CEMP Guidelines for marine monitoring and assessment of beach litter

(OSPAR Agreement 2020-02)[1]

Source: EIHA(2) WP 20/01/04-Add.1

OSPAR Theme: Human activities

OSPAR descriptor: Marine litter

Indicator full name: Abundance, composition and trends of marine litter washed ashore and/or deposited on coastlines, including analysis of its spatial distribution and, where possible, sources.

MSFD correspondence:

Descriptor: 10 - Marine Litter

Criterion: D10C1 - The composition, amount and spatial distribution of litter on the coastline, in the surface layer of the water column, and on the seabed, are at levels that do not cause harm to the coastal and marine environment.

Indicator: D10C1.1 – The composition, amount and spatial distribution of litter (excluding micro-litter) on the coastline.

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List of Abbreviations

BLEG: Beach Litter Expert Group

CEMP: Coordinated Environmental Monitoring Programme

CPs: Contracting Parties

CSV: Comma Separated Values

CV: Coefficient of Variation

EC: European Commission

EIHA: Environmental Impacts of Human Activities Committee

EU: European Union

GES: Good Environmental Status

GLM: Generalized Linear Modelling

ICG-ML: Intersessional Correspondence Group on Marine Litter

IMT: Intermediate measurable Target

MAD: Median Absolute Deviation

ML RAP: Marine Litter Regional Action Plan

MSCG: Marine Strategy Coordination Group

MSFD: Marine Strategy Framework Directive

NA or N/A: Not Analysed

NEAE: North-East Atlantic Environment

NGOs: Non-Governmental Organisation

PPE: Personal Protective Equipment

QSR: Quality Status Report

RSC: Regional Seas Convention

SD: Standard Deviation

SUP: Single Use Plastic

TG-ML: Technical Group on Marine Litter

TV: Threshold value

Definitions

Country-region: national marine area, including the coastline, within an OSPAR region (e.g. France-Bay of Biscay or Germany-Southern North Sea) used as the unit for assessment of beach litter data.

Country-subregion: national marine area, including the coastline, within a MSFD subregion used as the unit for assessment of beach litter data.

Beach: expanse of sand or pebbles along a shore washed by the tide or waves. Beaches can vary between extensive stretches of coastline from many kilometres length to shorter stretches of coast between headlands or bays between rocky outcrops.

Beach litter: any persistent, manufactured or processed, solid material discarded, disposed of or abandoned in the marine and coastal environment, and encountered on beaches.

Marine litter Good Environmental Status: properties and quantities of marine litter do not cause harm to the coastal and marine environment.

Survey site: geographic location of the sampling unit.

Sampling unit: fixed section of beach covering the whole area between the water edge to the back of the beach where the monitoring is carried out.

Total count: total number of litter items collected on the sampling unit per survey, excluding plastic and foamed polystyrene fragments < 2.5 cm.

1. Introduction

1.1.   The reduction of pollution of the marine environment by macro- and microlitter is one of the great environmental challenges facing society today.

1.2.   Under its draft North-East Atlantic Environment (NEAE) Strategy 2020-2030, OSPAR has a strategic objective to significantly reduce marine litter to levels that do not cause adverse impacts. This level, referred to as "Good Environmental Status" (GES), is also the objective set by the European Union (EU) in the Marine Strategy Framework Directive (MSFD, 2008/56/EC).

1.3.   Measures to reduce the input of marine litter and to remove litter from the marine environment are presently being implemented through actions at the OSPAR level (OSPAR Marine Litter Regional Action Plan/ML RAP) and through national actions. For Contracting Parties (CPs) who are EU Member States, measures implemented within the scope of the MSFD also contribute towards this objective. To direct these actions and assess their effectiveness in reducing marine litter pollution, but also to assess if GES and associated threshold values (TVs, Werner et al. 2020) are being achieved, indicators have been developed. Regarding marine litter, one of these indicators is the "Abundance, composition and trends of marine litter washed ashore and/or deposited on coastlines, including analysis of its spatial distribution and, where possible, sources", referred to as "beach litter". The indicator reflects spatial differences and temporal changes in abundance, composition and sources of marine litter in the coastal environment and is used as a proxy for litter pollution in the OSPAR marine environment.

1.4.   Beach litter is defined by OSPAR as any persistent, manufactured or processed, solid material discarded, disposed of or abandoned in the marine and coastal environment, and encountered on beaches. A part of this litter originates from the sea, through deliberate or accidental losses from vessels (including cargos and waste), and transported to and deposited on the coast from the sea by winds and water currents. Another part is directly deposited on the coast by humans, e.g. tourists, fishers or the results of fly-tipping. Litter is also deposited further inland on riverbanks, directly into rivers, in urban areas and in the countryside and is subsequently transported by rivers, rain and wind into the marine environment and onto beaches. In addition, sewage infrastructures discharge litter items directly or indirectly, via rivers and sewage outlets into the sea and these items can be washed ashore.

1.5.   The aim of this document is to provide guidelines for the monitoring and assessment programme for the OSPAR beach litter indicator that allows effective (i) detection of spatial differences and temporal changes in abundance, composition and, if possible, sources of litter encountered on beach monitoring sites and within country-regions, (ii) assessment of GES and associated TV achievement and (iii) evaluation of the effects and efficiency of OSPAR ML-RAP actions.

2. Monitoring

2.1   Aims

2.1.1. The first aim of OSPAR beach litter monitoring is to provide information on the abundance, composition, spatial distribution and trends of beach litter in the OSPAR area. The abundance reflects the magnitude of the pollution in adjacent waters and coastal areas; composition shows how common are the different litter types (string and cords, cotton bud sticks, caps and lids, cigarette filters, etc.) or litter material categories (plastic, wood etc.). The distribution highlights regional specificities that can relate to regional differences in sources, activities or human habits. Trends in the abundance of total litter, individual litter types or groups of types (i.e. fisheries related items, packaging, material class etc.) reflect changes in the level of pollution. This information can be used to describe the quality status of the OSPAR area and assess GES achievement. It can also be used to evaluate the effects and effectiveness of measures taken at national and OSPAR level to reduce marine litter pollution at a wide scale, notably through the OSPAR ML RAP.

2.1.2. Beach litter monitoring data also supplies information on litter sources. Beach litter is often a mixture of litter from sea-based sources, such as shipping, fisheries and aquaculture; and land-based sources, such as sewage treatment plants, urban areas, harbours & ports, tourism & recreational activities and unprotected waste disposal sites (OSPAR QSR 2010, Veiga et al., 2016). These sources can be local, regional or even distant, as litter may also be transported to a given site or region by ocean currents, rivers and wind drift. The composition of beach litter provides information on the different sources affecting survey sites and variation in composition supplies information on changes in sources. It is important to note that a given survey site or region can be subject to litter pollution from various sources.

