

Marine Litter

1.1 Introduction

The EU Marine Strategy Framework Directive calls for the assessment of ‘marine litter’ as a pressure on the marine environment as listed in Annex III of the Directive. Marine litter is defined by Galgani *et al.* (2010)¹ as ‘*any persistent, manufactured or processed solid material discarded, disposed of or abandoned in the marine and coastal environment*’. 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.

Marine litter is gaining increasing importance also as a result of increasing knowledge on its impacts on the marine environment and human activities. Impacts of marine litter on marine biota include mortality or damage through entanglement, ingestion and accumulation of chemicals from plastics. Marine litter can also facilitate the invasion of alien species².

There is no dedicated monitoring regime for ‘marine litter’ in Malta, hence the current situation with respect to this pressure is poorly known. The information available to date was generated by one-off research studies, including unpublished dissertations.

Current data limitations preclude the possibility to assess status in terms of this pressure. This report will thus provide a brief overview of the currently available data, mostly published data, which is deemed most relevant to the MSFD criteria and indicators established by the Commission Decision on criteria and methodological standards on good environmental status of marine waters (2010/477/EU) for Descriptor 10. For this purpose, this report is structured in terms of the types of marine litter addressed by these criteria and indicators.

While the available information is not deemed adequate enough to assess current status or establish concrete targets to achieve Good Environmental Status in terms of marine litter, it can shed some light with respect to available baseline data and

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

² 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

data gaps which would need to be addressed through the MSFD monitoring programme.

1.2 Existing legislation

1.2.1 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'. On the basis of this Annex the disposal of all forms of plastics from ships is prohibited. 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.

1.2.2 Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Convention)

The London Convention contributes to the international control and prevention of marine pollution by prohibiting the dumping of certain hazardous materials and establishing the need for a permit for the dumping of a number of other identified materials.

In 1996, Parties adopted a Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972 (known as the London Protocol) which entered into force in 2006. The 1996 Protocol prohibits all dumping, except for possibly acceptable wastes contained in an annex to the Protocol, including dredged material, sewage sludge, fish waste, man-made structures at sea, inert material, organic material of natural origin and bulky items primarily comprising iron, steel, concrete and similar materials.

1.2.3 Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (Barcelona Convention) and its Protocols

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.

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).

The Contracting Parties to the LBS Protocol shall take all appropriate measures to eliminate pollution deriving from land-based sources and activities, in particular to phase out inputs of the substances that are toxic, persistent and liable to bioaccumulate as listed in Annex I. This annex includes 'Litter' (defined as any persistent manufactured or processed solid material which is discarded, disposed of, or abandoned in the marine and coastal environment) as an element to be taken into account in the preparation of action plans, programmes and measures for the elimination of pollution from land-based sources and activities. On the basis of Article 15 and Annex I of the protocol, UNEP is proposing the drafting of a 'Regional Plan on Marine Litter Management in the Mediterranean'.

The Dumping Protocol prohibits the dumping of waste or other matter listed in Annex I to the protocol into the Mediterranean Sea, including persistent plastic.

1.2.4 EU Directive 2000/59/EC on port reception facilities for ship-generated waste and cargo residues (Legal Notice 278 of 2004)

The Port Reception Facilities Regulations target 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. The regulations also call for the preparation of a waste management plan with respect to the provision and use of port reception facilities.

1.2.5 EU Directive on packaging and packaging waste (Directive 2004/12/EC)

This Directive is relevant to 'marine litter' since it targets reduction of such pressure at source. The Directive covers all packaging placed on the European market and all

packaging waste. Member States should take measures to prevent the formation of the latter and to develop packaging reuse systems reducing their impact on the environment. Within this context, Member States must ensure that packaging placed on the market complies with the essential requirements of Annex II:

- to limit the weight and volume of packaging to a minimum in order meet the required level of safety, hygiene and acceptability for consumers;
- to reduce the content of hazardous substances and materials in the packaging material and its components;
- to design reusable or recoverable packaging.

1.2.6 Other Initiatives:

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. According to the Blue Flag guidelines, litter should not be allowed to accumulate and the beach must comply with national guidelines or legislation concerning litter and waste management. The guidelines also establish a beach litter measuring system, based on which the amount of litter is determined in representative areas on the beach and on the basis of which beaches are classified into different cleanliness levels. At a Blue Flag beach, the cleanliness level should be A+ or A.

