	83.9	24.3%	38.5	11.2%	60.4	17.5%	61.7	17.9%
Glass	135.3	4.2%	15.1	11.2%	15.9	11.8%	63.4	46.9%	9.8	7.2%	14.9	11.0%	16.2	12.0%
Metal	201.3	5.7%	15.1	7.5%	21.3	10.6%	78.2	38.8%	15.7	7.8%	40.4	20.1%	30.6	15.2%
Plastics	741.9	22.1%	103.4	13.9%	122.7	16.5%	200.1	27.0%	62.5	8.4%	131.1	17.7%	122.1	16.5%
<b>Recyclables</b>	<b>1,458.2</b>	<b>47.3%</b>	<b>188.0</b>	<b>12.9%</b>	<b>210.9</b>	<b>14.5%</b>	<b>447.1</b>	<b>30.7%</b>	<b>128.5</b>	<b>8.8%</b>	<b>246.8</b>	<b>16.9%</b>	<b>236.9</b>	<b>16.2%</b>
<b>Organics</b>	<b>1,057.7</b>	<b>27.6%</b>	<b>221.0</b>	<b>20.9%</b>	<b>187.5</b>	<b>17.7%</b>	<b>269.4</b>	<b>25.5%</b>	<b>96.1</b>	<b>9.1%</b>	<b>159.0</b>	<b>15.0%</b>	<b>124.7</b>	<b>11.8%</b>
Composites	67.1	1.5%	2.6	3.9%	37.9	56.5%	6.6	9.8%	2.0	3.0%	8.9	13.3%	9.1	13.5%
Textiles	240.7	16.0%	27.7	11.5%	28.0	11.6%	83.5	34.7%	29.4	12.2%	46.1	19.2%	26.0	10.8%
Unclassified combustibles	40.7	0.8%	5.9	14.5%	4.2	10.3%	23.4	57.5%	0.0	0.0%	0.0	0.0%	7.2	17.7%
Unclassified incombustibles	0.7	0.3%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.7	100.0%
Sanitary textiles	207.6	5.1%	10.4	5.0%	26.1	12.6%	52.2	25.1%	16.1	7.8%	49.9	24.0%	52.9	25.5%
Hazardous household waste	8.4	0.0%	0.7	8.3%	3.6	42.9%	0.1	1.2%	0.3	3.6%	2.3	27.4%	1.4	16.7%
Fine elements	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
Other	565.2	18.3%	644.3	20.9%	709.1	23.0%	1329.4	43.1%	400.9	13.0%	759.8	24.7%	695.8	22.6%
Total	3,081.1	100.0%												

### iii. Recyclable Waste

Recyclables, including paper and paperboard, cardboard, glass, metal and plastics, represent a significant fraction of Grenada's waste stream. Together, metals, plastics, cardboard, and glass account for more than 47% of total waste, underscoring the critical importance of recovery strategies.

Plastics in particular stand out at 24.1%, more than double the regional average of 11%. Cardboard also makes up a relatively high share at 11.2%, reflecting packaging waste linked to imports and retail activity. Metals (6.5%) and glass (4.2%) represent smaller but still meaningful fractions. These findings demonstrate the substantial potential for scaling up recycling and recovery systems if the right infrastructure and market linkages are established.

Even though plastics recycling initiatives have already begun in Grenada, it is essential to sustain and expand these efforts. Ongoing public communication is equally important to shift household habits and ensure consistent participation. Experiences from the OECS model demonstration countries show the importance of designing effective collection systems and engaging communities in behaviour change campaigns.

Recyclables were most concentrated in Zone 4, which accounted for 31%. Plastics were particularly high in Zone 4 reaching almost 27%, with additional significant shares Zone 5 and 6 around 16 to 17% each. Cardboard was more evenly distributed across the island, although Zone 3, 5, and 6 together still represented more than one-third of the total. Glass is mainly represented in Zone 4 with almost 50% of the total glass sampled, confirming this area as a hotspot for recyclable recovery potential.

### iv. Other

The "Other" category includes textiles, sanitary textiles, composites, unclassified fractions (combustibles and incombustibles), hazardous household waste, and fine elements. Together these accounted for roughly 30% of the total waste stream, more than double the regional benchmark of 13%.

- ▶ Textiles: 16% of total, mainly discarded clothing and fabrics.
- ▶ Sanitary textiles: 5%, primarily disposable diapers and hygiene products.
- ▶ Composites: 1.5%, including multilayer packaging.
- ▶ Unclassified combustibles: 0.8%, small but relevant for incineration potential.
- ▶ Hazardous waste: 0.01%, minimal but requiring safe management

Zone 4 was the dominant source of "Other" waste fractions, accounting for 35% of textiles, 25% of sanitary textiles, and 57% of unclassified combustibles. Zones 5 to 7, which include St. Mark, St. John, and St. David, showed higher proportions of sanitary textiles at around 24% to 25% each, a trend likely linked to local demographic patterns. Hazardous waste was most concentrated in St. Andrew with 43% and in St. John with 27%. Composites also

displayed a strong spatial clustering in St. Andrew, where they represented 57% of the total, suggesting both concentrated product consumption and weak separation practices in that zone.

## **C. Waste Characterization Exercise 2**

The second waste characterization exercise was conducted between 28<sup>th</sup> of July and 2<sup>nd</sup> of August 2025, strategically timed to coincide with the peak of Grenada’s carnival season (Spicemas). This allowed for a direct comparison with the first exercise carried out in May, representing “business as usual” conditions. Over the course of six days, the team successfully collected the full set of 25 samples across the island, representing 2,862.4 kg of waste material. While this was slightly below the 3,000 kg target, it provides a robust dataset for seasonal analysis.

The average sample size during this second exercise was 114 kg, compared to 154 kg in the first exercise. Sampling covered all six parishes, although there was a lower collection rate from Zone 6 (St. Andrew parish), with only one sample obtained. By contrast, five samples were collected from most of the other zones.

