Activity: WES N-E-MO-2

Training on marine litter monitoring

Marine litter in the Mediterranean: an overview of research and policy advances related to monitoring

Thomais Vlachogianni | PhD. Environmental Chemist & Ecotoxicologist
Senior MIO-ECSDE Policy & Programme Officer
WES Marine Litter Expert
Member of the MSFD Technical Group on Marine Litter
Member of the UNEP/MAP CORMON Group
WP Leader of Plastic Busters MPAs & Plastic Busters CAP
FROM THE ANTHROPOCENE TO THE PLASTOCENE...
The world produces more than 400 million tons of plastics every year.

GLOBAL PLASTIC PRODUCTION & FUTURE TRENDS

Global plastic production and accumulation: past, present, and future trends

- Inincinerated: 1,000 million tons
- Discarded: 5,300 million tons
- Still in use: 2,900 million tons
- Recycled: 700 million tons

Yearly production and accumulation of resin and fibers:

- 1950: 10 million tons
- 1960: 50 million tons
- 1970: 100 million tons
- 1980: 320 million tons
- 1990: 700 million tons
- 2000: 1,200 million tons
- 2010: 1,600 million tons
- 2020: 2,100 million tons
- 2030: 2,600 million tons
- 2040: 3,100 million tons
- 2050: 3,600 million tons

Illustrated by GRID-Arendal

IMPLICATIONS OF COVID-19 ON PLASTIC WASTE GENERATION

Plastic medical waste
Plastic personal protection equipment (PPE)
Single-use plastics (SUPs)

COVID-19 induced plastic waste generation
HOW PLASTIC ENDS UP IN THE ENVIRONMENT FROM LAND-BASED SOURCES

Major sources and pathways of human generated plastic waste in the marine environment
Pathways, sources, sinks and temporary accumulation

- Reservoirs - source and sink
  Plastics from atmospheric fallout, snows and rivers. Temporary and long-term storage and possible infiltration into groundwater.

- Snow and ice - pathway
  Microplastics are found in snow, ice and sea-ice, from the poles to remote mountain tops.

- Cities - source
  Clothes, synthetic products such as carpets, building materials, take-away food containers etc. are sources of plastic particles and fibres.

- Landfill - major source
  Exposed plastics can be transported by the wind and plastic particles and chemicals associated with plastics can leach from non-sanitary landfill into surrounding groundwater.

- Lakes - close to rivers and ocean
  Temporary and long-term storage. A source under specific weather patterns and hydrodynamic regimes.

- Rivers - direct pathway
  Transport of plastic debris to the ocean. Generated 48 to 12.7 million tons per year of macroplastic.

- Sediments - source and sink
  Plastics coming from both the land and sediments contribute to accumulation in sediments.

- Agriculture soil - source and sink
  Use of plastic films and large fibre textiles in farming practices. Sewage sludge with plastic residue used as fertilizer. Irrigation with plastic contaminated water. Artificial fertilizers and seeds coated with a polymer.

- Roads and traffic - source
  Particles from the wear on tyres, road surfaces and paint.

- Sewage and wastewater - source and pathway
  Wastewater treatment plants are a major source of microplastics and nanoparticles in water bodies.

HOW PLASTIC ENDS UP IN THE ENVIRONMENT FROM SEA-BASED SOURCES
LAND-BASED VS SEA-BASED SOURCES OF THE MARINE LITTER IN THE MEDITERRANEAN

SEA-BASED SOURCES ARE OF PARAMOUNT IMPORTANCE IN MANY AREAS OF THE MEDITERRANEAN, INCLUDING MPAs!

