

Marine Litter

Marine litter is any persistent, manufactured or processed solid material discarded, disposed of or abandoned in the marine and coastal environment. Marine litter consists of items that have been made or used by people and deliberately discarded into the sea or rivers or on beaches; brought indirectly to the sea with rivers, sewage, storm water or winds; or accidentally lost, including material lost at sea in bad weather.

Marine litter originates from many sources and causes a wide spectrum of environmental, economic, safety, health and cultural impacts. The very slow rate of degradation of most marine litter items, mainly plastics, together with the continuously growing quantity of the litter and debris disposed, is leading to a gradual increase in marine litter found at sea and on the shores.

Litter classification

Table.1 List of litter types for comprehensive and rapid beach surveys. In all cases quantification can be made using either counts, weights and volumes.

CLASS	MATERIAL COMPOSITION	LITTER CODE	LITTER FORM (and examples)	RLC
1	Plastic	PL01	Bottle caps & lids	RL01
2	Plastic	PL02	Bottles < 2 L	RL02
3	Plastic	PL03	Bottles, drums, jerrycans & buckets > 2 L	RL03
4	Plastic	PL04	Knives, forks, spoons, straws, stirrers, (cutlery)	RL26
5	Plastic	PL05	Drink package rings, six-pack rings, ring carriers	RL11
6	Plastic	PL06	Food containers (fast food, cups, lunch boxes & similar)	RL09
7	Plastic	PL07	Plastic bags (opaque & clear)	RL15
8	Plastic	PL08	Toys & party poppers	RL27
9	Plastic	PL09	Gloves	RL25
10	Plastic	PL10	Cigarette lighters	RL20
11	Plastic	PL11	Cigarettes, butts & filters	RL19
12	Plastic	PL12	Syringes	RL18
13	Plastic	PL13	Baskets, crates & trays	RL06
14	Plastic	PL14	Plastic buoys	RL04
15	Plastic	PL15	Mesh bags (vegetable, oyster nets & mussel bags)	RL25
16	Plastic	PL16	Sheeting (tarpaulin or other woven plastic bags, palette wrap)	RL16
17	Plastic	PL17	Fishing gear (lures, traps & pots)	RL06
18	Plastic	PL18	Monofilament line	RL07
19	Plastic	PL19	Rope	RL08
20	Plastic	PL20	Fishing net	RL05
21	Plastic	PL21	Strapping	RL17
22	Plastic	PL22	Fibreglass fragments	RL23
23	Plastic	PL23	Resin pellets	RL23
24	Plastic	PL24	Other (specify)	RL23
25	Foamed Plastic	FP01	Foam sponge	RL13
26	Foamed Plastic	FP02	Cups & food packs	RL09
27	Foamed Plastic	FP03	Foam buoys	RL04
28	Foamed Plastic	FP04	Foam (insulation & packaging)	RL13
29	Foamed Plastic	FP05	Other (specify)	RL13
30	Cloth	CL01	Clothing, shoes, hats & towels	RL25
31	Cloth	CL02	Backpacks & bags	RL25
32	Cloth	CL03	Canvas, sailcloth & sacking (hessian)	RL25
33	Cloth	CL04	Rope & string	RL08
34	Cloth	CL05	Carpet & furnishing	RL25