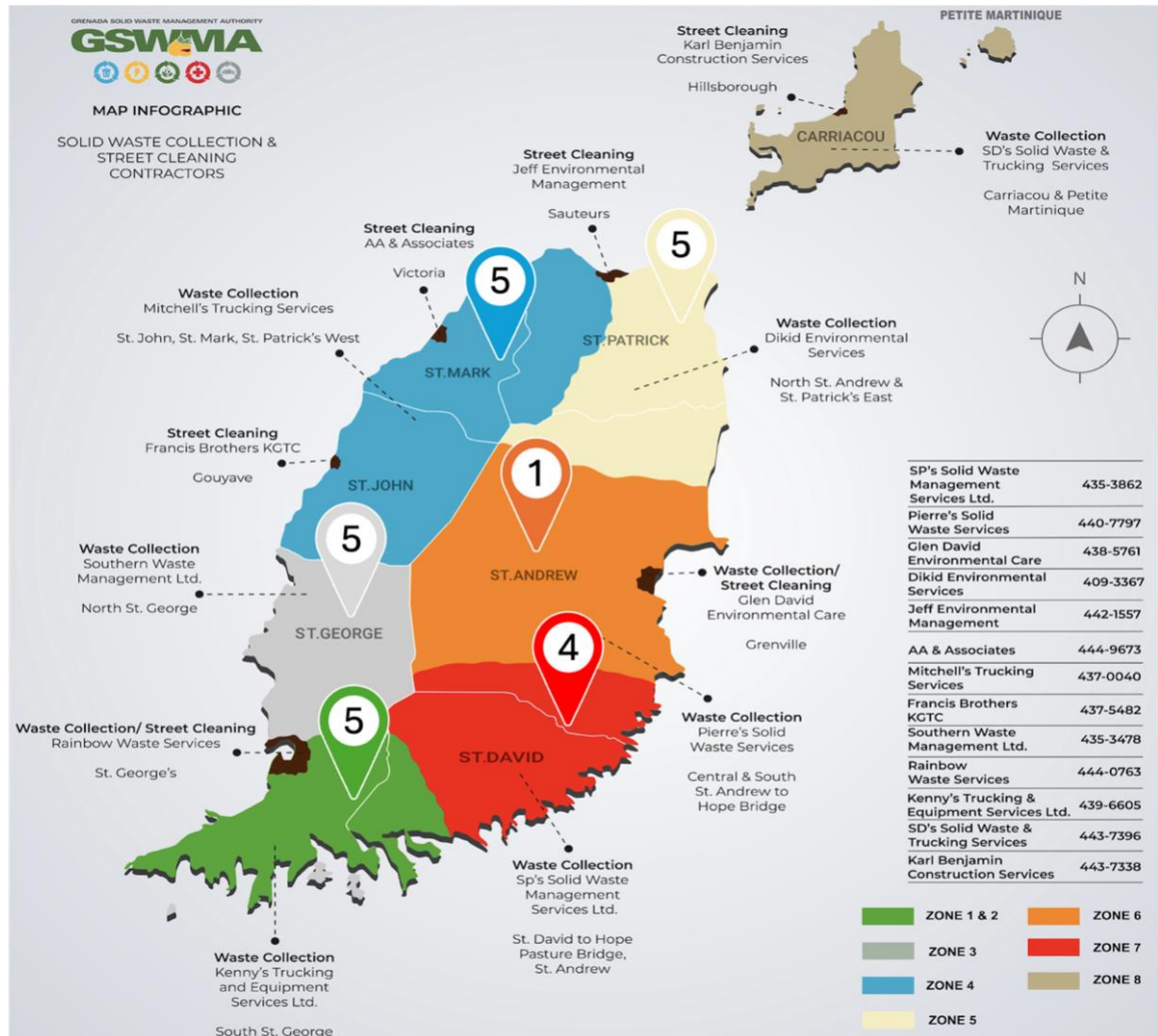


Figure 13: Waste characterization sample results by zone

### i. Overall Solid Waste

The second waste characterization exercise was conducted after several weeks of carnival events in the lead up to the main celebration of Spicemas. This time of the year is also deeper into the rainy season.

The largest change can be seen in the quantity of textiles which doubled from 7.81% to 16% of the waste stream. This is likely due to the carnival period and people changing items in their wardrobe for the range of events to suit the new trends and party themes. In addition, due to the wet weather and the high moisture content of the waste, any textiles in the waste would soak up this moisture making it significantly heavier than if it were dry.

When comparing Grenada to the average MSW profile of upper-middle-income Caribbean countries, the main trends remain consistent. Grenada continues to produce

more metals and plastics, but less paper and organics than regional peers. However, organic waste, at 27.6% of the total, remains a substantial portion of the island’s waste stream.

Table 9: Waste characterization sample results by zone

Zone	Actual number of Samples	Actual weight of Samples
Zone 1	5	594.50
Zone 2	5	576.50
Zone 3	5	599.90
Zone 4	5	564.70
Zone 5	1	129.30
Zone 6	4	397.50
<b>TOTAL</b>	<b>25</b>	<b>2,862.40</b>
<i>Target</i>	25	3,000.00

The geographic distribution of waste composition in Exercise 2 showed notable seasonal variations. Organic waste was particularly high in Zone 3 (St. George dense residential areas), reaching 40%, while in Zones 1 and 2 (southern peri-urban St. George and St. David) it dropped to less than 20%. Zones 4 (St. John) and 6 (St. Andrew rural) also reported relatively lower shares of organics at around 24%. Recyclables were strongest in Zone 7 (St. David, 59%), followed by Zones 4 and 5 (St. John and St. Mark, ~50%), while Zone 3 (St. George) contributed the highest absolute volume. Textiles were highly seasonal and peaked in Zones 1 and 2 (southern St. George’s and St. David), where they made up over 25% of the total waste stream, reflecting carnival-related clothing turnover.

## ii. Organic Waste

Organic waste accounted for 27.6% of the total waste stream in the second exercise, making it the largest fraction of MSW in Grenada. This category includes mainly food scraps and garden residues, much of which continues to be disposed of at the landfill despite the expansion of composting initiatives on the island.

Organic waste composition varied widely across zones. The highest proportion was recorded in Zone 3 (St. George’s city) at 40%, reflecting the dense urban population and limited opportunities for household composting. By contrast, Zones 1 and 2 (southern peri-urban St. George’s and St. David) reported only 20%, a lower figure influenced by greater access to space for backyard composting and the presence of sustainability-focused businesses. Rural parishes showed intermediate levels: Zone 4 (St. John) at 24%, Zone 6 (St. Andrew) at 25%, and Zone 7 (St. David) at 24%. These patterns suggest that composting practices are more common in rural and peri-urban areas, while dense urban households continue to rely more heavily on landfill disposal of organic waste.

The Perseverance landfill weighbridge records show that during the period of the second characterization (28 July – 2 August 2025), a total of 138.2 tons of green waste (Material Code 200201) was received (Table 10: Green waste registered by GWSMA From 28/07/2025 to 02/08/2025).

