BASELINE WASTE CHARACTERIZATION STUDY

VREEDZAAM MARKET
PARMARIBO, SURINAME

SEPTEMBER 2025

ON BEHALF OF GREEN HERITAGE FUND SURINAME

WRITTEN BY L. ZUILEN AND C. SAMSON

EDITED BY E. WIRKJOTAROENO

Imprint

Suggested citation: Zuilen, Louise, Cheyenne Samson, PROMAR (2025): Baseline Waste Characterisation Study Vreedzaam market in Paramaribo, Suriname. Edited by Evyen Wirjotaroeno.

The project team expresses its gratitude to all participants for their valuable and highly appreciated contributions.

Photo credits: Green Heritage Fund Suriname

Project Website: www.promar.org

Email: cheyenne@greenfundsuriname.org

Project Contribution to SDGs:

Disclaimer: This paper has been produced with the financial support of the German Federal Ministry for the Environment in the framework of the ‘Prevention of Marine Litter in the Caribbean Sea (PROMAR Project)’. Its contents are the sole responsibility of the authors and do not necessarily reflect the views of the German Federal Ministry for the Environment.

Acknowledgement

This report was prepared with the financial support of the German Government and under the coordination of Adelphi and the United Nations Environment Programme (UNEP) Cartagena Secretariat. The project team extends its gratitude to Mr. Ricardo Bhola, District Commissioner of Paramaribo North-East, and his staff for their collaboration and institutional support; to Mr. Anoesa, Market Manager, for his cooperation and facilitation of activities at the Vreedzaam Market; to the students of the Anton de Kom University of Suriname, Faculty of Technological Sciences (Timothy Sastrohardjo, Shanice Winter, Priscilla Winter, Sarojni Kalloe, Chenevieve Mac-Intosh, Shannon Deel, Lourdes Asmari, Shahid Hasnoe, Ivy Sontowinggolo, Tamischa Schillevoort, Jyotika Sangham, Mariska Pansa, and Joëla Guiamo) for their dedication and active participation; and to Mr. Panchoe of the Directorate of Waste Collection and Processing, Ministry of Public Works, for ensuring the timely transport of collected waste to the Ornamibo disposal site.

Table of Contents

List of Figures

List of Tables

Introduction

Marine ecosystems provide a wide range of ecosystem services. Any threat to marine ecosystems can have significant consequences for these services and, consequently, for human well-being worldwide. Such threats can lead to reduced health and food security, as well as the loss of livelihoods and income sources (Beaumont et al. 2019).

Unfortunately, marine environments are under pressure from multiple hazards, including overexploitation, habitat destruction, climate change, and pollution (Henderson & Green, 2020). Over the past decades, marine litter has become a global problem with no geographical or political boundaries (Hartley et al. 2018; UNIDO 2019; Beaumont et al. 2019). Due to its harmful ecological and socio-economic impacts, marine litter is recognised as one of the world's most significant pollution challenges, threatening both marine and coastal environments (G7 Leaders 2015; Veiga et al. 2016; UN Environment 2017).

One of the main drivers of marine plastic pollution is the rise in single-use plastics (SUPs). In 2015, packaging alone accounted for half of all plastic waste generated, and in 2018 it was estimated that 60–95% of marine plastic pollution came from disposable items (Tekman et al. 2022). Land-based sources, especially those near coasts and rivers, are the largest contributors. Several coastal cities in the world are responsible for the plastic pollution that enters the ocean, however, various studies show that higher volumes of plastics enter the ocean from cities located in developing countries in Asia, South America and Africa (Jambeck et al. 2015; Sandu et al. 2020).

In Suriname, similarly to many other countries in the world, plastic is a major waste stream. The landfill receives approximately 195,220 cubic meters of waste per year (ABS 2020). A 2017 study found that plastic waste was the second-largest category of household solid waste in Paramaribo (16.7%) (ILACO 2022). Recycling remains minimal, with only 8–10% of plastic waste being recycled, primarily by a small number of private companies. Most plastic ends up in open dumps, is burned, or is discharged into rivers. Annual plastic litter leakage into the ocean is estimated at 1,530–10,508 tonnes (OECD 2022).

The *Prevention of Marine Litter in the Caribbean Sea* (PROMAR) is dedicated to preventing marine litter in the Caribbean Sea, facilitating local action and supporting policy to promote a circular economy for plastics, with a focus on packaging and single-use plastics. This project is funded by the German government (BMUV, the German Federal Ministry for the Environment) and implemented by Adelphi and the United Nations Environment Programme's Cartagena Convention Secretariat (CCS) from 2020 to 2026 in close collaboration with national partners in the region. The first phase of the project ran from 2020 – 2024 in Costa Rica, Colombia and the Dominican Republic and the second phase from 2024 – 2026 in the British Virgin Islands, Suriname, Guyana, Trinidad & Tobago and Saint Kitts & Nevis.

In Suriname, the project is implemented by the Green Heritage Fund Suriname (GHFS) in partnership with a political counterpart, the Ministry of Oil, Gas, and Environment, formerly known as the Ministry of Spatial Planning and Environment.

PROMAR is structured around four work packages:

- WP I: Implementing a waste stream monitoring system in collaboration with local authorities.
- WP II: Testing and replicating circular economy solutions.
- WP III: Promoting Extended Producer Responsibility and facilitating policy dialogue at both the national and regional levels
- WP IV: Raising stakeholder awareness of marine litter issues.

In an effort to establish a baseline of the litter problem, two demonstration sites were selected for a waste characterisation study. During this study, an assessment was made of the amount and type of waste at these locations as well as the potential sources and pathways of this waste. This data will be used to set up a waste stream monitoring system as well as select and implement circular economy solutions in areas linked to the demonstration sites.