CLASS	MATERIAL COMPOSTION	LITTER CODE	LITTER FORM (and examples)	RLC
35	Cloth	CL06	Other cloth (including rags)	RL25
36	Glass & ceramic	GC01	Construction material (brick, cement, pipes)	RL23
37	Glass & ceramic	GC02	Bottles & jars	RL02
38	Glass & ceramic	GC03	Tableware (plates & cups)	RL26
39	Glass & ceramic	GC04	Light globes/bulbs	RL22
40	Glass & ceramic	GC05	Fluorescent light tubes	RL21
41	Glass & ceramic	GC06	Glass buoys	RL04
42	Glass & ceramic	GC07	Glass or ceramic fragments	RL23
43	Glass & ceramic	GC08	Other (specify)	RL23
44	Metal	ME01	Tableware (plates, cups & cutlery)	RL26
45	Metal	ME02	Bottle caps, lids & pull tabs	RL01
46	Metal	ME03	Aluminium drink cans	RL10
47	Metal	ME04	Other cans (< 4 L)	RL10
48	Metal	ME05	Gas bottles, drums & buckets (> 4 L)	RL03
49	Metal	ME06	Foil wrappers	RL09
50	Metal	ME07	Fishing related (sinkers, lures, hooks, traps & pots)	RL06
51	Metal	ME08	Fragments	RL23
52	Metal	ME09	Wire, wire mesh & barbed wire	RL29
53	Metal	ME10	Other (specify), including appliances	RL23
54	Paper & cardboard	PC01	Paper (including newspapers & magazines)	RL14
55	Paper & cardboard	PC02	Cardboard boxes & fragments	RL14
56	Paper & cardboard	PC03	Cups, food trays, food wrappers, cigarette packs, drink containers	RL09
57	Paper & cardboard	PC04	Tubes for fireworks	RL27
58	Paper & cardboard	PC05	Other (specify)	RL23
59	Rubber	RB01	Balloons, balls & toys	RL27
60	Rubber	RB02	Footwear (flip-flops)	RL25
61	Rubber	RB03	Gloves	RL25
62	Rubber	RB04	Tyres	RL28
63	Rubber	RB05	Inner-tubes and rubber sheet	RL28
64	Rubber	RB06	Rubber bands	RL23
65	Rubber	RB07	Condoms	RL18
66	Rubber	RB08	Other (specify)	RL23
67	Wood	WD01	Corks	RL23
68	Wood	WD02	Fishing traps and pots	RL06
69	Wood	WD03	Ice-cream sticks, chip forks, chopsticks & toothpicks	RL12
70	Wood	WD04	Processed timber and pallet crates	RL24
71	Wood	WD05	Matches & fireworks	RL12
72	Wood	WD06	Other (specify)	RL23
73	Other	OT01	Paraffin or wax	RL23
74	Other	OT02	Sanitary (nappies, cotton buds, tampon applicators, toothbrushes)	RL18
75	Other	OT03	Appliances & Electronics	RL23
76	Other	OT04	Batteries (torch type)	RL23
77	Other	OT05	Other (specify)	RL23

This classification system comprises a list of 10 different material classes and a total of 77 discrete types of litter.

General litter class	Code	Litter description with examples
Containers	RL01	Bottle caps, lids & pull tabs
	RL02	Bottles < 2 L
	RL03	Bottles, drums & buckets > 2 L
Fishing & Boating	RL04	Buoys
	RL05	Fishing net
	RL06	Fishing related (sinkers, lures, hooks, traps, pots & baskets/trays)
	RL07	Monofilament line
	RL08	Rope
Food & Beverage	RL09	Cups, food trays, fast food wrappers & cardboard drink containers
	RL10	Drink cans
	RL11	Drink package rings
	RL12	Ice-cream sticks, chip forks, chopsticks, toothpicks, matches & fireworks
Packaging	RL13	Foam (insulation & packaging)
	RL14	Paper & cardboard
	RL15	Plastic bags (opaque & clear)
	RL16	Plastic sheet or plastic tarpaulin
	RL17	Strapping
Sanitary	RL18	Sanitary (nappies, tampon applicators, cotton buds, condoms, etc)
Smoking	RL19	Cigarette butts
	RL20	Cigarette lighters
Other	RL21	Fluorescent light tubes
	RL22	Light globes
	RL23	Other (specify)
	RL24	Processed timber
	RL25	Rags, clothing, shoes, hats & towels
	RL26	Tableware
	RL27	Toys
	RL28	Tyres & Inner-tubes
	RL29	Wire, wire mesh & barbed wire

Marine litter monitoring aims to support (primary objectives)

- 1) Quantification and characterization of marine litter for the purposes of developing and evaluating the effectiveness of management, control, enforcement and/or mitigation strategies in particular integration with solid waste management.
- 2) Understanding of the level of threat posed by marine litter to biota and ecosystems.
- 3) Provision of comparable datasets to support national, regional and global assessments of marine litter.

