Monitoring Factsheet: Marine Litter

October 2015

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1. Subject: Marine Litter

Marine litter is defined as '*any persistent, manufactured or processed solid material discarded, disposed of or abandoned in the marine and coastal environment*'[1].

Based on this definition, 'marine litter' would consist of items made or used by people, such as plastics, wood, metals, glass, rubber, clothing and paper, deliberately discarded or unintentionally lost into the sea and on beaches. The definition however would exclude paraffin and other chemicals which are known to occur onshore.

2. Monitoring Requirements

2.1. Marine Strategy Framework Directive 2008/56/EC

2.1.1. Annex III characteristics/pressures/impacts

The MSFD calls for an assessment of the environmental status based on a list of characteristics listed in Table 1 of Annex III to the Directive, and pressures and impacts listed in Table 2 of the same Annex.

Implementation of this monitoring factsheet will address 'Marine Litter' as a pressure on the marine environment as listed in Table 2 of Annex III.

2.1.2. Annex I Good Environmental Status Descriptors

MSFD Annex I descriptors of Good Environmental Status and the associated criteria and indicators established by MSFD Commission Decision 2010/477/EU for assessment of progress towards the achievement of GES in terms marine litter, and which will be addressed by this monitoring factsheet are listed hereunder:

[1] Galgani, F.; Fleet, D.; Van Franeker, J.; Katsanevakis, S.; Maes, T.; Mouat, J.; Oosterbaan, L.; Poitou, I.; Hanke, G.; Thompson, R.; Amato, E.; Birkun, A & Janssen, C. 2010. Marine Strategy Framework Directive Task Group 10 Report. Marine Litter. Zampoukas, N. EUR 24340 EN - 2010

Descriptor 10: Properties and quantities of marine litter do not cause harm to the coastal and marine environment

- 10.1: Characteristics of litter in the marine and coastal environment
  - Trends in the amount of litter washed ashore and/or deposited on coastlines, including analysis of its composition, spatial distribution and, where possible, source (10.1.1)
  - Trends in the amount of litter in the water column (including floating at the surface) and deposited on the sea- floor, including analysis of its composition, spatial distribution and, where possible, source (10.1.2)

- 10.2: Impacts of litter on marine life
  - Trends in the amount and composition of litter ingested by marine animals (e.g. stomach analysis) (10.2.1)

2.2. Barcelona Convention and the Regional Action Plan on Marine Litter

The Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (Barcelona Convention) was adopted in 1976 and came into force in 1978. The principal aim of the Barcelona Convention and its protocols is to reduce pollution in the Mediterranean Sea and protect and improve the marine environment in the area, thereby contributing to its sustainable development. The Barcelona Convention/MAP are working towards an Integrated Monitoring Programme and an Integrated Policy of Assessments to be established by 2015. The Integrated Monitoring Programme should be able to provide all the data needed to assess whether Good Environmental Status defined through the ECAP process[2] has been achieved or maintained.

Two protocols under the Barcelona Convention are relevant to marine litter: the Protocol for the Protection of the Mediterranean Sea against Pollution from Land-Based Sources and Activities (LBS Protocol) and the Protocol for the Prevention of Pollution of the Mediterranean Sea by Dumping from ships and aircraft or incineration at sea (Dumping Protocol).

On the basis of Article 15 and Annex I of the LBS protocol, UNEP has adopted a 'Regional Plan on Marine Litter Management in the Mediterranean'. Article 11 of the regional plan stipulates the need for assessment of the state of marine litter in the Mediterranean. For this purpose, and in compliance with the monitoring obligations under Article 12 of the Barcelona Convention and Article 8 of the LBS Protocol, the Contracting Parties shall develop, in cooperation with the Secretariat, National Monitoring Programmes on Marine Litter. The Contracting Parties shall report biennially, in accordance with Article 13 of the LBS Protocol, on the implementation of the National Monitoring Programme.

[2] Ecosystem-based approach undertaken as part of the Barcelona Convention.

The Secretariat shall prepare by the end of 2014 Guidelines for the preparation of the National Marine Litter Monitoring Programme. Main elements of national reports shall be:

- Structure and content of the monitoring programme;
- Survey and monitoring locations, stations, parameters, indicators, frequency;
- Responsible institution and participating institutions;
- Beach litter assessment results;
- Benthic litter assessment results;
- Floating litter assessment results;
- Effectiveness in the implementation of the National Marine Litter Monitoring Programme; and
- Difficulties in the implementation of the National Monitoring Programme.

2.3. International Convention for the Prevention of Pollution from Ships (MARPOL)

The MARPOL Convention is the main international convention calling for the prevention of pollution of the marine environment by ships from operational or accidental causes. It was established within the framework of the International Maritime Organisation in recognition of the need to control and minimise the deliberate, negligent or accidental release of oil and other harmful substances from ships into the marine environment. The Convention includes six technical annexes of which Annex V is related to the 'Prevention of Pollution by Garbage from Ships'. In July 2011, IMO adopted extensive amendments to Annex V including the prohibition of the discharge of all garbage into the sea, except as provided otherwise under specific circumstances. Unless expressly provided otherwise, Annex V applies to all ships, which means all vessels of any type whatsoever operating in the marine environment, from merchant ships to fixed or floating platforms to non-commercial ships like pleasure crafts and yachts. According to this annex:

- every ship of 100 gross tonnage and above, and every ship certified to carry 15 or more persons, and fixed or floating platforms shall carry a garbage management plan
- every ship of 400 gross tonnage and above, and every ship certified to carry 15 or more persons engaged in voyages to ports or offshore terminals of another party, and every fixed or floating platform shall be provided with a Garbage Record Book:
  - each discharge into the sea or to a reception facility, or a completed incineration, shall be promptly recorded in the Garbage Record Book and signed for on the date of the discharge or incineration by the officer in charge;
  - the entry of each discharge or incineration shall include date and time, position of ship, category of the garbage and the estimated amount discharged or incinerated
  - in the event of any discharge or accidental an entry shall be made in the Garbage Record Book, or in the case of any ship of less than 400 gross

tonnage, an entry shall be made in the ship's official logbook, of the location, circumstances of, and the reasons for the discharge or loss, details of the items discharged or lost, and the reasonable precautions taken to prevent or minimise such discharge or accidental loss.