2.1.3. The data also provides information concerning the ecological and socio-economic risks induced by marine litter. Marine litter can be harmful to the marine environment and can result in death or severe suffering of marine fauna and deterioration of marine flora (Werner et al., 2016). While the levels of harm caused to ecosystems by marine litter are not yet fully comprehended, marine litter can have an impact upon individual, or groups of organisms at different levels of biological organization as well as on habitats in a number of ways. These include entanglement in, or ingestion of litter items, transport of chemicals, microbes and invasive biota and alteration or modification of assemblages of species e.g. through smothering or as a substrate. Marine litter is a threat not only to the marine environment but also carries a potential risk to human health and has significant implications for human welfare, impacting negatively on vital economic sectors such as tourism, fisheries, aquaculture or energy supply and bringing economic losses to individuals, enterprises and communities. The higher the number of beach litter items in the OSPAR area, the greater the potential risk of harm to the marine environment and human welfare.

2.1.4. A last aim is to produce beach litter data and metadata that are comparable across the OSPAR region, through the use of a standardized monitoring protocol, as described in these CEMP guidelines. For European comparability, some EU harmonization and standardization proposals from the MSFD Technical Group on Marine Litter (TG-ML) baseline report (Hanke et al., 2019) are taken into account. At a larger scale, the OSPAR beach litter monitoring programme provides data and metadata with a fit-for-purpose quality, which can be downloaded from the OSPAR beach litter database and used by scientists worldwide. This data quality is attained through the use of the standardized OSPAR monitoring protocol (quality assurance) and annual data quality control by national beach litter data coordinators and the OSPAR Beach Litter Expert Group (BLEG).

2.2. Strategy

2.2.1. Litter

All beach litter items >5mm are surveyed. The assessment of beach litter pollution is based on a time-series of abundance of litter categories, individual litter types, groups of litter types and total count of litter items recorded on the OSPAR beach litter survey sites. Meso-plastic and foamed polystyrene fragments (5 mm – 2.5 cm) are not included in the assessment because they are monitored less comparably within the OSPAR area due to their small size and the occurrence of very high numbers on some beaches. They are, however, still included in the monitoring, because a dedicated methodology for this size of litter does not yet exist. They could, however, be analysed separately as proposed by the TG-ML baseline method (Hanke et al., 2020). It is recommended to develop a specific monitoring method in the near future, which should allow for a sufficiently precise quantification of small plastic fragments as they represent a considerable risk for the marine environment due to their relatively high numbers and small size.

It is also recommended to record the presence or absence of industrial plastic pellets. The estimated abundance of the number of pieces of high viscosity and persistent floating chemicals (e.g. paraffins) as well as other chemicals, such as oil, should also be recorded during surveys. Because they are recorded using a different method than the litter items they are not included in their analysis, but should be analysed separately.

2.2.2. Survey sites

Survey sites can be located on beaches composed of sand, gravel or pebbles. These can include beaches with different levels of pebble, rock, shingle and vegetation coverage. It is not recommended to situate survey sites on shorelines composed entirely of large boulders or rocks, where litter that has fallen between the boulders cannot be recorded properly. Preferably, the survey sites, where the sampling units are situated, are not subject to cleaning.

2.2.3. Survey frequency

Surveys are carried out once every 3 months, resulting in four datasets per beach per year (one per season). Winter counts are not possible at some Scandinavian and Arctic sites as well as on some uninhabited islands.

2.2.4. Natural dynamics of beach litter

It is important to understand the dynamics of beached litter to understand what assessments of beach litter data can tell us. In between any two beach litter surveys, litter items that have been washed ashore by tides or deposited directly on to the beach can be buried, washed or blown away again by subsequent tides and winds. Also during strong wave action buried litter items can resurface (Williams & Tudor, 2001) and litter can be blown onto a site from adjacent land or streets. Therefore, the amount of litter items recorded during one survey will generally constitute a minimum value for litter being deposited at the site. However, on beaches in small bays, enclosed for example by rocky promontories, the dynamics of litter is different. Such sites can trap litter, which is subsequently only redistributed within the bay by waves and wind action. Therefore, the amount of litter items recorded during a survey could potentially represent litter accumulation over time.

The composition of litter recorded on beaches also reflects its ability to reach the shore. The litter washed ashore is biased towards litter items that float and those that do not disintegrate, dissolve or decay quickly in the marine environment. The main category of litter found on beaches is plastic, which often floats and does not disintegrate rapidly in water (OSPAR Intermediate Assessment 2017, Addamo et al., 2017). The main components of the other common categories all float and/or decay slowly (wood, bottles, jars, light bulbs, tins and cans). Metal and glass from seaborne sources, are therefore probably under-represented because they are more likely to sink than items made of plastic, rubber and wood. Paper is probably also underrepresented because it will generally disintegrate more rapidly in water than other materials. This significantly reduces the likelihood of environmental harm caused by paper litter. On beaches used intensively for recreation, the greater part of beach litter is often composed of items abandoned by beach visitors (e.g.: sweet, fast-food packaging and cigarette butts) rather than litter washed ashore.

2.2.5. Attribution of litter items to sources or litter types

Assessments are carried out at "litter type" level and types can in some cases be related to sources or specific litter groups. For example, fisheries related items can often be identified easily. The abundance of items can be used to assess the major sources of litter for a given region. Items can also be attributed to specific litter types, which can originate from many sources but that should be combated in every possible source, e.g. Single Use Plastics (SUP). Changes in the abundance of specific litter types or a selection of litter types, which originate from a given source or are associated with specific uses can be used to assess the effectiveness of measures implemented to reduce litter pollution from those sources or uses.

2.3 Method

2.3.1. Selection of survey site

2.3.1.1. Beaches, where survey sites are situated, should be selected on the basis of the following criteria:

Preferably, the beaches should:

  - be composed of sand, gravel or pebbles and exposed to the open sea;

- be accessible to surveyors all year round;

- be accessible to facilitate the removal of marine litter;

- be a minimum length of 100 metres;

- be free of 'buildings' all year round;

- not be subject to any other litter collection activities (i.e. beach cleaning).

The selection of survey sites per country-region (e.g. France-Bay of Biscay) should be representative of the litter sources and cover the spatial variation within that country-region sufficiently. Although these criteria should be followed as closely as possible, the national coordinators can use their expert judgement, experience and local knowledge of the coastal area and marine litter situation in their country, when selecting the survey sites. For example, in some countries or regions the local conditions do not allow for selection of beaches composed mainly of sand, in others, it may not be possible to find beaches of 100 m length due to the coastal topography. In this special situation, a minimum survey length of 50 m is accepted. In such cases, the resulting data must be normalized to 100 m before entering into the database.