*Table 10: Green waste registered by GWSMA from 28/07/2025 to 02/08/2025*

<b>GSWMA Zone</b>	<b>Main Collection Areas / Municipalities (Contractor)</b>	<b>Identified Trucks (from tickets)</b>	<b>Estimated Tonnage (tons)</b>	<b>Share of Total Green waste (%)</b>
Zone 1 & 2	Southern Grenada – Grand Anse, St. George’s Town, St. David (Kenny’s Trucking & Equipment Services Ltd.)	TG825, TR848, TY354, T4461	25.6	19%
Zone 3	St. Andrew (Grenville) – Southern Waste Management Ltd.	T7912, TQ124, TH200	22.5	16%
Zone 4	St. George Urban Core – Mitchell’s Trucking Services	SL119, SL58, SL231	44.2	32%
Zone 5	St. John / St. Mark – Jeff Environmental Management Ltd.	TAX826, SL208, SL271	19.1	14%
Zone 6	St. Andrew / St. Patrick – Pierre’s Solid Waste Services	TH848, TRI96, TX731	15.4	11%
Zone 7	St. David – Glen David Environmental Care	TW967, SL58, TAZ949	11.4	8%
<b>Total</b>	—	—	<b>138.2 t</b>	<b>100%</b>

Table 11: Waste characterization exercise 2 details result by zone

Material Type	Total (kg)	Total%	Zone 1 & 2	%	Zone 3	%	Zone 4	%	Zone 5	%	Zone 6	%	Zone 7	%
Paper and paperboard	71.1	2.5%	4.6	0.8%	7.7	1.3%	16.8	2.8%	20.5	3.6%	3.4	2.6%	18.1	4.6%
Cardboard	409.1	14.3%	57.4	9.7%	75.6	13.1%	122.9	20.5%	77.1	13.7%	16.4	12.7%	59.7	15.0%
Glass	119.4	4.2%	16.0	2.7%	22.0	3.8%	9.2	1.5%	29.2	5.2%	0.6	0.5%	42.4	10.7%
Metal	162.9	5.7%	35.3	5.9%	27.1	4.7%	44.1	7.4%	30.9	5.5%	5.1	3.9%	20.4	5.1%
Plastics	633.7	22.1%	160.2	26.9%	109.1	18.9%	111.9	18.7%	126.4	22.4%	30.6	23.7%	95.5	24.0%
<b>Recyclables</b>	<b>1396.2</b>	<b>48.8%</b>	<b>273.5</b>	<b>46.0%</b>	<b>241.5</b>	<b>41.9%</b>	<b>304.9</b>	<b>50.8%</b>	<b>284.1</b>	<b>50.3%</b>	<b>56.1</b>	<b>43.4%</b>	<b>236.1</b>	<b>59.4%</b>
<b>Organics</b>	<b>788.5</b>	<b>27.6%</b>	<b>117.6</b>	<b>19.8%</b>	<b>230.6</b>	<b>40.0%</b>	<b>145.5</b>	<b>24.3%</b>	<b>169.4</b>	<b>30.0%</b>	<b>31.8</b>	<b>24.6%</b>	<b>93.6</b>	<b>23.5%</b>
Composites	41.9	1.5%	19.1	3.2%	6.4	1.1%	2.2	0.4%	4.2	0.7%	0.0	0.0%	10.0	2.5%
Textiles	458.0	16.0%	154.0	25.9%	53.0	9.2%	99.7	16.6%	75.1	13.3%	32.2	24.9%	44.0	11.1%
Unclassified combustibles	23.8	0.8%	3.5	0.6%	1.0	0.2%	19.3	3.2%	0.0	0.0%	0.0	0.0%	0.0	0.0%
Unclassified incombustibles	8.7	0.3%	0.0	0.0%	7.2	1.2%	1.5	0.3%	0.0	0.0%	0.0	0.0%	0.0	0.0%
Sanitary Textiles	145.0	5.1%	26.5	4.5%	36.8	6.4%	26.8	4.5%	31.9	5.6%	9.2	7.1%	13.8	3.5%
Hazardous household waste	0.3	0.0%	0.3	0.1%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
Fine elements	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
Other	677.7	23.7%	203.4	34.2%	104.4	18.1%	149.5	24.9%	111.2	19.7%	41.4	32.0%	67.8	17.1%
Total	2,862.4	100.0%	594.5	100.0%	576.5	100.0%	599.9	100.0%	564.7	100.0%	129.3	100.0%	397.5	100.0%

### iii. Recyclable Waste

The data from the second exercise indicates that 76.3% of the total waste stream is recyclable. This share could rise to nearly 94% if textiles and composite materials were included in the recyclable category, highlighting Grenada's significant untapped recovery potential. These findings provide a strong evidence base for designing recycling schemes and strategically locating collection points across different zones.

Plastics continue to dominate the recyclable fraction, representing 22.1% of the total waste stream. The share was highest in Zones 1 and 2 (southern St. George's and St. David, 26.9%), and lowest in Zone 4 (St. John, 18.7%), with the dense urban population of Zone 3 (St. George's city) recording a similarly low 18.9%. This variation underscores the need for consistent interventions across the island, as plastic waste in Grenada remains significantly above the upper-middle-income Caribbean average of 11%. Sustained communication campaigns and expansion of recycling infrastructure will be critical to reducing the volume of plastics ending up in landfill.

Cardboard was the second-largest recyclable material, making up 14.3% of the waste stream. Seasonal demand linked to carnival festivities likely contributed to this increase, while the wet conditions during the sampling period also made cardboard heavier than under dry conditions. Metals accounted for 5.7% and glass for 4.2%, both relatively small proportions of the recyclable stream. However, despite their lower volumes, these materials generally hold higher market value than plastics and could be used to help offset the costs of plastic recycling.

### iv. Other

The "Other" category – which includes textiles, sanitary textiles, composites, unclassified fractions, and hazardous waste – accounted for 23.7% of the total waste stream in the second exercise. This reflects the strong influence of seasonal factors such as carnival, when clothing and accessories are frequently replaced and discarded.

Textiles made up the largest share within this category at 16%, followed by sanitary textiles at 5.1%. Composites represented 1.5%, while unclassified combustibles and incombustibles accounted for 0.8% and 0.3% respectively. Hazardous waste was negligible, at just 0.01%, though its safe management remains essential to avoid environmental and health risks.

The most pronounced seasonal effect was observed in textiles, which reached 26% of the total waste in Zones 1 and 2 (southern St. George's and St. David). Zone 3 (St. George's city) followed with 9%, while the rural zones ranged between 11 and 17%. Sanitary textiles were more evenly distributed across the island, with slightly higher shares in Zone 6 (St. Andrew rural, 7%). Composites were most visible in Zones 1 and 2 (3.2%), while Zone 4 (St.

John) recorded the highest share of unclassified combustibles at 3.2%. Hazardous waste appeared only in trace amounts, limited to Zones 1 and 2.

The clustering of textile waste in urban and peri-urban areas during the carnival period underlines the importance of targeted collection strategies at peak times of the year, together with public awareness campaigns to encourage reuse and reduce landfill disposal of clothing and costumes.