Garbage as defined in MARPOL Annex V means '*all kinds of victual, domestic and operational waste, excluding fresh fish and parts thereof, generated during the normal operation of the ship and liable to be disposed of continuously or periodically except those substances which are defined or listed in other Annexes to the Convention*'. This includes cargo residues not governed by Annex I (oil, oily waste, oily mixtures, oily bilge water, slops, sludge, oily tank washings, oily cargo residues, ballast water containing oily mixtures) or Annex II (tank washings and cargo residues containing noxious liquid substances) such as dry/bulk cargo residues and cargo-associated waste (such as dunnage and packaging).

2.4. EU Directive 2000/59/EC on port reception facilities for ship-generated waste and cargo residues

EU Directive 2005/59/EC is transposed into Maltese legislation through the Port Reception Facilities Regulations (Legal Notice 278 of 2004) targeting the reduction of discharges of ship-generated waste and cargo residues into the sea. Within this context, the port or terminal operator shall ensure that adequate authorised port reception facilities are available to meet the needs of ships normally using the port or terminal in question[3].

In accordance with the regulations the Master or the agent of a ship, other than a fishing vessel or recreational craft authorised to carry no more than 12 passengers, bound for a port or terminal shall complete a form[4] including information on the type and amount of waste and residues to be delivered at Port Reception Facilities. It is the duty of the Master or the agent of a ship to communicate such information to the port or terminal operator at which the ship will be calling.

2.5. Bathing Water Quality Directive

The Bathing Water Directive (BWD) is mainly concerned with the use of beaches by bathers and the management of water quality to standards that are safe for human health. As part of the requirements of the Directive, bathing water profiles have been prepared for all 87 designated bathing waters on the Maltese Islands. Each bathing water profile gives information about the bathing water quality, including the potential pollution risks at the site, including litter. Although not directly related

[3] MARPOL Annex V also calls for the provision of adequate facilities at ports and terminals for the reception of garbage without causing undue delay to ships and according to the needs to the ships using them.

[4] (i) at least 24 hours prior to arrival, if the port of call is known; (ii) or as soon as the port of call is known, if this information is available less than 24 hours prior to arrival; or (iii) at the latest upon departure from the previous port, if the duration of the voyage is less than 24 hours.

to monitoring processes, the bathing water profiles may provide information with respect potential sources of marine litter in specific coastal areas.

2.6. Blue Flag Programme

The Blue Flag programme for beaches and marinas is run by the international, non-governmental, non-profit organisation FEE (the Foundation for Environmental Education). This programme challenges local authorities and beach operators to achieve high standards in the four categories of water quality, environmental management, environmental education and safety.

The Blue Flag Beach criteria include the need to maintain the beach clean. The Blue Flag guidelines establish a beach litter measuring system, based on which, the amount of litter is determined in representative areas on the beach and beaches are classified into different cleanliness levels. Such measuring system differentiates between bulky litter (>10cm) and fine litter (<10cm); the former are counted within a defined area of $100m^2$, while the latter are counted within a defined area of $1m^2$.

3. Targets

This section includes targets set by policies in relation to marine litter.

Implementation of this monitoring factsheet will contribute towards the achievement of the targets adopted by Malta as part of the EU Marine Strategy Framework Directive, as listed hereunder. Such monitoring may also apply in assessing progress towards targets articulated through other processes.

Policy	Status to be achieved	Targets
Marine Strategy Framework Directive	Good Environmental Status The amount of marine litter entering the marine environment shows a declining trend over time	Efforts are undertaken to improve current level of knowledge on marine litter in Malta.
Barcelona Convention: ECAP Process	Operational Objective: The impacts related to properties and quantities of marine litter in the marine and coastal environment are minimized *Common Indicator*[5]*:* ▪ ***Trends in the amount of litter washed ashore and/or deposited on coastlines, including analysis of its composition, spatial distribution and, where possible, source*** Good Environmental Status defined as 'Number/amount of marine litter items on the coastline do not have negative impacts on human health, marine life and ecosystem services'	Decreasing trend in the number of/amount of marine litter (items) deposited on the coast
	Operational Objective: The impacts related to properties and quantities of marine litter in the marine and coastal environment are minimized *Common Indicator*[6]*:* ▪ *Trends in amounts of litter in the*	Decreasing trend in the number/amount of marine litter items in the water surface and the seafloor

[5] UNEP/MAP 2014.Working document on Common Indicators for the Mediterranean. Integrated Correspondence Groups of GES and Targets Meeting, Athens (Greece), 17-19 February 2014 , UNEP(DEPI)/MED WG.390/3

[6] UNEP/MAP 2014.Working document on Common Indicators for the Mediterranean. Integrated Correspondence Groups of GES and Targets Meeting, Athens (Greece), 17-19 February 2014 , UNEP(DEPI)/MED WG.390/3

	water column, including micro-plastics, and on the seafloor Good Environmental Status defined as 'Number/amount of marine litter items in the water surface and the seafloor do not have negative impacts on human health, marine life, ecosystem services and do not create risk to navigation'	
	Operational Objective: Impacts of litter on marine life are controlled to the maximum extent practicable *Indicator:* ▪ *Trends in the amount of litter ingested by or entangling marine organisms, especially mammals, marine birds and turtles* No Good Environmental Status defined	Decreasing trend in the cases of entanglement or/and a decreasing trend in the stomach content of the sentinel species.