2.3.1.2. Physical characteristics of the survey site influence deposition and retention levels of litter, for example rocky coasts with sandy bays have the potential to accumulate and retain more litter than long open sandy beaches. Furthermore, water currents, weather conditions and prevailing wind conditions have a significant influence on deposition and retention of litter and therefore litter abundance. For these reasons, the location and physical and geographical characteristics of each survey site have to be recorded in detail in the beach description form available in the OSPAR beach litter field monitoring guidelines. The form includes information on the location and the physical and geographical characteristics of each beach, including the proximity of possible sources of marine litter. Also included are questions regarding factors that could help explain the quantity and composition of marine litter found on that beach, for example, cleaning schemes. This form must be completed by the national beach litter coordinator. The coordinator is required to gather as much relevant information as possible. It is advisable to contact local, regional or national authorities for information on cleaning schemes, etc.; when considering the question of the proximity of shipping lanes, river mouths, wastewater outlets, etc. it is advised to use official data from responsible authorities only. When circumstances change, for example, the development of a new residential area nearby, the questionnaire must be updated. This data is stored in the beach description section of the OSPAR beach litter database. The information can be added online directly into the database.

2.3.1.3. Survey sites should not be cleaned between surveys. Due to an increasing number of beach clean-ups organised by municipalities, groups and individuals in the OSPAR area, there is a serious concern that these clean-ups may affect the reliability of OSPAR beach litter monitoring. Relevant authorities and local clean up groups, including community groups and/or NGOs potentially involved, should be informed of beach monitoring sites and asked to not clean them. In parallel, the sampling unit could be delimitated by signs asking people not to clean the beach between these signs. Information about the monitoring and the importance of not cleaning the sites could be communicated via the organisers of local events or in the media. When cleaning has been observed or is reported to have taken place at a sampling location, surveys should be postponed until at least two weeks after the clean-up has taken place.

2.3.2. Sampling units

Within the OSPAR area, the standard sampling unit is 100 meters, measured as a straight line parallel to the back of the beach, or as near to the back of the beach as possible. The two sides of the sampling unit are lines perpendicular to this line, leading from the back of the beach to the waterline, which forms the front border of the sampling unit. The whole 100m stretch of beach is surveyed, from the water's edge to the back of the beach, as defined by physical structures such as sea walls, the transition zone to dunes, vegetation, etc. (**Fig. 1**). Permanent reference points must be used to ensure that exactly the same sampling unit is monitored during each survey. The start and end points of the sampling unit can be identified by different methods. For example, numbered beach poles could be identified and registered. Coordinates obtained by GPS or Google Earth are

useful information for identifying the survey site. However, as they can have a 10-metre deviation, this method may not be suitable in the field for identifying the start and end points of the sampling unit.

If in a country-region, beaches of 100m length are lacking or rare, the survey unit can be reduced to a minimum length of 50 m. However, data obtained must be normalized to 100 m when entered in the OSPAR beach litter database to ensure a harmonisation of OSPAR beach litter data. Normalization means dividing the litter item count by the number of meters surveyed and multiplying that number by 100. The precise length surveyed must be indicated in the "Additional comments and observations about this beach" section of the database beach description form; and the tick box indicating that the survey diverts from the 100 m has to be clicked in the database survey form.

Figure 1: a 100m sampling unit (Credit: Spain).

2.3.3. Survey periods

Survey sites are surveyed 4 times a year, once per season. The survey periods are as follows:

- Winter: mid-December – mid-January;
- Spring: April;
- Summer: mid-June – mid-July; and
- Autumn: mid-September – mid-October.

Preferably, the surveys on all survey sites within a given region should be carried out inside the shortest timeframe possible within a given survey period and, if possible, on the same dates at each location each year. To improve the distribution of the surveys throughout the year surveys should preferably be carried out in January, April, July and October.

It must be noted that the survey periods must be and currently are harmonized with MSFD recommendation (Galgani et al., 2013). An update of these periods could be considered in the near future at both the OSPAR and EU level in order to make the time-lapses between two survey periods sufficiently equidistant.

Circumstances may lead to inaccessible and unsafe situations for surveyors: heavy winds, slippery rocks and hazards such as rain, snow or ice, etc. The safety of the surveyors must always come first.

<u>2.3.4. Collection and identification of litter</u>

Although the OSPAR beach litter surveys are mainly carried out for the assessment of macro-litter, all visible litter items larger than 5 mm found on the beach surface within the 100 m sampling unit must be counted during the survey. This includes the meso-litter fraction, although it is recognized that this fraction cannot be monitored within a 100 m sampling unit with the same precision as the larger litter items i.e. those larger than 2.5 cm. The litter items to be surveyed include identifiable litter types and associated pieces of these types, unknown items and unknown litter fragments. It is important that every item is counted, including cigarette butts and biofilm support media, even if they are smaller than 2.5cm.

The number of pieces of chemical pollutants (paraffin wax and other pollutants such as oil, which float on the water surface and are deposited on the coast) is estimated for an average one-meter section of the 100m sampling unit. Note, therefore, that the unit of this pollutant type is number/m (and not number/100 m as for the litter items), and that this value must NOT be normalized to 100 m. It is important to note that paraffin wax and other chemicals cannot be identified with certainty simply based on visual appearance. Chemical analysis has shown that pieces of light-coloured chemicals, which look like paraffin, can be a number of different chemical substances.

The simple presence or absence of industrial plastic pellets within the sampling unit is also recorded.

In situations, where large amounts of litter items are found or survey conditions are difficult (rain, heavy winds, snow,…), litter collected over the 100 m unit can be stored in bags and sorted and counted in a sheltered place or indoors. In this case, care should be taken to prevent fragmentation and/or entanglement of the litter items, which would affect the number of items counted.

2.3.4.1. Survey data form

All items found on the sampling unit should be entered on the survey data form provided in the OSPAR beach litter field monitoring guidelines. This includes pieces of chemical pollutants and presence or absence of industrial plastic pellets.

On the survey data form, each item is assigned to a unique OSPAR litter type.

The list of litter types found in the survey data form can be subjected to updates. The list detailed in the present CEMP guidelines is implemented from the 1st of April 2021. In this list, the litter items recorded are assigned to 126 litter types in 10 categories according to the material they are made of (e.g. plastic, wood, metal, etc.) or their use (e.g. medical, sanitary). All litter items found within the sampling unit should be assigned to one of the 126 predefined litter types and materials:

- Plastic (65 litter types);
- Rubber (4 litter types);
- Cloth (5 litter types);
- Paper and cardboard (8 litter types);
- Wood (9 litter types);
- Metal (15 litter types);
- Glass (4 litter types);
- Pottery/ceramics (3 litter types);
- Sanitary waste (8 litter types); and
- Medical waste (5 litter types).

The detailed list of litter categories and types, which are to be surveyed, is presented in Appendix 1.
All fragments that are clearly recognisable as a part of a single item should be counted as one item.
Tangles of rope are counted as one item.

Identifiable litter items, which are not listed in the OSPAR litter-type list, and litter items, which cannot be identified, are registered under the litter type "other" for the given material or use category. What the item actually is or respectively a description of the item, should be recorded on the survey data form. Providing information about non-listed items is important as it allows an identification of possible emerging litter types. It also enables the recording of items, which might be common at a local scale but rare on the scale of the OSPAR region. If possible, digital photos should be taken of unknown items so that they can be identified later.

