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Agenda Item 5: Parallel CORMON Sessions (Pollution and Marine Litter, and Biodiversity and Fisheries)

Updated Baseline Values and Proposal for Threshold Values for IMAP Common Indicator 22

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Note by the Secretariat

In 2016, the 19th Meeting of the Contracting Parties adopted the marine litter Baseline Values (Decision IG.22/10 – Annex II) .

The 2016 Baseline Values were established for IMAP Common Indicator 22 (i.e. beach macrolitter), Common Indicator 23 (i.e. seafloor macro-litter, and floating micro- and macro-litter), and Candidate Indicator 24 (i.e. affected (%) sea turtles and ingested (gr) marine litter). The 2016 Baseline Values were complimented with marine litter environmental reduction targets (Decision IG.22/10 – Annex III) including a reduction target of 20% for beach marine litter by 2024, and significant and measurable decrease of other marine litter types.

With the view to further updating the marine litter assessment criteria and related baseline values and taking into consideration the work undertaken in this field, MED POL in line with PoW 2018-2019 carried out a preliminary work to propose updated Baseline Values, and to subsequently recommend related Threshold Values for IMAP Ecological Objective 10 (Marine Litter). Those values were presented during the Regional Meeting on Pilot Projects and Assessment Tools for Marine Litter that was held in Athens, Greece, 19-20 November 2019 (UNEP/MED WG.476/3) for review and subsequent approval to be presented to the CorMon Meeting to be held in 2020.

Based on the comments received during the meeting and the relevant conclusions and recommendations, MED POL has prepared an advanced version of the document UNEP/MED WG.476/3 which is presented hereunder. The present document describes the conceptual and methodological approaches for defining baseline and threshold values, and for setting/updating them at regional and sub-regional levels; and is thus submitted to the present meeting for review and approval.

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List of Abbreviations / Acronyms

AD	Adriatic Sea
CI	Common Indicator
CM	Central Mediterranean
DD	Data Dictionaries
DS	Data Standards
EM	Eastern Mediterranean
EU	European Union
IMAP	Integrated Monitoring and Assessment Program of the Mediterranean Sea and Coast and Related Assessment Criteria
MED POL	Mediterranean Pollution Assessment and Control Programme
ML	Marine Litter
MSFD	Marine Strategy Framework Directive
TGML	Technical Group on Marine Litter
TV	Threshold Values
UN	United Nations
WM	Western Mediterranean

1. Objective

1. The objective of the present document is to elaborate/formulate/update marine litter assessment criteria at regional and sub-regional levels, taking into account recent developments on the national and regional levels concerning marine litter monitoring and assessment, and most importantly the outcomes of implementation of the Integrated Monitoring and Assessment Program of the Mediterranean Sea and Coast and Related Assessment Criteria (IMAP). This document includes a proposal for updated baseline values for IMAP Common Indicator 22 (CI22) (beach macro-litter), to replace those agreed in 2016, as well as to establish threshold values for IMAP CI22 underpinning comparable and compatibly assessment criteria at regional and sub-regional levels.

2. Conceptual Approach, Definition and Estimation of Marine Litter Baseline and Threshold Values

2.1 Baseline Values

2. After the adoption of the Regional Plan on Marine Litter Management in the Mediterranean in 2013 (Decision IG.21/7), UNEP/MAP adopted in 2016 the Marine Litter Baseline Values (Decision IG.22/10 – Annex II) against which the implementation of the Regional Plan programmes of measures could be assessed. These baseline value would enable the establishment of Marine Litter Environment Reduction Targets (Decision IG.22/10), as well as assessing whether Good Environmental Status (GES) is met. They also provide guidance on the way forward for the effective marine litter management in the region.

3. Definition of Baseline Values: According to definition provided by the UNEP/MAP Informal Online Group on Marine in 2015¹, “A baseline is a description of environmental state at a specific point against which subsequent values of state are compared. It may refer to a specified level of an impact or a pressure and act as a reference against which limit can be set or trends for the assessment of GES. Baselines can be derived from reference conditions, initial assessment values, the present state or a potential/predicted issue.”

4. The Joint Research Centre (JRC) of the European Commission (EC), introduced a similar definition: “A baseline value for marine litter refers to the information related to marine litter abundance that can be used as reference point in time in order to test the achievement of quantitative litter reduction goals (JRC, 2019).”

5. In the framework of the Ecosystem Approach (EcAp), UNEP/MAP adopted in 2016 a series of Baseline Values for marine litter based on a thorough analysis of existing marine litter data and information, taking into consideration the IMAP marine litter-related indicators 22, 23 and 24. This analysis was conducted by the UNEP/MAP Informal Online Group on Marine Litter in 2014-2015 and was considered and approved by the Meeting of the Integrated Monitoring Correspondence Group in 2015 (Athens, Greece, 30 March – 1 April 2015).

6. Baseline values will and can be used at different organizational levels for evaluating the compliance with reduction goals, and thus their setting is crucial in the entire process for reducing marine litter.

¹ UNEP/MED WG.411/Inf.10: First Report of the Informal Online Group on Marine Litter. Meeting of the Integrated Monitoring and Assessment Group (Athens, Greece, 30 March – 1 April 2015).

2.2 Threshold Values

7. Definition of Threshold Values: The New GES Decision (2017/848) of the European Commission (EC) provides a definition for the Threshold Values for marine litter: “*Threshold value means a value or range of values that allows for an assessment of the quality level achieved for a particular criterion, thereby contributing to the assessment of the extent to which good environmental status is being achieved.*”

8. For the determination of Threshold Values (TV), pristine or next to pristine areas/ environments should be considered. Due to the ubiquity of plastic in the marine environment worldwide, it is very difficult to define/find a pristine area, which for some experts does not even exist (Matiddi M. et Al., 2019).

9. The European Union (EU) Marine Strategy Framework Directive (MSFD) Technical Group on Marine Litter (TGML) proposes a threshold value, not based on evidence of ecological harm, which cannot be assessed in practice. Rather, it considers that there is some degree of freedom to establish a threshold value and an assessment method which shows a good level of ambition, is feasible (e.g. by selecting a low percentile value; percentile 1 and percentile 5), practical, and robust to apply (e.g. using the low percentile threshold value and the median assessment value). In that respect, a lower threshold value results in a lower residual risk of ecological harm (Willem van Loon et al. 2019).

10. For the determination of the baseline and threshold values in the Mediterranean, UNEP/MAP has embarked on the IMAP implementation, establishing and implementing national monitoring programmes for marine litter across the Mediterranean. Relevant data sets deriving from national monitoring programmes will be gradually available during the 2020-2021 biennium. These programmes are expected to support the process for achieving GES with quality controlled and quality assured data.

3. Data Sets and Data Management

11. Marine litter Baseline and Threshold Values are strongly linked and associated with data availability and data quality. Data should be acquired through harmonized monitoring methodologies in order to provide comparable data. This continues to be a challenge, though much progress has been made in the framework of IMAP, whereby data are streamlined through the development of relevant Data Standards (DS) and Data Dictionaries (DD) for the pollution and marine litter indicators, as well as the finalization of the IMAP (Pilot) Info System.

12. Quantitative data necessary to assess abundance, trends and distribution of marine litter are required in order to put in place and implement targeted and effective prevention and reduction measures for marine litter in the Mediterranean. While monitoring of marine litter has been ongoing for several years, it is not yet possible to get a comprehensive overview and thus to analyze the abundance of marine litter; distribution; categories; and trends in different spatial scales from local areas throughout the Mediterranean Sea. In that regard, there is still a need to further harmonize data collection methods, protocols and their analysis at all levels (e.g. categories, units, etc.).

13. The following information and data are required in order to establish marine litter baseline values:

- Ideally, data collected using the same, or a comparable, monitoring protocol;
- Data with sufficient spatial coverage;
- Data with sufficient temporal coverage;
- Data with sufficient “fit-for-purpose” quality;
- Agreement on a procedure for data clean-up; and
- Agreement on a baseline calculation method.

14. Moreover, it is crucial to agree on several variables related to data management and treatment (JRC, 2019), which include the following:

- The time period from which data is used for the calculation of baselines;
- The temporal aggregation of data;
- The spatial aggregation of data; and
- The mathematical procedure used for baseline calculation.

15. Guidance elements, to further strengthen data submission via corresponding data flows, as well as how these can be used for the determination of baseline and threshold values for marine litter are provided under Annex I to the present document.

4. Methodological Approach to determine Baseline and Threshold Values on Marine Litter at Regional and Sub-Regional Levels in the Mediterranean

16. For the definition of baseline and threshold values for each common IMAP marine litter indicator (i.e. beaches, sea bottom and water column), the data used correspond to data collected from Contracting Parties to the Barcelona Convention between 2016 and 2018 deriving from monitoring programmes, projects and initiatives, after taking into consideration the comparability of the submitted data sets. The selection of the 2016-2018 period is due to the availability of full years data in a significant number of countries compared to previous years in which data availability was rather limited.

