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TouMaLi PREVENTION OF MARINE LITTER

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Leibniz Institute for Baltic Sea Research Warnemünde IOW

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International Conference

Marine litter monitoring

Results of TouMaLi – campaigns

Session 4: Contribution of "TouMaLi" for sound waste management systems and sustainable tourism 11.11.2022

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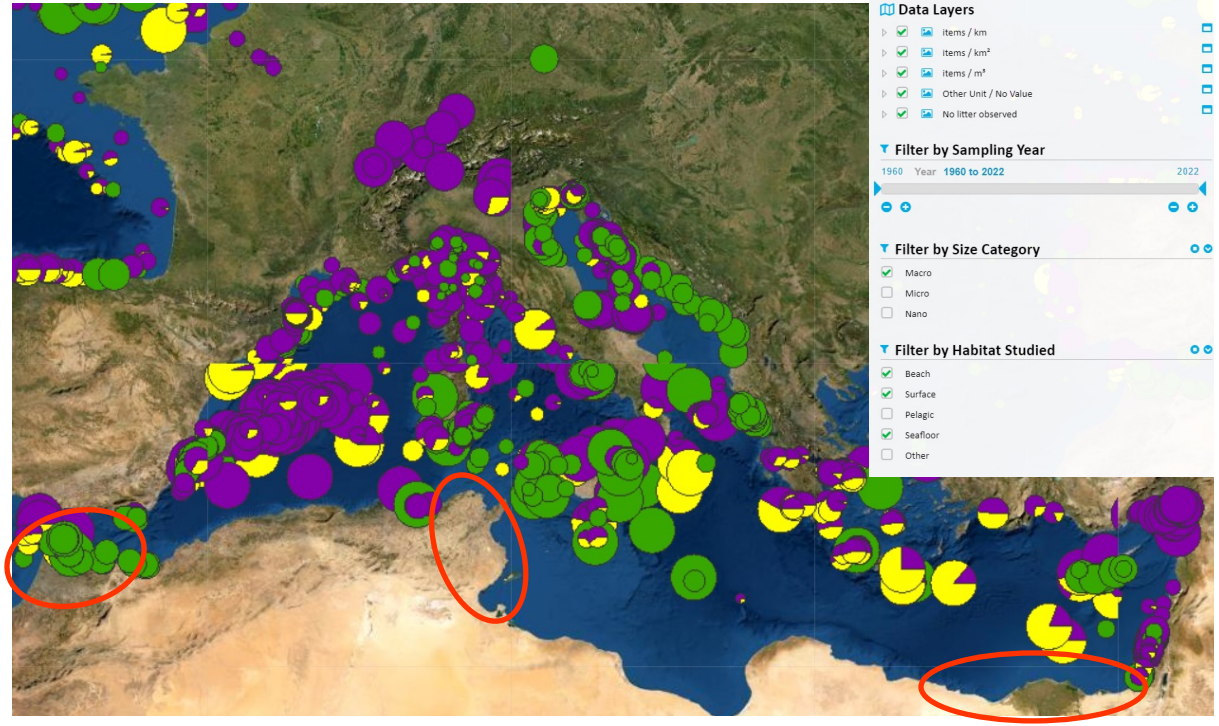
Background

- Marine litter is any persistent, manufactured or processed solid material discarded, disposed of or abandoned in the marine and coastal environment.[1]
- Marine litter has negative ecological[2], economic[3] and social impacts.[4]
- The Mediterranean Sea is one of the areas most affected by marine litter in the world.[5]
- Most studies/monitoring in the Mediterranean Area is done in Europe.[6]
- Lack of Marine litter data for North African beaches.