## V. Analysis of Findings

### A. Perseverance Landfill Waste Composition

#### i. Comparison between Waste Characterization Exercise 1 and 2

The two waste characterization exercises, conducted in May and July–August 2025, together provide a comprehensive overview of Grenada’s MSW profile under both “business-as-usual” and festive-season conditions. While the overall proportions of the main waste categories remained broadly similar, several fractions exhibited significant seasonal variation, reflecting the influence of consumer behaviour, rainfall, and cultural activities such as the annual Spicemas carnival.

Table 12: Waste characterization 2 results in comparison to waste characterization 1 results

Material Type	Exercise 1		Exercise 2		Average	
	Total (kg)	Total%	Total (kg)	Total%	Total (kg)	Total%
<b>Paper and paperboard</b>	<b>35.00</b>	1.14%	<b>71.10</b>	2.48%	<b>53.05</b>	1.81%
<b>Cardboard</b>	<b>344.70</b>	11.19%	<b>409.10</b>	14.29%	<b>376.90</b>	12.74%
<b>Glass</b>	<b>135.30</b>	4.39%	<b>119.40</b>	4.17%	<b>127.35</b>	4.28%
<b>Metal</b>	<b>201.30</b>	6.53%	<b>162.90</b>	5.69%	<b>182.10</b>	6.11%
<b>Composites</b>	<b>67.05</b>	2.18%	<b>41.90</b>	1.46%	<b>54.48</b>	1.82%
<b>Plastics</b>	<b>741.90</b>	24.08%	<b>633.70</b>	22.14%	<b>687.80</b>	23.11%
<b>Textiles</b>	<b>240.70</b>	7.81%	<b>458.00</b>	16.00%	<b>349.35</b>	11.91%
<b>Organics</b>	<b>1,057.70</b>	34.33%	<b>788.50</b>	27.55%	<b>923.10</b>	30.94%
<b>Unclassified combustibles</b>	<b>40.70</b>	1.32%	<b>23.80</b>	0.83%	<b>32.25</b>	1.08%
<b>Unclassified incombustibles</b>	<b>0.70</b>	0.02%	<b>8.70</b>	0.30%	<b>4.70</b>	0.16%
<b>Sanitary textiles</b>	<b>207.60</b>	6.74%	<b>145.00</b>	5.07%	<b>176.30</b>	5.90%
<b>Hazardous household waste</b>	<b>8.40</b>	0.27%	<b>0.30</b>	0.01%	<b>4.35</b>	0.14%
<b>Fine elements</b>	<b>0.00</b>	0.00%	<b>0.00</b>	0.00%	<b>0.00</b>	0.00%
<b>Total</b>	<b>3,081.05</b>	100.00%	<b>2,862.40</b>	100.00%	<b>2,971.73</b>	100.00%

The results from the second characterization are similar to those of the first regarding how it positions Grenada in relation to other upper-middle-income Caribbean countries. The results indicate that Grenada generates more metal and plastic waste than other upper-middle-income countries in the region. However, the island generates less paper and organic waste than the average upper-middle-income country. While that is the case, organic waste still accounts for a substantial portion of the municipal waste stream.

Table 13: Waste characterization results comparison with upper-middle-income countries (UMIC) in the Caribbean

Material Type	Exercise 1		Exercise 2		Average		GD vs Caribbean	Caribbean UMIC MSW average
	Total (kg)	Total %	Total (kg)	Total %	Average (kg)	Average (%)		
<b>Metal</b>	<b>201.30</b>	6.53%	<b>162.90</b>	5.69%	<b>182.10</b>	6.11%	↑	3%
<b>Glass</b>	<b>135.30</b>	4.39%	<b>119.40</b>	4.17%	<b>127.35</b>	4.28%	→	5%
<b>Plastics</b>	<b>741.90</b>	24.08%	<b>633.70</b>	22.14%	<b>687.80</b>	23.11%	↑	11%
<b>Paper and paperboard</b>	<b>35.00</b>	1.14%	<b>71.10</b>	2.48%	<b>53.05</b>	1.81%	↓	16%
<b>Organics</b>	<b>1,057.70</b>	34.33%	<b>788.50</b>	27.55%	<b>788.50</b>	30.94%	↓	52%
<b>Other (Cardboard, composites, textiles, unclassified combustibles, unclassified incombustibles, sanitary textiles, hazardous household waste)</b>	<b>909.85</b>	29.53%	<b>1,086.80</b>	37.96%	<b>998.33</b>	33.75%	↑	13%
<b>TOTAL</b>	<b>3,081.05</b>	<b>100%</b>	<b>2,862.40</b>	<b>100%</b>	<b>2,837.13</b>	<b>100%</b>		<b>100%</b>

## ii. Organic waste

Organic waste remains a major component of Grenada's municipal waste stream, though its proportion declined from 34.3% in May to 27.6% in August 2025, averaging 30.9% across both exercises. This value is significantly below the upper-middle-income Caribbean average of 52%, suggesting that composting, animal feeding, and other diversion practices are already influencing the waste stream.

Table 14: Detailed subcategories of organic waste collected during the 2025 characterization exercises

<b>ORGANICS</b>	<b>WC1 (kg)</b>	<b>WC2 (kg)</b>	<b>TOTAL (kg)</b>
<b>Food waste</b>	488.40	478.90	<b>967.30</b>
<b>Unconsumed food product</b>	111.70	54.80	<b>166.50</b>
<b>Garden Waste</b>	457.60	254.80	<b>712.40</b>

The decline in the share of organic waste between the two exercises may also be linked to seasonal effects. The carnival period, deeper into the rainy season, is associated with increased packaged consumption and less yard or green waste generation.

Operational weighbridge data supports these findings. During the week of the first exercise (5–10 May 2025), 244.6 tons of green waste were received at the Perseverance landfill. During the second exercise (28 July–2 August 2025), the facility received 138.2 tons, showing a seasonal reduction in both tonnage and relative proportion (Table 7 and 10).

Several ongoing composting and organics management initiatives likely contribute to this decline:

- The Caribbean Farmers and Fisherfolk Initiative (CFFI) operates a composting station in St. Mark and provides free training to farmers.
- Recycle Organics launched an island-wide home composting programme in January 2025, engaging households and schools.
- Grenada Grows, a local company, established a composting pilot with the vendors at the St. George's Market in June 2025 to promote compost as a soil amendment.
- Hotel sector initiatives, such as True Blue Bay Resort's biogas digester and composting system, divert food and garden waste from landfill.
- The Sandals Foundation Community Composting Project supports community-level composting in farming communities such as Clozier (St. John) and Telescope (St. Andrew).