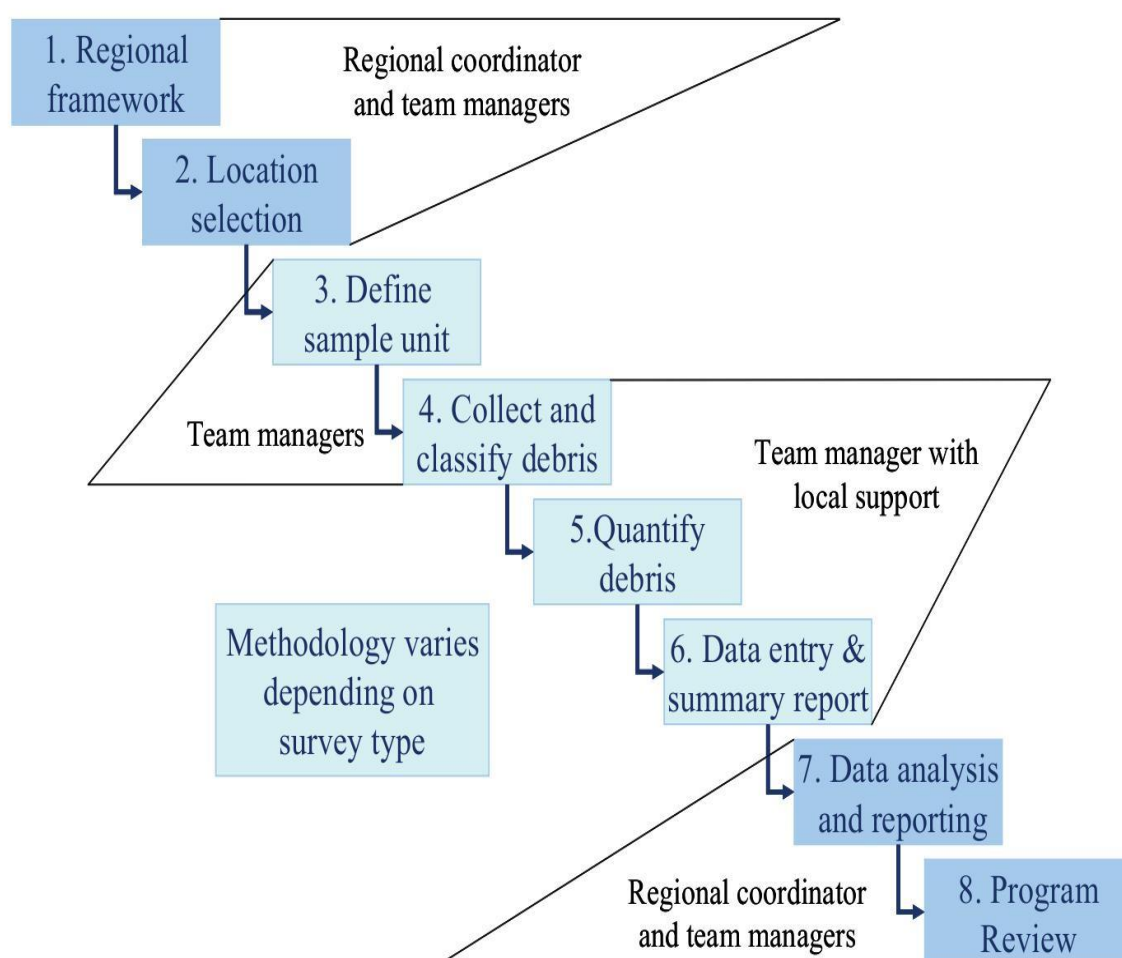


Fig.1 Different steps for developing a marine litter assessment.