As the capital of Suriname, Paramaribo has the highest population density of all districts in the country and consequently generates a high volume of municipal solid waste. Due to its geographical characteristics, it is in contact with the Atlantic Ocean, making it of interest for the purposes of the study. The selected demonstration sites are for tourist use and the use is linked to productive activities (market, shops) but there are no human settlements nearby; however, they receive large volumes of waste from different sources (especially shops and market vendors).

Methodology

2.1 Site selection

The former government partner, the Ministry of Spatial Planning and Environment, initially identified ten potential demonstration sites. Of these, five were eliminated due to budget constraints, primarily related to their distance from Paramaribo. The remaining five sites, all located in or near Paramaribo, were presented to stakeholders for feedback and additional suggestions at both the project inception meeting in September 2024 and the project launch meeting in November 2024.

Following this input, the GHFS team and local experts conducted field visits to the various sites to assess the feasibility of data collection and monitoring, based on the criteria established by Adelphi. After several rounds of consultation with local experts and the Adelphi team, two sites were selected as the most suitable demonstration locations: the area behind the Vreedzaam Market and the Leonsberg Jetty.

Vreedzaam market

The Vreedzaam Market (VZM), also known as Djoeka Wojo or the Maroon Market, is located along the Waterkant, next to the Central Market, and bordered at the rear by the Suriname River (Figure 2), a major river that flows into the Atlantic Ocean (Coordinates: 5.823189, -55.157777).

Figure 1 The Vreedzaam Markt *Source: DBS Suriname 2021*

This indoor market is renowned for its sale of spices, medicinal herbs, natural remedies, and other products tied to cultural heritage. It serves as a hub of Indigenous and Maroon traditions, offering crafts, traditional dishes, religious and ritual items, folk medicine, and music (Figure 1). Over time, the market has developed into a popular tourist attraction, valued for its wide variety of heritage products and its vibrant cultural atmosphere.

The Vreedzaam Market shares a parking lot with the Central Market (figure 2). During the day, this lot is used for parking, with vehicles parked all the way to the river's edge. In the late afternoon and evening, however, the lot transforms into a wholesale produce market.

The Central Market itself is one of the largest markets in Suriname. It has two floors: the ground floor, where produce, fish, and meat are sold, and the upper floor, which hosts retail vendors selling clothes, cigarettes, and other goods. The market manager, Sergio Anoesa, is responsible for the day-to-day management of both the Vreedzaam Market, the Central Market, and the shared parking lot. However, all three areas formally fall under the authority of the Ministry of Regional Development.

Despite the cultural and economic importance of the Vreedzaam Market, several challenges have been identified. The market generates a large volume of waste—particularly organic waste—yet the number of waste containers available is insufficient. As a result, waste often exceeds the capacity of the bins. According to Mr. Anoesa, cleaning the market is a top priority. However, responsibility for funding cleaning operations lies not with market management but with the district commissariat. Since the release of funds is tied to lengthy bureaucratic procedures, cleaning is frequently delayed. This results in an environment that is unhygienic and unappealing for both vendors and visitors.

The market manager is tasked with coordinating all cleaning activities, including hiring and supervising personnel and ensuring regular waste collection. Because this process is costly, waste is sometimes dumped behind the market and incinerated. In the past, attempts were made to involve members of the unhoused community and prisoners in cleaning and waste disposal, but these efforts have been inconsistent and unsustained.

Looking ahead, there are plans to restructure the Waterkant area where the market is located, to transform it into a cultural boulevard to promote recreation and tourism. These activities will need to be closely aligned with the PURP project, which focuses on the broader development of the Waterkant.

Given its high waste generation, insufficient management structures, and direct link to both tourism and the Suriname River, the Vreedzaam Market was identified as a strategic PROMAR demonstration site, providing an ideal location to monitor waste flows, pilot solutions, and test interventions aimed at reducing marine litter.

2.2 Sampling methodology

On 30 March, 13 and 27 April 2025, the PROMAR team carried out three cleanups (one every two weeks) and conducted daily site observations at the demonstration site. The objective of these activities was to measure the quantity, composition, and potential sources of litter. By comparing waste accumulation during daily monitoring with cleanup results, the approach provides insights into waste generation rates and probable sources.

The sampling methodology was adapted from the *Methodological Guide for Conducting Solid Waste Sampling on Beaches* (Adelphi 2025) and refined through feedback from the Adelphi team.

The field activities consisted of the following steps:

Site preparation

- The demonstration site (VZM) is relatively small; therefore, the entire waterfront was included.
- The site was divided into 6 zones: zones 1–5 measured 7 m each, and zone 6 measured 12 m.
- Flags and cement blocks were used as permanent markers.
- A strip 1.5–2 m wide was surveyed (see figure 3). This focus was chosen because:
    1. Most waste was concentrated within this strip.