Thesprotia, Greece
Lavezzi island, France
Milazzo, Italy
THE GROWING THREAT OF PLASTIC POLLUTION

Plastics ‘leak’ into all environmental compartments from different entry points and in various size fractions inducing wide-ranging effects.
Some 12,400 research articles have been published in the last 20 years documenting the marine litter and marine plastic pollution threat.
LATEST MARINE LITTER RESEARCH TOPICS – INDICATIVE EXAMPLES

- Artisanal trawl fisheries as a sentinel of marine litter pollution
- Public perceptions, knowledge, responsibilities, and behavior intentions on marine litter: Identifying profiles of small oceanic islands inhabitants
- Linking marine litter accumulation and beach user perceptions on pocket beaches of Northern Sardinia (Italy)
- Relationships between marine litter and type of coastal area, in Northeast Atlantic sandy beaches
- Assessing the potential for the introduction and spread of alien species with marine litter
- Exploring governance policy of marine fishery litter in China: Evolution, challenges and prospects
- Marine litter in the Red Sea: Status and policy implications
- The drift lighter project — Estimation of drifting range and source of North Pacific marine litter using disposable lighters washed up on coasts
- Understanding the interactions between cephalopods and marine litter: A research evaluation with identification of gaps and future perspectives
- Understanding the factors affecting the quantity and composition of street litter: Implication for management practices
KEY MEDITERRANEAN PROJECTS COMBATING MARINE PLASTIC POLLUTION

**MARINE LITTER MED, IMAP/MPA, ECAP**

**INDICIT I & II**

**IPA-ADRIATIC DEFISHGEAR**

**FP7 CLEANSEA**
**FP7 MARLISCO**
**FP7 PERSEUS**

**HORIZON 2020 SOS-ZEROPOL 2030**

**HORIZON 2020 BLUEMED COORDINATION AND SUPPORT ACTION**

**SEIS**

**WES SWIM-H2020 SM**

**LIFE+ SMILE, AMMOS, GHOST, DEBAG, MERMAIDS**

**ACT4LITER**

**AMARE**

**MED SEALITTER**

**PLASTIC BUSTERS MPAS**

**MED BLUEISLANDS**

**MELTEMI**

**COMMON**

**marGnet**

**BLUEMED**

**PLASTIC BUSTERS CAP**

**Mediterranean Sea basin lighthouse - actions to prevent, minimise and remediate litter and plastic pollution**
THE UfM LABELLED PLASTIC BUSTERS INITIATIVE