Different types of monitoring on Marine litter

Beach-visual:

Beach litter monitoring is a well-developed monitoring tool to determine trends of litter in the marine environment. It can also supply detailed information on composition and amount of litter, which can provide an indication of sources of litter and its potential impact.

Floating-Visual:

Monitoring by visual observation is being done in the marine water, but without a harmonized protocol.

Survey by boat/vessel:

Monitoring by different types of boats ie. Motorised boats, Mechanised trawler (pelagic/mid water/ bottom trawl) were engaged for litter monitoring purpose to determine the trends of different litter composition in the marine environment (swept area method).

Sea-Floor - Video on deep sea floor:

The video protocols for seafloor litter monitoring in deep areas have been engaged in the several developed/developing countries. Similar techniques are used for other types of monitoring (e.g., for seafloor biota), and there are possibilities for coordination with monitoring for other descriptors and other directives.

Sea-floor- Divers:

The most common protocols for monitoring litter on shallow seafloor region using divers (fishers/ SCUBA divers).

Biota-Birds (ingestion):

Based on the fulmar litter monitoring, this is a well-developed monitoring tool, to determine trends in the amount and composition of litter ingested by marine birds. It is also suitable to be used as a floating litter indicator.

Biota-Fish (ingestion):

This is presently an area of intense research activity, to measure trends and regional differences in ingested litter in benthic and pelagic fishes. Its application depends on the distribution of the species considered.

Selection of survey sites/area:

Sites may be chosen randomly from a large number of possible sites, meeting certain criteria based upon the method and the monitoring purpose. Also, the sites may be revisited or chosen for each monitoring occasion.

Sites can be chosen individually because they have certain characteristics. This may be because they are considered to have certain environmental or societal values. For example, a beach that has a high number of visitors, because the beach is situated in a certain area, or simply because the site has heavy litter loads. Usually, the site is revisited during subsequent surveys to assess trends. Priority should be given to the different monitoring programmes that measure the environmental status and its trends, in sites where the risk of harm is high.

The appropriate marine litter monitoring protocol need to be chosen based on the concept of litter work, nature of sites/areas selected, sampling frequency, cost involved, geographic applicability, technical/expertise needed and its limitations.

COMPREHENSIVE BEACH LITTER ASSESSMENT – Sample and Litter Data

<p>BEACH LITTER</p> <p>Sample and Beach litter data</p> <p>BC02</p> <p>Completed ONCE for each survey</p>	Organization		Organization responsible for the survey
	Surveyor Name		Name of the surveyor (person responsible for filling in this sheet)
	Contact		Phone contact for surveyor
	Region		Name for the region
	BeachID		Unique identity code for the beach (office use only)

Sample unit information

Beach Name			Unique Name by which the beach is known
Latitude/longitude start			Recorded as nnn.nnnnn degrees at the start of the sample – indicate NSEW
Latitude/longitude end			Recorded as nnn.nnnnn degrees at the end of the sample – indicate NSEW
Coordinate system			Datum and coordinate system for latitude and longitude
Survey date			Date survey was started for the sample (generally today's date)
Time start/end			Time taken to complete the survey (h)
Season			Spring, Summer, Autumn, Winter, NE Monsoon etc
Date of last survey or cleaning			Date on which the beach was last cleaned either by survey or maintenance clean up
Storm activity			Has there been any significant storm activity since the last survey
Number of persons			Number of persons collecting litter
Sample unit length			Length of sample unit along the beach (m)
Width of beach			Width of beach at the time of survey (m)
Sub-units (if used)			Number and distance along beach
Quality assurance			Is the sample for quality assurance purposes (either YES or leave blank)
Large items	Collate data on large items using the ML01 datasheet		

LITTER DATA (continue over page if more space required)

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Notes (e.g. entangled fauna, important events – storms, shipwrecks etc, conditions that may affect survey)

BENTHIC LITTER ASSESSMENT – TRAWL LITTER DATA SHEET

BENTHIC LITTER Trawl Litter Data Sheet BL02	Organization		Name of the organization responsible for collecting the data
	Surveyor Name		
	Contact		Phone contact for surveyor
To be completed once for EACH trawl	Date		
	LocationID		Unique code for the location (office use only)

