Bonaire 2020 Plastic Baseline

MARINE LITTER, TERRESTRIAL LITTER & PLASTIC WASTE

C. Caporusso (Seven Seas Care)
CLEAN COAST BONAIRE FOR WWF-NL | CAROLYN@CLEANCOASTBONAIRE.ORG

Table of Contents

Table of Figures

Countries that manage and plan for prevention and abatement of waste will benefit from a cleaner environment which can in turn improve international investment, tourism, and economic growth.

Marine Pollution in the Caribbean: Not a Minute to Waste (2020)

Introduction

Prevention of litter is an essential part of protecting the valuable natural resources of Bonaire. Plastic is recognized globally as the most prolific and harmful forms of litter, particularly in the marine environment. Steps are being taken internationally, regionally, and locally to reduce marine litter. To achieve a greater understanding of the abundance, type and source activities of litter in nature and public spaces of Bonaire, WWF-NL initiated the Clean Coast Bonaire project. In anticipation of the upcoming single-use plastic ban, the monitoring data collected to date has been compiled and analyzed to provide the Openbaar Lichaam Bonaire (OLB), Rijksdienst Caribisch Nederland (RCN) and Rijkswaterstaat (RWS) a snapshot of plastic litter on Bonaire at this moment in time. This baseline litter abundance information can be used as a reference point in order to test the achievement of our quantitative litter reduction goals.

This report addresses three questions:
- What is the average amount of plastic and other types of litter currently found at 3 sample sites on the coast of Bonaire?
- What is the average amount of plastic and other types of litter currently found at 8 sample sites in terrestrial locations on Bonaire?
- What is the amount of plastic currently generated on Bonaire?

In addition to reporting this baseline data, the report makes recommendations regarding how we can add to our current knowledge base and take positive steps towards plastic litter reduction.

Marine litter

Definition
An internationally agreed definition of the concept of marine litter (marine debris) has been established by the United Nations. According to this definition, marine litter (marine debris) is "**any persistent, manufactured or processed solid material discarded, disposed of or abandoned in the marine and coastal environment**."

Sources of marine litter
Studies show that marine litter comes from 3 main sources:
- **Land based sources**
  - public littering
  - poor waste management practices
  - industrial activities
  - sewage related debris
  - storm water discharge
- **Riverine sources** (same as sources above - transported by rivers to the ocean)
- **Ocean based sources**
  - fishing activities (particularly abandoned, lost or discarded fishing gear)
  - shipping
  - marine leisure industry
  - offshore oil and hydrocarbon industries

What is the connection between terrestrial and marine litter?

Research suggests that **80 percent of all marine pollution in the Caribbean region comes from land-based sources**. (UNEP-GPA 2016) Therefore, any discussion about how to prevent marine litter should also take terrestrial litter and waste management into account.

Why focus on plastic?

Approximately **80 percent of marine litter is composed of plastic**. Within the Caribbean region it is proving to be a key component of marine and coastal litter. Regional coastal clean-up survey data from 2017 show that 21 percent of items collected were plastic beverage bottles alone and 35 percent of all items are single use plastic. Because plastic degrades very slowly compared to other forms of solid waste, it remains in the environment for years. (Diez, et al. 2019)

THE **BLUE ECONOMY** IS THE "SUSTAINABLE USE OF OCEAN RESOURCES FOR ECONOMIC GROWTH, IMPROVED LIVELIHOODS, AND JOBS WHILE PRESERVING THE HEALTH OF OCEAN ECOSYSTEM."
World Bank

Impact of marine litter

Marine litter is a serious threat to the Blue Economy. Marine litter impacts the value of the goods and services provided by the oceans, including quality of fisheries and the pristine marine environment highly valued by the tourism sector. (Diez, et al. 2019) Global studies have shown that marine litter harms the economy, human health, and creates a range of growing pressures on marine ecosystems and biodiversity. (Chen 2015)

Known hazards of marine litter:

Environmental

- Entanglement of marine life
- Ingestion (whole & micro-plastics)
- Transportation of toxic chemicals into food chain
- Spread of invasive species

Human Health

- Ingestion of micro-plastics via seafood containing some potentially harmful and cancer-causing chemicals
- Mosquito borne diseases due to stagnant water collected in discarded plastic waste

Economic

- Loss of tourism revenue due to unattractive, littered coastline
- Additional clean-up expenses
- Navigational and shipping hazards (i.e., propeller entanglement)
- Fisheries reduction

Figure 1 Plastic Coast - Morotin, Bonaire before clean-up

Why is litter monitoring essential?

An effective litter management strategy for reduction and elimination requires a comprehensive, quantitative litter monitoring program. The implementation of a long-term, large-scale, harmonized litter monitoring program at regional and global levels is an essential part of plastic reduction because it will:

- Provide a greater understanding of the problem
- Identify types of litter, source industries/behaviors/activities, abundance, trends, and distribution at different spatial scales
- Simplify data sharing locally and regionally
- Produce verified, scientifically recognized, and quality-controlled data (via guidance, updates, communication, consistent reporting formats and training)
- Drive reduction and management strategies, policies, and legislation
- Assess the effectiveness of reduction strategies, policies, and legislation
- Enable future monitoring of reduction progress
- Allow for compliance checking
- Provide data to develop local and regional litter baselines
- Reinforce the need for joint action between countries and regions
- Support awareness campaigns by providing data to explain the full scope of the problem, as well as targeting specific products and human behaviors

Caribbean policy framework

The Caribbean Environment Programme (CEP) is one of 18 UN Environment-administered Regional Seas Programmes. The CEP and its Caribbean Action Plan (1981) were established by governments of the Wider Caribbean Region (WCR) to develop regional cooperation and national action for the sustainable management and use of the coastal and marine environment.