17. Considering all available information from Contracting Parties, all steps have been undertaken in close collaboration with, scientific community and other sources from the literature. The discussion and set-up of baseline values has also taken into consideration the ongoing discussions on marine litter monitoring, top-litter item identification and establishment of threshold values (i.e. JRC, 2019).

4.1 IMAP Candidate Indicator 22: Beach Marine Litter

18. For IMAP Common Indicator 22 (beach marine litter), thirteen (13) Countries have contributed with data for the present exercise. The set of data resulting from different surveys and initiatives were based on protocols with several differences. Therefore, the datasets were homogenized towards ensuring comparability, before performing the statistical analysis. Under the present exercise, it is presumed that data provided by the respective Focal Points have undergone thorough quality checks and do not contain erroneous data.

19. All the surveys have been collected in a database in accordance with the templates proposed by UNEP/MAP in accordance with monitoring programs on marine litter in the Mediterranean (UNEP/MAP, 2017). The extreme values that have been found (outliers) were replaced by the average item value for that location and year. The number of surveys conducted in each country and the year when it was undertaken for beach marine litter (IMAP CI22) are presented in Table 1.

Table 1: Number of surveys by country (beach litter)

Sub-region	Country	Surveys	Years	Sources
WM	Algeria	111	2018	SWIM H2020 Support Mechanism
	France	88	2016, 2017, 2018	Focal Point France
	Italy	73	2016, 2017	EMODnet
	Malta	24	2017, 2018	Focal point Malta
	Morocco	16	2018	Focal point Morocco
	Spain	139	2016, 2017, 2018	Focal Point Spain

Sub-region	Country	Surveys	Years	Sources
CM	Greece	3	2018	Focal Point Greece
	Italy	20	2016, 2017	EMODnet
	Libya	12	2018	MED POL Adopt-a-Beach Project in Libya
AD	Italy	22	2016, 2017	EMODnet
	Slovenia	16	2017	Focal Point Slovenia
	Montenegro	4	2018	MED POL Adopt-a-Beach Project in Montenegro
	Albania	4	2018	MED POL Adopt-a-Beach Project in Albania
EM	Cyprus	31	2016, 2018	EMODnet
	Israel	8	2017, 2018	Focal Point Israel
	TOTAL	571		

4.2 IMAP Candidate Indicator 23: Marine Litter on the Seafloor and in the Water column

20. For IMAP Common Indicator 23; 26 surveys were taken into consideration during this calculation for floating macro-litter (Table 2) and 335 surveys for seafloor macro-litter, with datasets being shared from France, Italy and Slovenia (Table 3). Moreover, sufficient data were not made available to enable a similar exercise for the calculation of updated baseline value/s and proposal of threshold value/s for floating micro-litter in the Mediterranean.

Table 2: Number of surveys by country (water column macro-litter)

Country	Subregion	Surveys	Years	Sources
France	WM	21	2017, 2018	Focal Point France
Italy	WM	1	2016	Focal Point Italy
Italy	CM	1	2016	Focal Point Italy
Italy	AD	1	2016	Focal Point Italy
Slovenia	AD	2	2017	Focal Point Slovenia
TOTAL		26		

Table 3: Number of surveys by country (seafloor macro-litter)

Country	Subregion	Surveys	Years	Sources
France	WM	252	2017, 2018	Focal Point France
Italy	WM	24	2016	Focal Point Italy
Italy	CM	48	2016	Focal Point Italy
Slovenia	AD	11	2017	Focal Point Slovenia
TOTAL		335		

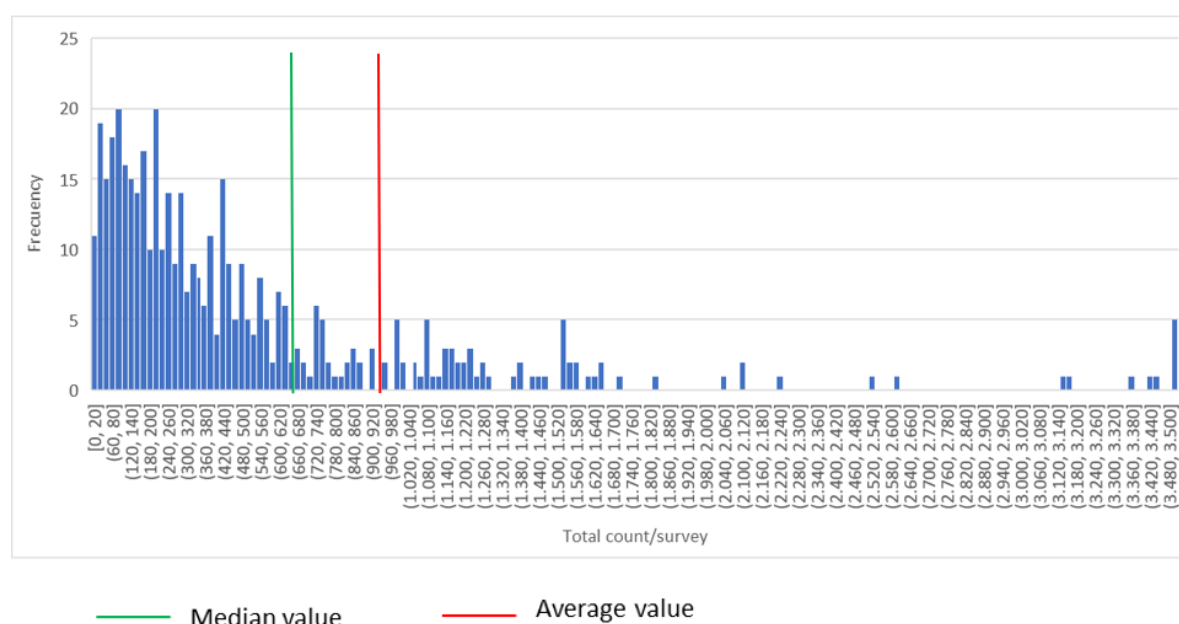
5. Determination of Baseline and Threshold Values

5.1 IMAP Candidate Indicator 22: Beach Marine Litter

21. For each country and subregion, the basic statistical values have been calculated together with average and median values corresponding to the total amounts of marine litter found in each survey by year and then by country as illustrated in Table 4. The beach litter data distribution is shown in Fig. 1.

Table 4: Descriptive statistics parameters by country

Country	Average	Standard Deviation	Median
Albania	779	395	681
Algeria	782	588	625
Cyprus	339	409	218
France	1157	1762	574
Greece	1502	1501	708
Israel	426	293	343
Italy	624	686	420
Libya	2226	1185	2002
Malta	207	237	136
Montenegro	1442	1371	972
Morocco	1744	3366	1327
Slovenia	6813	425	343
Spain	479	515	249
Total average	875	775	627

**Figure 1:** Beach litter data distribution

22. As can be seen, non-symmetrical distributions are predominant in the marine litter count (Table 4 and Figure 1). Further examination of data presented in both Figure 5 and Table 2 indicate that the standard deviation is very high, even greater than the average for some countries, and at the level of the Mediterranean, it gives a very wide range of average values (i.e. Spain: average 479 items/100 m; standard deviation 515 items/100 m, Table 4). The graphic representation under Figure 1 shows that the data distribution for IMAP CI22 (beach marine litter) is very irregular; and thus, **the median value is the most representative**. In fact, the median value is considered a better measure of the central location of a value than the average value in the case of a non-symmetric distribution (Baggelaar, Paul K. and Van der Meulen Eit C.J., 2014; Willem van Loon et al., 2019). This is due to the reason that, the median value is not sensitive to extreme values (Willem van Loon et al. 2019). For example, the median beach litter abundance values of France (Table 4) are much more comparable with other countries' median abundance values than the average values. Extreme values may sometimes occur, e.g. due to a storm event or an accidental loss of litter at sea. For all countries, the

use of the median value will make the assessment insensitive to these occasional extreme values (Willem van Loon et al. 2019).

23. In this exercise, the asymmetry of the data has been taken into account by executing an additional analysis of the descriptive statistical parameters not taking into account 100% of the collected information, calculating the corresponding Top-X marine litter items, corresponding to those items which reflect the 80th percentile of the total abundance. Descriptive statistics were applied for the most common beach marine litter types, which together represent 80% of the total abundance of all items in each survey within a certain period (80% higher types of litter) (Schulz, M. et al, 2019); thus, eliminating irrelevant information that could distort data analysis as shown in Table 5.

Table 5: Top-X descriptive statistics parameters by country

Country	Average	Standard Deviation	Median
Albania	597	291	529
Algeria	618	541	450
Cyprus	287	384	149
France	730	1334	340
Greece	1199	1373	460
Israel	122	137	89
Italy	498	600	307
Libya	1748	970	1542
Malta	151	228	61
Montenegro	1117	1433	574
Morocco	1373	1292	932
Slovenia	463	321	387
Spain	244	315	113
Total Average	702	709	455

24. As can be seen from Table 3, the best spatial coverage is considered to be the combination of “Country” and “Sub-region” (i.e. Country-SubRegion) (JRC, 2019). The Top-X calculation was conducted for each consecutive year for the period 2016-2018 (i.e. 2016, 2017 and 2018), and for each Country-SubRegion (e.g. IT-AD, IT-CM, IT-WM, etc).