[1]UNEP (2005) [2]Rochaman et al., (2016) [3]Mouat et al., (2010) [4]Campbell et al., (2019) [5]UNEP (2015) [6]Map by: litterbase.awi.de

Background

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Impacts of litter

When tourists are choosing a beach:

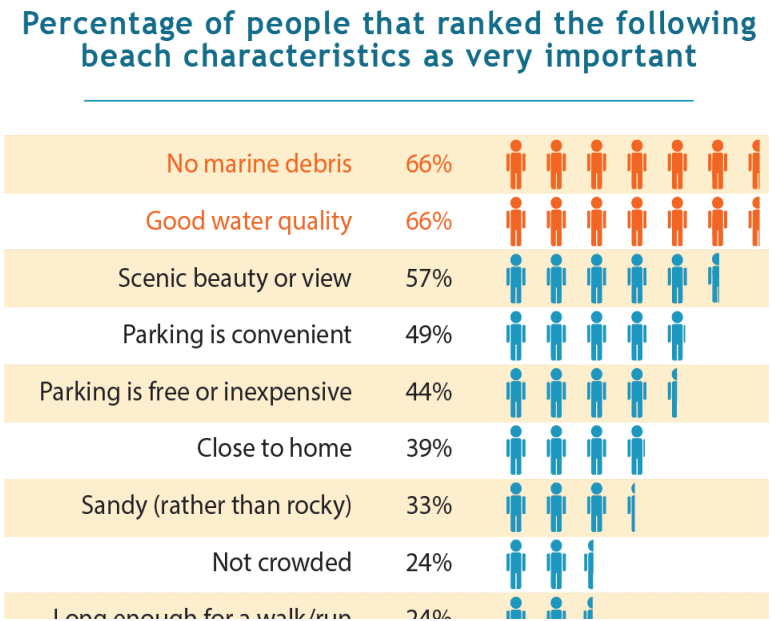
- Cleanliness is the most important factor for foreign tourists.[1]
- ~50 % of the local people would travel seven times further to visit a clean beach.[1]

Beach litter creates a feeling of:

- unhealthy conditions;
- is perceived as a risks to health and safety.

Average cleaning costs per kilometre of beach (in Europe) per year are:

- around € 7,000;
- and can increase to € 82,000.00 at regularly cleaned beaches, in tourist areas.[3]



[1]Ballance, A. et al., 2000 [2]Figure adopted by: www.marinedebris.noaa.gov [3]Mouat, J. et al. 2010

Solutions

Circular economy

New technical concepts

New trash bins

Recycling

Sustainable tourism

Extended responsibility

New legislations

How do we know if these measures make a difference?

Bans of products

Waste separation

Waste management

EPR

Guidelines

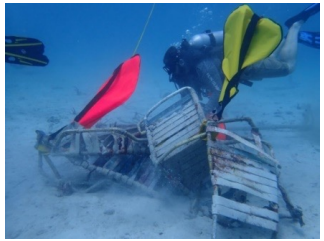
Marine litter monitoring

Sustainable alternatives for single use plastics

Programs on marine litter

Marine litter monitoring approaches

Marine compartement



Seabed

Watercolumn and Watersurface

Coast / Beach

Difficulty of surveys

Size of litter

Micro < 5 mm

Meso 5-25 mm

Macro > 25 mm

- Beach litter monitoring is most suitable for large-scale data collection.[1,2,3] It can be conducted by volunteers (Citizen science) on a broad scale over a long period at reasonable costs[4] and delivers comparable data of different regions.

[1]GESAMP (2019) [2]González-Fernández and Hanke (2020) [3]Ryan et al. (2020) [4]Haseler et al. (2020)

Objectives – Marine litter monitoring

Goal is the establishment of a long-term beach litter monitoring on the Mediterranean coast of Morocco, Tunisia, and Egypt

- Stratified randomised sampling strategy
  - Urban/touristic beaches, river mouth beaches and rural beaches

To gather quantitative marine litter data;

- Composition, amount, sources, trends and spatial distribution of macro-, (< 25 mm) and meso-litter (5-25 mm)

- Based on this data:
  - it is possible to calculate threshold or baseline values for the pollution;
  - to select mitigation measures to reduce inputs;
    - and to evaluate the effectiveness of mitigation measures.[1]

[1]GESAMP (2019)