Tax on plastic bags

In 2009, the Government of Malta introduced a tax on plastic bags as a measure to discourage people from using plastic bags, hence attempt to reduce the number of plastic bags used by the Maltese population.

1.3 Litter in the marine environment

This section provides a brief overview of the currently available data with respect to marine litter. The structure of this section follows the litter categories as identified in the MSFD criteria and indicators stipulated by the Commission Decision on criteria and methodological standards on good environmental status of marine waters (2010/477/EU), therefore:

- Litter washed ashore and/or deposited on coastlines (Indicator 10.1.1);
- Litter in the water column (floating litter) (Indicator 10.1.2)
- Litter deposited on the sea-floor (Indicator 10.1.2)

- Litter ingested by marine animals (Indicator 10.2.1)

No data is available with respect to microplastics (Indicator 10.1.3).

1.3.1 Litter washed ashore and/or deposited on coastlines

Amount and composition

Information on the amount of litter on Maltese coastlines was mainly generated through one-off research studies rather than long-term monitoring. One of the earlier studies by Sciberras & Axiak (1995)³ focused on two beaches on mainland Malta surveyed in August 1991 and April 1992. The mean density of shore-stranded litter ranged from 60 to 650 g/m² with the majority of items composed of plastic, followed by wood. Another study, carried out in April 1995 on four Maltese beaches, reported generally low densities of beach litter, which was predominantly composed of plastics, followed by paper and metal⁴. The mean density of litter recorded was 15g/m² for Pretty Bay, St. George's Bay and Golden Bay, and 73g/m² for Għajn Tuffieħa.

Data in terms of amount of litter collected from beach and underwater cleanups carried out in the period 2002-2006 is reported in MEDPOL's 'Assessment of status of marine litter in the Mediterranean'⁵. This data indicates that over this period, 873kg of litter were collected from 24km of coastline. Comparison of this data with that published in above-mentioned studies is not possible due to different methodologies employed.

Currently, data on beach litter is to a certain extent collected as part of the regular beach cleansing activities taking place at Malta's frequented beaches or coastlines. The total amount of litter collected from the whole extent of coastline⁶ subject to the beach cleansing activity is indicated in Table 1. This data however should be treated with caution for the purposes of the MSFD since different beaches are subject to varying efforts of beach cleaning depending on popularity of beach/coastline. Furthermore the amount of litter collected could also include litter in bins.

³ Sciberras, C. & Axiak, V. 1995. Coastal marine litter in the central Mediterranean: Baseline information on beach stranding, coastal densities and rates of photodegradation. *CIESM. Rapp. Comm. int. Mer Medit.* **34**: 146; as quoted in: The State of Environment Report for Malta - 1998

⁴ Gardiner, V. 1996. La pollution de plages a Malte. *Mediterranee*, **84**: 53-56. <http://www.youscribe.com/catalogue/presse-et-revues/savoirs/sciences-humaines-et-sociales/la-pollution-des-plages-a-malte-article-n-3-vol-84-pg-53-56-1153934>

⁵ UNEP/MAP 2011. Assessment of the Status of Marine Litter in the Mediterranean. UNEP(DEPI)/MED WG.357/Inf.4

⁶ While the localities subject to beach cleansing activities are known, the exact length of coastline from which the litter is not mapped.

Table 1: Monthly amounts of beach litter collected from the whole stretch of coastline subject to beach cleansing activities for 2012⁷.

Month	Amount of litter (kg)
January	22,162
February	13,741
March	41,581
April	43,751
May	66,380
June	100,485
July	159,692
August	170,280
September	114,360
October	67,000
November	38,940
December	17,380
Total (2012)	855,752

Origin

Gardiner (1996) states that the composition of the examined litter in his study implied that most litter originated locally from land-based sources, with the major source deemed to be the tourism industry. Tudor et al. (2002)⁸ report the outcome of a litter sourcing study carried out on 33 beaches in the UK and the Mediterranean, including one highly frequented beach in Malta. This study confirmed that the source of litter on this beach mainly constituted 'beach user' debris (mainly fast food items). In their investigations of marine litter in Xlendi (Gozo) in 1997, Axiak & Zammit (1998)⁹ also reported that most of the paper, plastic and polystyrene items reported at this site were normally associated with fast food items.