25. The Mediterranean Top-X marine litter items list that contributed to the 80th percentile of the total recorded items for the period 2016-2018 for each Country-SubRegion are presented in Table 6 (Baggelaar, Paul K. and Van der Meulen Eit C.J., 2015). The Top-X and Top-10 marine litter lists per country can be found under Annex II to this document.

Table 6: Relative and cumulative frequency of marine litter in the Mediterranean (Top 10 and Top X)²

	UNEP Code	Item name	Relative Frequency. ³	Cumulative Frequency
Mediterranean Top-10 Marine Litter	G76	Plastic/polystyrene pieces 2.5 cm > < 50 cm	0,16504423	0,16504423
	G27	Cigarette butts and filters	0,12921627	0,2942605
	G21/G24	Plastic caps and lids (including rings from bottle caps/lids)	0,08743357	0,38169407
	G95	Cotton bud sticks	0,05249481	0,43418888
	G7/G8	Drink bottles	0,04973091	0,48391979
	G30/G31	Crisps packets/sweets wrappers/Lolly sticks	0,03998183	0,52390162
	G124	Other plastic/polystyrene items (identifiable) including fragments	0,03299665	0,55689827
	G50	String and cord (diameter less than 1 cm)	0,02712216	0,58402043
	G208a	Glass fragments >2.5cm	0,02302928	0,60704971
	G200	Bottles (including identifiable fragments)	0,02032637	0,62737608
Mediterranean Top-X (80%) Marine Litter Items	G73	Foam sponge items (i.e. matrices, sponge, etc.)	0,01956879	0,64694487
	G34/G35	Cutlery, plates and trays / Straws and stirrers	0,01892997	0,66587484
	G3	Shopping bags incl. pieces	0,0179509	0,68382574
	G10	Food containers incl. fast food containers	0,01342144	0,69724718
	G33	Cups and cup lids	0,01306833	0,71031551
	G204	Construction material (brick, cement, pipes)	0,01288535	0,72320086
	G152	Cigarette packets	0,01184849	0,73504935
	G67	Sheets, industrial packaging, plastic sheeting excluding agriculture and greenhouse sheeting	0,01109412	0,74614347
	G4	Small plastic bags, e.g. freezer bags incl. pieces	0,01085015	0,75699362
	G175	Cans (beverage)	0,01072495	0,76771857
	G54	Nets and pieces of net > 50 cm	0,01030122	0,77801979
	G158	Other paper items (including non-recognizable fragments)	0,01023381	0,7882536
	G145	Other textiles (including pieces of cloths, rags, etc.)	0,01013108	0,79838468

26. The Mediterranean Top-X list includes 23 items (from G76 to G145) and represents approximately 80% of the information collected, while the Top-10 list only represents 63% of the information (Table 4).

27. The parameter used in the analysis (median) was defined and a weighing factor was applied. The weighing factor has been calculated as the percentage of the length of the coast corresponding to each country within its subregion and within the entire Mediterranean coast (JRC, 2019).

28. Accordingly, it was found that the data provided by the Contracting Parties represent 58% of the total length of the Mediterranean coastline. The analysis must take into account a weighting factor based on the length of coast of each country in each subregion, and of each subregion in the total Mediterranean coast to increase spatial representativeness. This approach significantly increased the data representativeness as illustrated in Table 7.

² The Relative and cumulative frequency for the full UNEP/MAP list for beach marine litter items is presented under Annex III.

³ Objects with relative frequencies <0.01 are excluded from the Top X (Baggelaar, Paul K. and Van der Meulen Eit C.J., 2015).

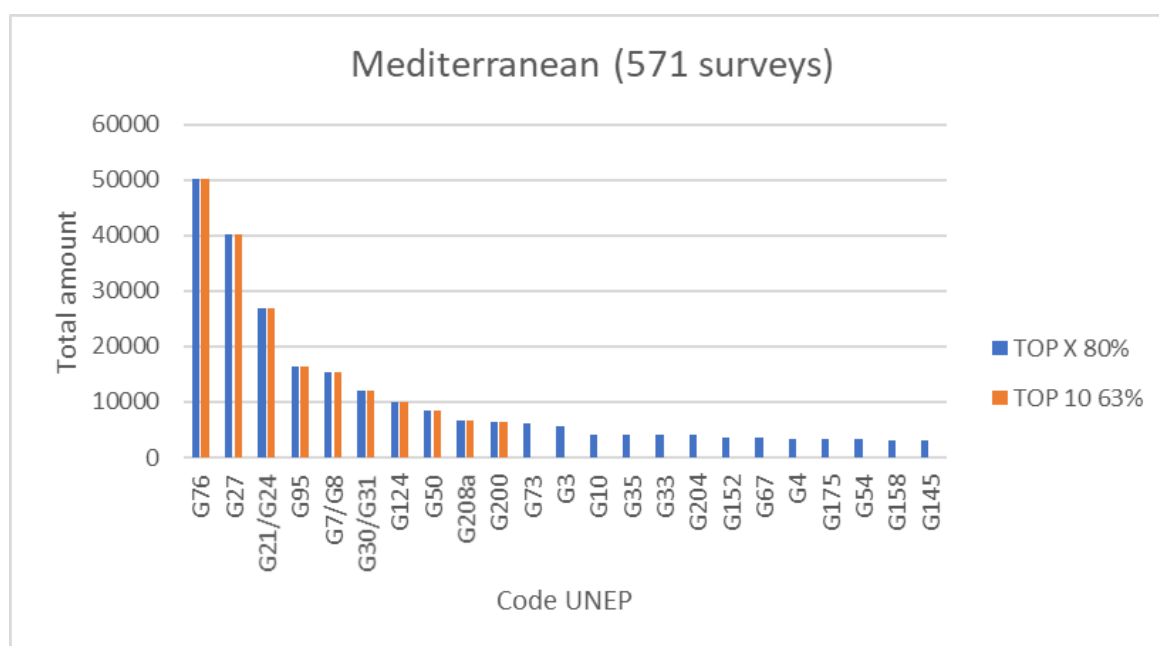


Figure 2: Top-X vs. TOP-10 marine litter items per Mediterranean (Table 6)

Table 7: Percentage of the Mediterranean coast by country (World Resources Institute, 2016)

Mediterranean sub region	% Coast length	Country Code	% subregion coast length
WM	29	DZ	14
		ES	27
		FR	15
		IT	20
		MA	5
		MT	2
		TN	17
CM	12	AL	2
		GR	42
		IT	15
		LY	43
AD	34	AL	4
		BA	0,4
		HR	44
		SI	0,6
		IT	50
		ME	1
EM	25	CY	7
		EG	11
		GR	30
		IL	2
		LB	3
		TR	47

29. This methodology was applied to 100% of the data obtained, as well as to 80% (Top-X list) of the data (Table 6) and thus determine the baseline that will be compared to the values previously proposed (UNEP/MAP, 2016). Further to the above analysis, the baseline values for beach marine litter were calculated as depicted in Table 8:

Table 8: Median by sub-region and Mediterranean

Mediterranean Sub regions	Median (item/100m)	
	100% data set	80% -Top X
WM	314	236
CM	808	638
AD	423	337
EM	205	104
Mediterranean Sea AVERAGE	438	329

30. Hence, for **IMAP Common Indicator 22 (beach marine litter)**, the proposed, updated **Baseline Value for the Mediterranean is 329 item/100 m** (Table 6). The beach litter baseline proposed by 19th Ordinary Meeting of the Contracting Parties to the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean and its Protocols (Athens, Greece, 9-12 February 2016) was 450-1400 items/100 m.

31. To calculate the threshold value, it was proceeded with the estimation of the 1st, 5th and 10th percentiles of the baseline results (Willem van Loon, David Fleet and Georg Hanke, 2019). The lowest values generated amongst the 1st, 5th and 10th percentiles are selected as threshold value against which to compare the state of beach marine litter in the Mediterranean, following the marine litter descriptor aim.

32. In order to give each sub-region an equal contribution, it is proposed to give each an equal weight while calculating the corresponding threshold value/s in accordance with the above percentiles as shown in Table 9. This method will prevent data of one or more countries with many surveys or with extremely high or low total abundance values from dominating the threshold value (Van Loon et al, 2019).

33. As can be inferred from Table 9 (Q10-80%), for **IMAP Common Indicator 22 (beach marine litter)**, the proposed **Threshold Value is 59⁴ items/100 m**.

⁴ The proposal of a Threshold Value is a strategic decision. The value 59 items/100m corresponds to the average value for the Mediterranean.

Table 9: Percentile calculation

Sub regions	Q01 (items/100m)		Q05 (items/100m)		Q10 (items/100m)	
	100% data set	80% -Top X	100% data set	80% -Top X	100% data set	80% -Top X
WM	7	6	33	22	52	31
CM	78	43	92	56	157	69
AD	87	62	111	81	163	112
EM	17	3	29	9	44	22
Total average	47	29	66	42	104	59

34. In order to reach achieve GES, a reduction percentage should be applied in order to give overall information about the reduction level that should be applied on the baseline value in order to comply with the proposed/calculated Threshold Value. The reduction percentage is calculated as per Van Loon et al. (2019) as follows:

$$\text{Reduction Percentage} = ((\text{median} - \text{TV})/\text{median}) \times 100$$

35. Accordingly, it is found that the reduction percentage between the proposed Baseline Values and the proposed Threshold Value for the Mediterranean is approximately 82% (Table 6).