4. Competent Authorities

Policy	Competent Authority
MSFD	Office of the Prime Minister (delegation of technical implementation to the Malta Environment and Planning Authority)
Barcelona Convention (EcAp process)	Malta Environment and Planning Authority
MARPOL and Port Reception Facilities Regulation	Transport Malta (Maritime)

5. Spatial Extent of monitoring requirements

Policy	Extent of marine waters
MSFD	Extent of waters to be monitored depends on relevance and established GES and targets.
Barcelona Convention – LBS protocol & ECAP Process	Regional

6. Monitoring Approach

This monitoring factsheet includes five monitoring subprogrammes listed hereunder:

Monitoring sub-programme	Title	Monitoring Purpose
1	Marine Litter washed ashore - characteristics and abundance	Pressure
2	Marine Litter in water column - characteristics and abundance	Pressure
3	Marine Litter on the seabed - characteristics and abundance	Pressure
4	Mobile species – Mortality/injury rates from other human activities	Impact
5	Information on relevant anthropogenic activities	Activities

The monitoring programme focuses on the assessment of the composition and quantities of litter washed ashore, in the water column and on the seabed, together with an indication of source/pathways where possible. The programme also addresses entanglement of mobile species in marine litter.

The monitoring programme ensures the link with anthropogenic activities of potential relevance to marine litter through existing regulations or policies.

7. Assessment of status

Assessment of status will be based on analysis of trends in the recorded parameters. The extent of the data which is currently available is insufficient to allow for reduction thresholds to be set at this stage. However, negative trends in the quantities of litter recorded in the various environmental media would be indicative of progress towards achievement of Good Environmental Status in terms of marine litter.

8. Monitoring sub-programme 1: *Marine Litter washed ashore - characteristics and abundance*

8.1. Monitoring Parameters

The main parameter to be recorded for litter washed ashore is litter items per 100m and litter items/m^2 per category as listed in Table 1.

Table 1: Parameters to be monitored for litter washed ashore. The categories reflect the core items of the Masterlist in the MSFD Guidance on Monitoring of Marine Litter in European Seas. This list may be subject to further regional discussions; other items of the Masterlist can be included as necessary.

General Code of items [7]	UNEP-Code[8]	General Name	Litter washed ashore: Parameters			
			No. of litter items per 100m	No. of litter items/m^2	Source (if possible)[9]	Pathway (if possible)
Artificial Polymer materials (Plastic)						
G1	PL05	4/6 pack yokes, six-pack rings				
G2	PL07	Bags				
G6	PL02	Bottles				
G9	PL02	Cleaner Bottles and containers				
G10	PL06	Food containers incl. fast food containers				
G12	PL02	Other cosmetic bottles and containers				
G13	PL02	Other bottles and containers				
G22	PL01	Plastic caps/lids chemicals/detergents: non-food				
G26	PL10	Cigarette lighters				
G32	PL08	Toys and party poppers				
G33	PL06	Cups and cup lids				
G40	PL09	Gloves (washing up)				
G41	RB03	Gloves (industrial/professional rubber gloves)				
G49	PL19	Rope (diameter more than 1cm)				
G50	PL19	String and cord (diameter less than 1cm)				
G52	PL20	Nets and pieces of net				
G59	PL18	Fishing line/monofilament				
G62	PL14	Floats for fishing nets				
G66	PL21	Strapping bands				

[7] Joint Research Centre 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. ISBN 978-92-79-32709-4 (pdf); ISSN 1831-9424 (online)

[8] 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., and 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: xii + 120 pp.

[9] The MSFD Guidance on Monitoring of Marine Litter in European Seas indicates that a number of techniques have been developed to assist in the identification of sources on teh basis of litter items recorded in the marine environment.

G95	OT02	Cotton bud sticks				
Rubber						
G125	RB01	Balloons and balloon sticks				
G128	RB04	Tyres and belts				
G130		Wheels				
Cloth/textile						
G137	CL01	Clothing/rags (clothing, hats, towels)				
Paper/Cardboard						
G148	PC02	Cardboard (boxes and fragments)				
G150	PC03	Cartons/tetrapack milk				
G151	PC03	Cartons/tetrapack (others)				
G153	PC03	Cups, food trays, food wrappers, drink containers				
Processed/worked wood						
G160	WD04	Pallets				
G162	WD04	Crates				
G164		Fish boxes				
G165	WD03	Ice-cream sticks, chip forks, chopsticks, toothpicks				
G173	WD06	Other (specify)				
Metal						
G174		Aerosol/spray cans industry				
G175	ME03	Cans (beverage)				
G176	ME04	Cans (food)				
G178	ME02	Bottle caps, lids and pull tabs				
Glass/Ceramics						
G200	GC02	Bottles incl. pieces				
G202	GC04	Light bulbs				
G205	GC05	Fluorescent light tubes				
G210	GC08	Other glass items				
Chemicals						
G213	OT01	Paraffin/wax				
Unidentified						
G211	OT05	Other medical items (swabs, bandaging, adhesive plaster etc)				

8.2. Supporting Parameters

- Slope and aspect of beach
- Prevailing wind force and direction
- Beach curvature
- horizontal profile
- total beach length
- type and uniformity of substratum
- presence of offshore reefs and seagrass meadows
- description of back of beach
- degree of exposure (using Thomas Index of Exposure, Thomas, 198610).
- a photographic record of whole area of the surveyed beach and of other relevant features.
- Land uses in the vicinity of the beach
- presence and location of nature and/or man-made surface runoff points.
- data on the near-shore and off-shore prevailing sea currents and hydrodynamics (if possible).
- Date of official beach cleaning activities taking place on site;
- Location of all litter bins; whether they have been found full or half full.