VESSEL AND GEAR CHARACTERISTICS

VESSEL AND GEAR CHARACTERISTICS		
Vessel name		Name of the vessel
Vessel Length and tonnage		Length of the vessel (metres) Gross tonnage of the vessel (tonnes)
Trawl gear/net details		Grapple, net mesh, net dimensions, etc
Gear anchoring point		Stern or beam/height above water
Distance behind vessel		Distance behind vessel the trawl operates (m)
Depth		Maximum depth at the site (m)

TRAWL SHOT DETAILS

Site sub-block (numbered 1-25)	Sub-blocks are numbered from 1-25 starting at the NE corner and running E-W and progressing N-S	
Latitude/Longitude start		Recorded as nnn.nnnnn degrees at the start of the sample unit
Latitude/Longitude end		Recorded as nnn.nnnnn degrees at the end of the sample unit
Co-ordinate system	Datum and coordinate system employed	
Distance covered	Total distance covered by the trawl shot (m)	

OBSERVATION DETAILS

OBSERVATION DETAILS			
Time start/end			Time over which the survey was undertaken
Current seas			Wave and swell height (metres)
Current wind			Estimate wind speed & direction at sample start (km/hr & degrees)

LITTER DATA

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Notes

SUMMARY OF DIFFERENT MARINE LITTER MONITORING PROTOCOLS

(MSFD Technical Subgroup on Marine Litter)

Indicator Code	Environ. matrices	Method/ protocol	Level of maturity	Technical/ Equipment	Expertise needed	Cost	Level of detail generated	Geographic applicability	Limitations
10.1.1	BEACH	Visual/ collection	High Extensively applied in NEA and Baltic but further R&D needed on statistical analysis	Low	Low/Medium	L/M	High	High Depending on site availability	Great variability among sites; Amount of items deposited can be affected by weather/sea conditions
10.1.2	FLOATING	Visual	High Extensively used in several parts of the world	Low	Low/Medium	L/M	Medium	High	Observation may be affected by weather/sea conditions and must be adapted so the item's minimum size is detected;
10.1.2	FLOATING	Aerial survey	Low	High	Medium	H	Low	High	Expensive, unless coupled with existing aerial surveys; Mainly sensitive to large, floating items
10.1.2	FLOATING	Automated camera survey	Low In development	Medium	High	M/H	Medium	High	Still in development, needs to be adapted for routine use. Depends on good sea conditions
10.1.2	SEA FLOOR (20-800M)	Bottom-trawl (video optional)	Medium/ High	Low/ Medium	Low/ Medium	L/M	Medium	Medium	Restricted to flat/smooth bottoms
10.1.2	SEA FLOOR (Deep)	Remote operated vehicle/Video	Medium/ High	High	High	H	Medium	Medium	Expensive, unless coupled with existing deep-sea bottom surveys
10.1.2	SEA FLOOR shallow	Diving (video optional)	Medium	Medium	Medium	M	Medium	High	Depends on accessibility to diving areas

OSPAR (2007). OSPAR Pilot Project on Monitoring Marine Beach Litter. Monitoring marine litter in the OSPAR region. OSPAR Commission.

NOWPAP (2007a). Guidelines for Monitoring Marine Litter on the Seabed of the Northwest Pacific Region. Prepared by NOWPAP and MERRAC.

UNEP/IOC/FAO (1991). Assessment of the state of pollution of the Mediterranean Sea by persistent synthetic materials which may float, sink or remain in suspension. MAP Technical Reports Series No. 56. UNEP, Athens.

JRC SCIENTIFIC AND POLICY REPORTS. 2013. Guidance on Monitoring of Marine Litter in European Seas: A guidance document within the Common Implementation Strategy for the Marine Strategy Framework Directive, MSFD Technical Subgroup on Marine Litter. Prepared by European Commission Joint Research Centre, Institute for Environment and Sustainability.