5.2 IMAP Common Indicator 23: Floating Marine Litter

5.2.1 Floating Macro-litter

36. As can be inferred from Table 2, the limited surveys conducted in few countries pose significant difficulties for obtaining sufficient representativity for the data with common measurement units and observation methods (Ioakeimidis, C. et al, 2017). This situation does not allow for conducting a robust statistical analysis as it was the case for IMAP CI22 (beach marine litter). On the other hand, it is possible to establish an approach based on few studies regarding the evaluation of larger floating marine litter (Ioakeimidis, C. et al, 2017), updated with data provided by the countries for 2016-2018 period as illustrated in Table 10.

Table 10: Update 2016/18 floating litter data

Mediterranean Sub-region	Median (items/km ²)	Average (items/km ²)
WM	16	25
CM	5	5
AD	149	149
EM*	7	7
Mediterranean Sea - Average	44	47

*No data. Extrapolated from mean abundance in the other sub-regions (Ioakeimidis, C. et al, 2017).

37. In order to give each sub-region an equal contribution, it is proposed to give each sub-region an equal weight in the threshold value calculation. This can be done taking the average value of the sets of the median and average of all sub-regions. This method will prevent the data of any country, with numerous surveys or with extremely high or low total abundance values, from dominating the threshold value.

38. In this regard based on the same methodology the updated Baseline Value for IMAP Common Indicator 23 (floating macro- litter) could be 44 item/km² (Table 10). However, additional surveys and data will be needed in order to be able to calculate a more robust updated baseline value for floating macro-litter (IMAP CI23).

39. The floating litter baseline proposed by 19th Ordinary Meeting of the Contracting Parties to the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean and its Protocols (Athens, Greece, 9-12 February 2016) was 3-5 items/km².

40. Regarding the calculation of the threshold value, and due to the lack of sufficient data, a conservative approach has been used for the definition of threshold value (TV) for floating marine litter. The TV is defined as the lowest sub-regional value. Hence, for IMAP Common Indicator 23 (floating marine litter), the proposed Threshold Value is 5 items/ km². Accepting a Threshold Value of 5 item/km² entails an 89% reduction compared with the Mediterranean median.

41. It should be noted that the amount of existing information is still limited to establish definitive baselines and threshold values. These can be adjusted once national monitoring programs can provide additional data through IMAP.

5.2.2 Floating Micro-litter

42. At present time, more data is required in order to be able to calculate and propose updated baseline and threshold values for floating micro-litter in the Mediterranean.

5.3 IMAP Common Indicator 23: Sea floor Marine Litter

43. Analysis for IMAP Common Indicator 23 (seafloor) includes also macro-litter and micro-litter. Focus will be given on macro-litter due to relevant data availability.

5.3.1 Seafloor Macro-litter:

44. As can be inferred from Table 3, the data obtained for seafloor macro-litter have insufficient spatial coverage to undertake a statistical analysis. The information regarding the sea bottom litter is limited (Ioakeimidis, C. et al, 2017), and a better data spatial distribution is necessary to properly establish a baseline and a threshold value.

45. There are few studies regarding the evaluation of sea floor macro-litter items. Therefore, it is possible to make an approximation for Eastern Mediterranean based on previous compilations such as Ioakeimidis, C. et al, 2017 as illustrated in Table 11.

Table 11: Update 2016/18 sea floor marine litter

Mediterranean Sub-region	Median (items/km²)	Average (items/km²)
WM	57	66
CM	99	99
AD	54	61
EM*	416	1646
Mediterranean Sea Average	161	464

* Values extrapolated from mean abundance in all Mediterranean (Ioakeimidis, C. et al, 2017). This value has not been included in the calculation of Mediterranean Sea average.

46. For IMAP Common Indicator 23 (seafloor macro-litter) the proposed, updated Baseline Value could be 161 item/km², using median and average values as the best approach considering the actual amount of data.

47. The seafloor macro-litter baseline proposed by 19th Ordinary Meeting of the Contracting Parties to the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean and its Protocols (Athens, Greece, 9-12 February 2016) was 130-230 items/km².

48. The threshold value for IMAP Common Indicator 23 (seafloor marine litter) could be defined as the lowest sub-regional median. In that case the proposed Threshold Value could be 54 items/ km².

49. It should be noted that the amount of existing information is limited to establishing definitive baselines and threshold values. These can be adjusted once national monitoring programs can provide additional data. Cooperation with the MEDITS survey programme (International bottom trawl survey in the Mediterranean) could be another possible and viable option which has been also recommended by the Regional Meeting on Pilot Projects and Assessment Tools for Marine Litter (Athens, Greece, 19-20 November 2019).

5.3.2 Seafloor Micro-litter

50. At present time additional data is required to propose updated baseline and the threshold values for micro-litter found on the seafloor of the Mediterranean.

5.3.3 Entanglement and ingestion

51. Since the first scientific publications on the topic of entanglement and ingestion, over 500 marine species have been listed for ingesting marine litter and sea turtles were among the first species recorded. Given their propensity to ingest litter, their wide distribution, and the large range of habitats used during their life, sea turtles, in particular the loggerhead species (*Caretta caretta*), have been chosen as indicator species for the Mediterranean basin (Matiddi et al., 2019).

52. A specific protocol to collect data on marine litter ingested by sea turtles has been developed and tested by 10 partners in seven countries in the Mediterranean Sea and Atlantic Ocean within the European Project INDICIT (GA n°11.0661/2016/748064/SUB/ENV.C2). This protocol provides standardized methodologies for the analysis of marine litter ingested by sea turtles in order to support the new Commission Decision (EU)8, Criteria D10C3, and could be useful to support the IMAP common indicator CI24: “Amount of macro-litter ingested by marine animals”.

53. The proposed protocol to catalog the litter ingested by sea turtles will be useful in gathering data on the composition and abundance of litter and to assess its impact on the marine environment. Moreover, collecting this type of standardized data will help to define threshold values in the future (Matiddi et al., 2019).

54. At present additional data is required to propose updated baseline and the threshold values corresponding to this indicator.

6 Proposal for Updated Baseline Values and Establishment of Threshold Values for Marine Litter

55. Based on the data made available to UNEP/MAP and its MED POL programmes a proposal for updated Baseline Value and Threshold Value, at this stage can be made only for IMAP Common Indicator 22 (beach macro-litter) which is presented under Table 12.

Table 12: 2016 (Agreed) and 2019 (Proposed/Updated) Baseline Values; Proposed Threshold Values; and percentage reduction in baseline values to achieve GES.

IMAP Indicators	Categories of Marine Litter	BV-2016	Proposed BV-2020	Proposed TV-2020
CI22	Beach Marine Litter	450-1400 items/100m	329 items/100m	59 items/100m
CI23	Floating Litter	3-5 items/km ²	_ ²	_ ²
	Seafloor Litter	130-230 items/km ²	_ ²	_ ²
	Floating micro-litter	200,000 – 500,000 items/km ²	_ ²	_ ⁵
	Seafloor micro-litter	-	_ ²	_ ²
CI24	Macro and micro-litter ingested by marine animals	40-60% 1-3 gr	_ ²	_ ²
	Species negatively affected	-	_ ²	_ ²

⁵ Threshold values could not be proposed due to insufficient data.

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Annex I

**Guidance elements, to further strengthen data submission and corresponding data flow
for marine litter for the determination of baseline and threshold values**

Annex I: Guidance elements, to further strengthen data submission and corresponding data flow for marine litter, for the determination of baseline and threshold values

1 Field guides and litter identification tools are important elements which ensure sampling consistency throughout the region. Guides should be developed in local languages and address cultural aspects.

2 Under UNEP/MAP IMAP framework, the most comprehensive document for data collection is provided through the “Integrated Monitoring and Assessment Guidance” (UNEP, 2016) where the sampling and data collection methodologies are detailed for different environments under study. The aforementioned document addresses the following survey categories:

- A. Beach litter surveys.
- B. Benthic litter surveys, which include:
 - a. Observations made by divers, submersibles or camera tows.
 - b. Collection of litter via benthic trawls.
- C. Floating litter surveys, which include:
 - a. Observations made from ship or aerial based platforms.
 - b. Collection of litter via surface trawls.

3 During the 2019 Meetings of the MED POL Focal Points (Istanbul, Turkey, 29-31 May 2019), and 7th EcAp Coordination Group (Athens, Greece, 9 September 2019), Data Standards (DS) and Data Dictionaries (DD) for marine litter IMAP Common Indicators were agreed based on the work of CorMon on Marine Litter (Podgorica, Montenegro, 4-5 April 2019), including a detailed list of parameters and relevant elements that should be recorded during the monitoring surveys. Based on these parameters, single forms in excel format were recommended for reporting of marine litter data in different environments (e.g. beach, seafloor, floating, etc.). The forms are to include relevant information for subsequent data analysis (e.g. country, sub-region, location, survey date, etc.). The following steps are recommended for the submission and analysis of relevant data for marine litter items in a coherent and coordinated manner:

4 Step 1: Development of Datasets

5 Contracting Parties’ Focal Points should send a file in excel format annually with data corresponding to each survey category.