8.3. Monitoring methodologies

- Two stretches of shoreline parallel to the waterline are identified on selected beaches: 100m stretches for lightly-moderately littered beaches and 50m stretches for heavily littered beaches; stretches to be marked by reference landmarks or GPS coordinates to ensure same site will be monitored for all surveys.
- Surveyor walks slowly along the 100m/50m stretch counting any litter items >2.5 cm within 5m on each side of the 100m/50m stretch.
- Each item observed is recorded in a tally form of data sheet for each category of marine litter. When the surveyor reaches the end of the 100m/50m stretch, the counting will be repeated walking in the reverse direction, giving two replicate counts.
- The density of occurrence of sighted litter items for each category will be expressed in number of litter items per 100m and number of litter items per m^2.
- The time of start and of finish of each survey should be recorded as well as the prevailing weather and sky condition (especially cloud cover).
- If the beach is cleaned regularly, the survey should be undertaken ideally 3 days after the last cleaning. If the beach is cleaned daily, then the survey should be undertaken towards the last half of the day (afternoon).

[10] Thomas, M.L.H. 1986. A physically derived exposure index for marine shorelines. Ophelia., 25 (1). 1-13.

- all litter should be removed from the beach and disposed of appropriately; Any large litter items that cannot be safely moved should be marked and possibly photographed[11]

8.4. Monitoring area

Location of beaches to be subject to visual surveys of litter washed ashore is indicated hereunder. Such locations are subject to revisions following the initial monitoring episodes.

Name of beach	Location	Blue Flag Status (2014)[12]	Beach Profile (as per BWQ Directive)[13]
Recreational Beaches			
Għajn Tuffieħa	Mġarr, Malta	✓	BWP 12
Mellieħa Bay	Mellieha, Malta	✓	BWP 16
Remote Beaches			
Shingle beach at Fomm ir-Riħ	Mġarr, Malta	×	×
Għar Qawqla	Żebbug, Gozo	×	×

8.5. Monitoring frequency

Monitoring frequency is indicated in below table. The monitoring frequency is subject to revisions following the initial monitoring episodes.

Litter category	Methodology	Frequency
Litter washed ashore	Visual Surveys	3-monthly

[11] Arrangements may be made to remove such large items from the beach.
[12] Blue Flag Status to be updated on an annual basis
[13] https://ehealth.gov.mt/HealthPortal/public_health/environmental-health/health_inspectorate/env._hlt._risk_management/bathing_water_profiles.aspx

9. Monitoring sub-programme 2: *Marine Litter in water column - characteristics and abundance*

9.1. Monitoring Parameters

The main parameter to be recorded by visual surveys for litter in the water column is: litter items/m^2 or litter items/km^2. Data to be available as a list of georeferenced objects according to a list of categories as per Table 2 and the following size classes:

- 2.5cm-5cm;
- 5cm-10cm;
- 10cm-20cm;
- 20cm-30cm and
- 30cm-50cm

Table 2: Parameters to be monitored for litter in the water column including categories of marine litter to be used[14]. This list may be subject to further regional discussions; other items of the Masterlist can be included as necessary.

General Code of items[15]	UNEP-Code[16]	General Name	Litter items					Georeference	Source (if possible)[17]	Pathway (if possible)
			2.5cm-5cm	5cm-10cm	10cm-20cm	20cm-30cm	30cm-50cm			
Artificial Polymer materials (Plastic)										
G2	PL07	Bags								
G6	PL02	Bottles								
G18	PL13	Crates and containers/baskets								
G51	PL20	Fishing net								
G57	PL17	Fish boxes – plastic								
G63	PL14	Buoys								
G67	PL16	Sheets, industrial packaging, plastic sheeting								
G124	PL24	Other plastic/polystyrene items (identifiable)								
Rubber										
G125	RB01	Balloons and balloon sticks								

[14] MSFD Guidance document indicates that 'It is not uncommon that floating litter items appear grouped either because they have been released together or because they accumulate on oceanographic fronts. The reporting system should acknowledge this and foresee a way to report such groups'.

[15] Joint Research Centre 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. ISBN 978-92-79-32709-4 (pdf); ISSN 1831-9424 (online)

[16] 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., and 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: xii + 120 pp.

G126	RB01	Balls								
G128	RB04	Tyres and belts								
G134	RB08	Other rubber pieces								
Cloth/textile										
G135	CL01	Clothing (clothes, shoes)								
G141	CL05	Carpet and furnishing								
G142	CL04	Rope, string and nets								
G143	CL03	Sails, canvas								
G145	CL06	Other textiles (including rags)								
Paper/Cardboard										
G148	PC02	Cardboard (boxes and fragments)								
G149	PC03	Paper packaging								
G154	PC01	Newspaper and magazines								
G158	PC05	Other Paper Items								
Processed/worked wood										
G160	WD04	Pallets								
G162	WD04	Crates								
G173	WD06	Other (specify)								
Metal										
G175	ME03	Cans (beverage)								
G182	ME07	Fishing related (weights, sinkers, lures, hooks)								
G191	ME09	Wire, wire mesh, barbed wire								
G192	ME05	Barrels								
G197		Other (metal)								

9.2. Supporting parameters

9.2.1. Visual Surveys at sea

Operational Observation Parameters

- Observation height
- Observation width
- Observation distance
- Observation angle
- Ship speed

Environmental parameters

- Wind speed
- Sea state
- Light conditions
- Sun direction

[17] The MSFD Guidance on Monitoring of Marine Litter in European Seas indicates that a number of techniques have been developed to assist in the identification of sources on teh basis of litter items recorded in the marine environment.

- Quality of vision
- General weather conditions

9.3. Monitoring methodologies

9.3.1. Visual surveys from beaches

- As part of the visual surveys described in section 8.3, the surveyor will use same stretch of coastline to count any floating litter that is visually observed within a stretch of 10m out in the water.
- two replicate counts are taken, by repeating the counts while walking back to the starting point.
- Density of occurrence of sighted litter for each category of litter will then be expressed in number /m^2 of water.