The Action Plan led to the 1983 adoption of the **Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region (the Cartagena Convention)**. This is the most comprehensive umbrella environmental agreement for the region and provides the operative legal framework for much of the ocean governance activity in the Wider Caribbean Region.

It consists of three protocols:
- Protocol Concerning Specially Protected Areas and Wildlife (SPAW)
- Protocol Concerning Pollution from Land-Based Sources and Activities (LBS)
- Protocol Concerning Cooperation in Combating Oil Spills
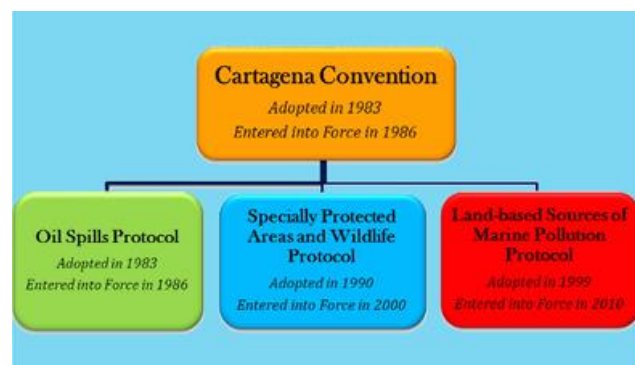

Figure 2 Cartagena Convention & associated protocols UNEP.ORG

The Convention and its three Protocols constitute a legal commitment by the participating governments to protect, develop, and manage their common waters

individually and jointly. The Convention is a framework agreement setting out the political and legal foundations for actions to be developed nationally and regionally and in response to the specific protocols of the Convention.

The Cartagena Convention's Land-Based Sources Protocol is a key instrument for addressing land-based pollution in the Wider Caribbean Region. It aims to prevent, reduce, and control pollution and to ensure sound environmental management. Requirements for assessment and monitoring are an important component, as well as public participation in the review of possible benefits and risks of any major project likely to have an important impact on the marine environment. (Diez, et al. 2019)

The Netherlands is a member state of the Cartagena Convention and ratified the SPAW Protocol in 1992 and the Oil Spills Protocol in 1984. However, **the Netherlands has not ratified the Land-Based Sources Protocol**.

In June 2017, the United Nations Conference to Support the Implementation of Sustainable Development Goal 14, OSPAR Commission (OSPAR) and the Cartagena Convention (CEP) registered a voluntary commitment to collaborate across the Atlantic. Several initial areas for cooperation among the Wider Caribbean Region and the North-East Atlantic have been identified where OSPAR and CEP can partner to provide technical and programmatic support to member states.

Litter monitoring objectives in Bonaire

The WWF-NL implemented OSPAR Marine Litter Monitoring (starting September 2018) and CROW terrestrial monitoring (starting March 2020) in Bonaire via independent contractor in order to:
- fill in the knowledge gap regarding marine and terrestrial litter
- identify types of litter, trends and shifts in litter amounts, and reasons and causes of litter
- provide data to the Openbaar Lichaam Bonaire (OLB), Rijksdienst Caribisch Nederland (RCN) and Rijkswaterstaat (RWS) in a manner that is consistent with monitoring currently conducted in the Netherlands by an independent contractor with funding from the RWS
- pilot the methodology in order to lay the foundation for expansion and harmonization of litter monitoring across the Caribbean to drive regional solutions to plastic waste
- develop and calculate an indicator for how clean Bonaire is, and how clean Bonaire would like to be as a policy goal
- establish a plastic waste baseline and 5-year monitoring strategy to determine if the amount of plastics on Bonaire is declining
- guide cleaning actions and local measures to prevent litter and focus waste management strategy
- support and strengthen the Afvalbeheer op Maat
- monitor effectiveness of single use plastic ban and other plastic pollution mitigation efforts

Marine litter monitoring

OSPAR Marine Litter Monitoring Protocol

The OSPAR Marine Litter Monitoring Protocol was developed in 2000 by a team of experts to monitor marine litter accumulating on the coastlines of the OSPAR region.

- It is conducted in 15 EU countries (including the Netherlands).
- It is a high-resolution survey including over 120 marine litter items.
- Its parameters require complete clearance of a specific survey site at set intervals, allowing for the survey data to be used to calculate:
    - flux-accumulation rate (i.e., how much washes ashore in a fixed time)
    - trends of total amounts of litter (i.e., are we finding more or less over time)
    - trends of different types of litter (i.e., are we finding more COVID masks)

Collection of this high level of data allows policy makers to focus strategy and resources on problematic items and activities, as well as to verify success of reduction policies.

The OSPAR protocol is recognized by global policy makers and marine litter data provided by OSPAR was influential in recent marine litter reduction policies enacted in the EU. These new regulations include bans of several single-use plastic items as well as requiring industry producers to help cover the costs of waste management and clean-up.