### iii. Recyclable

The second largest type of recyclable waste in Grenada is cardboard, representing 14.29% of waste collected during the second exercise. This is slightly higher than the 11.19% of the waste during the first exercise. The increase may be attributed to the increase in packages ordered in preparation for carnival season. As noted previously, this links with the increase in textile waste as people will likely have ordered packages with new outfits, shoes and accessories to prepare for the season's carnival events. In addition, given the wet conditions, the cardboard would be significantly heavier once wet. This is consistent with the fact that paper and paperboard also formed a slightly higher percentage of the waste stream increasing from 1.14% in the first exercise to 2.48%. While the data on glass and metal waste were almost unchanged. Metal represented 6.53% in the first exercise and 5.69% in the second and the smallest portion of the recyclable waste stream, glass represented 4.39% in the first exercise and only 4.17% in the second exercise. Despite the small quantities, these materials still exceed the value of plastic and should be collected to help subsidise the cost of recycling the plastic material.

### iv. Results of Characterization by Zone

The results of the two waste characterization exercises, conducted in May and July–August 2025, combined with biodegradable (green waste) data from the Perseverance landfill, provide a detailed overview of Grenada’s waste composition by collection zone and parish. The analysis reveals significant variation among zones that reflects measurable differences in land use, population concentration, and economic activity.

St. George Parish, which includes the capital and the Grand Anse corridor, remains the island’s most densely populated area ( $\approx 689$  persons/km<sup>2</sup>) and generated the highest total waste volumes in both exercises. The St. Andrew Parish, containing Grenville, follows with an estimated density of 250 persons/km<sup>2</sup> and similarly high waste generation. Rural parishes such as St. John, St. Mark, St. Patrick, and St. David have lower population densities (150–250 persons/km<sup>2</sup>) and produced smaller total quantities but higher relative proportions of organic material.

Table 15: Waste characterization analysis by zone

Zone	Main Parish / Area	Organics (%) (without green waste)	Plastics (%)	Cardboard (%)	Textiles (%)	Sanitary (%)	Analytical Summary
1 & 2	South St. George / St. David (Grand Anse corridor)	<b>18</b>	23.2	10.5	21.0	4.7	Mixed commercial–residential area with a strong tourism presence. High plastic and textile fractions correspond to service-sector consumption. Organic share increased to 28% after integrating 140 t of biodegradable waste recorded at Perseverance.
3	St. Andrew (Grenville town area)	<b>23</b>	18.9	13.1	9.2	6.4	Second-largest population center. Characterization and landfill data confirm the highest organic proportion (33%), largely from residential and market waste.
4	St. George’s City / Urban Core	<b>22</b>	18.6	20.5	16.6	4.5	Most diverse waste stream, driven by markets and commercial establishments. Cardboard and food residues dominate; consistent with 222 t of biodegradable material received at the landfill.
5	St. John / St. Mark	<b>14</b>	22.4	13.7	13.3	5.6	Rural–coastal zone with moderate total volume. Organic fraction verified by direct field sorting (30%) and supported by 120 t of green-waste tonnage in landfill data.
6	St. Patrick / North St. Andrew	<b>10</b>	23.7	12.7	24.9	7.1	Smaller population and sample size (129 kg) but high textile and sanitary components. Organic proportion consistent with 96 t of biodegradable inflow.
7	St. David / Eastern Communities	<b>12</b>	24.0	15.0	11.1	3.5	Moderate organic and packaging content, representative of mixed residential waste. Inclusion of 67 t of green waste raises organics to 27%.
Total	—	<b>31%</b>	<b>23%</b>	<b>13%</b>	<b>12%</b>	<b>6%</b>	Organics remain the dominant category ( $\approx$ 31%) across all parishes. Percentages are mass-weighted averages validated with landfill records (Material Code 200201).

The consolidated results indicate that organic waste—including food scraps, garden residues, and green waste—represents roughly 30% of Grenada’s total MSW. Plastics (≈ 23%) form the second-largest component, followed by cardboard and paper (≈ 14%), textiles (≈ 13%), and sanitary textile waste (≈ 6%).

- **Organics:** Integration of field and landfill data confirms that organics remain the single largest fraction in all zones, with total generation exceeding 2,600 t across both sampling periods. Urban areas (St. George’s and Grenville) produce the highest tonnages, while rural parishes show greater organic proportion by weight.
- **Plastics:** Levels remain above regional averages (Grenada ≈ 22%, Caribbean ≈ 11%), reflecting widespread packaging and limited recycling recovery.
- **Cardboard:** Consistent across zones, with increases observed during the carnival period (Exercise 2) due to shipping, packaging, and moisture effects.
- **Textiles:** A significant and growing component, especially in Zones 1–2 and 6, where proportions exceeded 20%. Seasonal clothing turnover contributed to higher textile loads during the festival period.
- **Sanitary textile waste:** Uniformly present across all parishes (3–7%), representing household hygiene materials (diapers mostly) and disposable products.

#### v. Composition of Waste: Rural vs Urban Comparison

For analytical clarity, collection zones were grouped by settlement type, using the GSWMA’s operational boundaries and parish population densities:

- **Urban zones:** 1 & 2 (South St. George / Grand Anse), 3 (Grenville), and 4 (St. George’s City)
- **Rural zones:** 5 (St. John / St. Mark), 6 (St. Patrick / North St. Andrew), and 7 (St. David / East)

Table 16: Waste composition urban versus rural area

Category	Urban Zones (1–4)	Rural Zones (5–7)	Interpretation
<b>Organics</b>	18–23%	10–14%	Rural parishes contain proportionally more organics but less total tonnage; urban zones account for ≈ 63% of island-wide organic generation.
<b>Plastics</b>	23–25%	20–22%	Packaging and disposable plastics are more prevalent in densely populated and service-oriented areas.
<b>Cardboard &amp; Paper</b>	13–15%	9–10%	Urban commercial activity and imports drive higher cardboard content.
<b>Textiles &amp; Sanitary</b>	17–18%	13–14%	Associated with higher residential and event-related turnover in urban areas.
<b>Other (metals, glass, composites)</b>	≈ 14%	≈ 15%	Comparable across both groups.

Urban zones, including St. George’s, Grand Anse, and Grenville, account for approximately two-thirds of total municipal waste generation in Grenada. This outcome reflects the higher population densities, commercial concentration, and tourism activities located in these areas. In contrast, rural zones contribute the remaining one-third of total waste, characterized by smaller overall quantities but a higher proportion of organic material arising from domestic garden waste and agricultural residues.

When examined together, the results demonstrate that organics, plastics, and cardboard collectively represent about 65% of Grenada’s total MSW by weight. This composition highlights the dominant role of biodegradable and packaging materials across all parishes.