These studies imply that most of the litter on the Maltese coastline originates from the intense use of beaches on the islands, rather than washed ashore or deposited on the coastline. This conforms to the conclusions drawn by MEDPOL's 'Assessment of status of marine litter in the Mediterranean'¹⁰, that most of the Mediterranean marine litter is from land-based sources, rather than ships.

⁷ Data provided by the Beach Cleansing Directorate

⁸ Tudor, D.T., Williams, A.T., Randerson, P., Ergin, A., Earll, R.E., 2002. The use of multivariate statistical techniques to establish beach debris pollution sources. *Journal of Coastal Research*, 36, 716-725.

⁹ Axiak, V. & Zammit, A. (1998). Xlendi and its Visitors. Environmental Quality and Beach Management in Xlendi. Malta Council for Science and Technology. 8pp; as quoted in: State of Environment Report for Malta 1998

¹⁰ UNEP/MAP 2011. Assessment of the Status of Marine Litter in the Mediterranean. UNEP(DEPI)/MED WG.357/Inf.4

Turner & Holmes (2011)¹¹ studied specifically the origin of ‘plastic production pellets’ or resin pellets, on the main natural beaches of Malta. Sources of such pellets could be both marine and land-based through either spillages during handling and transfer, or losses during transportation. The precise origin of such plastic pellets on the Maltese coastline is not known. However, the authors could not attribute the presence of such pellets to local industries or to Malta’s major transshipment hub (Malta Freeport). Instead, the authors conclude that since pellets found on Maltese beaches are of similar size, colour and composition as reported in beaches of both the western and eastern Mediterranean more than two decades ago, these pellets could constitute a general and persistent characteristic of the region, reflecting a multitude of sources and spillages which have subsequently been dispersed throughout the region.

1.4 Litter in Water Column

Data on marine litter in the water column is very limited and studies in this regard are scarce.

Sciberras & Axiak (1995)¹² report on the outcome of sea surveys for floating marine litter. An overall mean density of 41 items per km² of floating megalitter in coastal areas around Malta is reported through this study. Such litter was predominantly composed of plastic debris.

Morris (1980)¹³ reported a high density of floating debris (approximately 2000 km⁻²) in an area of the Mediterranean 40 miles SW of Malta. The majority of objects counted (60–70%) appeared to be pieces of plastic¹⁴. However, Aliani *et al.* (2003) imply that this density of floating marine litter may not be necessarily representative of the concentration in the area¹⁵. These authors have reported lower densities of floating litter through visual surveys of large debris in the Ligurian Sea.

Observations of floating litter are undertaken as part of the monitoring regime for Blue Flag beaches. Such monitoring is carried out throughout the bathing season (between 15 June and 30 September) during which any presence of oil (including odours) or floating materials (tarry residues, wood, plastic articles, bottles, containers, glass, or other floating material) on the seaward side of the beach are noted. Table 2 lists the items of floating litter observed throughout 20 monitoring sessions for the beach at Qawra Point and 5 monitoring sessions for the beaches St.

¹¹ Turner, A. & Holmes, L. 2011. Occurrence, distribution and characteristics of beached plastic production pellets on the island of Malta (central Mediterranean). *Marine Pollution Bulletin* **62**: 377–381

¹² Sciberras, C., and Axiak, V. (1995). Coastal marine litter in the central Mediterranean: Baseline information on beach stranding, coastal densities and rates of photodegradation. *CIESM. Rapp. Comm. int. Mer Medit.* 34: 146; as quoted in: *The State of Environment Report - 1998*

¹³ Morris, R.J., 1980. Floating plastic debris in the Mediterranean. *Marine Pollution Bulletin*, 11, 125.

¹⁴ Morris, R.J., 1980. Floating plastic debris in the Mediterranean. *Marine Pollution Bulletin*, 11, 125.