6 The file name should have the following labeling:

Sub-regionCode_CountryCode_Year (yyyy)

7 Step 2: Statistical analysis (beach macrolitter, seafloor macrolitter and floating macrolitter)

8 The collected marine litter data and relevant excel sheets are subsequently developed in R-Language⁶ with which data files are read and analyzed. Accordingly, a final report is generated.

9 For the exercise elaborated under the present document, the 2016-2018 datasets were consolidated in R-Language in “.csv” format under schematic representation shown in Figure 1:

⁶ Statistical programme

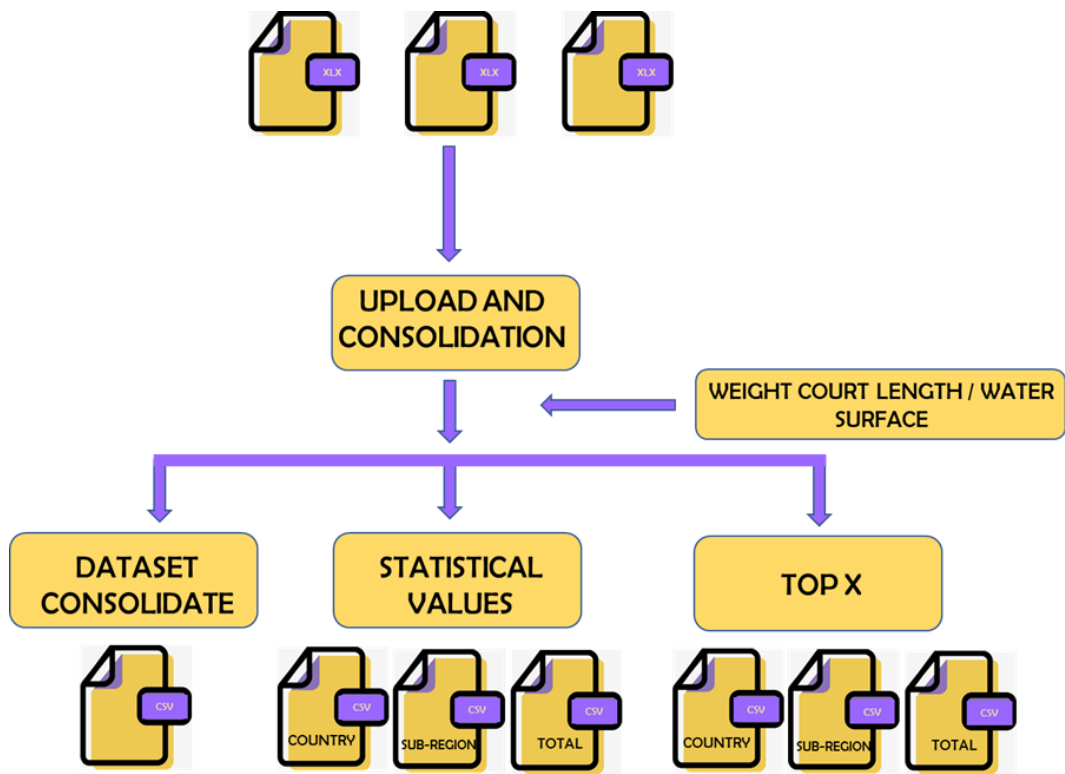


Figure 1: Schematic representation of the methodological approach for the collection of the available datasets and the statistical treatment of the data.

10 Step 3: Calculation of Baseline and Threshold Values

- A. Baseline Values: The schematic representation of the methodological approach for the calculation of baseline values based on median and mean approach are depicted in Figure 2.

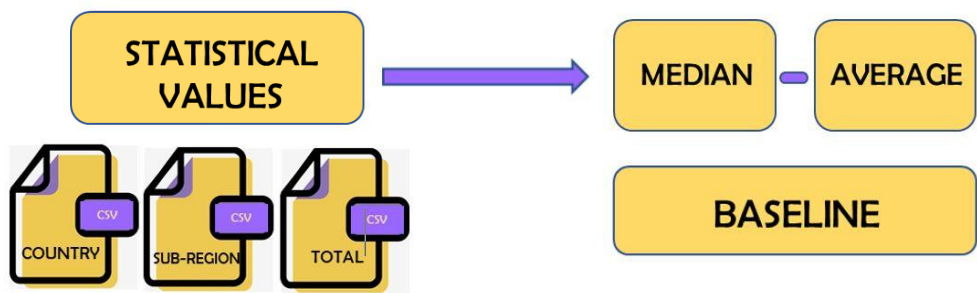


Figure 2: Schematic representation of the methodological approach for the calculation of baseline values.

- B. Threshold Values: There is some freedom to establish a threshold value and an assessment method which shows a good level of ambition and is considered feasible and realistic. Here we show two possibilities based on the lowest percentiles (01Q, 05Q and 10Q). The first one (Figure 3) is based on the three lowest percentiles average, while the second one (Figure 4) is based on lower subregional percentile (01Q).

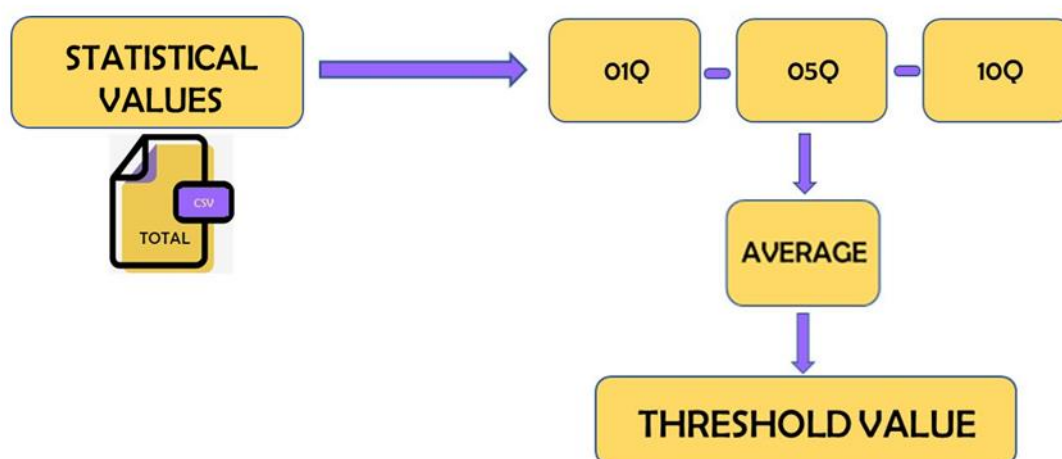


Figure 3: Schematic representation of the methodological approach for the calculation of threshold values.