2. Closer to the water, the slope and slippery rocks presented safety risks.

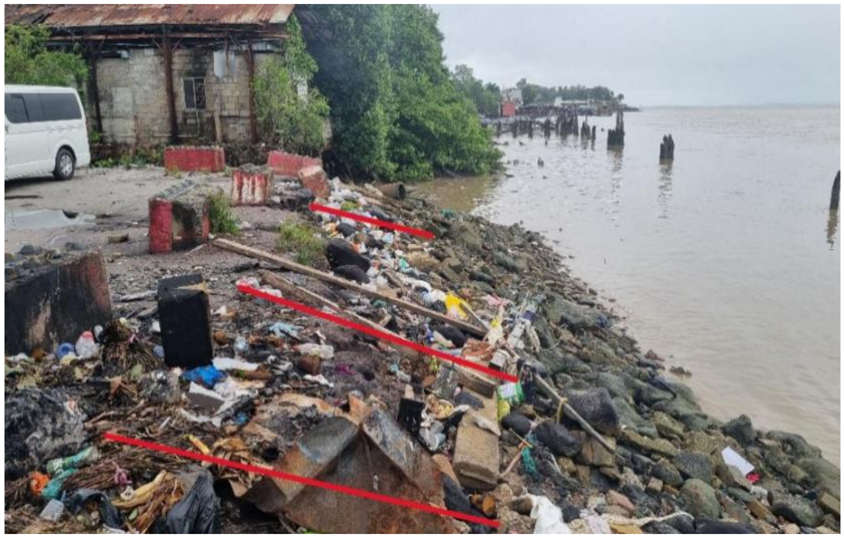

Figure 2 Vreedzaam Markt (Marron Markt, red circle) and study area (red lines). Source: Google Maps 2025

Cleanup procedure

Figure 3 Study area where litter was removed *Source: PROMAR Suriname*

Photographs were taken before and after each cleanup for documentation and comparison (figure 4). All visible waste was collected. During the first cleanup, organic waste was included; afterwards, based on Adelphi's advice, organic material was removed and weighed separately.

Large or embedded items that could not be safely removed were documented but left in place. At the end of cleaning, the site represented a zero-waste baseline for monitoring.

Waste Sampling and Characterisation

Waste characterisation took place immediately after the cleanup. The team consisted of:

- **Waste sorters**: identified type, brand, and weight of items.
- **Note-takers**: recorded counts and data.

Sorting began once three or more bags were filled (figure 6). Data was recorded in the *Solid Waste Sampling on Beaches Data Recording and Analysis Tool*, translated into Dutch for field use. After characterisation (figure 5), waste was bagged and stored at a central collection point (figure 7), from where it was removed by the Directorate of Waste Collection and Processing (Ministry of Public Works)**.**

Figure 4 Demonstration site before and after the cleanup. Source: PROMAR Suriname

Figure 5 Waste categorization *Source: PROMAR Suriname*

Figure 6 Waste sorters and note-takers *Source: PROMAR Suriname*

Daily Monitoring (14 days)

Following the baseline cleanup and the first measurement, the demonstration site was observed for a two-week period. Every day, the site was visited to document accumulated waste and any additional activities (e.g., on-site waste incineration) through photographs (figure 8).

Figure 7 Waste placed at collection point at the end of the activities. Source: PROMAR Suriname

Daily Monitoring (14 days)

Following the baseline cleanup and the first measurement, the demonstration site was observed for a two-week period. Every day, the site was visited to document accumulated waste and any additional activities (e.g., on-site waste incineration) through photographs.

Figure 8 Observer taking picture of waste during observation period

2.3 Data analysis

Quantitative Analysis

The total weight and volume of waste generated were calculated per category and subcategory. Statistical analysis was performed using Excel to compute:

- Waste generation rates
- Percentage composition by weight
- Estimation of waste by brand

Clean Coast Index (CCI)

The pollution levels at the site were determined using the Coastal Pollution Index (CCI: Clean Coast Index). This index is a tool used for the assessment of beach cleanliness based on the total weight of plastic waste found within a defined area. Based on the results, the area can be categorised into levels ranging from very clean to very dirty (Alkalay et al. 2007).

The calculation of the index is carried out as follows:

$$CCI = \frac{total\ amount\ of\ items\ collected\ (plastic\ and\ foam)}{sampling\ area} \times K$$

Where K = 20 for interpretability.

To interpret the values assigned through the CCI, they are categorised using the following scale (figure 9):

Clean Coast Index (CCI)	(1) Very clean No plastic waste is observed in the coastal region	(2) Clean No plastic waste observed in most of the coastal region	(3) Moderate Some plastic waste is observed in the coastal region	(4) Dirty Plastic waste observed in most of the coastal region	(5) Very dirty Plastic waste is observed covering the coastal region
Numerical Index	0-2	2-5	5-10	10-20	20+

Figure 9 Categories CCI

Results

On Sunday, March 30th, the baseline waste characterisation study was conducted with the participation of a local expert, the GHFS team (four members), and ten students from the Faculty of Technological Sciences. Due to the large volume of waste collected that day, only 2 of the 43 bags were categorised at the item level, while the rest were categorised by waste type. Waste collection occurred from 10:30 to 14:30, and separation and categorisation took place from 11:00 to 16:30. The collection focused on an area extending approximately 1 meter from the edge of the parking lot, though this area was reduced in places due to erosion or steep slopes creating unsafe working conditions. A burn pile with incinerated waste was observed but not collected for safety reasons. Incineration left large clumps of melted plastic and other materials. Bulky waste items such as a chair, a cooking plate, and construction debris were noted. Organic waste was prevalent, collected separately, and weighed immediately.