Survey procedure

When using the OSPAR Marine Litter Monitoring method, a survey site of 100 meters in length is selected and measured. Data regarding the location, use, physical characteristics, and distance from potential litter sources (such as ports and restaurants) is collected. This survey site is initially cleared of all litter. Subsequent surveys take place at set intervals, ideally 4 times per year (every 3 months).

Figure 3 Sampling of items found during clean-up survey

Litter categories are by composition and source activity, as follows:

Plastic/Polystyrene	Pottery/Ceramics
Glass	Sanitary
Metal	Medical
Wood	Other
Paper/Cardboard	Single-use Plastic
Cloth	Fishing
Rubber	

OSPAR in Bonaire

Starting in September 2018, 3 sites are surveyed 4 times per year at 3-month intervals. Two of the sites, **Boka Onima** and **Piedra Pretu** are on the eastern, windward coastline and primarily accumulate beach cast litter items. **Te Amo Beach**, the one site on the western, leeward coast is a popular recreational beach where most items are littered by beachgoers.

Although in the OSPAR region, the survey length is 100 meters, due to the extreme abundance of litter in the Caribbean and requirement for clearance of all litter, the survey area used in Bonaire was reduced to 50 meters. The OSPAR protocol does not consider beach width, so the results are not reported in terms of square meters.

Figure 4 Map of OSPAR survey sites on Bonaire

Marine litter findings

Based upon available data collected during 2019 and 2020, the average litter amounts per meter have been determined. The survey data collected in 2018 was excluded from this dataset because the initial surveys that took place were for training and clearance of the sites.

The two sites on the east coast (Piedra Pretu and Boka Onima) are very similar in composition and abundance. Boka Onima averages **49 litter items per meter** with over 92% of the items composed of plastic/polystyrene. Piedra Pretu averages **50 litter items per meter** with over 96% of the items composed of plastic/polystyrene. Te Amo Beach is averaging **40 litter items per meter** with over 70% of the items composed of plastic/polystyrene. However, it is important to note that to determine a scientifically credible baseline and to track trends over time, a more robust data sample (3-5 years minimum) is recommended.

SURVEY SITE	AVERAGE AMOUNT OF LITTER ITEMS FOUND PER METER	MOST COMMON ITEM	% OF PLASTIC/POLYSTYRENE
PIEDRA PRETU	50	Plastic/Polystyrene pieces	96%
BOKA ONIMA	49	Plastic/Polystyrene pieces	92%
TE AMO BEACH	40	Cigarette butts	70%

Figure 5 Average amounts of marine litter items found per meter

At the two east coast sites, the majority of the items can be identified as either plastic or expanded polystyrene (EPS) but are too degraded or fragmented to be identified. Common identifiable plastic/EPS items found are caps/lids, drink bottles, foam sponge, food containers, cutlery/trays/straws, chip/candy wrappers and lollypop sticks, cups and string or cord. A more detailed list is provided as Attachment 1 for Boka Onima and Attachment 2 for Piedra Pretu. At Te Amo Beach, cigarette butts are by far the most common item. Other commonly found plastic/EPS items found here are unidentifiable pieces, cutlery/trays/straws, caps/lids,

chip/candy wrappers and lollypop sticks, and decorations. A more detailed list for Te Amo Beach is provided as Attachment 3.
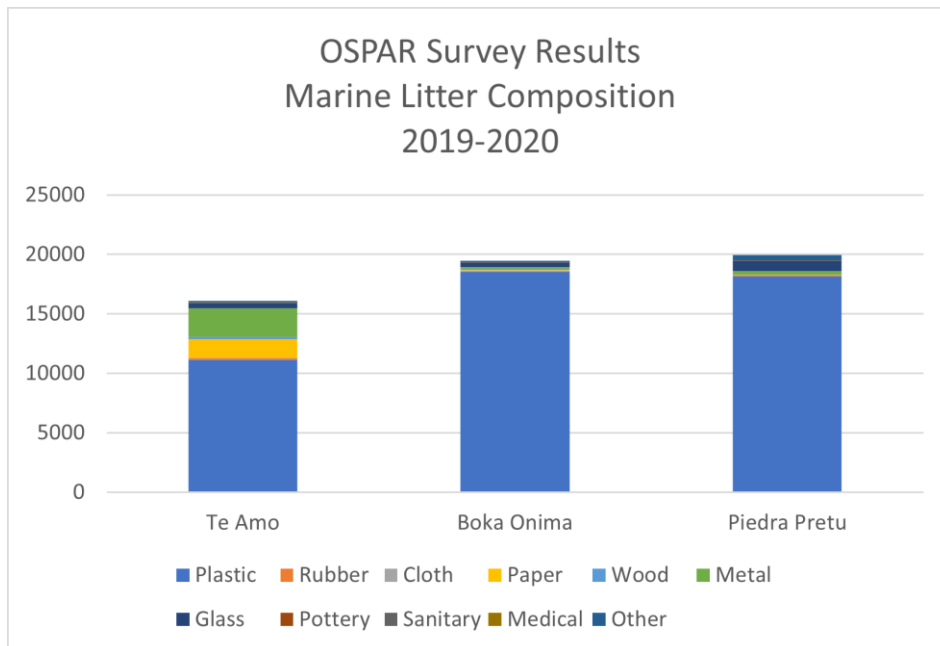

Figure 6 Graph of OSPAR survey results marine litter composition by amount 2019-2020

Regional expansion of Bonaire's marine litter monitoring program

The UN Caribbean Environment Programme (UNEP-CEP) as Secretariat to the Cartagena Convention, the Gulf and Caribbean Fisheries Institute, and the Global Partnership on Marine Litter - Caribbean Node, with support from the OSPAR Commission recognize the imperative of a harmonized marine litter monitoring program in the Wider Caribbean Region. To that end, they convened regional marine litter experts to discuss best practices on harmonized monitoring, and to assess the effectiveness of monitoring and managing marine litter data, with the ultimate goal of developing and implementing recommendations for a uniform litter monitoring and management programme, supported by countries and stakeholders in the Caribbean.