Beach litter monitoring methods

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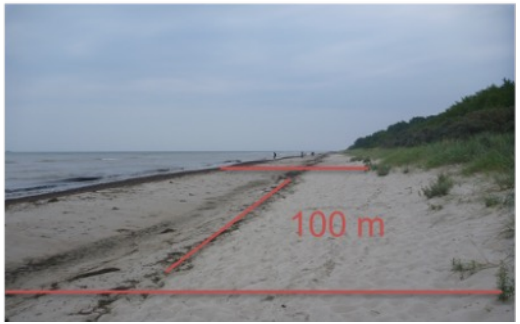
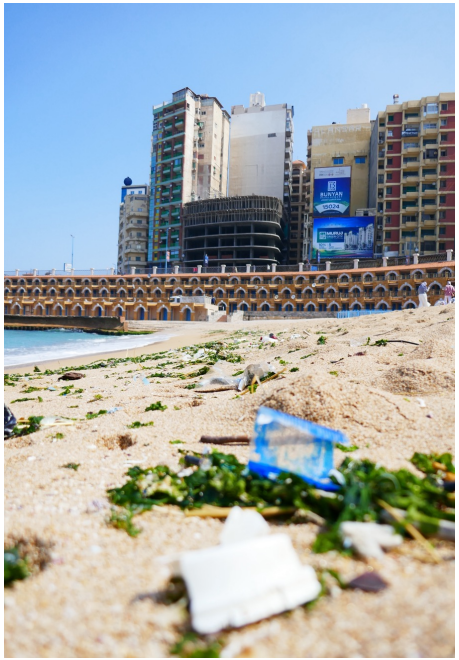
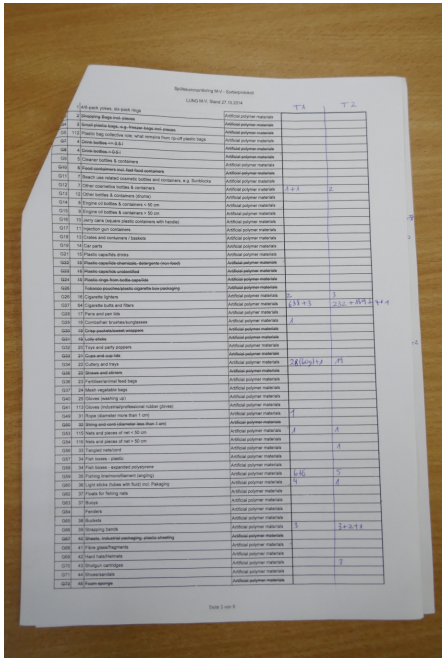
100m UNEP / OSPAR method – Macro-litter (> 25 mm)



Sand Rake method – Meso-litter (5 - 25 mm)

Beach litter monitoring methods





First beach litter sampling campaigns

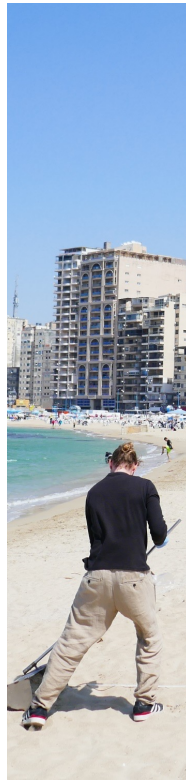
Activities in Egypt March 22

- **9 beaches monitored:**
  - 8x UNEP / OSPAR method (20-50 m, depending on pollution)
  - 10x Sand rake method

Activities in Tunisia Nov 21 & June 22

- **9 beaches monitored:**
  - 15x UNEP / OSPAR method (20-100 m, depending on pollution)
  - 19x Sand rake method

Activities in Morocco planned for the beginning of 2023



First results

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- 100 m macro-litter method campaign

First study results **Egypt**	100m (extrapolated)
Alexandria IV (20 m)	24000
Marsa Matruh - Leedo (30m)	15100
Alexandria II (30 m)	7700
Alexandria I (50 m)	7100
Marsa Matruh - El gharam (50m)	6500
Alexandria III (50 m)	3300
Alexandria - Maamoura 2 (40 m)	2300
Alexandria - Montazah Club (35 m)	2000