Table 1. Weights collected by area 30-03-2025

Name	Weight (kg)
Zone 1	78.47
Zone 2	88.47
Zone 3	48.82
Zone 4	15.25
Zone 5	26.92
Zone 6	17.42
Total	**275.35**

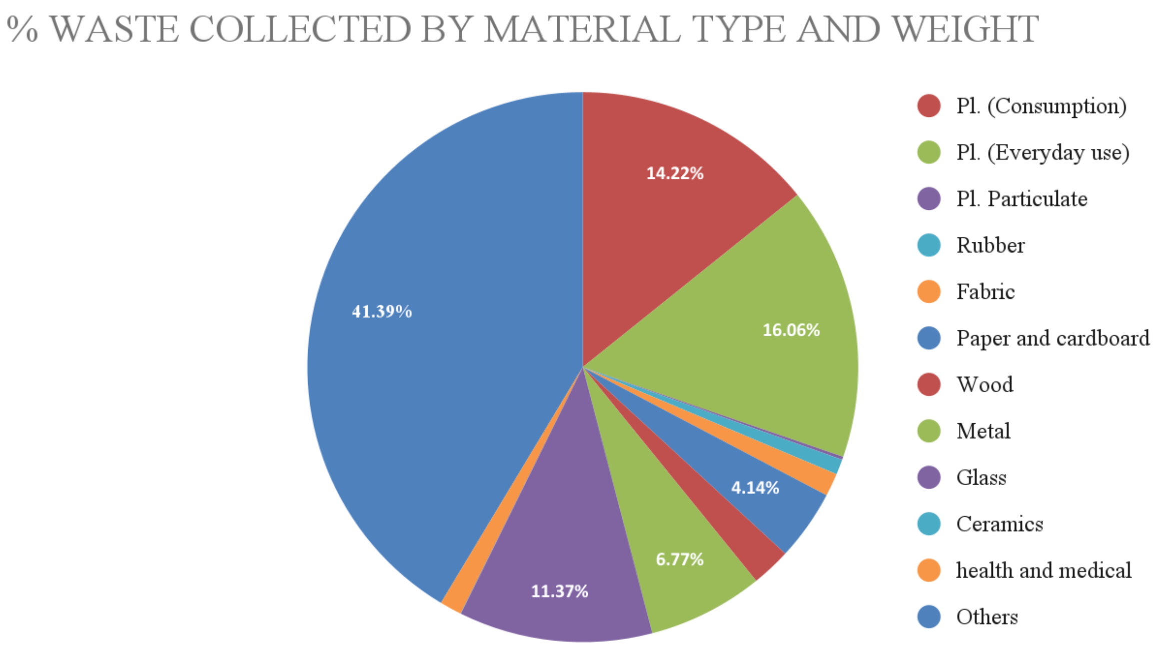

Figure 10 Composition of waste collected on 30 March 2025 by material type

The second measurement took place on April 13th. Between the baseline cleanup and this date, litter reaccumulated quickly, especially around a residual burn pile in Zone 5 that remained smouldering and was not removed. New waste was dumped near this pile and spread into Zones 4 and 6. A new burn pile appeared in Zone 3, mainly composed of unsold organic market waste still tied with plastic rope. Additional waste was added gradually. Large branches dumped in Zone 5 suggested yard waste was transported from elsewhere. Erosion played a significant role in waste dispersal into the river in Zones 3, 4, and 6, with Zone 3's study area narrowing from about 1 meter to 0.5 meters. Fourteen team members worked from 10:00 to 13:00 to collect 43 bags of waste and categorise them. Due to erosion, the monitored area was reduced to under 94.2 m². Trash heaps were not removed for safety: the pile in Zone 3 was on an unstable slope with rat nests, and the pile in Zones 5 and 6 presented unknown hazards like sharp objects. Instead, their volume was estimated from measurements: Zone 5-6 pile was 11.49 m³; Zone 3 pile was 2.04 m³. During collection, 217.98 kg of waste was gathered.

Table 2. Weights collected by area 13-04-2025

Name	Weight (kg)
Zone 1	3.33

adelphi
UN environment programme
GREEN HERITAGE FUND
PROTECTING NATURE & WILDLIFE IN SURINAME
MINISTRY OF OIL, GAS & ENVIRONMENT

Zone 2	8.74
Zone 3	11.43
Zone 4	26.18
Zone 5	36.26
Zone 6	81.66
Organic	50.38
Total	**217.98**

After discussion with Adelphi, one bag per zone was randomly selected for item-level categorisation, while all bags were categorised by material type.

Figure 11 Trash heaps located in zone 3 (a) and 5-6 (b) *Source: PROMAR Suriname*