Because Bonaire is the first OSPAR Marine Litter Monitoring site in the Caribbean, UNEP-CEP requested that Clean Coast Bonaire prepare an assessment based on our program to:
- review the different monitoring procedures used in the Caribbean Region, including OSPAR
- evaluate the monitoring procedures based on criteria from UNEP 2009
- provide recommendations on methodology, data management and governance

The assessment, Harmonizing Marine Litter Monitoring in the Wider Caribbean Region: A Hybrid Approach (Caporusso & Hougee 2019) recommends adopting a combined approach that allows for engagement with citizens for monitoring while

ensuring good quality data collection on certain pre-selected sites. This is to be accomplished by continuation of support and promotion of the Trash Free Seas programs (the most prevalent marine litter data collection in the Wider Caribbean Region) as well as introduction of the modified OSPAR Marine Litter Monitoring Methodology developed on Bonaire throughout the region on selected, targeted sites.

In September 2020, Saba became the second island in the WCR to use OSPAR Marine Litter Monitoring. The Dutch Caribbean Nature Alliance (DCNA) and Saba Conservation Foundation, with support from WWF-NL, have implemented a litter monitoring program based on Bonaire's modified OSPAR protocol at one site.

Terrestrial litter monitoring

Methodology: CROW
The CROW Monitoring Protocol was developed in 2015 by the Rijkswaterstaat: Ministerie van Infrastructuur en Millieu. The protocol measures actual litter in public spaces in order to determine and monitor the progress and effect of efforts to reduce litter.

Survey procedure
The surveys require a specific measuring area of 100m x 100m to be surveyed at set intervals. During the survey, the 3 most littered 10m x 10m areas within the measuring area are determined by visual inspection and the coarse litter contained within them are counted. It includes 33 different litter items.

Fine litter (such as cigarette butts) are only counted within a 1m x 1m area within each 10m x 10m area.

Once counted, the amounts are used to grade the measuring areas as follows:
A+ - very clean (0 litter items)
A - clean (1-3 litter items)
B – moderately clean (4-10 litter items)
C – dirty (11-25 litter items)
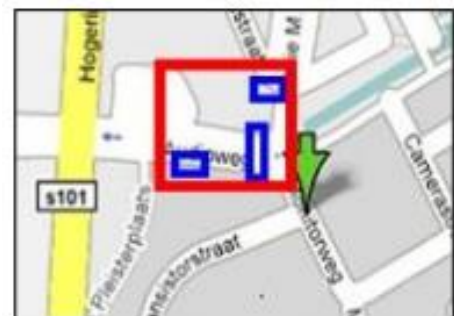D – very dirty (> 25 litter items)

Figure 7 Example of measuring area

CROW in Bonaire

To more effectively monitor plastics found in nature, a few minor adaptations were made to the CROW protocol. Sub-categories of items were added in order to denote the composition. For example, the item *(drink/koffie/ijs) bekers* was sub-divided into Plastic Cups, Polystyrene Cups and Paper Cups.

Eight sites were selected, with the main concentration in the more heavily populated area of Kralendijk: Seru Largu, Rincon center, Scholengemeenschap Bonaire, Parke Tului Domacasse, La Sonrisa Ballpark, Kaya Industria, Kaya Soeur Bartola, and Wilhelminaplein.
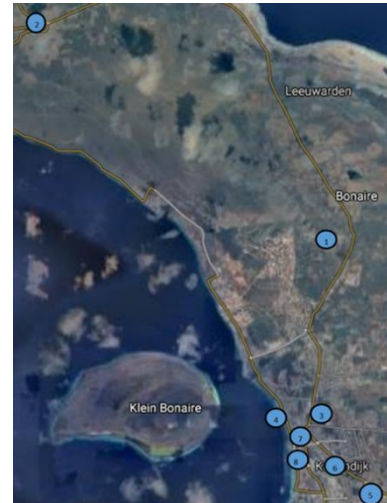
Figure 8 Map of CROW monitoring sites on Bonaire

Terrestrial litter findings

In Bonaire, overall the surveys are averaging **0.55 coarse litter items per square meter**. With respect to composition, an average of 61.5% of the items are plastic/polystyrene. Commonly found plastic/EPS items are straws, chip/candy wrappers, lollipop sticks, cups, bottles, bags, stirrers, and takeaway food containers. A more detailed list can be found as Attachment 4.