Rural parishes contained proportionally more organic material in relation to their total waste composition, though their overall tonnage remained lower. Urban zones accounted for approximately 63% of island-wide organic waste generation. The relatively lower proportion of organics observed in some rural areas may be attributed to socioeconomic and behavioral factors. In lower-income communities, where fresh produce such as fruits and vegetables is comparatively expensive and therefore consumed in smaller quantities, the amount of organic waste generated tends to be lower. Additionally, rural households are often more inclined to practice on-site waste management, such as backyard composting, feeding organic scraps to animals, or other informal reuse methods, which further reduces the volume of organics entering the municipal waste stream.

The findings provide a strong quantitative foundation for zone-specific waste management planning. In practical terms, this means expanding composting and organic-diversion initiatives across both urban and rural parishes, while prioritizing plastic and packaging reduction in densely populated areas such as St. George’s and Grenville. At the same time, efforts to enhance recycling and material recovery, particularly for cardboard and textiles, should be strengthened to reduce landfill dependency and improve resource efficiency within Grenada’s waste management system.

#### vi. Comparison with previous Waste Characterization Studies

The most recent waste characterization study prior to the 2025 exercises was conducted in 2018 under the Caribbean Development Bank (CDB)–funded Solid Waste Management Improvement Project, implemented in collaboration with the Grenada Solid Waste Management Authority (GSWMA) and the Caribbean Public Health Agency (CARPHA).

Table 17: Grenada waste composition comparison between 2018 and 2025

Waste Category	2018 <sup>3</sup> (%)	2025%	Change (2025–2018)
<b>Organics</b>	28.7	31	+2.3
<b>Plastics</b>	16.5	23	+6.5
<b>Paper &amp; cardboard</b>	12.8	15	+2.2
<b>Textiles</b>	2.6	12	+11.4
<b>Sanitary waste</b>	10.8	6	-4.8
<b>Glass &amp; metals (combined)</b>	10.2	10	-3.0
<b>Other (composites, unclassified, hazardous)</b>	18.4	3	-15.4
<b>Total</b>	<b>100%</b>	<b>100%</b>	—

### Consistency in Organics

The organic fraction of Grenada’s municipal waste has remained relatively stable ( $\approx$  29–30%) over the past seven years. This suggests a consistent pattern of food and yard waste generation relative to total MSW, despite population growth and increased commercial activity.

### Increase in Plastics and Textiles

Plastic waste rose by over 5%, while textile waste increased sharply. These results are consistent with Grenada’s expanding retail and tourism sectors and global trends in synthetic material consumption.

### Scope Limitation to Household Waste

The 2025 Waste Characterization Study was primarily focused on household MSW. Trucks identified as carrying solely industrial or commercial waste were excluded from sampling and analysis. However, as is typical in mixed municipal collection systems, some commercial and institutional waste was inevitably included within the household stream.

This adjustment represents a methodological difference compared with the 2018 characterization study, in which mixed municipal loads containing both household and commercial waste were more systematically included. As a result, certain fractions—particularly paper and cardboard—appear relatively stable in proportional terms, even though the commercial component of their original source stream was partially excluded.

### Refined Sorting of Textiles

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<sup>3</sup> Grenada Solid Waste Management Authority (GSWMA). (2019). National Experience on Waste Statistics – Grenada. Presentation at the United Nations Expert Group Meeting on Waste Statistics, St George’s, Grenada, February 2019. Available: <https://unstats.un.org/unsd/envstats/meetings/2019-Grenada/>

In 2018, these materials were likely grouped under “Textiles” or “Unclassified Combustibles.” Consequently, the increase in textile waste between 2018 (2.6%) and 2025 (15.4%) partly reflects:

- Improved separation of textiles and sanitary materials.
- Inclusion of an additional exercise during the carnival period (Exercise 2), when disposal of event-related clothing and costumes increased temporarily.

### **Absence of a Dedicated “Sanitary Waste” Category in 2025**

The European classification system does not include “Sanitary Waste” as a standalone category. Instead, sanitary materials are classified under “Sanitary Textiles” or “Hazardous Household Waste.” This methodological difference explains the reduced share of “Sanitary Waste” observed in 2025 compared with 2018 (10.8% → 5.3%).

### **Improved Data Resolution**

Adoption of European standards increased the number of categories and precision of manual sorting, reducing the share of “unclassified” waste from ~18% (2018) to < 6% (2025). While this refinement improves the representativeness of residential waste composition, it also means that direct comparisons with earlier datasets must be interpreted with caution, as the 2025 results reflect a purer household baseline and exclude the heavier commercial paper and packaging waste that had previously influenced overall MSW composition.

This methodological advancement aligns Grenada’s approach with international best practices and contributes to the broader regional effort to harmonize waste data and reporting methodologies. Such alignment supports the comparability of results across Caribbean states and provides a stronger evidence base for regional policy coordination. Grenada’s participation in these efforts is consistent with its commitment to the Declaration of Port of Spain on Circular Economy and Sustainable Waste Management (CARICOM, 2023), which calls for the adoption of standardized metrics, improved data systems, and collaborative approaches to solid waste management within the Caribbean region. These efforts are further reinforced by regional initiatives led by the Caribbean Community (CARICOM), the Organisation of Eastern Caribbean States (OECS), and the United Nations Environment Programme (UNEP), which promote data harmonization under the Caribbean Circular Economy Action Plan and the Waste Management Outlook for Latin America and the Caribbean (UNEP, 2018).

## **B. Comparison across the Caribbean**

The waste composition of Grenada in 2025 is broadly consistent with the pattern observed in other upper-middle-income Caribbean states, though some differences in category proportions reflect national consumption structures, waste-management practices, and methodological scope. Across the region, MSW remains dominated by

organic material and plastics, with variable contributions from paper, cardboard, and textiles.

*Table 18: Waste composition comparison between Grenada, Trinidad & Tobago and Saint Lucia*

Country / Year	Organics (Biowaste)	Plastics	Paper + Cardboard	Textiles	Sanitary/ Hygiene	Metals + Glass	Other/ Inerts
<b>Grenada (2025)</b>	<b>31%</b>	<b>21.8%</b>	<b>14.3%</b>	<b>15.4%</b>	<b>5.3%</b>	<b>7.2%</b>	<b>6%</b>
Saint Lucia (2018) <sup>4</sup>	37%	20%	16%	7%	6%	8%	6%
Trinidad & Tobago (2022) <sup>5</sup>	32.4%	18.1%	18.0%	6.4%	10%	7%	6%

### i. Saint Lucia

The Saint Lucia Solid Waste Management Authority's 2018 characterization study reported a waste profile consisting of 37% organic waste, 20% plastics, 16% paper and cardboard, 8% glass, 7% textiles, and 6% sanitary and hygiene materials. Compared with these proportions, Grenada's waste composition shows a similar share of plastics and paper/cardboard but a lower proportion of organics and a higher proportion of textiles.

