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Case study

Bar, Montenegro
Europe

Bar
Montenegro

Population
46,171

Total MSW Generation
561.05 kg/cap/year

Size of the city
598.00 km2
0.00 km2 water mass

MSW Collected
94%

Settlement type
Urban

Plastic Waste Generation
133.1 kg/cap/year

Year of Survey
2024

Plastic to water systems
5.7 kg/cap/year

Borders map courtesy of geoBoundaries

Context and description

The Municipality of Bar is situated in the southeastern region of the Montenegrin coast, nestled between Skadar Lake and the Adriatic Sea. The area is divided into three main zones: the port and coastal zone, the shores of Lake Skadar, and the mountainous Rumija region in the central part of the municipality.

Bar benefits from Mediterranean-Adriatic waterways, being closest to the Otranto Gate, only 95 km from the port of Bar. This port has significant potential as a major traffic hub for ships traveling along the Atlantic-Gibraltar and Indian Ocean-Red Sea-Suez Canal routes.

The region has a Mediterranean climate, characterized by dry, hot summers and mild, wet winters, making it a prominent tourist destination in summer months with its coastal beaches and historical sites. In 2022, Bar saw significant tourist activity, leading to increased waste generation during peak seasons.

In 2022, Bar generated approximately 26,709 tonnes of municipal solid waste (MSW), averaging 578.48 kg/capita/year. Waste characterization studies from 2014 revealed that over 20% of the collected waste was various types of plastic. However, recycling efforts remain minimal, with only 1.5% of waste (mainly paper and PET bottles) being sorted by the formal sector, with the informal sector primarily focused on metal waste, with little plastic recycling. The municipality's waste collection coverage rate is 91% and is managed using modern, automated vehicles and a substantial number of waste containers.

Context and description continued

The "Možura" sanitary landfill serves multiple municipalities, including Bar, with an area of approximately 135 hectares and a capacity of 1,056,036 m3. Despite its pollution control measures and aims to minimize the consumption of raw materials and energy while preventing or reducing emissions into the air, water, and land, it still faces challenges with informal disposal sites and illegal dumping.

The Waste Flow Diagram (WFD) assisted in identifying plastic leakage at various stages of the waste management value chain, allowing robust recommendations to be identified that pinpoint the stages of the SWM chain that require further attention.

The Municipality of Bar, Montenegro, forms part of the wider Integrated MSW and Marine Litter Prevention in the Western Balkans II project, implemented by GIZ.

Survey implementation arrangement

City	Bar
Financed by	
Implemented by	GIZ

Overview data

Population	46,171
Waste generation rate, including commercial and institutional waste	1.58 kg/capita/day
Total MSW generation	73 tonnes/day
Collection rate	94 %
MSW sent to disposal	91 %
MSW sorted for recovery	2 %
MSW managed in controlled facilities	1 %
Plastic waste generation	6,143 tonnes/year
Unmanaged plastic	9 % of the entire plastic waste generation

MSW composition at point of generation

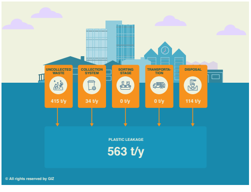
paper 15.00 %	metals 4.00 %
plastics 23.00 %	other 7.00 %
glass 4.00 %	organic 47.00 %

WFD results

Plastic waste generation: 6,143 t/y	Fate of unmanaged plastic waste	Plastic to water systems
Unmanaged 9 %	Retained on land 39 %	Contribution directly entering water systems 74 %
Managed 91 %	Cleaned from drains 4 %	Contribution entering via storm drains 26 %
	Ending up in water systems 46 %	
	Openly burnt 11 %	

Plastic waste to the environment	563 tonnes/year	9 % of the plastic waste generated
Plastic to water systems	261 tonnes/year	384 trucks
Plastic to water systems per person	5.7 kg/person/year	190 PET bottles per person

Contribution to unmanaged plastic by SWM stage



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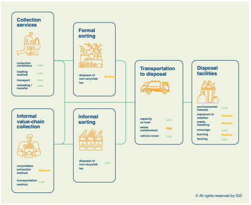
Plastic leakage potential levels per leakage influencers


Collection services
collection containers Low
loading method Low
transport Low
reloading / transfer Low
Formal sorting
disposal of non-recyclables Medium
Informal value-chain collection
recyclables extraction method Medium
transportation method Low
Informal sorting
disposal of non-recyclables Low
Transportation to disposal
capacity vs load Low
waste containment High
vehicle cover Low
Disposal facilities
environmental hazards Low
exposure to weather Medium
waste handling Medium
coverage Low
burning Medium
fencing Low

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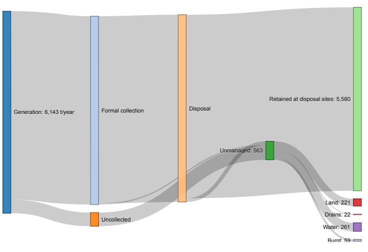
Sankey waste flow diagram



Aims

- To create a waste analysis for the Municipality of Bar, detailing the specific quantities of waste generated, collected, transported, and disposed of, with a particular focus on identifying the sources and fates of plastic waste.
- To precisely measure the volume of plastic waste leaking into the environment at various stages of the waste management system in Bar. This included evaluating the efficiency and coverage of waste collection services in both urban and rural areas of Bar, identifying specific gaps in service that contribute to uncollected waste and informal dumping.
- To analyse the seasonal impact of tourism on waste generation in Bar, quantifying the increase in waste volumes during peak tourist months and assessing the capacity of the current waste management system to handle these fluctuations.
- To develop specific, actionable recommendations tailored to the Municipality of Bar, aimed at reducing plastic leakage, improving waste collection and recycling rates, and addressing the unique challenges posed by the local geography and seasonal tourism.

Lessons learned & challenges

- Approximately 563 tonnes/year of unmanaged plastic waste finds its way into the environment, with a substantial portion ending up in water streams and on land. This finding shows the need for expanding waste collection coverage and improving collection efficiency, particularly in rural and peri-urban areas.
- Currently, only 57 tonnes/year of waste being managed in controlled facilities. Infrastructure investments are needed to enhance sorting and recycling programs and encourage waste segregation at source.
- The influx of tourists significantly increases waste generation during peak seasons, putting additional strain on the waste management system, highlighting that effective strategies are needed to manage seasonal waste surges to maintain cleanliness and reduce environmental impact.

- Despite formal waste management systems, informal disposal sites and illegal dumping remain prevalent. Strengthening enforcement of waste management regulations and providing adequate disposal facilities are crucial to address this issue.