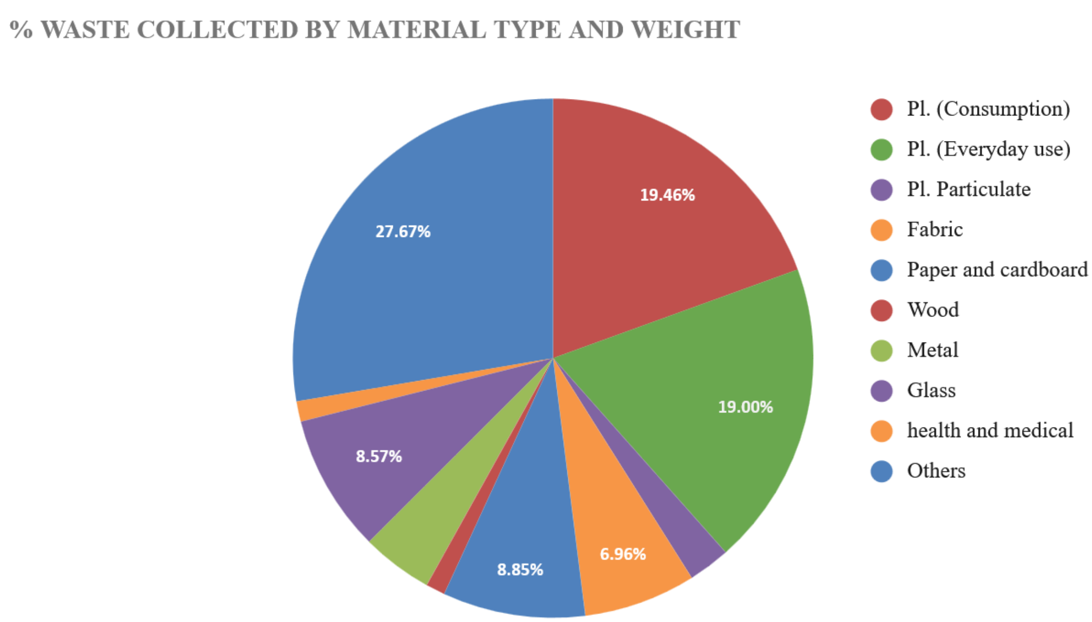

Figure 12 Composition of waste collected on 13 April 2025 by material type

The results of the item-level categorisation (6 of the 31 bags) show that the most found items are plastic bags, followed by unidentified plastic fragments and napkins.

Table 3. Top 10 items collected 27-04-2025

No.	Item	Quantity
1	plastic bags	22.77%
2	unidentified plastic fragments (loose)	11.77%
3	napkins	10.56%
4	drink bottles	10.23%
5	disposable cups (plastic)	6.27%
6	cardboard shards	5.39%
7	food packaging (bag type)	3.85%
8	aluminum cans (drinks)	2.97%
9	seasoning packets	2.20%
10	cigarette packs	2.20%

The most common brands found during the waste categorisation were Coca-Cola, which is locally produced by the Fernandes company, Fernandes (drink bottles), Diamont Blue (drink bottles), Basic One (drink bottles) and Arni water (drink).

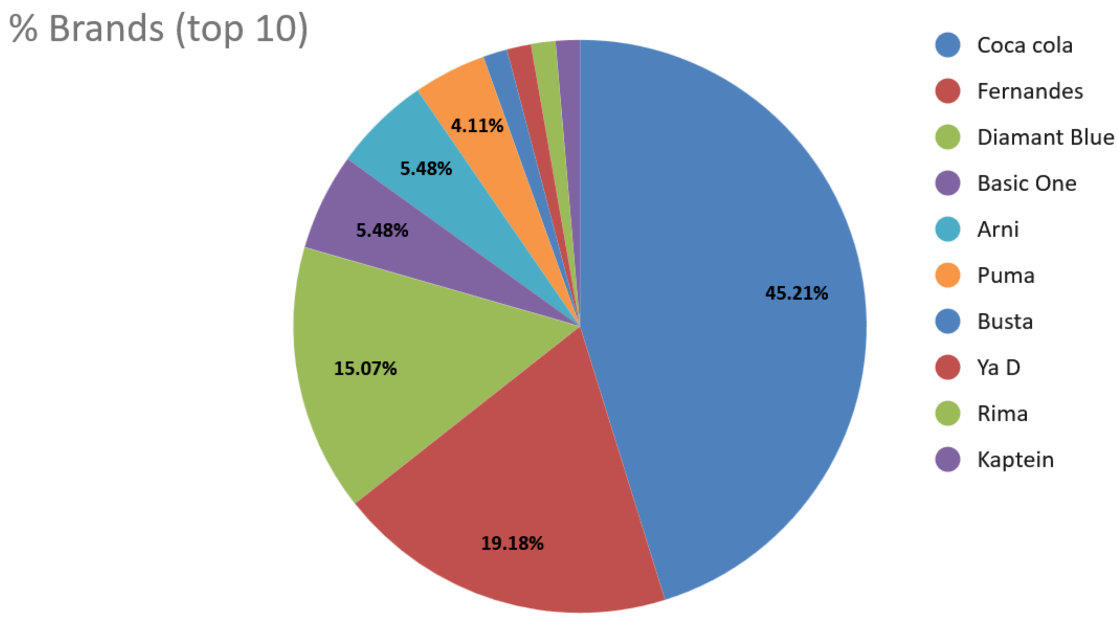

Figure 13 Share of Major brands identified in collected waste 13 April 2025

The final measurement was conducted on Sunday, April 27, following a two-week observation after the first measurement. Waste dumping in Zones 5 and 6 continued, with Zone 6 and the adjacent area between the study site and a nearby building showing high dumping levels. Although the volume within the study area declined, litter increased just outside the site boundaries. Severe erosion was noted in Zones 5 and 6. The collection took place from 10:40 to 13:45, with 15 people collecting 18 bags of waste. The burn pile in Zones 5 and 6 increased to 20.83 m^3; the pile in Zone 3 had been incinerated. Zone 6 contained more waste than previously.

Table 4. Weights collected by area 27-04-2025

Name	Weight (kg)
Zone 1	11.51
Zone 2	31.30
Zone 3	12.06
Zone 4	9.89
Zone 5	20.14
Zone 6	12.15
Total	**97.03**

Waste segregation and categorisation commenced at 10:40 AM and continued till 12:30 PM. The results of the waste type categorisation and item level categorisation can be seen below (figure 14).