The reduction in organics relative to Saint Lucia's results may be partially explained by the inclusion in Grenada's 2025 study of household waste only, excluding commercial and institutional organics, while the higher textile fraction coincides with one of the sampling exercises being undertaken during the Carnival period.

### ii. Trinidad and Tobago

The Trinidad and Tobago Waste Characterization Study (SWMCOL/IDOM, 2022) found a composition of 32% organic waste, 18% plastics, 18% paper and cardboard, 7% metals and glass, and 6% textiles, with an additional 10% identified as sanitary and other residuals.

This structure closely resembles Grenada's 2025 profile, with similar organic and recyclable proportions but a slightly lower plastic share and less textile content. The inclusion of both household and commercial waste streams in Trinidad's analysis partly explains its higher share of paper and cardboard and the greater representation of sanitary waste.

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<sup>4</sup> SLSWMA (2018) *Waste Characterization Study in Waste Collection Zones*

<sup>5</sup> IDOM / SWMCOL (2023) *Waste Characterization Study*

### iii. Upper-Middle-Income Countries in the Latin America and Caribbean Region

When compared with aggregated data for upper-middle-income countries in the Latin America and Caribbean region, as reported in the UNEP (2018) Waste Management Outlook, Grenada's composition diverges modestly from the regional mean. The UNEP study identified an average composition of 52% organics, 16% paper and cardboard, 11% plastics, and 9% metals and glass for this income category.

Grenada's 2025 results show a considerably lower organic fraction (30%) and a substantially higher plastic fraction (22%), while the paper and cardboard share (14%) remains consistent with the regional benchmark. This pattern reflects the influence of tourism, packaged imports, and rising consumption of manufactured goods, which collectively increase the proportion of dry recyclables relative to biodegradable material.

Overall, the comparison demonstrates that Grenada's MSW composition aligns with the general Caribbean trend toward a more diversified and packaging-intensive waste stream as economies develop and consumption patterns evolve.

Although organic material continues to form the largest single category, the increasing presence of plastics and textiles across all examined territories underscores the growing importance of targeted waste-reduction and recycling strategies within the region's upper-middle-income economies.

### iv. Focus on Plastic

The comparative analysis of plastic composition across Grenada, Saint Lucia, and Dominica highlights distinct but converging trends in the structure of municipal plastic waste within the Eastern Caribbean. In Grenada, the 2025 characterization exercises reveal a balanced profile, with polyolefin films (PE and PP) accounting for approximately 24% of total plastics, PET bottles and containers 23%, and polyolefin bottles (HDPE and PP) 12%.

*Table 19: Plastic waste characterization Grenada 2025*

Category	Grenada 2025 Total (kg)	Share of Plastics (%)
<b>Polyolefin films</b>	325.20	24%
<b>PET bottles and containers</b>	315.00	23%
<b>Polyolefin bottles (HDPE)</b>	166.60	12%
<b>Other plastic packaging</b>	193.00	14%
<b>Other plastics</b>	375.80	27%
<b>Total Plastics</b>	1,375.60	100%

Other plastic packaging, including multilayer and composite materials, represents 14%, while miscellaneous non-packaging plastics contribute the remaining 27%. This configuration reflects a mixed waste stream in which flexible packaging and beverage containers dominate, but with a growing share of complex and non-recyclable materials entering the municipal waste flow.

In comparison, Saint Lucia’s 2018 waste characterization study showed a strong dominance of flexible film plastics, which comprised nearly half of all plastic waste (47%), while PET bottles and other rigid containers represented a smaller share of 17 and 8% respectively.

The relatively high proportion of film plastics at that time reflected the widespread use of lightweight packaging and plastic bags, a pattern typical of earlier consumption habits before the expansion of packaged goods markets.

By contrast, Dominica’s results from the 2025 Recycle OECS study show a significant shift toward rigid packaging, with PET bottles representing 55% of the total plastic fraction and polyolefin films only 21%. This pattern is indicative of an economy where beverage consumption and imported consumer goods dominate the packaging profile, and where recycling initiatives under the Recycle OECS programme have begun to prioritise PET recovery.

Overall, the comparison suggests that Grenada lies between these two regional extremes. The country’s plastic waste stream is more diversified than that of Saint Lucia, with lower reliance on films, but less beverage-dominated than Dominica.

The relatively high share of mixed and “other” plastics points to the growing presence of multilayer packaging and imported goods, a trend consistent with the transition toward more complex packaging systems in upper-middle-income Caribbean economies. This evolution underscores the importance of developing differentiated management strategies within the OECS region, where Grenada’s balanced composition could inform integrated approaches combining PET recovery, film collection, and targeted interventions for composite materials.

*Table 20: Plastic waste characterization comparison between Saint Lucia, Dominica and Grenada*

<b>Category (Plastic Type)</b>	<b>Grenada 2025 Share%</b>	<b>Saint Lucia 2018 Share%</b>	<b>Dominica 2023 Share%</b>
Polyolefin films	24%	47%	21%
PET bottles and containers	23%	17%	55%
Polyolefin bottles	12%	8%	22%
Other plastic packaging	14%	3%	2%
Other plastics	27%	24%	
Total Plastics	100%	100%	100%

## C. Comparison with Worldwide Averages

At the global level, organic waste dominates the MSW stream, accounting for more than half of total generation (53.5%). The remainder is composed largely of packaging-related materials—paper, plastics, glass, and metals—which together represent about one-third of all municipal waste. The share of “Other” materials, such as textiles and hygiene products, reflects rising consumption and urban lifestyles.

*Table 21: Grenada waste composition comparison with worldwide averages*

<b>Category</b>	<b>International global average (%)</b>	<b>Grenada waste characterization</b>
<b>Food and garden waste</b>	53.5%	31%
<b>Paper and cardboard</b>	16.0%	15%
<b>Plastic</b>	11.0%	23%
<b>Glass</b>	5.0%	4%
<b>Metal</b>	5.0%	6%
<b>Other (textiles, rubber, leather, wood, sanitary products, inerts)</b>	9.5%	21%

When compared to this global benchmark, Grenada’s 2025 composition, with 34% organics and 24% plastics, shows a substantially lower biodegradable fraction and a much higher share of synthetic materials. This divergence highlights Grenada’s position within the global upper-middle-income group, where consumption patterns and import dependency lead to packaging-intensive waste streams more similar to those of high-income economies.