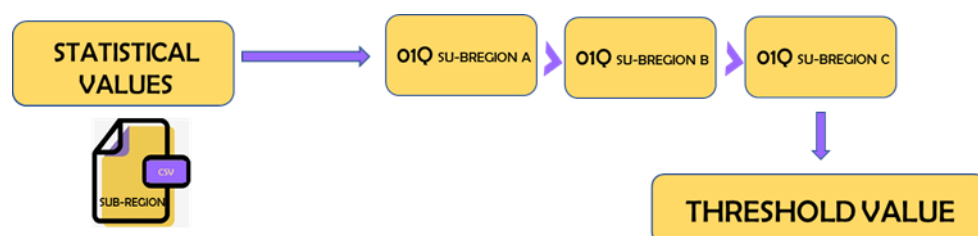
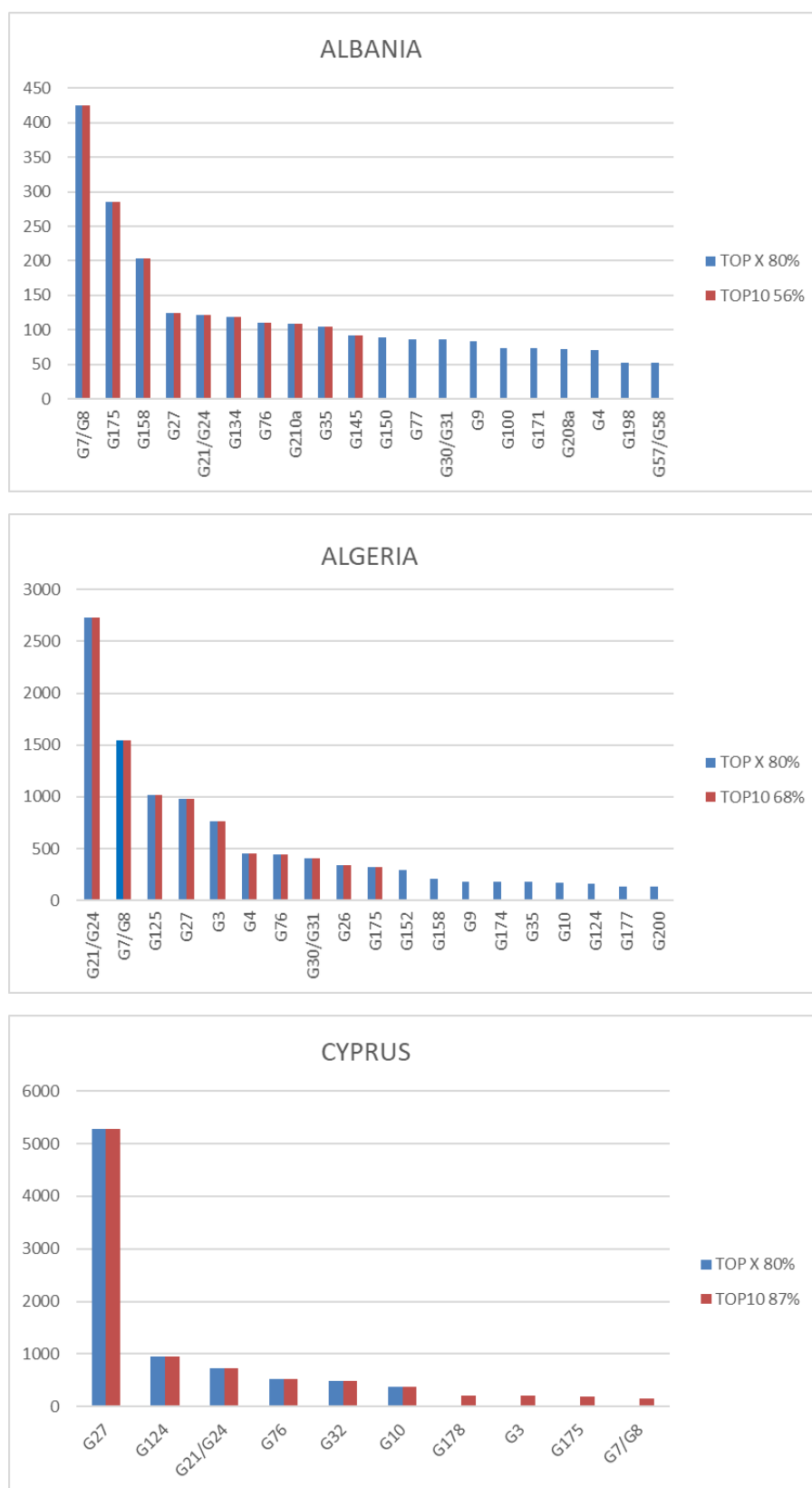


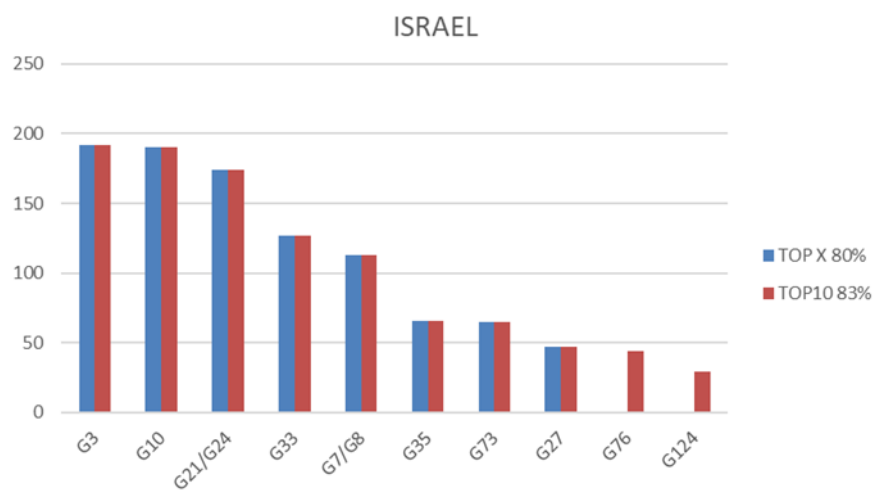
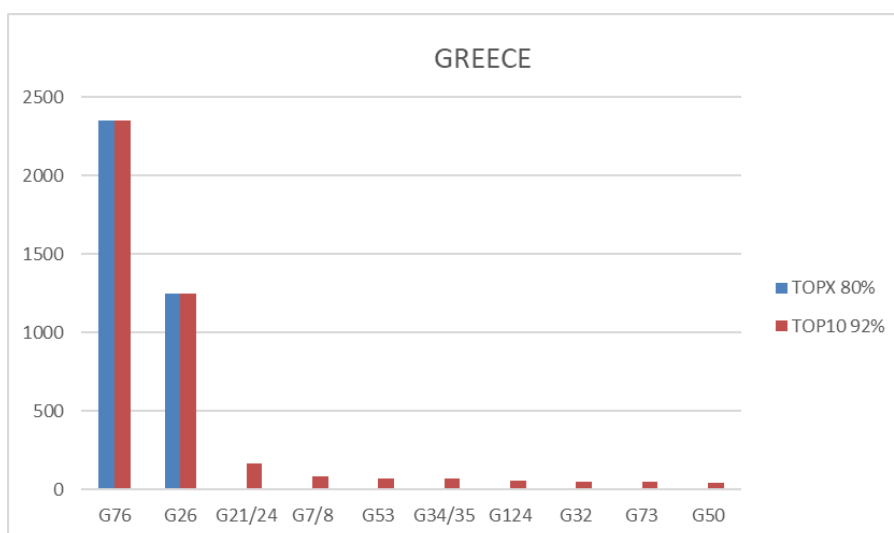
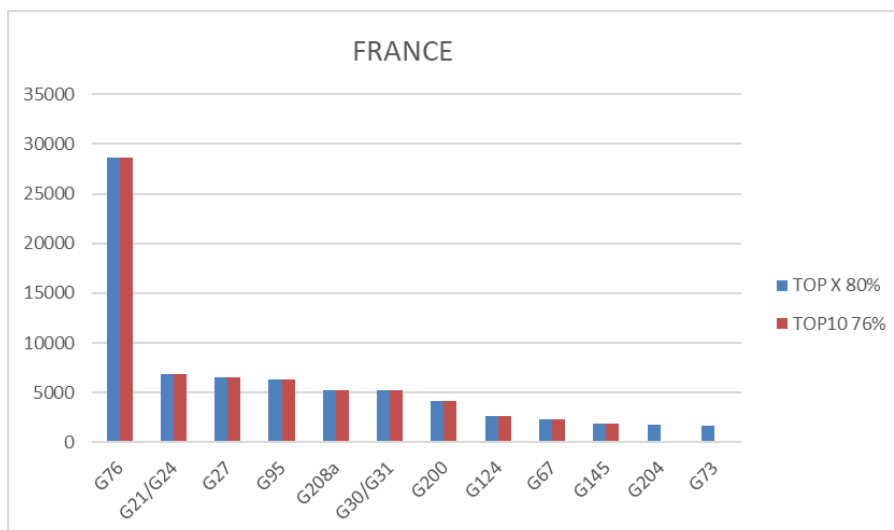
Figure 4: Schematic representation of the methodological approach for the calculation of threshold values based on lower percentile approximation (i.e. 01Q)