9.3.2. Visual surveys of litter at sea

- Visual surveys are undertaken on a boat moving at cruising speed for a distance of 6km;
- Observer/s[18] will record any floating debris observed within an appropriate corridor away from the boat as indicated in Table 3.

Table 3: Width of 'observation corridor' based on observation height and ship speed as quoted by the MSFD guidance document[19]

Observation elevation above sea	Ship speed 2 knots = 3.7km/h	6 knots = 11.1km/h	10knots = 18.5km/h
1m	6m	4m	3m
3m	8m	6m	4m
6m	10m	8m	6m
10m	15m	10m	5m

- The observer will record each item which is visually observed, in a tally form of datasheet, for each category of marine litter.
- The density of occurrence of sighted litter items for each category of litter will then be expressed in number/m^2 or number/km^2. Items should be georeferenced.
- The distance moved by the boat during the visual counting is recorded using GPS readings at the start and at the end of the survey.

[18] Ideally two observers will be involved in the visual monitoring, one on each side of the boat

[19] Joint Research Centre. 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. ISBN 978-92-79-32709-4 (pdf); ISSN 1831-9424 (online)

9.3.3. Visual surveys of litter at sea by volunteers and/or 'boats of opportunity'

- Visual surveys as described in Section 9.3.2 may be carried out using 'boats of opportunity' if these are available such as:
  - Ferry for a selected coastal transect repeated in appropriate intervals
  - Scheduled cruises
- The observer/volunteer will record observations as indicated in Section 9.3.2 on data sheets.
- The length of the visually observed transect will vary, hence distance covered should be recorded.

9.4. Monitoring area

9.4.1. Visual surveys from beaches

Location of beaches from which visual surveys of floating litter are to be carried out is indicated hereunder. Locations are subject to revisions following the initial monitoring episodes.

Name of beach	Location	Blue Flag Status (2014)[20]	Beach Profile (as per BWQ Directive)[21]
Recreational Beaches			
Għajn Tuffieħa	Mġarr, Malta	✓	BWP 12
Mellieħa Bay	Mellieha, Malta	✓	BWP 16
Remote Beaches			
Shingle beach at Fomm ir-Riħ	Mġarr, Malta	×	×
Għar Qawqla	Żebbug, Gozo	×	×

9.4.2. Visual surveys of litter at sea

Monitoring of floating litter will be an iterative process during which in an initial phase hot spots and pathways are determined[22]. The locations proposed in Table 4 are being proposed for the first monitoring year with a view to understand the variability of litter distribution in offshore areas. Following the first monitoring year, locations for sustained monitoring of floating litter will be determined on the basis of the data generated.

[20] Blue Flag Status to be updated on an annual basis

[21] https://ehealth.gov.mt/HealthPortal/public_health/environmental-health/health_inspectorate/env._hlt._risk_management/bathing_water_profiles.aspx

[22] Joint Research Centre. 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. ISBN 978-92-79-32709-4 (pdf); ISSN 1831-9424 (online)

Table 4: Location of start points proposed for formal offshore visual surveys

Offshore Monitoring stations		
Malta North	378799.33 4	4028101.37
Malta East	530961.17 3	3976110.62
Malta South	473775.46 3	3904926.63
Malta West	375854.66 3	3951016.29

Figure 1: Location of start points of the proposed offshore visual surveys

9.5. Monitoring frequency

The monitoring frequency for the first monitoring year is listed below. This monitoring frequency is subject to revision in subsequent monitoring years.

Litter Category	Methodology	Frequency
Litter in the water column	Visual Surveys	3-monthly
	Visual surveys at sea	6-monthly

10. Monitoring sub-programme 3: *Marine Litter on the seabed - characteristics and abundance*

10.1. Monitoring Parameters

10.1.1. Shallow seabed <20m

The main parameter to be recorded for litter on shallow seabed: litter items/m^2 per category listed in Table 5.

Table 5: Parameters to be monitored for litter on shallow seabed including categories of marine litter to be used on the basis of the Masterlist in the MSFD Guidance on Monitoring of Marine Litter in European Seas. This list may be subject to further regional discussions; other items of the Masterlist can be included as necessary.

General Code of items[23]	UNEP-Code [24]	General Name	Litter shallow seabed: Parameters		
			No. of litter items/m^2	Source (if possible) [25]	Pathway (if possible)
Artificial Polymer materials (Plastic)					
G2	PL07	Bags			
G6	PL02	Bottles			
G10	PL06	Food containers incl. fast food containers			
G51	PL20	Fishing net			
G55	PL18	Fishing line (entangled)			
G59	PL18	Fishing line/monofilament (angling)			
G61		Other fishing related			
G66	PL21	Strapping bands			
G67	PL16	Sheets, industrial packaging, plastic sheeting			
G95	OT02	Cotton bud sticks			
G124	PL24	Other plastic/polystyrene items (identifiable)			
Rubber					
G125	RB01	Balloons and balloon sticks			
G128	RB04	Tyres and belts			

[23] Joint Research Centre 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. ISBN 978-92-79-32709-4 (pdf); ISSN 1831-9424 (online)

[24] 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., and 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: xii + 120 pp.

[25] The MSFD Guidance on Monitoring of Marine Litter in European Seas indicates that a number of techniques have been developed to assist in the identification of sources on teh basis of litter items recorded in the marine environment.