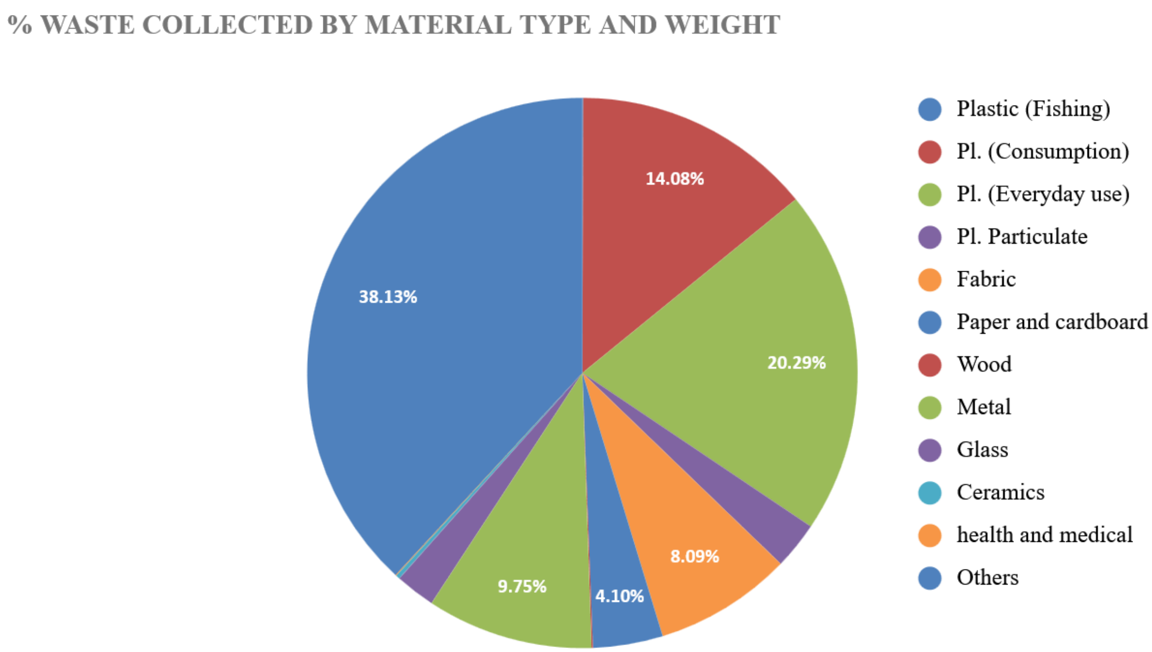

Figure 14 Composition of waste collected on 27 April 2025 by material type

Table 5. Top 10 items collected 27-04-2025

No.	Item	Quantity
1	plastic bags	16.75%
2	unidentified plastic fragments (loose)	13.71%
3	drink bottles	10.15%
4	food packaging (bag type)	8.80%
5	cardboard shards	8.29%
6	disposable cups (plastic)	6.09%
7	aluminum cans (drinks)	2.71%
8	glass fragments (undefined)	2.54%
9	napkins	2.37%
10	cigarette packs	2.20%

The most frequently found brands were Fernandes (drink bottles), Arni (drink bottles), Kentucky Select (cigarettes), Coca-Cola (drink bottles) and Pacifico (drink bottles) (figure 15).

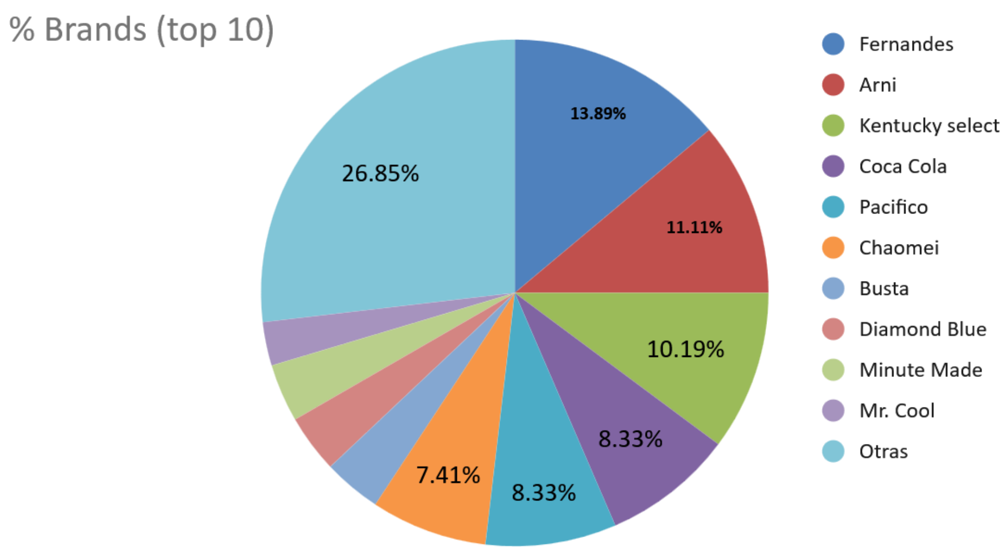

Figure 15 Share of Major brands identified in collected waste 27 April 2025

The success of every cleaning operation is measured by the tonnage of litter cleared from the beach or the number of trash bags collected at the end of the operation. The Clean Coast Index (CCI) is used to assess the cleanliness levels of the VZM monitoring area; this is presented below (table 6).

Table 6. Clean Coast Index (CCI)

	Baseline clean-up 1 30 March 2025	**Baseline clean-up 2 13 April 2025**	**Baseline clean-up 3 27 April 2025**
Measured CCI	110.3 $= \frac{(164+299+17)}{87} x20$	223.3 $= \frac{(270+217+116)}{54} x20$	147.7 $= \frac{(1+204+108+86)}{54} x20$
Standard CCI	Scale 20+ **The monitoring site is very dirty**		

adelphi
UN environment programme
GREEN HERITAGE FUND PROTECTING NATURE & WILDLIFE IN SURINAME
MINISTRY OF OIL, GAS & ENVIRONMENT

Discussion

The waste characterisation study provides important insights into waste composition, distribution, and dynamics at the demonstration site. Several limitations should be considered when interpreting the findings. Item-level categorisation was applied to only a small subset of collected bags, which limits representativeness. Erosion altered the size of sampling areas over time, reducing comparability across measurements. In addition, large waste piles were not removed or categorised, potentially leading to **an** underestimation of total waste volumes.