SURVEY SITE	AVERAGE LITTER ITEMS PER SQ METER*	MOST COMMON COARSE ITEM	% OF PLASTIC/ POLYSTYRENE	AVERAGE GRADE COARSE LITTER
WILHELMINAPLEIN	0.1	Metal bottle caps	60.9%	A (1-3)
RINCON CENTER	0.44	Metal bottle caps	45.5%	C (11-25)
PARKE TULUI DOMACASSE	0.5	Balloons	62.1%	C (11-25)
LA SONRISA BALLPARK	0.52	Metal bottle caps	63.7%	D (>25)
KAYA INDUSTRIA	0.63	Paper pieces	46.7%	D (>25)
SCHOLENGEMEEN SCHAP BONAIRE	0.66	Plastic straws	74.2%	D (>25)
SERU LARGU	0.7	Metal bottle caps	38.1%	D (>25)
KAYA SOEUR BARTOLA	0.87	Metal bottle caps	44.1%	D (>25)

* ALL ITEMS COUNTED IN 100M SQUARE SURVEY AREA

Figure 9 Average amount of terrestrial litter items found per meter
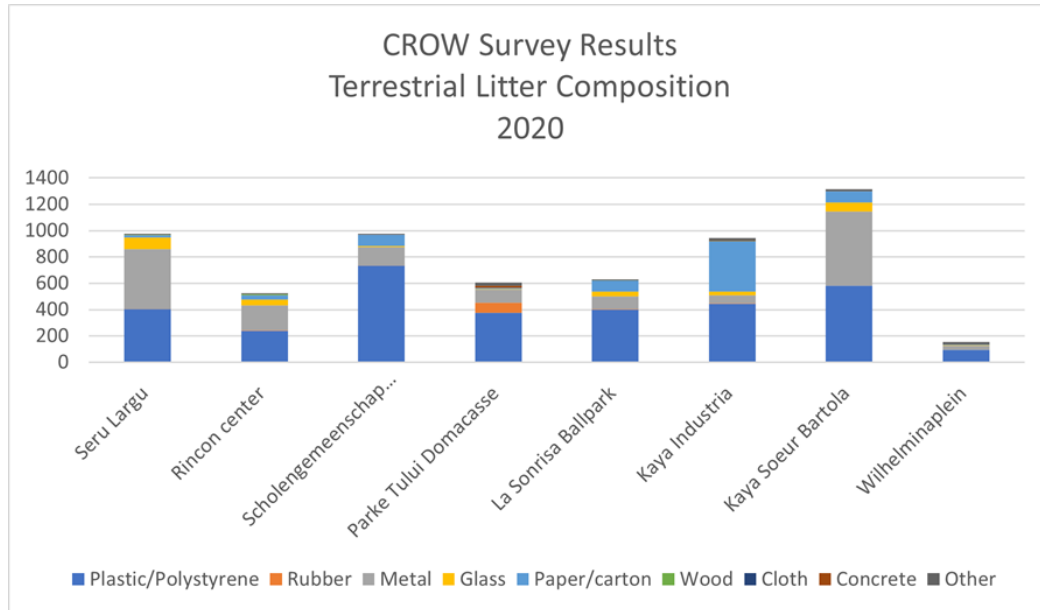
Figure 10 Graph of CROW survey results terrestrial litter composition by amount 2020

Fine litter items/cigarette butts

Fine litter items such as cigarette butts, chewing gum, food residue and broken glass are only counted in the most littered 1m square area of each survey. Cigarette butts are encased in paper, but the filters are composed of plastic. During surveys, cigarette butts and broken glass are the primary items causing the low survey grades.

Although cigarette butts are only counted in 1/100th of the survey areas, they are still ranking as the 2nd most littered items.

Wilhelminaplein is the only survey site that has in-ground cigarette butt receptacles.

Figure 11 Cigarette butt receptacle at Wilhelminaplein

SURVEY SITE	AVERAGE GRADE FINE LITTER	AVERAGE CIGARETTE BUTTS PER SURVEY*
LA SONRISA BALLPARK	C (11-25)	2.92
WILHELMINAPLEIN	B (4-10)	4.93
KAYA INDUSTRIA	C (11-25)	12
SCHOLENGEMEENSCHAP BONAIRE	C (11-25)	14.93
KAYA SOEUR BARTOLA	C (11-25)	18
PARKE TULUI DOMACASSE	C (11-25)	18.33
RINCON CENTER	C (11-25)	18.75
SERU LARGU	C (11-25)	21.73

* COUNTED ONLY IN MOST LITTERED 1 SQUARE METER

Figure 12 Average fine litter grade & cigarette butts found per survey

Plastic waste generated on Bonaire

Current data collection by Selibon BV

In order to monitor the volume of plastic waste generated on Bonaire before and after the single-use plastic ban, in 2020 data provided by Selibon BV was analyzed. Selibon's yearly *Afval Trend* report contains data from 2013 to 2020. The specificity of the data is limited to the weight of waste entering the landfill as classified by source and/or composition during their regular operations. The list of classifications consists of:

Used oil
Rejected products
Asbestos products
Car wrecks
Appliances
Tires
Construction & demolition waste
Business/industrial waste
Confidential documents
Other waste

Industrial waste
Large household waste
Fruit/vegetable/yard waste (organics)
Glass
Household waste
Household hazardous waste (paint, batteries)
Cadavers
Old (iron) metal
Metal (non-iron) (aluminium, copper)

Other waste
Plastic
Paper & cardboard
Pallet/wood waste
Other waste
SIAL
Medical waste
Textiles
Litter
Litter from kunuku
Illegally dump waste

Data provided for 2020 by Selibon indicates the following:

Plastic: 824 tons
Huishoudelijk Afval/Household waste: 42533 tons
Total waste: 170801.04 tons

The classification of "Plastic" refers to waste that has been deposited into Selibon's plastic recycling receptacles, the percentage content by item type, format or polymer type is unknown. It is unknown what proportion of the household waste (or any other categories) consists of plastic (single-use or otherwise).