G134	RB08	Other rubber pieces			
Cloth/textile					
G137	CL01	Clothing/rags (clothing, hats, towels)			
G145	CL06	Other textiles (including rags)			
Paper/Cardboard					
G148	PC02	Cardboard (boxes and fragments)			
G158	PC05	Other Paper Items			
Processed/worked wood					
G160	WD04	Pallets			
G173	WD06	Other (specify)			
Metal					
G175	ME03	Cans (beverage)			
G176	ME04	Cans (food)			
G180	ME10	Appliances (refrigerators, washers etc..)			
G182	ME07	Fishing related (weights, sinkers, lures, hooks)			
G187	ME05	Drums e.g. oil			
G197		Other (metal)			
Glass/Ceramics					
G200	GC02	Bottles incl. pieces			
G201	GC02	Jars incl. pieces			
G208	GC07	Glass or ceramic fragments >2.5cm			
G210	GC08	Other glass items			

10.1.2. Seabed >20m - <800m

The main parameter to be recorded for litter on seabed: litter items/ha or Litter Items/km^2 per categories listed in Table 6.

Table 6: Parameters to be monitored for litter on seabed through the use of the MEDITS protocol including categories of marine litter to be used. This list may be subject to further regional discussions; other items of the Masterlist can be included as necessary.

General Code of items[26]	General Name	Litter seabed: Parameters		
		No. of litter items per km^2	Source (if possible) [27]	Pathway (if possible)
A	Plastic			
A1	Bags			
A2	Bottles			
A3	Food wrappers			
A4	Sheets			

[26] Joint Research Centre 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. ISBN 978-92-79-32709-4 (pdf); ISSN 1831-9424 (online)

[27] The MSFD Guidance on Monitoring of Marine Litter in European Seas indicates that a number of techniques have been developed to assist in the identification of sources on teh basis of litter items recorded in the marine environment.

A5	Other plastic objects			
A6	Fishing nets			
A7	Fishing lines			
A8	Other fishing related			
A9	Ropes/strapping bands			
A10	Sanitaries			
B	Rubber			
B1	Tyres			
B2	Other (gloves, shoes etc..)			
C	Metals			
C1	Beverage cans			
C2	Other food cans/wrappers			
C3	Middle size containers			
C4	Large metallic objects			
C5	Cables			
C6	Fishing related			
D	Glass/Ceramic			
D1.	Bottles			
D2.	Pieces of glass			
D3	Ceramic jars			
D4	Large objects (specify)			
E	Textile/natural fibers			
E1	Clothing (clothes, shoes)			
E2	Large pieces (carpets etc..)			
E3	Natural ropes			
F	Wood (processed			
G	Paper/cardboard			
H	Other (specify)			
I	Unspecified			

10.2. Supporting Parameters

10.2.1. Shallow Seabed 0-20m

- Slope and aspect of the seabed
- Prevailing wind
- Depth
- Substratum type and uniformity
- Presence of reefs and seagrass meadows
- Source characteristics, potential debris inputs

10.2.2. Seabed >20m - <800m

- Date of trawl survey
- Position
- Type of trawl
- Speed
- Distance
- Sampled area
- Depth
- Hydrographical and meteorological conditions

10.3. Monitoring methodologies

10.3.1. Shallow seabed: near-shore Visual Surveys of Litter on Seabed.

- Two line transects 40m long[28] commencing from the water edge and running perpendicular to the shoreline are identified. These should be equally spaced over the length of the beach. The midline of each transect as located on the waterline will be marked and identified by GPS coordinates.
- Trained SCUBA diver/s travel along the midline of the transect and record items of litter >2.5cm visually visible within 2m on both sides of the midline of the transect.
- Items are counted and recorded by category of litter (as per Section 10.1.1).

10.3.2. Seabed >20m - <800m

- Number of litter items collected by Mediterranean Trawl Surveys (MEDITS) is recorded in terms of the categories listed in Section 10.1.2, per haul in line with the 'Protocol for monitoring marine litter on a voluntary basis' included in Annex XVII of the MEDITS Handbook Version 7 (2013).

10.4. Monitoring area

10.4.1. Shallow seabed 0-20m

Areas to be subject to monitoring of litter on shallow seabed are listed hereunder. These locations are subject to revisions following the first monitoring year.

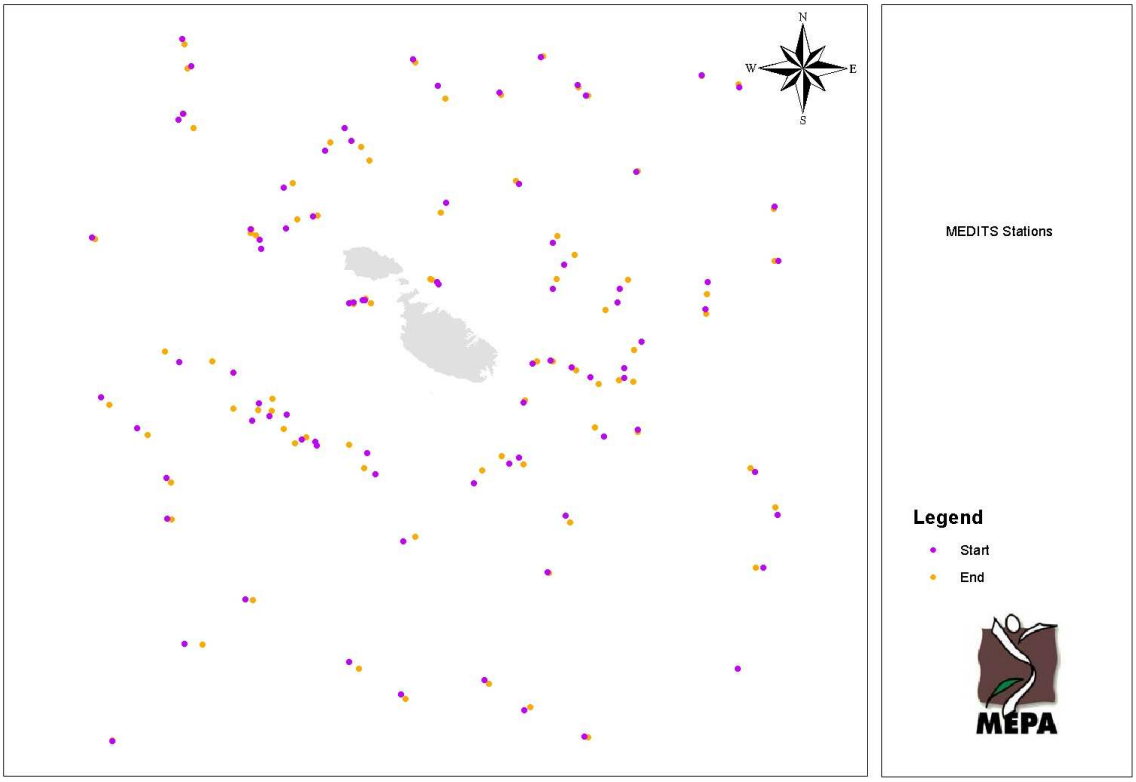
- Shingle beach, Iċ-Ċagħkija, Fomm ir-Riħ (Malta)
- Għar Qawqla (Gozo)