¹⁵ Aliani, S.; Griffa, A. & Molcard, A. 2003. Floating debris in the Ligurian Sea, north-western Mediterranean. *Marine Pollution Bulletin* **46**: 1142–1149

George's Bay, Fond Għadir (Sliema), Buġibba Perched Beach, Golden Bay, and Mellieħa Bay in 2011. Floating litter items were observed solely from the Buġibba Perched Beach.

Table 2: Presence of floating litter recorded as part of the Blue Flag monitoring regime¹⁶

Date	Beach	Type of floating material
1 st June 2011	Bugibba Perched Beach	Anthropogenic litter (not specified)
12 th July 2011		Plastic articles
		Containers
		Anthropogenic litter (not specified)

1.5 Litter on the sea-floor

The most comprehensive study on litter deposited on the seafloor has been recently published by Mifsud *et al.* (2013)¹⁷. This study determined the density and composition of litter on the seabed in circalittoral waters on the basis of litter collected from 44 stations within Geographical Sub-area 15, sampled during the 2005 session of the MEDITS surveys. 357 items were collected from 3.5km² of swept area (mean of 97 ± 78 items per km²). The most abundant type of litter was plastic (47%), followed by metal (13%) and glass (13%), with the majority of plastic items being plastic bags, plastic/polystyrene pieces and beverage containers. Source identification of litter observed was not successful.

Litter items recorded during this study included limestone slabs which could be attributed to the use of Fish Aggregating Devices (FADs) targeting the dolphinfish (*Coryphaena hippurus*). Dolphinfish are captured by means of FADs anchored using limestone slabs. These slabs are generally left behind at the end of the fishing season and fresh slabs, estimated at more than 15000, are used every year¹⁸. Pace *et al.* (2007)¹⁹ estimated the density and distribution of these limestone slabs on the seabed around Malta, as a preliminary study of their ecological effects. The total number of limestone slabs was 28 in 3.5 km² of swept area, 15 of which were found in 1.4 km² of non-FAD area and the remaining 13 were found in 2.1 km² of FAD area. This number of limestone slabs was much lower than expected implying that the limestone slabs are being removed from the seabed with time. The authors put forward two potential explanations for this: either that the slabs are being removed by trawling activities or that they are gradually sinking into the sediment.

No other data is available with respect to litter deposited on the seafloor with the exception of a value of total marine litter collected from underwater cleanups

¹⁶ Data extracted from lab reports (prepared by Ecoserv Ltd) commissioned by the Malta Tourism Authority.

¹⁷ Mifsud, R.; Dimech, M. & Schembri, P.J. 2013. Marine litter from circalittoral and deeper bottoms off the Maltese islands (Central Mediterranean). *Mediterranean Marine Science* 14 (2): 298-308.

¹⁸ Pace, R.; Dimech, M.; Camilleri, M. & Mosterio Cabalenas, A. 2007. Distribution and density of discarded limestone slabs used in the traditional *lampuki* fishery. *Rapp. Comm. int. Mer Médit.*, **38**: 568

¹⁹ Pace, R.; Dimech, M.; Camilleri, M. & Mosterio Cabalenas, A. 2007. Distribution and density of discarded limestone slabs used in the traditional *lampuki* fishery. *Rapp. Comm. int. Mer Médit.*, **38**: 568

carried out in the period 2002-2006 as reported in MEDPOL's 'Assessment of status of marine litter in the Mediterranean'²⁰. This data indicates that during this period, 3,831kg of underwater litter was collected from 7km of coastline. No further details in relation to this data are available.

For the purpose of the MSFD Initial Assessment, photographs²¹ of marine litter collected through the 2012 session of the MEDITS trawl surveys were assessed with a view to identify the litter items and classify them in accordance with the categories of marine litter on the seafloor identified by the draft 'Monitoring Guidance for Marine Litter in European Seas' prepared by the MSFD GES Technical Subgroup on Marine Litter. The categories identified by this guidance are reproduced in Table 4, while **Error! Reference source not found.** includes the outcome of this exercise.

Although this exercise is very preliminary and should not be interpreted as a scientific assessment of litter present on the seabed²², the results are similar to those reported by Mifsud *et al.* (2013)²³ for the 2005 sessions of MEDITS surveys. Based on the 2012 photos, which were available for 40 MEDITS stations, 290 items were recorded and the litter items constituted predominantly of plastic items (48%), followed by Glass/ceramics (26%) and metal (19%).