4.1 Combined Analysis of Waste Quantities and Areas

Total waste collected decreased from the baseline to the final measurement:

- Baseline (March 30): 275.35 kg
- Second measurement (April 13): 217.98 kg
- Final measurement (April 27): 97.03 kg

The monitored area was reduced over time due to erosion and safety concerns, which likely influenced the quantity of waste collected, particularly in Zones 3, 5, and 6, where erosion was significant.

Zone 6 exhibited fluctuating but generally increasing waste presence, becoming a prominent hotspot by the final measurement. This may have been the result of people choosing to dispose of their waste outside the study area.

Burn piles persisted or increased in size (Zone 5-6), representing an accumulation of waste that was not removed due to safety risks, indicating ongoing localised burning and waste disposal behaviours.

4.2 Waste Composition and Item-Level Trends

Plastic bags were consistently the most frequent waste item across all measurements, accounting for approximately 17-23% of itemised waste, signalling their dominance and persistence in the litter stream. Furthermore, unidentified plastic fragments, drink bottles, napkins, and disposable cups consistently ranked among the top items, highlighting plastic pollution as a significant component.

Cardboard and food packaging materials were also recurrent, reflecting market and household waste sources.

Cigarette packs and aluminium cans maintained a minor but steady presence, suggesting habitual littering behaviours.

Brand presence showed a mix of local and international products, with Coca-Cola (via local producer Fernandes), Fernandes, Arni, Kentucky Select, and Pacifico featuring prominently, indicating recognisable consumer goods as major contributors to the waste profile.

4.3 Site-Specific Observations

Organic waste was notably prevalent, often collected separately and forming significant portions of burn piles or separate piles, indicating organic waste accumulation patterns linked to the market.

Erosion has seriously impacted the study site, reducing accessible areas and likely transporting waste into adjacent ecosystems such as the river, particularly in Zones 3, 4, 5 and 6.

The persistence of burn piles and the appearance of new piles suggest ongoing informal waste disposal practices involving incineration, which complicates clean-up efforts and poses environmental hazards.

4.4 Clean Coast Index (CCI)

The monitoring area is categorised as very dirty (20+). Through the third clean-up, the monitoring area obtained a lower CCI, indicating that the clean-ups possibly had an impact but are not sufficient to create a sustainable clean demonstration site; other interventions are necessary. Other explanations for the decrease in waste accumulation could be:

- Continued informal waste incineration.
- Waste leakage into the river due to rapid erosion rates as a result of surface water runoff and wave impact.
- Shifting of the dumping locations outside the sampling zones.

4.5 Barriers and Challenges During the Baseline Waste Characterization Study

Despite having formal support from local government authorities and market management, on-the-ground participation during the data collection activities was limited. Although stakeholders were invited to support the activities, no representatives were present during the implementation of the study. In addition, recruiting volunteers to assist with data collection proved challenging. Multiple calls for volunteers were shared through social media, and a participation fee was offered; however, it remained difficult to secure a sufficient number of volunteers to support the fieldwork.

At the Vreedzaam Market demonstration site, the team faced significant logistical and safety challenges due to the presence of large, accumulated trash piles. These piles were too large to be removed manually and were regularly incinerated, creating unsafe conditions for handling waste by hand. To ensure that the waste at this site was still captured in the study, the volume of these waste piles was estimated and included in the analysis rather than physically collected and weighed.

Conclusion

The waste characterisation study demonstrates that the area is subjected to persistent and complex waste accumulation, dominated by plastic and organic materials. The study area experiences continuous and dynamic waste accumulation with clear spatial and temporal patterns. While total collected waste decreased, this is influenced by erosion reducing the monitored area and safety concerns limiting the clean-up of hazardous piles. It may also have been influenced by a change in littering behaviour, as the amount of litter in the surrounding areas (outside of the study area) had increased. The CCI score, still being "very dirty," despite a decrease in waste accumulation, indicates that these activities must be prolonged and supported by other interventions to change scores into "<10".

Plastic waste remains the dominant litter type, with consumer packaging and single-use items prevalent. The presence of localised burn piles and erosion-driven dispersal highlights the challenges in managing and mitigating waste in this environment. Addressing persistent littering behaviours, improving waste collection infrastructure, and implementing erosion control measures are likely essential for long-term waste reduction and ecosystem protection in this area. Without these coordinated actions, waste buildup and environmental degradation are likely to continue.

5.1 Recommendations

Future studies should focus on identifying the sources of waste more precisely. While most organic waste can be attributed to one of the three nearby markets, the Vreedzaam Market, the Central Market, and the temporary market on the parking lot, the origin of much of the plastic waste remains unclear.

For future repetitions of this study, clear guidelines and instructions should be provided to observers to ensure consistent and comparable data collection. Waste sorters and note-takers should also receive in-depth training beforehand, focusing on:

- Accurate classification of waste types within each category.
- The importance of systematically recording brand information.

A structured waste management system should be designed and implemented for the markets. This should include:

1. Additional waste bins for both recyclable and non-recyclable waste within the Central and Vreedzaam Markets, as well as on the adjacent parking lot (demonstration site).
2. More frequent waste collection to prevent accumulation and subsequent incineration.
3. Market vendors should be made more aware of the importance of proper waste management. Training and outreach should emphasise how a clean and hygienic market environment benefits vendors directly by attracting more visitors and tourists, thereby increasing client numbers and potential income, as well as their role in the market's waste management system.
4. As the markets fall under government management, the relevant authorities should assume a more active role in ensuring proper waste management. This includes both overseeing market cleaning operations and monitoring compliance with waste disposal practices.