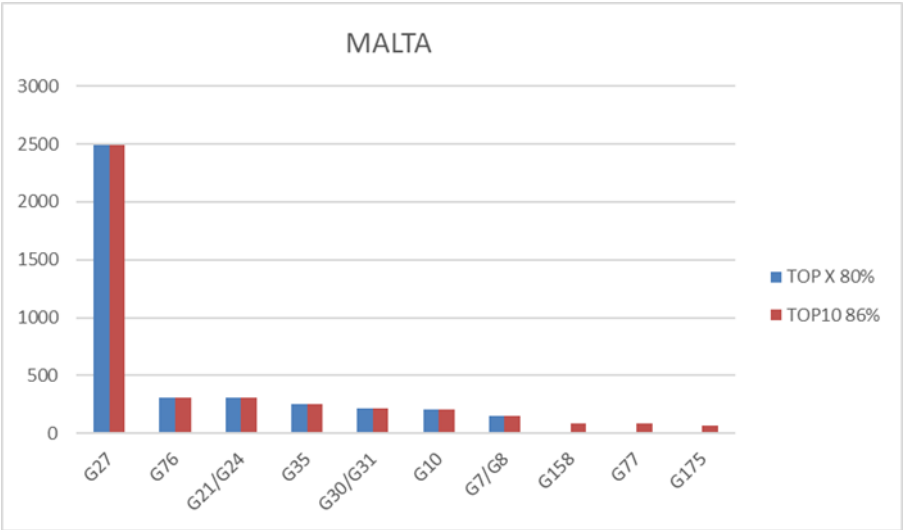
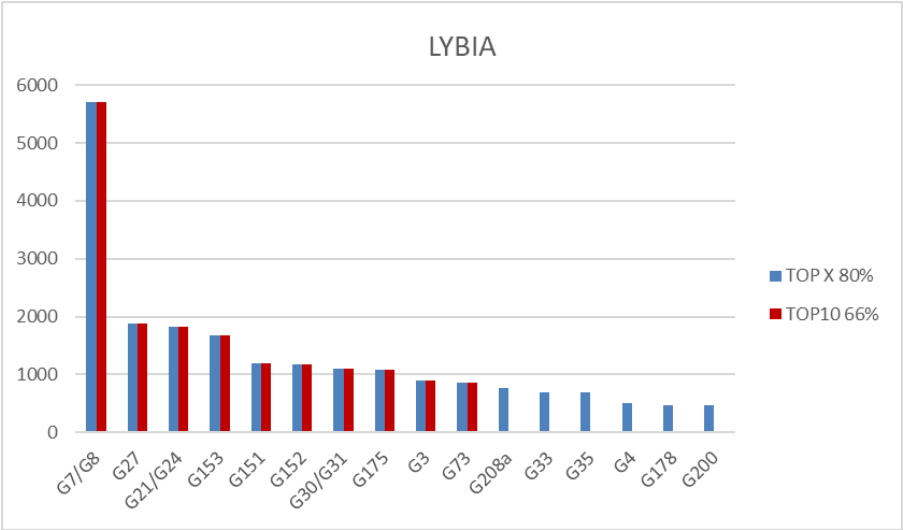
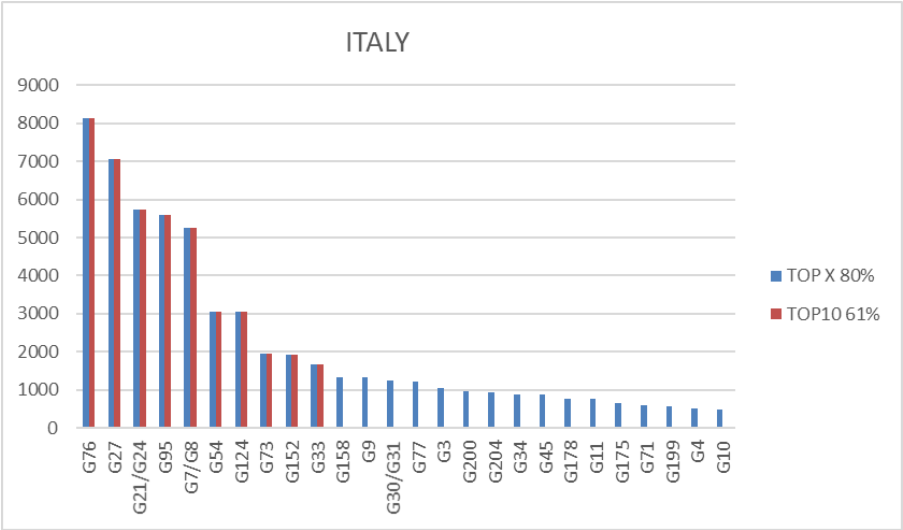
Annex II

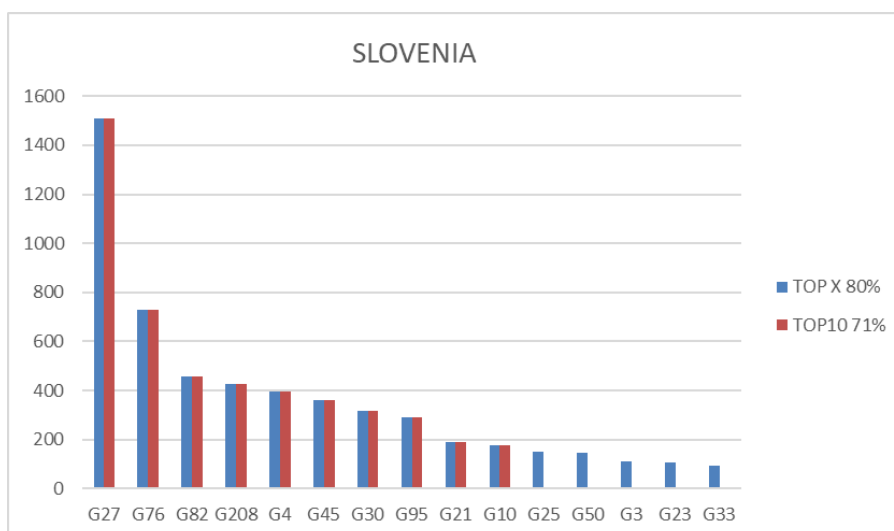
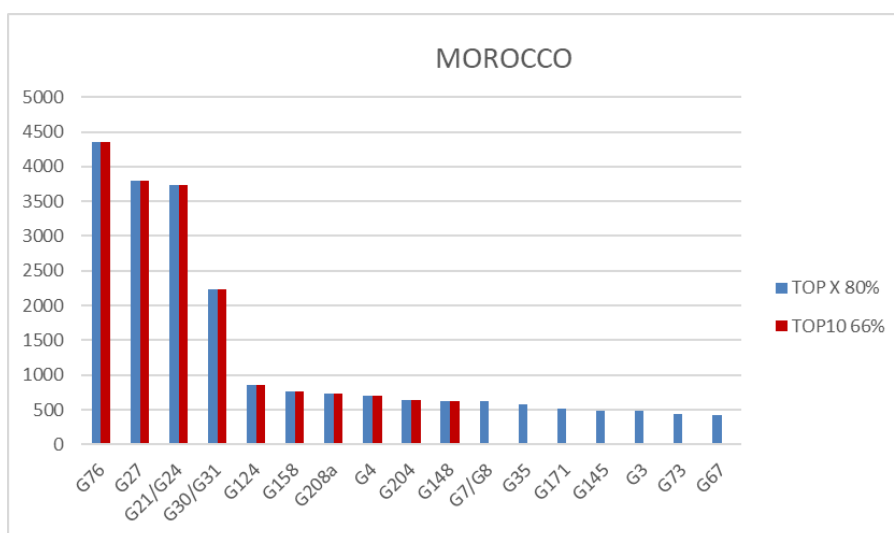
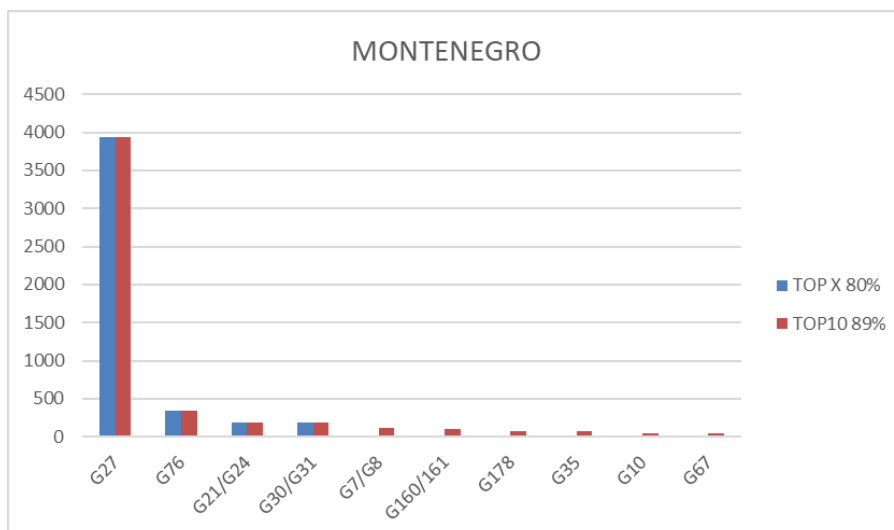
Top-X vs. TOP-10 marine litter items per different Country contributing with the data to the current exercise for updating the Baseline Values and proposing Threshold Values for Beach Marine Litter

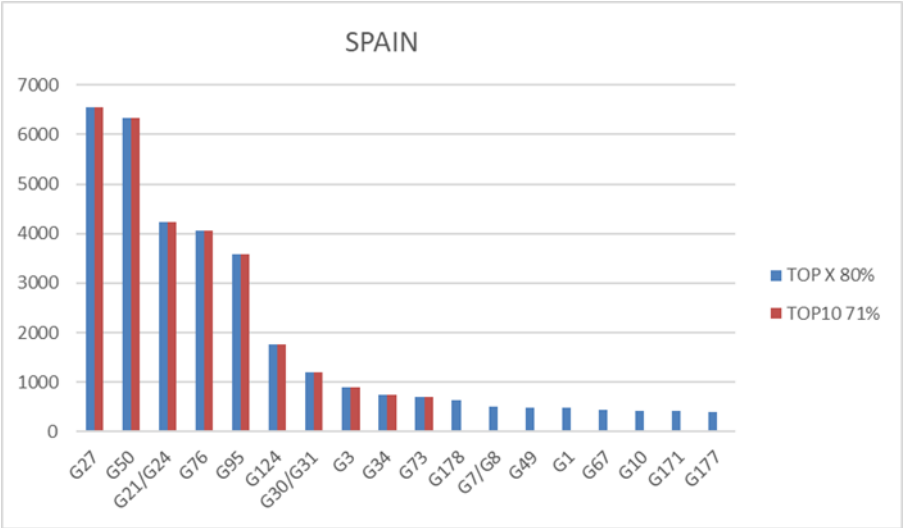
Annex II: Top-X vs. TOP-10 marine litter items per different Country contributing with the data to the current exercise for updating the Baseline Values and proposing Threshold Values for Beach Marine Litter.