HARMONIZED MONITORING

SETTING UP A JOINT GOVERNANCE PLAN

BUILDING CAPACITIES AND TRANSFERRING KNOWLEDGE

DIAGNOSING THE IMPACTS

IDENTIFYING MARINE LITTER HOTSPOTS

SHOWCASING PREVENTION & MITIGATION MEASURES

MEASURES AGAINST MARINE LITTER in coastal and pelagic Mediterranea MPAs

INTERREG MED

PLASTIC BUSTERS MPAs

Plastic Busters CAP
The Mediterranean Sea is one of the most affected areas by marine litter worldwide!
<table>
<thead>
<tr>
<th>Reference</th>
<th>Study area</th>
<th>Number of beaches</th>
<th>Years</th>
<th>Litter density (items/100 m)</th>
<th>Plastic (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vlachogianni et al., 2018</td>
<td>Greece</td>
<td>24</td>
<td>2014-2016</td>
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<td>Bosnia &amp; Herzegovina</td>
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<td>Cyprus</td>
<td>3</td>
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<td>26</td>
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<td>12</td>
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<td>244</td>
<td>90</td>
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<tr>
<td>Vlachogianni et al., 2018</td>
<td>Montenegro</td>
<td>8</td>
<td>2014-2016</td>
<td>271</td>
<td>78</td>
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<tr>
<td>Vlachogianni et al., 2018</td>
<td>Croatia</td>
<td>16</td>
<td>2014-2016</td>
<td>303</td>
<td>96</td>
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<tr>
<td>Gjyli et al., 2020</td>
<td>Albania</td>
<td>5</td>
<td>2018</td>
<td>333</td>
<td>65</td>
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<tr>
<td>Nachite et al., 2019</td>
<td>Morocco</td>
<td>12</td>
<td>2015-2017</td>
<td>369</td>
<td>83</td>
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<td>Greece</td>
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<td>90</td>
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<tr>
<td>Vlachogianni et al., 2018</td>
<td>Slovenia</td>
<td>18</td>
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<td>76</td>
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<tr>
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<td>Morocco</td>
<td>5</td>
<td>2018</td>
<td>436</td>
<td>82</td>
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<tr>
<td>Fortibuoni et al., 2021</td>
<td>Italy</td>
<td>64</td>
<td>2015-2018</td>
<td>477</td>
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<td>Morocco</td>
<td>12</td>
<td>2015</td>
<td>494</td>
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<td>Vlachogianni et al., 2019</td>
<td>France</td>
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<td>2018</td>
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<tr>
<td>Papachristopoulou et al., 2019</td>
<td>Greece</td>
<td>62</td>
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<td>619</td>
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<td>Vlachogianni et al., 2019</td>
<td>Algeria</td>
<td>17</td>
<td>2018</td>
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<tr>
<td>Vlachogianni et al., 2019</td>
<td>Croatia</td>
<td>3</td>
<td>2018</td>
<td>2681</td>
<td>90</td>
</tr>
</tbody>
</table>
Plastic pollution pose a threat to wildlife and ecosystems with impacts varying from entanglement and ingestion, to bio-accumulation and bio-magnification of toxics either released from plastic items or adsorbed and accumulated on plastic particles; facilitation of introduction of invasive alien species; damages to benthic habitats and communities (e.g. through abrasion of coral reefs from fishing gear, disruption of colonies, reduced oxygenation or ‘smothering’ of communities)
# Percentage of Species Investigated Among Different Taxa for Marine Litter Ingestion in the Mediterranean Sea

<table>
<thead>
<tr>
<th>Taxa</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anellida</td>
<td>1%</td>
</tr>
<tr>
<td>Mollusca</td>
<td>1%</td>
</tr>
<tr>
<td>Arthropoda</td>
<td>9%</td>
</tr>
<tr>
<td>Echinodermata</td>
<td>1%</td>
</tr>
<tr>
<td>Elasmobranchs</td>
<td>11%</td>
</tr>
<tr>
<td>Teleosts</td>
<td>65%</td>
</tr>
<tr>
<td>Reptiles</td>
<td>1%</td>
</tr>
<tr>
<td>Seabirds</td>
<td>10%</td>
</tr>
</tbody>
</table>

Humans are exposed to a large variety of plastics (micro, nano) through inhalation, ingestion, and direct skin contact, all along the plastic lifecycle.

Basic toxicological data on the consumption of microplastics and nanoplastics by humans for a food risk safety assessment are lacking.
MICROPLASTICS – WHAT DO WE KNOW?

- A lot is already known about microplastics, and more knowledge is being acquired, but some of the evidence remains uncertain and it is by its nature, complex (for instance, differences in size, shape, chemical additives, concentrations, measurements, fates, unknowns, human factors, actions).

- There is a fair knowledge of microplastics concentrations for freshwaters and the ocean surface, but little is known about concentrations and implications of microparticles below the ocean surface.

- Most microplastics go in and out of most organisms, and as with many chemicals, ‘the poison is in the dose’. Most effect studies are performed using concentrations that are much higher than those currently reported in the environment, or using very small microplastics for which limited exposure data exists, or using spherical ones which are not representative of real-world types of particles, or using relatively short exposure times. Currently, it is not known to what extent these conditions apply to the natural environment. This limits the reliability of the risk assessments.
Plastic contributes to greenhouse gas emissions at every stage of its lifecycle, from its production to its refining and the way it is managed as a waste product.