First study results **Tunisia**	100m (extrapolated)
Monastir (20 m)	12325
Hammam Sousse (50 m)	8356
Alhambra (50 m)	6680
Tabarca (50 m)	4814
Bizerte (50 m)	4020
Cap Angela (50 m)	3330
Alhambra 2 (50 m)	1226
Hammamet (100 m)	1100

First results

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Egypt

Top ten litter items in total numbers and %

1	Cigarette butts and filters	Plastic	3964	17.0%	17.0%
2	Plastic pieces 2.5 cm > < 50 cm	Plastic	2815	12.1%	29.1%
3	Small plastic bags, e.g. freezer bags incl. pieces	Plastic	1935	8.3%	37.4%
4	Crisp packets/sweet wrappers	Plastic	1634	7.0%	44.5%
5	Sheets, Industrial packaging, plastic sheeting	Plastic	1389	6.0%	50.4%
6	Plastic caps/lids drinks	Plastic	970	4.2%	54.6%
7	Straws and stirrers	Plastic	836	3.6%	58.2%
8	Food containers incl. fast food containers	Plastic	813	3.5%	61.7%
9	String and cord (diameter less than 1 cm)	Plastic	757	3.3%	64.9%
10	Food waste (galley waste)	Others	729	3.1%	68.1%

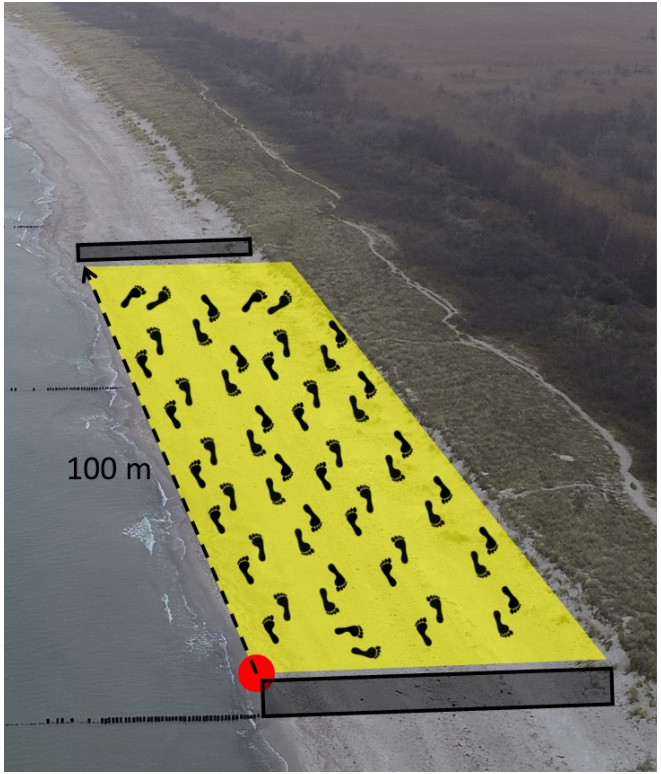
Tunisia

Top ten litter items in total numbers and %

1	Plastic pieces 2.5 cm > < 50 cm	Plastic	2546	14.1%	14.1%
2	Plastic caps/lids drinks	Plastic	2100	11.7%	25.8%
3	Crisp packets/sweet wrappers	Plastic	1674	9.3%	35.1%
4	Shopping Bags incl. pieces	Plastic	1311	7.3%	42.4%
5	Small plastic bags, e.g. freezer bags incl. pieces	Plastic	1022	5.7%	48.1%
6	Slack/Coal	Others	657	3.7%	51.7%
7	Polystyrene pieces 2.5 cm > < 50 cm	Plastic	629	3.5%	55.2%
8	Cotton bud sticks	Plastic	616	3.4%	58.6%
9	String and cord (diameter less than 1 cm)	Plastic	505	2.8%	61.5%
10	Paper fragments	Paper	497	2.8%	64.2%

It is not possible to quantify smaller pieces of litter such as cigarettes, meso-plastic, some bottle caps, etc. with naked eye monitoring methods.

Beach litter monitoring methods



Combined monitoring approach to cover both, macro-, and meso-litter.