Annex II
Relative and Cumulative Frequency for the Full UNEP/MAP List
for Beach Marine Litter Items

Annex III: Relative and Cumulative Frequency for the Full UNEP/MAP List for Beach Marine Litter Items

	UNEP Code	Item name	Relative Frequency.	Cumulative Frequency
Mediterranean Top-10 Marine Litter		G76	Plastic/polystyrene pieces 2.5 cm > < 50 cm	0,16504423
		G27	Cigarette butts and filters	0,12921627
Mediterranean Top-X (80%) Marine Litter Items		G21/G24	Plastic caps and lids (including rings from bottle caps/lids)	0,08743357
		G95	Cotton bud sticks	0,05249481
		G7/G8	Drink bottles	0,04973091
		G30/G31	Crisps packets/sweets wrappers/Lolly sticks	0,03998183
		G124	Other plastic/polystyrene items (identifiable) including fragments	0,03299665
		G50	String and cord (diameter less than 1 cm)	0,02712216
		G208a	Glass fragments >2.5cm	0,02302928
		G200	Bottles (including identifiable fragments)	0,02032637
		G73	Foam sponge items (i.e. matrices, sponge, etc.)	0,01956879
		G34/G35	Cutlery, plates and trays / Straws and stirrers	0,01892997
		G3	Shopping bags incl. pieces	0,0179509
		G10	Food containers incl. fast food containers	0,01342144
		G33	Cups and cup lids	0,01306833
		G204	Construction material (brick, cement, pipes)	0,01288535
		G152	Cigarette packets	0,01184849
		G67	Sheets, industrial packaging, plastic sheeting excluding agriculture and greenhouse sheeting	0,01109412
		G4	Small plastic bags, e.g. freezer bags incl. pieces	0,01085015
		G175	Cans (beverage)	0,01072495
		G54	Nets and pieces of net > 50 cm	0,01030122
		G158	Other paper items (including non-recognizable fragments)	0,01023381
		G145	Other textiles (including pieces of cloths, rags, etc.)	0,01013108
		G26	Cigarette lighters	0,00905249
		G178	Bottle caps, lids & pull tabs	0,00897545
		G13	Other bottles, drums and containers	0,00709112
		G77	Plastic/polystyrene pieces > 50 cm	0,00704297
		G153	Cups, food trays, food wrappers, drink containers	0,00675406
		G171	Other wood < 50 cm	0,00615056
		G151	Cartons/Tetrapack (non-milk)	0,00594190
		G9	Cleaner bottles & containers	0,00591301
		G32	Toys and party poppers	0,00583276
		G177	Foil wrappers, aluminium foil	0,00575571
		G125	Balloons, balloon ribbons, strings, plastic valves and balloon sticks	0,00531593
		G148	Cardboard (boxes & fragments)	0,00468675
		G49	Rope (diameter more than 1cm)	0,00462576
		G100	Medical/Pharmaceuticals containers/tubes	0,00446204
		G70	Shotgun cartridges	0,00432722
		G45	Mesh bags (e.g. mussels nets, net sacks, oyster nets including pieces and plastic stoppers from mussel lines	0,00406720
		G134	Other rubber pieces	0,00397411

	G198	Other metal pieces < 50 cm	0,00394201	0,90229573
	G53	Nets and pieces of net < 50 cm	0,00384249	0,90613822
	G11	Beach use related cosmetic bottles and containers, e.g. Sun blocks	0,00370125	0,90983947
	G137	Clothing / rags (clothing, hats, towels)	0,00368841	0,91352788
	G66	Strapping bands	0,00360816	0,91713604
	G71	Shoes and sandals made of artificial polymeric material	0,00327751	0,92041355
	G59	Fishing line/(tangled and not tangled)	0,00288267	0,92329622
	G96	Sanitary towels/panty liners/backing strips	0,00287946	0,92617568
	G5	The part that remains from rip-off plastic bags	0,00279279	0,92896847
	G28	Pens and pen lids	0,00269970	0,93166817
	G208b	Ceramic fragments >2.5cm	0,00263549	0,93430366
	G159	Corks	0,00261302	0,93691668
	G160/G161	Pallets / Processed timber	0,00262586	0,93954254
	G176	Cans (food)	0,00246536	0,9420079
	G199	Other metal pieces > 50 cm	0,00244931	0,94445721
	G1	4/6-pack yokes, six-pack rings	0,00237869	0,9468359
	G150	Cartons/Tetrapack Milk	0,00215719	0,94899309
	G191	Wire, wire mesh, barbed wire	0,00212830	0,95112139
	G210a	Other glass items	0,00209299	0,95321438
	G172	Other wood > 50 cm	0,00200310	0,95521748
	G98	Diapers/nappies	0,00199668	0,95721416
	G174	Aerosol/Spray cans industry	0,00193809	0,95915225
	G133	Condoms (incl. packaging)	0,00190359	0,96105584
	G128	Tyres and belts	0,00184581	0,96290165
	G144	Tampons and tampon applicators	0,00183297	0,96473462
	G68	Fibre glass items and fragments	0,00182655	0,96656117
	G60	Light sticks (tubes with fluid) incl. Packaging	0,00182334	0,96838451
	G165	Ice-cream sticks, chip forks, chopsticks, toothpicks	0,00178161	0,97016612
	G56	Tangled nets/cord	0,00173988	0,971906
	G147	Paper bags	0,00156974	0,97347574
	G99	Syringes/needles	0,00149912	0,97497486
	G138	Shoes and sandals (e.g. Leather, cloth)	0,00148307	0,97645793
	G57/G58	Fish boxes	0,00131293	0,97777086
	G202	Light bulbs	0,00121663	0,97898749
	G18	Crates and containers / baskets (excluding fish boxes)	0,00120700	0,98019449
	G211	Other medical items (swabs, bandaging, adhesive plaster etc.)	0,00119095	0,98138544
	G37	Mesh bags (e.g. vegetables, fruits and other products) excluding aquaculture mesh bags	0,00105933	0,98244477
	G154	Newspapers & magazines	0,00098229	0,98342706
	G141	Carpet & Furnishing	0,00089883	0,98432589
	G44	Octopus pots	0,00087957	0,98520546
	G19	Vehicle parts (made of artificial polymer or fiber glass)	0,00083142	0,98603688
	G91	Biomass holder from sewage treatment plants and aquaculture	0,00082179	0,98685867
	G14	Engine oil bottles & containers <50 cm	0,00079932	0,98765799
	G16	Jerry cans (square plastic containers with handle)	0,00079932	0,98845731

	G166	Paint brushes	0,00078327	0,98924058
	G62/G63	Buoys (e.g. marking fishing gear, shipping routes, mooring boats etc.)	0,00078327	0,99002385
	G65	Buckets	0,00069980	0,99072365
		Other sanitary waste	0,00066128	0,99138493
	G29	Combs/hair brushes/sunglasses	0,00063239	0,99201732
	G17	Injection gun containers (including nozzles)	0,00061955	0,99263687
	G186	Industrial scrap	0,00060671	0,99324358
	G97	Toilet fresheners	0,00058103	0,99382461
	G101	Dog faeces bag	0,00049115	0,99431576
	G162	Crates and containers / baskets (not fish boxes)	0,00045583	0,99477159
	G43	Tags (fishing and industry)	0,00038521	0,9951568
	G15	Engine oil bottles & containers >50 cm	0,00037558	0,99553238
	G40	Gloves (washing up)	0,00036916	0,99590154
	G23	Plastic caps and lids (including rings from bottle caps/lids)	0,00033706	0,9962386
	G187	Drums and barrels (e.g. oil, chemicals)	0,00033385	0,99657245
	G36	Heavy duty sacks (e.g. fertilizer or animal feed sacks)	0,00031780	0,99689025
	G182	Fishing related (weights, sinkers, lures, hooks)	0,00030175	0,997192
	G47	Plastic sheeting from mussel culture (Tahitians)	0,00028891	0,99748091
	G41	Gloves (industrial/professional rubber gloves)	0,00027286	0,99775377
	G210b	Other ceramic/pottery items	0,00027286	0,99802663
	G69	Hard hats/Helmets	0,00026965	0,99829628
	G140	Sacking (hessian)	0,00022792	0,99852420
	G164	Fish boxes	0,00019582	0,99872002
	G42	Crab/lobster pots and tops	0,00019582	0,99891584
	G127	Rubber boots	0,00018619	0,99910203
	G180	Appliances (refrigerators, washers, etc.)	0,00018298	0,99928501
	G190	Paint tins	0,00015730	0,99944231
	G46	Oyster trays (round from oyster cultures)	0,00011235	0,99967985
	G213	Paraffin/Wax	0,00010112	0,99978097
	G179	Disposable BBQ's	9,63E-05	0,99987727
	G207	Octopus pots	4,82E-05	0,99992547
	G184	Lobster/crab pots	3,85E-05	0,99996397
	G163	Crab/lobster pots	3,60E-05	1