According to the 2019 CIEL report "Plastic & Climate: The Hidden Costs of a Plastic Planet" by 2050, the greenhouse gas emissions from plastic could reach over 56 gigatons—10-13 percent of the entire remaining carbon budget.
KEY LEGISLATIVE FRAMEWORKS RELATED TO MARINE PLASTIC POLLUTION

KEY LEGISLATIVE FRAMEWORKS

EU
- Plastics Strategy
- Single-Use Plastics Directive

Barcelona Convention
- Ecosystem Approach
- Regional Plan for Marine Litter Management in the Mediterranean

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BARCELONA CONVENTION: POLICY ADVANCES FOR MARINE LITTER

COP22 Antalya Ministerial Declaration: Leaving a Pollution and Litter-free Legacy

Updated Regional Action Plan on Marine Litter Management in the Mediterranean

Mediterranean priority list of SUPs per group of items

List of Chemical Additives of Concern Used in Plastic Production

2021 Baseline Values and Threshold Values for IMAP Common Indicator
# Mediterranean Priority List of SUPs

<table>
<thead>
<tr>
<th>Group of items</th>
<th>Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Packaging</td>
<td>Bags</td>
</tr>
<tr>
<td>Smoking-related</td>
<td>Cigarette filters</td>
</tr>
<tr>
<td>Food and beverage packaging</td>
<td>Drink bottles, caps and lids, crisp packets and sweet wrappers</td>
</tr>
<tr>
<td>On-the-go food and beverage packaging</td>
<td>Cutlery, plates and trays, straws and stirrers, drinks cups and cup lids, food containers including fast food packaging</td>
</tr>
<tr>
<td>WC flushed items</td>
<td>Sanitary applications, including cotton buds, wet wipes and sanitary towels</td>
</tr>
<tr>
<td>Personal protective equipment</td>
<td>Masks and gloves</td>
</tr>
</tbody>
</table>

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THRESHOLD VALUE FOR IMAP COMMON INDICATOR 22

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 achieve.

130 items/100m
THE EUROPEAN THRESHOLD VALUE FOR BEACH MACROLITTER

A beach litter threshold value has been adopted at EU level

< 20 litter items for every 100 metres of coastline

Good Environmental Status
MSFD GES TECHNICAL GROUP ON MARINE LITTER

Identifying Sources of Marine Litter

Harm caused by Marine Litter

Riversine Litter Monitoring – Options and Recommendations

Top Marine Beach Litter: Ilaria in Europe

Guidance on Monitoring of Marine Litter in European Seas

Review of the Commission Decision 2013/347/EU concerning WFD criteria for assessing good environmental status

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## MARINE LITTER IN THE MEDITERRANEAN: KEY FIGURES

<table>
<thead>
<tr>
<th>Mediterranean-wide</th>
<th>Mediterranean coastal &amp; marine protected areas</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>UNEPMAP IMAP</strong></td>
<td><strong>EU MSFD</strong></td>
</tr>
<tr>
<td>Beach macrolitter threshold = 130 items/100 m beach</td>
<td>Beach macrolitter threshold = 20 items/ 100m beach</td>
</tr>
<tr>
<td>5 x exceeded</td>
<td>7 – 147 x exceeded</td>
</tr>
</tbody>
</table>

**UNEPMAP, 2021. Updated Baseline Values and Proposal for Threshold Values for IMAP Common Indicator 22. UNEP/MED WG.509/11**

**Fossi et al., 2022. Report on the results and findings of the piloted harmonized marine litter monitoring approach in Mediterranean MPAs. Interreg Med Plastic Busters MPAs project.**
MARINE LITTER IN THE MEDITERRANEAN: KEY FIGURES

40-50%

of all litter collected, is generated on land (mainly from tourism/recreation and poor waste management)

Fisheries & aquaculture related litter on beaches

15%

of all litter collected on European beaches

Fisheries & aquaculture related litter on seafloor

17%

of all litter collected from the seafloor in the Adriatic and Ionian seas (trawl surveys)

High impact plastic contamination

96%

of bioindicator species (turtles, fish, cetaceans, invertebrates, etc.) ingested marine litter (incl. microplastics)

Based on 1280 samples of 46 bioindicator species

References:
THE JOINT LIST OF LITTER CATEGORIES

JRC TECHNICAL REPORTS

A Joint List of Litter Categories for Marine Macrolitter Monitoring

Manual for the application of the classification system

Thank you for your attention!

www. wes-med.eu