Litter fragments, which cannot be identified, because they are too fragmented, are registered as either plastic or foamed polystyrene under the three different size categories of the litter type "fragments". Foamed polystyrene includes both expanded and extruded polystyrene.

Litter items categorised according to their use as either sanitary or medical are made of plastic, cardboard, glass etc. and can be added to the relevant material categories during analysis if required. For example, sanitary wastes made of plastic (see Appendix 1), e.g *plastic cotton bud sticks*, which are a major component of litter in some regions, will be included in the plastic category for analysis in order to provide a more precise picture of the material composition of litter.

To ensure that all surveyors register items in a similar way, several items that might otherwise lead to misinterpretation are highlighted here:

- Fragments of plastic that are not recognisable as an item should be counted as either plastic or foamed polystyrene fragments according to their size (OSPAR ID 1171, 1172, 461, 462, 471 or 472 on the survey data form).

- Fragments of plastic that are recognisable as a (shopping) bag (OSPAR ID 2 on the survey data form) should be registered as such.

- Fragments of plastic that are recognisable as a small plastic bag (OSPAR ID 3 on the survey data form) should be registered as such.

- All fragments that are recognisably part of a balloon (including the plastic valves, the plastic ribbons or string tied to the balloon) should be registered as 'balloon' (OSPAR ID 49 on the survey data form).

- Fragments of glass that are recognisable as for example bottles (OSPAR ID 91 on the survey data form) should be registered as such.

- Glass fragments that are not recognisable as an item are not counted.

- All pieces of string and cord including dolly ropes (OSPAR ID 321 and 322 on the survey data form) should be counted as single items. Often a piece of string or cord is found with smaller pieces lying around it that were obviously part of this rope. All these pieces should be counted as single items.

OSPAR beach litter monitoring records litter types which are targeted by existing measures such as OSPAR RAP actions or the European Directive 2019/904 on the reduction of the impact of certain plastic products on the environment, also known as the single-use plastics and fishing gear Directive. The monitoring of these litter types allows for the assessment of the effect and efficiency of these measures. The relationship between OSPAR litter types and RAP measures is detailed in Appendix 1.

After a RAP update, it is recommended to undertake a review of the OSPAR beach litter monitoring survey list to ensure it is coherent with newly implemented measures and it allows an assessment of effect and effectiveness of these measures. If necessary, a new litter type, targeted by a measure, should be included in the survey type list.

Following the COVID-19 pandemic and its related massive use of disposable personal protective equipment (PPE) leading to a new environmental pollution challenge, the survey list has been amended to include the most used disposable plastic PPE, in line with scientific community recommendations (Canning-Clode et al., 2020). These PPE are single use plastic gloves and single use plastic face masks (respectively OSPAR ID 1051 and 1052 under

the category of medical waste). CPs should include these litter types in their national monitoring program and report them in the OSPAR beach litter database to allow an assessment of the magnitude of this new pollution source and its associated impact on the marine environment at the OSPAR area level.

2.3.4.2. Photo guide

A photo guide is available to assist the surveyors with the identification and categorisation of litter items. The photo guide is a multilingual catalogue of the litter types on the 100-metre survey data form. It is available in the OSPAR beach litter field monitoring guidelines.

2.3.4.3. Removal and marking of items

All litter items should be removed from the beach during the survey and disposed of responsibly after being recorded. Regional or national regulations and arrangements should be followed during disposal of beach litter. Larger items that cannot be removed (safely) by the surveyors should be marked with, for example, environmentally safe paint spray so they will not be counted again during the following survey.

2.3.4.4. Survey information form

The total amount of litter recorded on the survey unit and the types of litter found can be influenced by a number of factors. To assure that data is analysed and interpreted properly, all relevant information concerning the survey must be recorded on the survey information form provided in the OSPAR beach litter field monitoring guidelines and entered in the "additional information" section of the database survey form.

Examples of relevant information are:

- When a survey differs from the standard methodology described in this guideline this should be recorded on the survey form. For example when a different length of beach was surveyed or litter was not collected;
- Circumstances that influence data recording. For example tracks (car/tractor) on the beach, sand replenishment of the beach;
- Events that lead to unusual types and/or amounts of litter on the reference beach. For example beach events, shipping container losses, overflows in sewage treatment systems;
- Any unusual circumstances or difficult conditions at the time of the survey that might influence the data recording. For example heavy winds or rain or sand storms.

2.3.5. Sampling timing and safety

It is advised to begin monitoring at least one hour after high tide to reduce the danger of surveyors being cut off by the incoming tide.

It is recommended that a minimum of two people work on remote beaches. Dangerous or suspicious looking items, such as ammunition, chemicals, medicine and drugs should not be removed. Instead, inform the police or authorities responsible.

2.3.6. Training of fieldworkers

The OSPAR beach litter field monitoring guidelines is a practical guide for monitoring marine litter on beaches. Advice from experienced fieldworkers on how to monitor beach litter has been incorporated into this document to ensure that litter recording is standardised within the OSPAR area.

CPs should ensure an adequate training for all the fieldworkers who participate in the surveys. Coordinators or surveyors from OSPAR are available for training. Please contact the OSPAR secretariat or your national coordinator for advice. An experienced person, ideally the person that has carried out surveys on that survey site in the past, should accompany a person carrying out a survey for the first time. Intercalibration exercises should be carried out with neighbouring countries or at OSPAR regional levels to ensure that litter items are attributed to OSPAR litter types

2.4   Data reporting, handling and management

2.4.1. The reporting format includes the survey data form and the survey information form that can be viewed in the OSPAR beach litter field monitoring guidelines.

2.4.2. All data collected and associated information are to be sent to the national data coordinator within weeks following the survey. After the required quality control, the data and associated information are entered into the OSPAR online beach litter database at a survey site level by national data coordinators, preferably within a month of surveying. For details, please contact the OSPAR secretariat for advice.

2.4.3. When a litter type has not been surveyed (e.g. test types or old types), "NA" (meaning Not Analysed) must be entered in the database survey form. This is a code for a missing value that is used in the OSPAR database and will be present in the exported data files.

2.4.4. When a survey has been conducted but no litter items were observed, this must be recorded in the database by assigning a zero to all litter types surveyed and indicating "survey conducted with no litter found" in the "Remarks" section of the database survey form.

2.4.5. When a survey has not been conducted; this must be recorded in the checklist for the annual documentation of beach litter monitoring activities and the reasons why the survey could not be carried out must be given (Appendix 3).

2.5   Quality Assurance/ Quality Control

2.5.1 National data coordinators of OSPAR beach litter monitoring are required to:

- ensure that surveys are carried out in compliance with the quality assurance procedure presented in Appendix 2 in order to prevent the entry of incorrect data into the database;
- check the correctness of the data directly before and after entry into the database;
- undertake an annual quality control examination of national beach litter data entered into the OSPAR database to ensure that it is correct and that it may be used for analysis, e.g. for Indicator Assessments.

2.5.2 A checklist for the annual documentation of changes to the prevailing conditions on OSPAR survey sites as well as of organizational changes and problems encountered during the coordination and execution of surveys, which might have affected the results of monitoring (monitoring metadata), is included in Appendix 3.