The findings of this study and the subsequent recommendations have direct implications for national and regional policy frameworks under the PROMAR project. Addressing the waste management challenges at the Vreedzaam and Central Markets not only improves local hygiene and aesthetics but also contributes to the broader goals of marine litter reduction and the promotion of a circular economy in Suriname.

1. **Integration into Municipal Waste Policy:** The establishment of an effective waste management system for the markets aligns with Suriname's municipal waste management strategies.

2. **Support for Circular Economy Initiatives:** Improved sorting and collection of recyclables at market sites provide opportunities to link vendors and waste streams with local recycling enterprises. This supports PROMAR's objective of fostering circular economy practices by diverting plastics and other materials from landfills.

3. **Strengthening Institutional Responsibility:** The fact that waste management funding is dependent on bureaucratic processes highlights the need for stronger institutional roles and clearer accountability mechanisms. Assigning more direct responsibility to market authorities, supported by the district commissariat, could reduce delays and improve operational efficiency.

4. **Capacity Development and Public Awareness:** Training programs for vendors, students, and market staff would institutionalise proper waste practices, creating long-term behavioural change. Awareness campaigns tied to tourism development (such as the planned cultural boulevard at the Waterkant) could position waste management as a central component of urban renewal.
5. **Contribution to Regional and International Goals**: By strengthening waste monitoring and management at the demonstration sites, Suriname can provide valuable data and case studies for regional cooperation under the Cartagena Convention and global frameworks such as the UN Sustainable Development Goal 14 (Life Below Water). These activities directly contribute to PROMAR's regional objectives of reducing plastic leakage into the Caribbean Sea and advancing Extended Producer Responsibility (EPR) models.

adelphi
UN environment programme
GREEN HERITAGE FUND
PROTECTING NATURE & WILDLIFE IN SURINAME
MINISTRY OF OIL, GAS & ENVIRONMENT

References

ABS. 2020. *9th Environment Statistics Publication*. No. 9. Environment Statistics Publication, no. 9. General Bureau of Statistics (ABS).

adelphi. 2025. "Beach Data Sampling | Promar.Org." PROMAR. https://promar.org/en/beach-data-sampling.

Alkalay, Ronen, Galia Pasternak, and Alon Zask. 2007. "Clean-Coast Index—A New Approach for Beach Cleanliness Assessment." *Ocean & Coastal Management* 50 (5–6): 5–6. https://doi.org/10.1016/j.ocecoaman.2006.10.002.

Beaumont, Nicola J., Margrethe Aanesen, Melanie C. Austen, et al. 2019. "Global Ecological, Social and Economic Impacts of Marine Plastic." *Marine Pollution Bulletin* 142 (May): 189–95. https://doi.org/10.1016/j.marpolbul.2019.03.022.

G7 Leaders. 2015. "G7 Leaders' Declaration G7 Summit 7-8 June 2015." June. https://sustainabledevelopment.un.org/content/documents/7320LEADERS%20STATEMENT_FINAL_CLEAN.pdf.

Hartley, Bonny L., Sabine Pahl, Joana Veiga, et al. 2018. "Exploring Public Views on Marine Litter in Europe: Perceived Causes, Consequences and Pathways to Change." *Marine Pollution Bulletin* 133 (August): 945–55. https://doi.org/10.1016/j.marpolbul.2018.05.061.

ILACO. 2022. *Preparation of an Integrated Waste Management Plan (IWMP) for Suriname*. Suriname.

Jambeck, Jenna R., Roland Geyer, Chris Wilcox, et al. 2015. "Plastic Waste Inputs from Land into the Ocean." *Science* 347 (6223): 6223. https://doi.org/10.1126/science.1260352.

OECD. 2022. *Global Plastics Outlook: Economic Drivers, Environmental Impacts and Policy Options*. OECD. https://doi.org/10.1787/de747aef-en.

Sandu, Cristina, Emoke Takacs, Giuseppe Suaria, et al. 2020. "Society Role in the Reduction of Plastic Pollution." In *Plastics in the Aquatic Environment - Part II*, edited by Friederike Stock, Georg Reifferscheid, Nicole Brennholt, and Evgeniia Kostianaia, vol. 112. The Handbook of Environmental Chemistry. Springer International Publishing. https://doi.org/10.1007/698_2020_483.

Tekman, Mine B., Bruno A. Walther, Corina Peter, Lars Gutow, and Melanie Bergmann. 2022. *Impacts of Plastic Pollution in the Oceans on Marine Species, Biodiversity and Ecosystems*. Zenodo. https://doi.org/10.5281/ZENODO.5898684.

UN Environment. 2017. *Marine Litter Socio Economic Study*. United Nations Environment Programme. https://wedocs.unep.org/20.500.11822/26014.

UNIDO. 2019. *Addressing the Challenge of Marine Plastic Litter Using Circular Economy Methods*. Working paper. Practices (KAP) on marine littering. https://www.unido.org/sites/default/files/files/2019-06/UNIDO_Addressing_the_challenge_of_Marine_Plastic_Litter_Using_Circular_Economy.pdf.

Veiga, Joana M., Thomais Vlachogianni, Sabine Pahl, et al. 2016. "Enhancing Public Awareness and Promoting Co-Responsibility for Marine Litter in Europe: The Challenge of MARLISCO." *Marine Pollution Bulletin* 102 (2): 2. https://doi.org/10.1016/j.marpolbul.2016.01.031.