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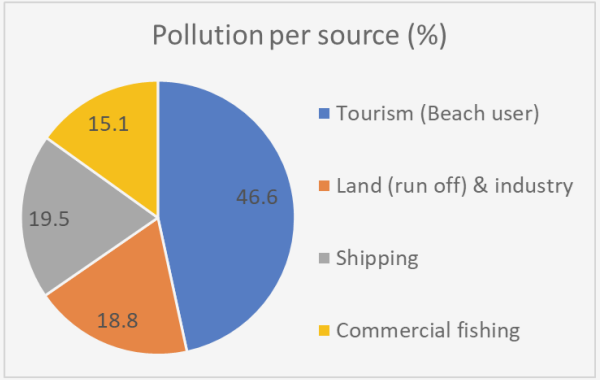
First results

- Sand Rake method campaign

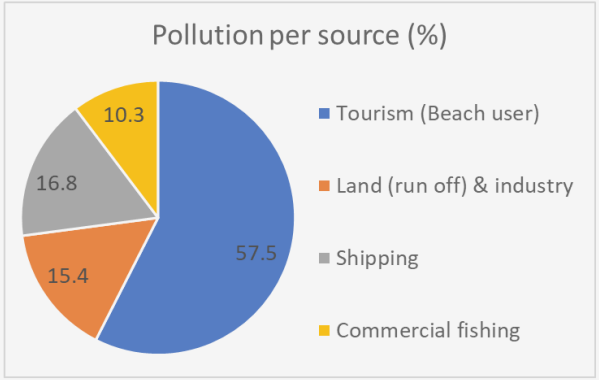
Egypt

Top ten litter items in total numbers and %				
1 Sheets, Industrial packaging, plastic sheeting	Plastic	1447	23.9%	23.9%
2 Plastic pieces 0.5 - 2.5 cm	Plastic	1094	18.1%	42.0%
3 Cigarette butts and filters	Plastic	776	12.8%	54.8%
4 String and cord (diameter less than 1 cm)	Plastic	433	7.2%	61.9%
5 Polystyrene pieces 0.5 - 2.5 cm	Plastic	296	4.9%	66.8%
6 Plastic pieces 2.5 cm > < 50 cm	Plastic	202	3.3%	70.2%
7 Crisp packets/sweet wrappers	Plastic	195	3.2%	73.4%
8 Plastic caps/lids drinks	Plastic	150	2.5%	75.9%
9 Slack/Coal	Others	119	2.0%	77.8%
10 Small plastic bags, e.g. freezer bags incl. pieces	Plastic	96	1.6%	79.4%



Tunisia

Top ten litter items in total numbers and %				
1 Plastic pieces 0.5 - 2.5 cm	Plastic	618	26.7%	26.7%
2 Cigarette butts and filters	Plastic	398	17.2%	43.8%
3 Plastic caps/lids drinks	Plastic	301	13.0%	56.8%
4 Sheets, Industrial packaging, plastic sheeting	Plastic	116	5.0%	61.8%
5 Polystyrene pieces 0.5 - 2.5 cm	Plastic	116	5.0%	66.9%
6 Plastic pieces 2.5 cm > < 50 cm	Plastic	107	4.6%	71.5%
7 Plastic rings from bottle caps/lids	Plastic	97	4.2%	75.7%
8 String and cord (diameter less than 1 cm)	Plastic	93	4.0%	79.7%
9 Slack/Coal	Others	66	2.8%	82.5%
10 Foam sponge / foamed plastic items and fragmen	Plastic	41	1.8%	84.3%



Long-term beach-litter monitoring

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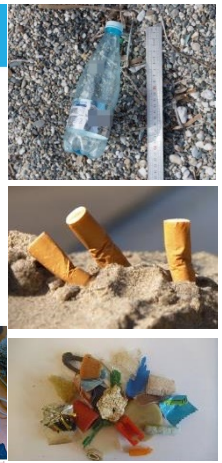
Analysis & classification of litter items

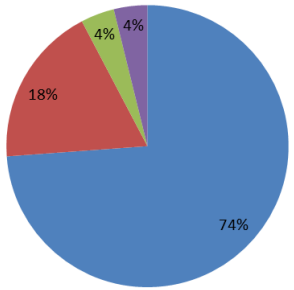
- Litter found is categorized in a harmonized ‘list of litter’
- 8 categories with ~ 200 litter items