3. Assessment

3.1. Aims

The assessment method uses data from OSPAR beach litter monitoring to assess the abundance, composition and trends of litter on the OSPAR beaches, and to evaluate if the reduction aims for litter on the coastline defined by OSPAR and the EU are being reached.

3.1.1. Threshold value

In 2020, a TV of 20 items/100 m coastline (excluding meso-fragments of plastic and foamed polystyrene) was adopted by EU Marine Strategy Coordination Group (MSCG) (Van Loon et al., 2020). This TV is a recommendation and assessment task for individual EU member states. Though this TV has not yet been adopted at the OSPAR level, it is proposed to use it as an indicative value regarding beach litter status in the OSPAR area.

3.1.2. Intermediate measurable Targets (IMT)

The adoption of the TV guideline, requires that Regional Sea Conventions (RSCs) develop regional Intermediate Measurable Targets in the path towards reaching the TV. The method for setting Intermediate Targets will probably be developed in TG-ML, in close cooperation with the RSCs.

3.1.3. Decreasing trends of litter groups and types

In Europe and the RSCs, many measures have been implemented to reduce marine litter pollution and many more are planned. It is relevant to monitor and assess, if specific measures lead to the desired reduction (decreasing trend) of specific litter groups and types. For example, the EU SUP and fishing gears directive (EU 2019/904) is expected to lead to reductions of the SUP and fishing gear items, and, therefore, the abundance and trends of SUP and fishing gear items should be assessed. Another example is the EU plastic bag directive (EU 2015/720), which should lead to a decreasing trend of plastic bags on coastlines.

3.2. Assessment method

The assessment method below is based on the previous OSPAR assessment method (Schulz et al. 2017, Schulz et al. 2019), and new EU baseline and TV assessment methods (Hanke et al. 2019, Van Loon et al. 2020).

3.2.1. Data extraction

All OSPAR beach litter data and metadata can be extracted from the online OSPAR beach litter database as a CSV (Comma Separated Values) file by selecting and downloading data according to spatial and temporal selection criteria. Note that if the data file contains survey records from before and after 2010 or before and after 1rst April 2021, the old or new litter types which were not monitored in the respective period are entered as NA (or N/A), which indicates missing values. These NA or N/A values will be automatically skipped by litteR, and clear warning messages will make the user aware of these missing values.

3.2.2. Data description

- The OSPAR assessment includes a map with all the survey sites used in the assessment.

- A data overview table is made, showing for the complete data period the number of surveys per survey site per year, and the total number of surveys per country-MSFD subregion or country-OSPAR region per year.

  Note: For MSFD countries, it is proposed to use the MSFD subregions, because this will align the OSPAR assessment with the MSFD reporting process. However, other scales (country or OSPAR regions) could also be used depending on the assessment objective.

3.2.3. Data quality control and cleanup

- The litteR software is the primary tool for OSPAR beach litter data analysis

  https://cran.r-project.org/web/packages/litteR/index.html.
  litteR contains all agreed OSPAR beach litter data analysis methods, and is an improved version of the preceding OSPAR Litter Analyst software.
  It is recommended to read the litteR user manual carefully before using the software for the first time.

- In the OSPAR data file, the column headers "spatial_code" and "date" are added in the respective columns which give the desired spatial information (beach, country of subregion) and date. By doing this, the litteR software knows precisely which metadata columns to use.

- In the litteR type file, the litter types file to be analysed, and the litter groups they are assigned to, are precisely and easily defined.

- The plastic and foamed polystyrene fragments <2.5 cm (OSPAR ID 1171 and 1172), chemical pollutants and industrial plastic pellets data columns are automatically excluded by the litteR software from the data analysis, according to the EU baseline and TV methods (Hanke et al. 2019, Van Loon et al. 2020).

- Do a first analysis of the datafile to check the correct technical format of the datafile, and to check for duplicated records. litteR gives detailed warnings and errors in the logfile, which facilitate the correction of the data file if needed. Correct the possible format errors and remove duplicates.

- Do a second analysis of the corrected datafile to detect possible outliers. This outlier analysis should be performed at the beach level to obtain the most relevant information. If outliers are detected, check with your monitoring organization, who should look at their original monitoring survey list for possible errors. If no clear errors can be found, the statistical outlier should be maintained in the dataset.

3.2.4. Descriptive statistics

- For descriptive statistics, a default period of the most recent 3 data years is used. Although this is a shorter period than the previously used 6 years MSFD period, it gives more recent status information which is preferable. Note that a minimum of 40 surveys is recommended to use to obtain sufficiently precise descriptive results, similar to a TV assessment (Van Loon et al., 2020).

- The spatial levels to be analysed are the basic survey site level, and the higher spatial level is either the country-region (OSPAR) or the country-subregion (MSFD) levels which are related. However, for MSFD counties, it is recommended to use the country-subregion to ensure coherence between the OSPAR and MSFD reporting. The OSPAR regions, the MSFD subregions or even the OSPAR area levels can also be analysed but they are often too global to give useful descriptive and trend information.

- The follow groups are analysed: Total Count (cleaned, see 3.2.3), Single Use Plastics, Fisheries items, Sanitary items, and the material groups (e.g.: plastic, rubber, metal, glass, processed wood, paper).

- The most abundant litter types accounting for 80% of the Total Count of all litter types (top-80%) are analysed for descriptive statistics and trends. Note that in the groups (Total Count, SUP and FISH, materials) all litter types are analysed.

- A selection of litter types from the OSPAR ML RAP, for which measures have actually been implemented, is analysed.

- The litteR software produces for the selected period, spatial scale and group or type the following indicators: median, Median Absolute Deviation (MAD), mean, Coefficient of Variation (CV, which is the standard deviation (SD) divided by the mean), number of surveys, slope, p-value.

3.2.5. TV and IMT assessment

- The median value of at least 40 beach surveys per country-subregion from the most recent data period is used as an assessment value in order to obtain sufficient confidence in the median assessment value (Van Loon et al., 2020). It is assumed that sufficient monitoring beaches are available per country-subregion

- This median assessment value can be compared with the TV of 20 items/100 m as a measure of beach litter pollution status, to be compared with the IMT and TV, respectively.

3.2.6. Trend analysis, linear

- The following trend analysis periods are used for default OSPAR trend assessments: 6 years (short term) and 10 years (medium term).

- The follow groups are trend analysed in the selected period: Total count (without meso-plastics and foamed polystyrene fragments and chemical pollutants), SUP, Fisheries items, sanitary items, and the material groups (plastic, rubber metal, glass, processed wood, paper).

- The top-80% types (which account for 80% of the Total Count) are trend analysed.

- A selection of litter types from the OSPAR ML RAP, for which measures have been implemented, is trend analysed in the selected period.

- Optionally, additional trend analyses may be performed at the survey site level, to obtain more insight in spatial differences within a country-subregion/region, and possibly in specific sources.