10.4.2. Seabed >20m - <800m

MEDITS sampling stations collected within Geographical sub-area 15 are used for the purpose of assessing litter on the deeper seabed. The start and end points of the trawl surveys are indicated in Figure 2.

[28] depth ranging between 0-20m with skilled SCUBA divers

Figure 2: Location of MEDITS stations



10.5. Monitoring frequency

Litter Category	Methodology	Frequency
Litter on the seabed	Shallow seabed <20m	Yearly for the first monitoring year. Monitoring frequency to be determined following the first monitoring year.
	Seabed >20m - <800m	Yearly

11. Monitoring sub-programme 4: *Mobile species – Mortality/injury rates from other human activities*

11.1. Monitoring Parameters

Number of dead loggerhead sea turtle *Caretta caretta* stranded or entangled in nets/fishing gear per year.

11.2. Monitoring methodologies

- Dead or stranded turtles with signs of entanglement in marine litter are recorded.

11.3. Monitoring area

Not applicable

11.4. Monitoring frequency

As necessary.

12. Monitoring sub-programme 5: *Information on relevant anthropogenic activities*

12.1. Data from Beach Cleaning activities (including ad hoc beach cleaning campaigns)

- Beach cleaning will influence the data collected on 'litter washed ashore'. It is therefore important that such cleaning activities will be documented and that interpretation of collected data will take in consideration such beach cleaning. It is also essential that the body responsible for cleaning the beaches will be contacted before surveys begin. Data to be made available includes:
  - Beach location;
  - Mass of litter removed from that particular beach or part of beach;
  - Date and time of day of cleaning operation;
  - Period in days between last clean-up operation of beach.

- Data from near-shore clean-up campaigns organized by Local Councils, NGOs, and other voluntary entities can also contribute to monitoring in terms of marine litter. Data which can be provided includes:
  - Exact location of clean-up;
  - Date and time of day of campaign;
  - Weather and sea conditions at time of campaign;
  - Sorting of litter according to the required categories;
  - Weight of litter by category, and possibly
  - Exact surface area from which litter was collected.

12.2. Maritime Garbage received at Port Reception Facilities

- In accordance with Article 7 (1) of the Port Reception Facilities Regulations (Legal Notice 278 of 2004), the information listed in Table 7 should be provided by the Master or the agent of a ship, other than a fishing vessel or recreational craft authorised to carry no more than 12 passengers. It shall be the duty of the Master or the agent of a ship to communicate also such information to the port or terminal operator at which the ship will be calling and to call for the authorised port reception facility. Such data will eventually provide valuable information as regards the rate of generation of marine litter from maritime activities, as well as long-term and seasonal trends in such rates of generation. Additional information required includes:
  - Flag state;
  - Estimate Time of Arrival;
  - Estimate Time of Departure;
  - Previous port of call;
  - Next port of call;
  - Last port and date when ship-generated waste was delivered;

- Are you delivering all? Some? None? of your waste into port reception facilities
- Type and amount of waste and residues to be delivered and/or remaining on board and percentage of maximum storage capacity.

Table 7: Information required in terms of the Port Reception Facilities Regulations

Type	Waste to be delivered (m^3)	Maximum dedicated storage capacity (m^3)	Amount of waste retained on board (m^3)	Port at which remaining waste will be delivered	Estimated amount of waste to be generated between notification and next port of call (m^3)
2. Garbage[29]					
▪ Food waste					
▪ Plastic					
▪ Other					
3. Cargo-associated waste (specify)					
4. Cargo residues (specify)					

- MARPOL Annex V stipulates the need of a Garbage Record Book including information as required by the Port Reception Facility Regulations. As per above, such data will eventually provide valuable information as regards the rate of generation of marine litter from maritime activities, as well as long-term and seasonal trends in such rates of generation. Entries in the Garbage Record Book shall be made on each of the following occasions:
  - 4.1.1 When garbage is discharged to a reception facility ashore or to other ships:
    Date and time of discharge;
    Port or facility, or name of ship;
    Categories of garbage discharged;
    Estimated amount discharged for each category in cubic metres;
    Signature of officer in charge of the operation.

  - 4.1.2 When garbage is incinerated:
    Date and time of start and stop of incineration;
    Position of the ship (latitude and longitude) at the start and stop of incineration;
    Categories of garbage incinerated;

[29] Garbage as defined in MARPOL Annex V, means all kinds of victual, domestic and operational waste excluding fresh fish and parts thereof, generated during the normal operation of the ship and liable to be disposed of continuously or periodically except those substances which are defined or listed other annexes to the Convention.

Estimated amount incinerated in cubic metres;
Signature of the officer in charge of the operation.