²⁰ UNEP/MAP 2011. Assessment of the Status of Marine Litter in the Mediterranean. UNEP(DEPI)/MED WG.357/Inf.4

²¹ Photos were taken by the Fisheries Department

²² No standardisation of data was undertaken

²³ Mifsud, R.; Dimech, M. & Schembri, P.J. 2013. Marine litter from circalittoral and deeper bottoms off the Maltese islands (Central Mediterranean). *Mediterranean Marine Science* 14 (2): 298-308.

Table 3: Litter Categories from MEDITS litter for Mediterranean and Black Sea as stipulated by the draft Monitoring Guidance for Marine Litter in European Seas²⁴

A – Plastic	
A1	Bags
A2	Bottles
A3	Food wrappers
A4	Sheets
A5	Other plastic objects
A6	Fishing nets
A7	Fishing lines
A8	Other fishing related
A9	Ropes/strapping bands
A10	Sanitaries (diapers, etc.)
B – Rubber	
B1	Tyres
B2	Other (gloves, shoes, etc.)
C – Metal	
C1	Beverage cans
C2	Other food cans/wrappers
C3	Middle size containers
C4	Large metallic objects
C5	Cables
C6	Fishing related
D – Glass/Ceramics	
D1	Bottles
D2	Pieces of glass
D3	Ceramic jars
D4	Large objects
E - textiles / natural fibers	
E1	Clothing (clothes, shoes)
E2	Large pieces (carpets etc..)
E3	Natural ropes
F – Wood (processed)	
G – Paper/Cardboard	
H - Other	
I - Unspecified	

²⁴ Monitoring Guidance for Marine Litter in European Seas. MSFD GES Technical Subgroup on Marine Litter (TSG-ML). DRAFT REPORT, July 2013

1.6 Ingested litter

Gramentz (1989)²⁵ reports on a study of loggerhead turtles incidentally caught by Maltese fishermen during the periods March-May and June-October 1986. The author states that over 20% of the 99 loggerhead turtles examined for pollution were contaminated by plastic or marine litter. Galil (2006)²⁶ quotes the same study by Gramentz (1988)²⁷ stating that 8 out of 92 (8.7%) incidentally caught turtles in Malta were affected by marine debris. The turtles examined had ingested transparent, milky white or light blue plastic, Styrofoam and nylon debris, possibly mistaking them for jellyfish. Effects of such ingested litter are described as follows²⁸:

- at low ingestion levels litter may replace food with non-nutritive material that, if persistent, may reduce growth.
- Litter items can lodge in the turtle's gastrointestinal tract, injuring the animal or causing its death.

Other data on ingested marine litter in incidentally caught or otherwise injured or dead turtles may also be available through Malta's Turtle Rehabilitation Unit. However this data was not available for the purpose of this report.

1.7 Assessment of status and data gaps

The currently available data does not allow assessment of 'Marine Litter' as per MSFD criteria and indicators. The general conclusions which can be drawn from the collated information in this report, include the following:

- Marine litter on Maltese coastlines, in the water column and deposited on the seafloor seems to be predominantly composed of plastic items;
- Sources of marine litter on the coastline are mainly land-based;
- Sources of marine litter on the seabed are still unclear.

Data gaps for all types of marine litter addressed by the MSFD criteria and indicators are significant, particularly in relation to sources. No data is available with respect to microplastics.

Furthermore, no trend data is available, therefore there is no indication of whether litter in the marine environment is increasing, decreasing or has remained stable throughout the past years. The results of initiatives undertaken to date (such as the tax on plastic bags) are thus unknown.

²⁵ Gramentz, D. 1989. Marine Turtles in the Central Mediterranean Sea. *Centro* (1) 4: 41-56pp.

²⁶ Galil, 2006. In: UNEP/MAP 2011. Assessment of the Status of Marine Litter in the Mediterranean. UNEP(DEPI)/MED WG.357/Inf.4

²⁷ The original publication by Gramentz (1988) was not available for the purpose of this report.

²⁸ Galil, 2006. In: UNEP/MAP 2011. Assessment of the Status of Marine Litter in the Mediterranean. UNEP(DEPI)/MED WG.357/Inf.4