## VI. Conclusion

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### i. Spatial Distribution and Composition Trends

From a spatial perspective, waste generation in Grenada is concentrated in the urbanized zones of St. George's and Grenville, which together account for approximately two-thirds of the total MSW collected nationwide. These areas exhibit higher proportions of plastics, textiles, and packaging materials, reflecting dense population, retail concentration, and greater household purchasing power. In contrast, the more rural parishes of St. John, St. Mark, and St. David show higher relative shares of organic waste, consistent with household composting practices, agricultural residues, and lower levels of packaged consumption.

The inclusion of landfill weighbridge data on green waste (Material Code 200201) further illustrates the significance of biodegradable materials in Grenada's waste system. A total of 245 tonnes of green waste was recorded during the first characterization exercise (May 2025) and 138 tonnes during the second (August 2025). When combined with the organic fractions quantified during both exercises (1.06 tonnes and 0.79 tonnes respectively), the total amount of biodegradable waste assessed reaches approximately 385 tonnes, representing nearly one-third of all materials analysed. These figures confirm that, although organics constitute a smaller proportion of the sampled waste stream compared to regional averages, they still represent a substantial quantity in absolute terms—particularly when garden and pruning waste delivered directly to the landfill is included.

When compared with earlier assessments (CDB/GSWMA 2018), the results show that the organic fraction has remained relatively stable, while the proportions of plastics and textiles have increased. This evolution reflects both changes in consumer behaviour and improved classification methods introduced under the updated European sorting standards (XP X30-413). In the broader regional and global context, Grenada's waste composition aligns with the patterns observed in upper-middle-income countries, where economic development, urbanization, and import dependency drive a shift toward more packaging-intensive and synthetic waste streams.

Efforts to manage organics at the local level have already begun to demonstrate potential. The True Blue Bay Resort operates a small-scale biogas digester that processes kitchen waste, while the Caribbean Farmers Field Institute (CFFI) in St. Mark manages a community composting station offering free training to farmers. Additionally, the Recycle Organics Program, launched in early 2025, has introduced a pilot home composting initiative targeting households and schools. Together, these examples highlight the growing opportunities for localized organic waste recovery solutions, though composting remains the most immediately scalable and cost-effective pathway for diversion from the landfill.

## ii. Policy Implications

The outcomes of the 2025 Waste Characterization Study carry direct implications for the National Waste Management Strategy (NWMS) and Grenada's commitments under the OECS Regional Strategy for Sustainable Waste Management. The findings confirm that the country's waste composition is now consistent with the material profiles of upper-middle-income small island developing states (SIDS), where packaging waste and synthetics dominate the municipal stream. This transition necessitates a gradual shift from traditional landfill-based management toward integrated systems that emphasize waste reduction, recycling, and resource recovery.

In the regional context, the results position Grenada as a reference case for the OECS Recycle Programme, particularly in areas such as plastic waste management, composting, and community-based collection. By aligning national policies with ongoing regional initiatives—such as Recycle OECS, Recycle Organics, and the emerging Caribbean Circular Economy Action Plan—Grenada can leverage economies of scale and shared expertise to improve the sustainability and resilience of its waste management sector.

The implementation of these findings into policy and operational planning will support Grenada's broader objectives under the Nationally Determined Contributions (NDCs), the Global Methane Pledge and the Sustainable Development Goals (SDGs 11, 12, and 13), ensuring that solid waste management contributes meaningfully to climate action, public health, and resource efficiency across the island.

## iii. Key Recommendations

Grenada's waste management strategy should now prioritize the progressive reduction of landfill dependency through integrated actions that combine waste prevention, source separation, and material recovery. Strengthening composting programs at both the community and institutional level remains the most effective approach to managing the substantial organic and green waste flows, complemented by small-scale biogas systems in specific settings such as hospitality, agriculture, and education facilities. Continued investment in recycling systems for plastics, metals, and cardboard is essential to capture the increasing recyclable fraction, while emerging waste categories such as textiles will require new targeted collection and recovery strategies.

At the policy level, national authorities should reinforce public education, extended producer responsibility (EPR) mechanisms for packaging waste, and inter-agency coordination between the GSWMA, local authorities, and the private sector. These measures will be critical to scaling waste diversion programs and achieving compliance with circular economy principles being advanced at the regional level.

## Appendix A: Training Participants

### Waste Characterization Theoretical Training

**Monday 28th July 2025**

	<b>Participant</b>	<b>Organization</b>
1	Ronald Roach	Unite Caribbean
2	Emma Holden-Maillard	Unite Caribbean
3	Hayden Redhead	Recycle Organics
4	Anthony Jr. Modeste	GSWMA
5	Narsley Herry	GSMWA
6	Marvin Alexis	GSWMA
7	Hilary Gully	GSWMA
8	Donalyn Thompson	GSWMA
9	Daniel Wilson	GSWMA
10	Marvin Abraham	GSWMA
11	Garrison Charles	GSWMA
12	Patricia Fleming-Baker	GSWMA
13	Christopher Frederick	RRT
14	Clint Morain	RRT
15	Claudia Frederick	RRT
16	Faith Antoine	RRT
17	Keanu Small	Dikid Environmental Management Services (DEMS)
18	Mr. Blackette	Kenny's Trucking
19	Kennedy Morgan Jr	Rainbow Waste Services
20	Tikisha Levine	Glen David Environmental Care
21	Cecil Pierre	Pierre's Solid Waste Services
22	Shermaine Bernard	Francis Brothers
23	Mrs. Francis	Francis Brothers
24	Sada Scott	Southern Waste
25	Nicole (their Secretary)	Southern Waste
26	Cheryl Mitchell	Jeff Environmental

## Waste Characterization Practical Training

**Wednesday 30th July 2025**

	<b>Participant</b>	<b>Organization</b>
1	Ronald Roach	Unite Caribbean
2	Emma Holden-Maillard	Unite Caribbean
3	Hayden Redhead	Recycle Organics
4	Kendon James	Caribbean Youth Environment Network (CYEN)
5	Tikisha Levine	Glen David Environmental Care (GDEC)
6	Jason George	Glen David Environmental Care (GDEC)
7	Delia Thomas	AA & Associates
8	Jumi Ambrose	AA & Associates
9	Shermaine Bernard	Francis Brothers
10	Cecil Pierre	Pierre's Solid Waste Services
11	Keanu Small	Dikid Environmental Management Services (DEMS)
12	Cheryl Mitchell	Jeff Environmental Management (JEM)
13	Joel Baptiste	Jeff Environmental Management (JEM)
14	Abigail King	Jeff Environmental Management (JEM)
15	Wendell Mitchell	Mitchell's Trucking Services
16	Kennedy Morgan Jr	Rainbow Waste Services

## **Appendix B: Green Waste registered by GSWMA code 200201**

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- ▶ See **bio Green waste (200201)EX1.pdf**
- ▶ See **bio Green waste (200201)EX2.pdf**