- 4.1.3 When garbage is discharged into the sea in accordance with regulations 4, 5 or 6 of MARPOL Annex V:
  Date and time of discharge;
  Position of the ship (latitude and longitude). Note: for cargo residue discharges, include discharge start and stop positions;
  Category of garbage discharged;
  Estimated amount discharged for each category in cubic metres;
  Signature of the officer in charge of the operation.

- 4.1.4 Accidental or other exceptional discharges or loss of garbage into the sea, including in accordance with regulation 7 of MARPOL Annex V:
  Date and time of occurrence;
  Port or position of the ship at time of occurrence (latitude, longitude and water depth if known);
  Categories of garbage discharged or lost;
  Estimated amount for each category in cubic metres;
  The reason for the discharge or loss and general remarks.

13. Links to monitoring processes

Monitoring in terms of this factsheet is linked with monitoring or related processes as follows:

- Offshore monitoring stations are shared with offshore monitoring for 'nutrient and organic matter enrichment' and 'contaminants'.
- Stations used for the purpose of monitoring marine litter on the deep seabed are those of Mediterranean International Bottom Trawl Surveys (MEDITS) pursuant to Council Regulation 199/2008 concerning the establishment of a '*Community framework for the collection, management and use of data in the fisheries sector and support for scientific advice regarding the Common Fisheries Policy*' and Commission Decision 2008/949/EC outlining a multiannual Community programme pursuant to Council Regulation 199/2008.
- Monitoring in terms of entanglement would contribute to monitoring of pressures for 'marine turtles'.

In general, there needs to be strong coordination between the monitoring of litter washed ashore and beach cleaning activities.

14. Quality Assurance & Quality Control

For monitoring of marine litter washed ashore, in the water column and on the seabed, the following must be ensured:

- use of reference material with examples of each litter type to identify litter items;
- training of surveyors/observers/volunteers.

15. Data collection, storage and dissemination

All data should be collected and stored in accordance with the INSPIRE Technical Specifications listed in this section and/or any other relevant INSPIRE standard as identified through the Marine Pilot Project[30]. Processed data to be uploaded in a geoportal.

- 'D2.8.II/III.7 INSPIRE Data Specification on Environmental Monitoring Facilities – Technical Guidelines'[31].
- 'D2.8.III.16 Data Specification on Sea Regions – Technical Guidelines'[32]

16. Responsible organisations

Monitoring sub-programme	Sub-themes		Responsible authorities
Litter washed ashore	Visual surveys		MEPA
Litter in the water column	Visual surveys on beaches		MEPA
	Visual surveys of litter at sea		MEPA
Litter on the seafloor	Shallow seabed <20m		MEPA
	Seabed >20m - <800m	Sampling	Fisheries
		Analysis	MEPA
Entanglement			MEPA
Activities	Data on beach cleaning activities		Beach Cleansing Directorate
	Data in relation to maritime garbage		Transport Malta (Maritime)

[30] https://circabc.europa.eu/w/browse/bc33dff1-0f8c-467a-8382-7724c5f79d45

[31] http://inspire.ec.europa.eu/index.cfm/pageid/2

[32] http://inspire.ec.europa.eu/index.cfm/pageid/2;

17. Gaps and Research Needs

Gaps	Plans to address gaps
There is not enough knowledge on microlitter to develop standardised methodologies.	Pilot monitoring to generate baseline data on microlitter in sediment and surface waters may be explored. Methodologies to be defined, reflecting those stipulated by the Guidance on Monitoring of Marine Litter in European Seas - A guidance document within the Common Implementation Strategy for the Marine Strategy Framework Directive and by AEE Consortium (2014)[33]
The monitoring programme does not cover ingested litter as per MSFD indicator 10.2.1: *Trends in the amount and composition of litter ingested by marine animals (e.g. stomach analysis)*	Mechanisms to be set up to enable consistent monitoring of ingested litter in stranded turtle specimens in line with the methodologies stipulated by the Guidance on Monitoring of Marine Litter in European Seas - A guidance document within the Common Implementation Strategy for the Marine Strategy Framework Directive. The use of other species for monitoring ingested litter could also be explored.
Transboundary impacts are expected to be of relevance when assessing marine litter. However the current baseline data is not sufficient to define the extent of such impacts.	Information generated through the implementation of this monitoring factsheet in terms of the presence and possibly sources of marine litter, will facilitate identification of transboundary impacts.

[33] AEE Consortium (2014) Service Contract for the development of a long-term monitoring strategy for the marine environment, a social and economic analysis of the use of marine waters and costs of degradation, and baseline sediment survey in inland waters (CT3048/2012) – Long Term Monitoring Programme for the Marine Environment - ERDF156 - Developing national environmental monitoring infrastructure and capacity

18. Main Sources

- AAE Consortium (ADI Associates Ltd, Ecoserv Ltd and E Cubed Consultants). 2014. Long Term Monitoring Strategy for the Marine Environment of the Maltese Islands under the Marine Strategy Framework Directive. Service Contract for the development of a long-term monitoring strategy for the marine environment, a social and economic analysis of the use of marine waters and costs of degradation, and baseline sediment survey in inland waters (MEPA tender ref: CT3048/2012). ERDF156 - Developing national environmental monitoring infrastructure and capacity. Malta, unpublished report, 252 pp.

- AAE Consortium (ADI Associates Ltd, Ecoserv Ltd and E Cubed Consultants). 2014. Long Term Monitoring Programme for the Marine Environment of the Maltese Islands under the Marine Strategy Framework Directive. Service Contract for the development of a long-term monitoring strategy for the marine environment, a social and economic analysis of the use of marine waters and costs of degradation, and baseline sediment survey in inland waters (MEPA tender ref: CT3048/2012). ERDF156 - Developing national environmental monitoring infrastructure and capacity. Malta, unpublished report, 346 pp.

- Joint Research Centre 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. ISBN 978-92-79-32709-4 (pdf); ISSN 1831-9424 (online)