These linear trend analyses are performed by litteR using the robust Theil-Sen trend analysis and Mann Kendall significance test, respectively. The significances (p-values) of the trends are reported as an indication of the confidence in the trends.

3.2.7. Trend analysis, asymptotic (optional)

- An asymptotic trend analysis method for Total Count using Generalized Linear Modeling (GLM) has been developed (Walvoort et al. 2021). In a first step, the decreasing trend period is investigated and defined using a plot of annual median total count values. Then, the GLM trend analysis method is performed using the individual survey data points in this decreasing trend period. Minimum data requirements are a trend period of at least 5 years containing at least 30 surveys. An important assumption is that the modelled decreasing trend will be maintained in the future, which will require sustained and possibly additional measures. The uncertainty in the model forecasts, based on the data variation, is reflected in confidence intervals of the forecasts. Please note that these model forecasts are only indicative estimations.

- This asymptotic trend analysis method is specifically designed to test the progress of reaching IMTs and the TV. Other litter groups (such as SUP) and litter types with sufficient counts can in principle also be modelled and predicted using this method (Walvoort et al. 2021).

- This optional method is not available in litteR, but is provided in a separate R-script which should be run in Rstudio (Walvoort et al. 2021).

3.2.8. Reporting

- A selection of results from the extensive litteR reports can be made and copied into a well readable assessment report.

- An assessment checklist is presented in Appendix 4. This checklist can be used to setup a data analysis report.

4. Change Management

4.1   The Environmental Impacts of Human Activities Committee (EIHA) is responsible for policy and resource questions on the acquisition and storage of data. Quality control and analysis and technical aspects are managed by the Intersessional Correspondence Group on Marine Litter (ICG-ML) with the support of the Beach Litter Expert Group (BLEG). It is also responsible for necessary adaptations to the monitoring system in order e.g. to make sure that it fulfils the requirements of OSPAR NEAE strategy and the MSFD.

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Appendix List

Appendix 1: List of beach litter categories and items and relation with existing measures (OSPAR ML RAP 2014-2020, European Directive 2019/904 on single-use plastics and fishing gears)

Appendix 2: Quality control procedure for OSPAR beach litter monitoring data and metadata on the survey sites

Appendix 3: Checklist for the annual documentation of beach litter monitoring activities

Appendix 4: Checklist for an OSPAR beach litter assessment

Appendix 1: List of OSPAR beach litter types and relationship with existing measures (OSPAR ML RAP 2014-2020 and European Directive 2019/904 on single-use plastics and fishing gears)

Legend for measures:

A   Consumption reduction
B   Restrictions on placing on the market
C   Product requirements
D   Marking requirements
E   Extended producer responsibility
F   Separate collection and product requirements
G   Awareness raising

Beach litter		Existing measures	
OSPAR ID	Types	ML RAP 2014-2020	Directive EU/2019/904
Plastic			
1	4/6-pack yokes		
2	Bags (e.g. shopping)	Action 44	E, G
3	Small plastic bags, e.g., freezer bags		
112	Plastic bag ends		
4	Drinks (bottles, containers and drums)	Action 43	C, E, F, G
5	Cleaner (bottles, containers and drums)		
610ª	Food containers incl. fast food containers - plastic	Action 43	A, E, G
620ª	Food containers incl. fast food containers - foamed polystyrene	Action 43/49	A, B, E, G
7	Cosmetics (bottles & containers e.g. sun lotion, shampoo, shower gel, deodorant)		
8	Engine oil containers and drums <50 cm		
9	Engine oil containers and drums > 50 cm		
10	Jerry cans (square plastic containers with handle)		
11	Injection gun containers		
12	Other bottles, containers and drums		
13	Crates		
14	Car parts		
15	Caps/lids	Action 43	C, E, F, G
16	Cigarette lighters		
17	Pens		
18	Combs/hair brushes		
19	Crisp/sweet packets and lolly sticks	Action 43	E, G
20	Toys & party poppers		
211ª	Cups - plastic	Action 43	A, D, E, G
212ª	Cups - foamed polystyrene	Action 43/49	A, B, D, E, G
22	Cutlery/trays/straws	Action 43	B
23	Fertiliser/animal feed bags		
24	Mesh vegetable bags		
25	Gloves (typical washing up gloves)		
113	Gloves (industrial/professional gloves)		
26	Crab/lobster pots	Action 35/36	E, G
114	Lobster and fish tags	Action 35/36	E, G
27	Octopus pots	Action 35/36	E, G
28	Oyster nets or mussel bags including plastic stoppers	Action 35	E, G
29	Oyster trays (round from oyster cultures)	Action 35	E, G
30	Plastic sheeting from mussel culture (Tahitians)	Action 35	E, G
31	Rope (diameter more than 1 cm)	Action 35/36	E, G

321[a]	String and cord (diameter < 1cm) not from dolly ropes or unidentified	Action 35/36	E, G
322[a]	String and filaments exclusively from dolly ropes	Action 35/36/37	E, G
115	Nets and pieces of net < 50 cm	Action 35/36	E, G
116	Nets and pieces of net > 50 cm	Action 35/36	E, G
331[a]	Tangled nets/cord/rope and string without dolly rope or mixed with dolly rope	Action 35/36	E, G
332[a]	Tangled dolly rope	Action 35/36/37	E, G
341[a]	Fish boxes - plastic	Action 36	
342[a]	Fish boxes - foamed polystyrene	Action 36/49	
35	Fishing line (angling)	Action 35/36	E, G
36	Light sticks (tubes with fluid)	Action 35/36	E, G
37	Floats/Buoys		E, G
38	Buckets		
39	Strapping bands		
40	Industrial packaging, plastic sheeting		
41	Fibre glass		
42	Hard hats		
43	Shotgun cartridges	Action 48	
44	Shoes/sandals		
45	Foam sponge		
64[a]	Cigarette butts	Action 43/48	D, E, G
121[a]	Bagged dog faeces		
481[a]	Biofilm support media	Action 48	
1171[a]	Plastic fragments 0.5 - 2.5cm		
1172[a]	Foamed polystyrene fragments 0.5 - 2.5cm	Action 49	
461[a]	Plastic fragments 2.5cm >< 50cm		
462[a]	Foamed polystyrene fragments 2.5cm >< 50cm	Action 49	
471[a]	Plastic fragments > 50cm		
472[a]	Foamed polystyrene fragments > 50cm	Action 49	
48	Other plastic items		
Rubber			
49	Balloons, including plastic valves, ribbons, strings etc.	Action 43/48	B (only for the sticks), E, G
50	Boots		
52	Tyres and belts		
53	Other rubber pieces		
Cloth			
54	Clothing		
55	Furnishing		
56	Sacking		
57	Shoes (leather)		
59	Other textiles		
Paper / Cardboard			
60	Bags		
61	Cardboard		
118	Cartons e.g. tetrapak (milk)		
62	Cartons e.g. tetrapak (other)		
63	Cigarette packets		
65	Cups		
66	Newspapers & magazines		
67	Other paper/cardboard items		
Wood (machined)			
68	Corks		
69	Pallets		