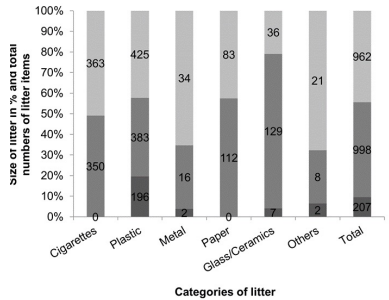
Table 1. Material categories used in the Joint List with their letter code.

Type Code	Material Category
ch_	chemicals
ct_	clothes/textile
fw_	food waste (organic)
gc_	glass/ceramics
pl_	artificial polymers/plastic
pp_	paper/cardboard
ru_	rubber
wo_	processed/worked wood



Pollution report & maps
Identification of pathways & sources





Concepts for litter mitigation & reduction

Assessment / Evaluation of measure efficiencies

Conclusions

- Marine litter monitoring is an important part of the protection of our marine environment and it is crucial to gather quantitative marine litter data in the long term.
- Beach litter monitoring is most suitable for large-scale data collection.
- The 100 m and the Sand Rake methods can be conducted by volunteers (Citizen science) on a broad scale over a long period at reasonable costs and deliver comparable data of different regions.
- It is unlikely that small litter, such as cigarette butts, can all be picked up with the 100 m method. For meso-litter, the Sand Rake method is more suitable.
- Litter analysis needs to be done in a clear, unambiguous, and harmonized way; to ensure consistency, compatibility, and comparability of monitoring data, for all litter.
- Joint List of Litter Categories and Photo-guides are very helpful for litter analysis.
- Only with the implementation of a long-term monitoring of marine litter it is possible to evaluate if mitigation measures are actually helpful.
  - Start with pilot areas

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Thank you!

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Litter Monitoring Methodology

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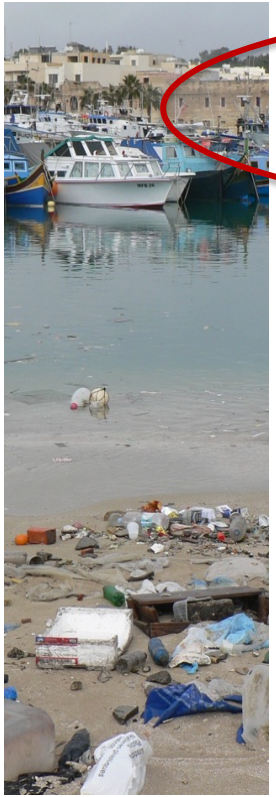
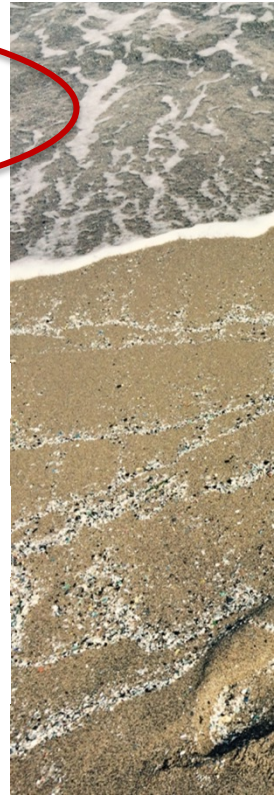


Beach litter monitoring
- 100m UNEP/OSPAR method (>25 mm)
- Sand Rake method (>5-25mm)
- Beach wrack (>25 mm)

Underwater monitoring
- Sport boat harbours
- Litter (>100 mm)



Pollution status assessment

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Definition of target values

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Pollution report & maps

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Analysis & classification of litter items

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Identification of pathways & sources

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Concepts for litter mitigation & reduction ↔ **Assessment of plastic substitutes**

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Assessment of measure efficiencies ↔ **Environmental labels**

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Ecosystem Service Assessment

↓

Awareness rising

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Exemplary implementation of measures
&
Long-term marine litter monitoring