Knowledge gaps in data

With this data it is not possible to determine the total volume of plastic (single-use or other) generated on Bonaire.

It is unknown what proportion of the household waste (or any other categories) consists of plastic (single-use or otherwise).

The percentage content of within the "Plastic" category by item type, format or polymer type is unknown.

Historic waste composition analysis at landfill

A "Waste sorting analysis" for Selibon NV was conducted in 2011 and 2012 for domestic waste and 2013 for commercial waste. (Note: "commercial" is not a category within the Selibon Afval Trend report). The analysis was conducted by Regra Bonaire BV on behalf of Selibon.

The purpose of the study was to help Selibon in developing new policies on waste prevention, management, and recycling. By determining the average percentage of each category of waste, the approximate volume of each could be extrapolated based on the statistics collected by Selibon.

Samples were taken from a typical collection tour from various representative neighborhoods for the domestic waste study. The commercial study reviewed the waste from 5 branches: restaurants, hotels/resort, offices, supermarkets/shops and businesses.

The waste items were sorted into the following categories and weighed.

Garden(bio) waste	Concrete/stones
Kitchen(bio) waste	Equipment
Paper/carton	Rest(remaining)waste
Glass	Drinking cartons
Clothes/textile	Diapers/hygienic
Plastics	Foam boxes
Metal	Small waste particles from 4cm to 1cm
Wood	Small waste particles < 1cm

The results of the analysis show that approximately 21% of household waste was plastic in 2011 and 13.9% in 2012. In 2013, 13.2% of commercial waste was determined to be plastic.

Knowledge gaps in data

This information is out of date, particularly with respect to behavioral changes and decreased tourist volume due to the COVID-19 pandemic.

It is unknown what proportion of the waste consists of single-use plastic.

Current waste composition data collected in NL

As part of the monitoring of the National Waste Management Plan, the composition of Dutch household residual waste is examined annually in the Netherlands by the Rijkswaterstaat as per the Samenstelling van het huishoudelijk restafval, sorteeranalyses. It is outsourced to EURECO BV, a research agency that specializes in physical research of various waste streams.

A representative sample is taken from the residual household waste of about 13,000 kg. This waste is sorted into components. The Eureco sorting process, including the unloading of the samples, is completely indoors and conducted by permanent, specialized staff. The samples are temporarily stored in bunkers. Between delivery and sorting are no later than 3 working days. The sorting process uses an elevator belt, vibrating sieve (20 mm), inspection belt and scales. Recognizing iron is done with the help of a magnet.

By determining the average percentage of each category of waste from samples taken from various representative neighborhoods, the approximate volume of each is extrapolated based on the statistics.

Figure 13 EURECO sorting in action (Image from: eureco-onderzoek.nl)

This study is more detailed than the ones completed previously on Bonaire, a detailed list of components can be found as Attachment 5.

Knowledge gaps

The level of detail within the sub-categories of plastic does not specifically address single-use items of interest on Bonaire.

Recommendations

Marine litter knows no boundaries. For example, it is apparent that marine litter found on the east coast of Bonaire is washing ashore from elsewhere and marine litter found on the west coast of Bonaire is being generated locally. Reduction measures

must be prioritized both within and outside of our coastlines because in the simplest terms this is a case of "Our plastic = Your problem / Your plastic = Our problem."

Bonaire's unique position as both a member of the Wider Caribbean Region community and a part of the Netherlands and European Union provides us with an opportunity to mitigate marine litter and preserve our valuable natural resources via several different pathways. A combination of local, national, regional, and international action and cooperation is essential to address this problem.

Increase litter data collection and sharing

- Ensure that long-term marine and terrestrial litter monitoring programs occur in Bonaire, Saba, and St. Eustatius in a manner consistent with the current monitoring programme in the European Netherlands as supported by Rijkswaterstaat.

- Support expansion of OSPAR Marine Litter Monitoring to Curacao, Aruba, and St. Maarten.

- Establish database for the Dutch Caribbean to capture and monitor all waste monitoring data and make annual reports publicly available.

Implement integrated litter management strategy on Bonaire

- Introduce new legislation to prevent common and persistent litter items at the source, guided by annual report of monitoring data.

- Implement behavioural change prevention measures such as: trash receptacle management, enforcement, design of public space, anti-littering and awareness campaigns specifically targeting common and persistent litter items on beaches and other public areas (i.e. cigarette butts).

- Support expansion of Selibon's efforts to mitigate litter.

- Increase public, private and volunteer cleaning efforts.

- Encourage local parties and visitors to actively reduce their plastic footprints with programs such as Boneiru Duradero's Beyond Plastic Bonaire's e-learning program and a Bonaire Clean Pact.

Commit to regional cooperation regarding marine litter within the Wider Caribbean Region

- Submit a request to the Dutch government to ratify the Cartagena Convention's Land-Based Sources Protocol (LBS), a key instrument for addressing land-based pollution in the Wider Caribbean Region, and increase efforts to actively implement their mandates.