70	Crates		
71	Crab/lobster pots	Action 35/36	
119	Fish boxes	Action 35/36	
72	Ice lolly sticks / chip forks		
73	Paint brushes		
74	Other wood < 50 cm		
75	Other wood > 50 cm		
Metal			
76	Aerosol/Spray cans		
77	Bottle caps		
78	Drink cans		
120	Disposable BBQ's		
79	Electric appliances		
80	Fishing weights	Action 35/36	
81	Foil wrappers		
82	Food cans		
83	Industrial scrap		
84	Oil drums		
86	Paint tins		
87	Lobster/crab pots and tops	Action 35/36	
88	Wire, wire mesh, barbed wire		
89	Other metal pieces < 50 cm		
90	Other metal pieces > 50 cm		
Glass			
91	Bottles		
92	Light bulbs/tubes		
931[a]	Jars incl. fragments of jars		
93	Other glass items		
Pottery / Ceramics			
94	Construction material e.g. tiles		
95	Octopus pots	Action 35/36	
96	Other pottery/ceramic items		
Sanitary waste			
97	Condoms – plastic (1)		
981[a]	Cotton bud sticks – plastic (1)	Action 43/48	B
982[a]	Cotton bud sticks - cardboard	Action 48	
99	Sanitary towels/panty liners/backing strips – plastic (1)	Action 43	D, G
100	Tampons and tampon applicators – plastic (1)	Action 43	D, G
101	Toilet fresheners – plastic (1)		
1021[a]	Wet wipes – plastic (1)	Action 43	D, E, G
102	Other sanitary items		
Medical waste			
103	Containers / tubes		
104	Syringes		
1051[a]	Single use face masks – plastic (1)		
1052[a]	Single use gloves – plastic (1)		
105	Other medical items (swabs, bandaging etc.)		

[a]: recently added items

(1): Sanitary or medical litter types made of plastic that can be added to the plastic category during analysis to provide a more precise picture of the litter material composition.

Appendix 2: Quality control procedure for OSPAR beach litter monitoring data and metadata on the survey sites

To improve and guarantee the quality of beach litter data, and to ensure the regular updating of the information on the characteristics of the beaches on which the survey sites are situated (metadata), the quality assurance procedure presented below should be followed.

National beach litter data coordinators

All OSPAR Contracting Parties nominate national data coordinators, who are responsible for beach litter surveys, quality control and processing of the data from beach litter surveys in their country.

The tasks of the national data coordinators include:

- Quality control of the beach litter data.
- The uploading of monitoring data into the OSPAR beach litter database by the deadlines defined by ICG-ML (national coordinators will be informed of the deadlines via basecamp). This task can be carried out by the national coordinators themselves or by persons under the supervision of the national coordinators.
- The collection of data on changes to the characteristics of the beaches on which the survey sites are situated (metadata).
- The collection of data on factors, which might have affected the results of surveys.
- To act as national contact persons with regard to enquiries from the OSPAR secretariat and the OSPAR Beach Litter Expert Group (BLEG).

National data coordinators can and should preferably be members of the BLEG.

National data coordinators, as well as persons working on OSPAR beach litter survey data under the supervision of the national coordinators, should be familiar with beach litter surveys and the results of the surveys in their given region.

National beach litter data coordinators play a central role in the quality control of the national beach litter data. The OSPAR secretariat, the database manager and the OSPAR BLEG lead should have clear information on who the national beach litter coordinators are, in case advice or action is needed. A national beach litter data coordinator can organize or perform corrective actions on national data sets in the database when needed.

In order to provide good quality data, the national data coordinators should ensure that surveys are carried out in compliance with the CEMP Guidelines for monitoring and assessment of beach litter (OSPAR Agreement 2020-02)

To ensure comparability of data between survey sites:

- The length of the sampling unit must be exactly 100m (in the particular case of absence of 100 m length beach in the country-region, data obtained on shorter sampling unit must be normalized to 100 m).
- All litter encountered on the sampling unit must be recorded during every survey.
- Surveys should preferably be performed at least by two surveyors, who can complement and check one another.
- Surveys should take place within the survey periods laid down by the guidelines. National coordinators must make sure that the correct date is entered into the database. Survey dates are very relevant when carrying out trend analysis. Occasional deviation from these monitoring periods may occur, but should be kept to a minimum, in order to keep a good equidistance in time between the individual surveys.
- National data coordinators should ensure that on each site no more than one survey per survey period (4 per a year) is carried out.

To ensure comparability of data between surveys on the same survey site:

- Monitoring of exactly the same 100m stretch of beach during each successive survey is required. This means strict adherence to the start- and end-points of the 100 m sampling unit.

To ensure correct allocation of litter items to the litter types on the OSPAR beach litter protocol.

- School field workers on using the field protocol and provide them with the OSPAR photo guide. Make sure they are acquainted with protocol before the survey begins. Use experienced beach litter surveyors to train new staff in the field.
- In case of doubts about correct allocation of litter items, contact a member of the BLEG.
- Take photos of unusual or unknown litter items for later consultation.
- Use a measuring tape to assess size of litter items classified according to their size.

To reduce the effects of beach cleaning on data acquisition:

- Keep in touch with your local municipality, plan surveys in advance, so they do not coincide with or take place immediately after beach cleaning activities.
- If the beach has been cleaned, postpone the beach survey to at least 14 days after the beach cleaning has taken place.

To ensure that the information on the characteristics of the survey sites is correct and up-to-date

- Enter all the required information on the characteristics of the survey sites into the database. This information provides an indispensable basis for the interpretation of the results of the beach litter surveys.
- Ensure that the coordinates of the start- and end-points of the survey site are expressed in the correct geodetic system (WGS84), entered into the database and that they indicate the exact position of the site correctly in maps. The location of the sampling unit (begin point and end point) is important to ensure that always the correct unit is monitored through the years, it provides information on potential sources affecting the site and allows for a better interpretation of the results of the surveys.
- Update the information in the database at regular intervals. The updating interval should coincide with the reporting periods for Indicator Assessments. The update should include information on measures, which could have influenced the litter on the survey site

In order to prevent the entry of incorrect data into the database; national data coordinators must check the correctness of the data directly before and after entry into the database

Checking the data before entering it in the database

- Unusual entries (litter items not usually recorded for that region) or unusual numbers of items for a given litter type (examples are large numbers of plastic-bag-ends, because surveyors mistake this type for fragments of plastic bags, and large numbers of "other glass", because surveyors include all glass fragments) must be confirmed with the surveyors before entry into the database.

Checking the data after entry into the database

- The person who uploads the data into the database should check the correct transmission of the data from the survey data form into the database and correct any inconsistences, using the "edit" function of the database, immediately after data entry. After entering and saving the data in the OSPAR database all the information, which has been uploaded for a given beach code and date, is presented in condensed form, which enables the person who has entered the data to check quickly if the data is correct. This is a very important, because input mistakes "always" do happen.

In order to ensure that the national data entered into the database is the data set, which is to be used for analysis of beach litter data e.g. for Indicator Assessments, the national data coordinator should perform an annual quality control of new beach litter data.

This annual quality control includes both the filling of the checklist presented in Appendix 3 and a national data control.

National beach litter data can be downloaded from the OSPAR beach litter database. Beach litter data are exported as a CSV-file, and can be read into Excel for easy reading and quality control.

The national data coordinator should contact the persons who carried out the surveys or uploaded the data to clarify any inconsistencies found with the data. National coordinators should perform any necessary corrections to data in the OSPAR database.

Common problems encountered with data in the OSPAR beach litter database are:

- Duplicate records: Duplicate records are when two or more entries are made for the same OSPAR beach code on the same date. Duplicate records can be completely identical (all data is identical) or partially identical (i.e. the litter data is duplicate, but some details are different (i.e. in survey conditions, comments, dead animals etc.). The national beach coordinator must decide which of the records is the correct entry and must delete any incorrect entries.
- Empty records: Empty records can occur when a new entry form is opened and saved without entering survey data. The database default value is zero, so even if data is not entered into the entry form, the database will enter zero values for all litter types on the list. As it is also possible that during a survey no litter items are recorded, it is important to check to see if a record, which only contains zero values, is correct.
- Too many records for individual survey sites in one year. Three (in countries, where winter surveys are impossible) to four surveys a year are mandatory.

The corrected data set can then be analysed using litteR to ensure that the data is compatible with that software. LitteR automatically performs quality checks too and reports its results e.g. double records.

Timing of the quality control procedure

The quality control should be performed in spring, on the previous year's beach litter data.

The national quality control and data correction of the previous year's data dataset must be completed before June 30th.

The national data coordinator reports successful completion of the quality control procedure to ICG-ML, via Basecamp.

Appendix 3: Checklist for the annual documentation of beach litter monitoring activities

The checklist for the documentation of beach litter monitoring, presented below, includes annual reporting criteria aimed at improving the overall quality of beach litter data. The annual documentation will enable the updating of information collected on survey sites (beach questionnaires) and will provide an incentive for national coordinators, at the end of the monitoring year, to check that all surveys have been carried out and that all relevant information has been collected and entered into the OSPAR beach litter database.

National Annual Report OSPAR Beach Litter Monitoring					
YEAR					
COUNTRY					
NUMBER OF SITES SURVEYED					
NATIONAL COORDINATOR: Institute, phone number, email					
MONITORING ORGANISATION: Contact person, institute, phone, email					
EXECUTION OF MONITORING yes (y) / no (n)					
Site code					
Site name					
April					
June/July					
September/October					
December/January					
REASONS FOR MISSING SURVEYS					
INCIDENTAL CIRCUMSTANCES, WHICH COULD HAVE EFFECTED THE SURVEYS					
OCCURRENCE OF NEW TYPES OF LITTER (which might require an amendment of the OSPAR Beach Litter Monitoring Protocol in the future)					
FACTORS WHICH MIGHT HAVE INFLUENCED THE DATA					
GENERAL OBSERVATIONS					
IS THE DATA ENTERED IN TO THE DATABASE yes (y) / no (n)					
PROBLEMS ASSOCIATED WITH ORGANISING THE SURVEYS					

An example of a national report

National Annual Report OSPAR Beach Litter Monitoring						
YEAR	2016					
COUNTRY	Germany					
NUMBER OF SITES SURVEYED	4					
NATIONAL COORDINATOR: Institute, phone number, email	David M. Fleet LKN-SH (49) 04861 61643 david.fleet@lkn.landsh.de					
MONITORING ORGANISATION: Contact person, institute, phone, email	David M. Fleet LKN-SH (49) 04861 61643 david.fleet@lkn.landsh.de					
EXECUTION OF MONITORING yes (y) / no (n)						
Site code	DE01	DE02	DE03	DE05	DE	DE
Site name	Sylt	Scharhörn	Minsener Oog	Juist		
April	n	y	y	y		
June/July	y	y	y	y		
September/October	y	y	n	y		
December/January	y	n	y	y		
REASONS FOR MISSING SURVEYS	Lost survey form	winter survey not possible on uninhabited island	surveyor was sick			
INCIDENTAL CIRCUMSTANCES, WHICH COULD HAVE EFFECTED THE SURVEYS	sand enrichment carried out at the site in July					
OCCURRENCE OF NEW TYPES OF LITTER (which might require an amendment of the OSPAR Beach Litter Monitoring Protocol in the future)	the remains of wrecked drones					
FACTORS WHICH MIGHT HAVE INFLUENCED THE DATA	Easterly winds were more frequent in 2016 than in previous years	Easterly winds were more frequent in 2016 than in previous years	Easterly winds were more frequent in 2016 than in previous years	Easterly winds were more frequent in 2016 than in previous years		
GENERAL OBSERVATIONS				birds entangled in fishing nets were especially common		
IS THE DATA ENTERED IN TO THE DATABASE yes (y) / no (n)	y	y	y	y		
PROBLEMS ASSOCIATED WITH ORGANISING THE SURVEYS	lost survey form in April	none	the person responsible for the surveys changed in August	none		

Appendix 4: Checklist for an OSPAR beach litter assessment

STEP	ADDITIONAL INFORMATION
1. Data extraction	Extract the desired data from the OSPAR beach litter database
2. Data description	Make a data overview table (number of surveys per beach and country-subregion/region) Optional: make a geographical plot of the survey locations
3. Data quality control	Perform a technical quality control using litteR Perform an outlier analysis using litteR Correct the data where necessary
4. Descriptive statistics	Use a 3 year period Use the country-subregion/region level and the survey site level For Total Count, SUP, Fisheries items, sanitary and material groups For the top-80% types and ML RAP-types Results: median, MAD, mean, CV, Number of surveys (N), slope + p-value
5. TV / IMT assessment	Compare the median assessment at the country-subregion/region level, using the 40 most recent surveys, with the TV or IMT. If for other groups such as SUP an IMT is available, perform a related analysis using the 40 most recent surveys.
6. Linear trend analysis	Use default trend periods of the most recent 6 years (short term) and the most recent 10 years (medium term), respectively. Perform linear Theil-Sen and Mann-Kendall trend analysis at the country-subregion/region level for Total Count, SUP, Fisheries items, sanitary and material groups, and for the top-80% types and RAP-types. Optionally, these analyses can also be performed at the survey site level for supporting local information.
7. Asymptotic trend analysis (option)	Use the most recent decreasing trend period of at least 5 years which contains at least 30 surveys for sufficient power. It is recommended to apply this method to litter groups such as Total Count and SUP, and to litter types which usually occur (few zero counts). If the model is significant (p<0.05) it may be used for forecasting of litter counts. Please note the uncertainty (90% confidence intervals) of the forecasts, and keep in mind that these model forecasts are only indicative estimations. Use the separate R-script within RStudio to perform this analysis.