- Ensure that within Bonaire and the Caribbean Netherlands the implementation, compliance, and enforcement of plastic reduction policies and legislation are aligned with regional reduction goals (as per UNEP-CEP Regional Action Plan on Marine Litter Management).

- Increase communication and discuss mitigation measures (such as regional plastic monitoring and reduction efforts) within the Wider Caribbean Region to address sources and underlying causes of marine litter.

Support international plastic reduction efforts

- Advocate as Caribbean Netherlands towards the Dutch Government in support of a [global plastic treaty](#).

- Join the global movement to adopt education and public awareness campaigns regarding plastic reduction.

Fill the knowledge gap regarding waste generation on Bonaire with respect to plastic and single-use plastic

- Conduct a similar study to the *Samenstelling van het huishoudelijk restafval, sorteeranalyses* with cooperation from Rijkswaterstaat and Eureco prior to the commencement of the single-use plastic ban.

- Include single-use plastic and other marine litter indicator items in the study to monitor effectiveness and impact of Bonaire's impending single-use plastic ban.
  - add sub-categories to collect data regarding single-use items of interest (with assistance from Clean Coast Bonaire to also target common marine litter items and items found in nature)
  - review and determine what other information would be beneficial to collect (i.e. polymer types for recycling potential)
  - include samples from domestic sources, commercial sources and the contents of the plastic recycling repositories

- To collect sufficient waste composition data in a cost-effective way, the following should be evaluated:
  - Minimum frequency of surveys required (i.e. every year, every five years).
  - Training by Eureco of Selibon staff to conduct sample sorting in-house with data to be analyzed and reported by an on-island consultant.

Conclusion

Marine litter is a serious threat to our Blue Economy and impacts the value of the goods and services provided by the oceans, especially the pristine marine environment highly valued by our tourism sector. Bonaire must act to protect and prioritize our valuable coastal and marine natural capital.

To heighten effectiveness, national policies on marine pollution within Bonaire and the Caribbean Netherlands should be guided by, and aligned with, regional and global frameworks. This will help to meet international commitments (e.g., Sustainable Development Goals) and fully benefit from international cooperation and resources. There is tremendous potential to build on programs that are already in place, such as OSPAR Marine Litter Monitoring and the Cartagena Convention Land-Based Sources Protocol. What is now required is a shift in thinking and the political will to prioritize plastic litter reduction.

Bonaire is already taking a positive step in the right direction with the single-use plastic ban Letter of Intent. However, additional steps can be taken to secure our valuable resources by increasing Bonaire's commitment to protection of the marine environment by local action and regional cooperation.

References:

Caporusso, C. and Hougee, M. (2019) Harmonizing Marine Litter Monitoring in the Wider Caribbean Region: A Hybrid Approach.

Chen, C.L. (2015) M. Bergmann et al. (eds.), Marine Anthropogenic Litter, DOI 10.1007/978-3-319-16510-3_15.

Cheshire, A.C., Adler, E., Barbière, J., Cohen, Y., Evans, S., Jarayabhand, S., Jeftic, L., Jung, R.T., Kinsey, S., Kusui, E.T., Lavine, I., Manyara, P., Oosterbaan, L., Pereira, M.A., Sheavly, S., Tkalin, A., Varadarajan, S., Wenneker, B., Westphalen, G. (2009). UNEP/IOC Guidelines on Survey and Monitoring of Marine Litter. UNEP Regional Seas Reports and Studies, No. 186; IOC Technical Series No. 83.

De Graf, P. for Selibon NV Waste (2013). Sorting analysis for Selibon NV Held in December 2012 and January 2013

Diez, S.M., Patil, P.G., Morton, J., Rodriguez, D.J., Vanzella, A., Robin, D.V., Maes, T., Corbin, C. (2019). Marine Pollution in the Caribbean: Not a Minute to Waste. Washington, D.C. : World Bank Group.

Rijkswaterstaat: Ministerie van Infrastructuur en Milieu (2015). Monitoringprotocol zwerfafval Landelijke meting schoonheidsbeelden en samenstelling

Rijkswaterstaat: Ministerie van Infrastructuur en Milieu (2018). Samenstelling huishoudelijk restafal

UNEP-CEP. (2014) Regional Action Plan on Marine Litter (RAPMALI) for the Wider Caribbean Region CEP Technical Report: 72

UNEP-GPA. (2016) http://web.unep.org/nairobiconvention/unep-global-programme-action-unepgpa

Wenneker, B., Oosterbaan, L., Intersessional Correspondence Group on Marine Litter (ICGML). (2010). Guideline for Monitoring Marine Litter on the Beaches in the OSPAR Maritime Area. OSPAR Commission, 2010 Agreement number 2010-02 ISBN 90 3631 973 9

WWF, the Ellen MacArthur Foundation & BCG (2020). The Business Case for a UN Treaty on Plastic Pollution

Attachment 1: Top 15 most commonly found items at Boka Onima 2019-2020

Note: The items that are plastic or expanded polystyrene (EPS) highlighted in yellow.

Boka Onima - Top 15 Most Commonly Found Items 2019-2020	Average Amount Per Survey	Average Amount Per Meter
Plastic/polystyrene (EPS) pieces 0 - 2,5 cm	1733.5	34.67
Plastic/polystyrene (EPS) pieces 2,5 cm > < 50 cm	214.63	4.29
Plastic caps/lids	138.13	2.76
Glass pieces	42.75	0.86
Drinks (bottles, containers and drums)	40.88	0.82
Foam sponge	34.88	0.70
Plastic/polystyrene (EPS) food containers (incl. fast food containers)	29.75	0.60
Plastic cutlery/trays/straws	28.88	0.58
Chip/candy wrappers and lollypop sticks	14.63	0.29
Glass bottles	12.5	0.25
Plastic cups	11.38	0.23
String and cord (diameter less than 1 cm)	7.88	0.16
Wood pieces (manufactured)	7.38	0.15
Plastic/polystyrene (EPS) pieces > 50 cm	6.75	0.14
Paraffin wax 0-1cm	6.25	0.13

Attachment 2: Top 15 most commonly found items at Piedra Pretu 2019-2020

Note: The items that are plastic or expanded polystyrene (EPS) highlighted in yellow.

Piedra Pretu - Top 15 Most Commonly Found Items 2019-2020	Average Amount Per Survey	Average Amount Per Meter
Plastic/polystyrene (EPS) pieces 0 - 2,5 cm	1974.13	39.48
Plastic/polystyrene (EPS) piece 2,5 cm > < 50 cm	126.5	2.53
Glass pieces	109.75	2.2
Plastic caps/lids	60.38	1.21
Tar	49.88	1.00
Glass bottles	25.25	0.51
Foam sponge	24.50	0.49
String and cord (diameter less than 1 cm)	9.88	0.20
Plastic cutlery/trays/straws	9.25	0.19
Plastic/polystyrene (EPS) food containers (incl. fast food containers)	8.25	0.17
Paraffin wax 0-1cm	8.25	0.17
Plastic/polystyrene (EPS) pieces > 50 cm	6.13	0.12
Drinks (bottles, containers and drums)	5.75	0.12
Rubber pieces	5.5	0.11
Chip/candy wrappers and lollypop sticks	5.25	0.11

Attachment 3: Top 15 most commonly found items at Boka Onima 2019-2020

Note: The items that are plastic or expanded polystyrene (EPS) highlighted in yellow.

Te Amo Beach - Top 15 Most Commonly Found Items 2019-2020	Average Amount Per Survey	Average Amount Per Meter
Cigarette butts	990.75	19.82
Metal bottle caps	242.63	4.85
Plastic/polystyrene (EPS) pieces 0 - 2,5 cm	112	2.24
Cardboard firework bottoms	69	1.38
Plastic cutlery/trays/straws	60.38	1.21
Plastic caps/lids	55.13	1.10
Glass pieces	54	1.08
Paper pieces	52	1.04
Chip/candy wrappers and lollypop sticks	33.38	0.67
Plastic decorations (beads, rhinestones, plastic ribbons, flowers, sequins)	27.38	0.55
Plastic/polystyrene (EPS) piece 2,5 cm > < 50 cm	23.5	0.47
Cardboard pieces	19.63	0.39
Foil wrappers	18.75	0.375
Glass bottles	17.88	0.36
Paper towels/napkins	12.63	0.25

Attachment 4: Top 15 most commonly found coarse litter items 2020

Note: The items that are plastic or expanded polystyrene (EPS) highlighted in yellow. Cigarette butts are not included in this list because they are only counted in a 1 m2 area.

CROW - Top 15 Most Commonly Found Coarse Litter Items 2020	Average Amount Per Survey	Average Amount Per Meter
Metal bottle caps	13.61	0.1361
Plastic straws	4.12	0.0412
Chip/candy wrappers	2.91	0.0291
Glass bottles	2.56	0.0256
Paper pieces	2.23	0.0223
Plastic lollipop sticks	1.77	0.0177
Plastic cups	1.64	0.0164
Plastic bottles <1 litre	1.38	0.0138
Paper towels/napkins	1.23	0.0123
Paper receipts (bank, parking, train, bus)	1.12	0.0112
Plastic bag (shop + shirts)	1.11	0.0111
Plastic cutlery	1.04	0.0104
Metal cans	1.01	0.0101
Plastic stirrers	0.88	0.0088
Polystyrene (EPS) takeaway containers	0.84	0.0084

Attachment 5: Eureco waste component analysis categories

Category	1st Sub-category	2nd Sub-category	3rd Sub-category
Fruit/vegetable/yard waste (organics)	Fruit/vegetable/yard waste (organics) Unidentifiable/other	Kitchen Garden	
Paper/cardboard	Recyclable Non-recyclable	Packaging Non-packaging Packaging Non-packaging	Drink carton Non-drink carton
Incontinence material			
Plastic	Packaging Non-packaging	Containers Other packaging Garbage bags Non-garbage bags	Bottles (water/soft drink) Bottles (dairy/juice) Container (non-beverage) Bags Wrappers Plastic wrap/cling film Laminated aluminium EPS/Styrofoam Form-holding
Glass	Packaging Non-packaging		
Iron	Packaging Non-packaging		
Non-iron	Packaging Non-packaging		
Textile (inc. footwear)	Re-usable Recyclable Non re-usable/Non recyclable Footwear		
Household hazardous waste	Batteries Other		
Other	Electric appliances Wood Stone/concrete Residual	Small Large Packaging Non-packaging	