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Plastic Busters CAP

PLASTIC BUSTERS CAP POLICY TOOLKIT FOR A MARINE LITTER MANAGEMENT APPROACH THAT COUPLES EBM & ICZM

Recommendations for addressing marine litter in the Mediterranean

Plastic Busters CAP

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INTRODUCTION

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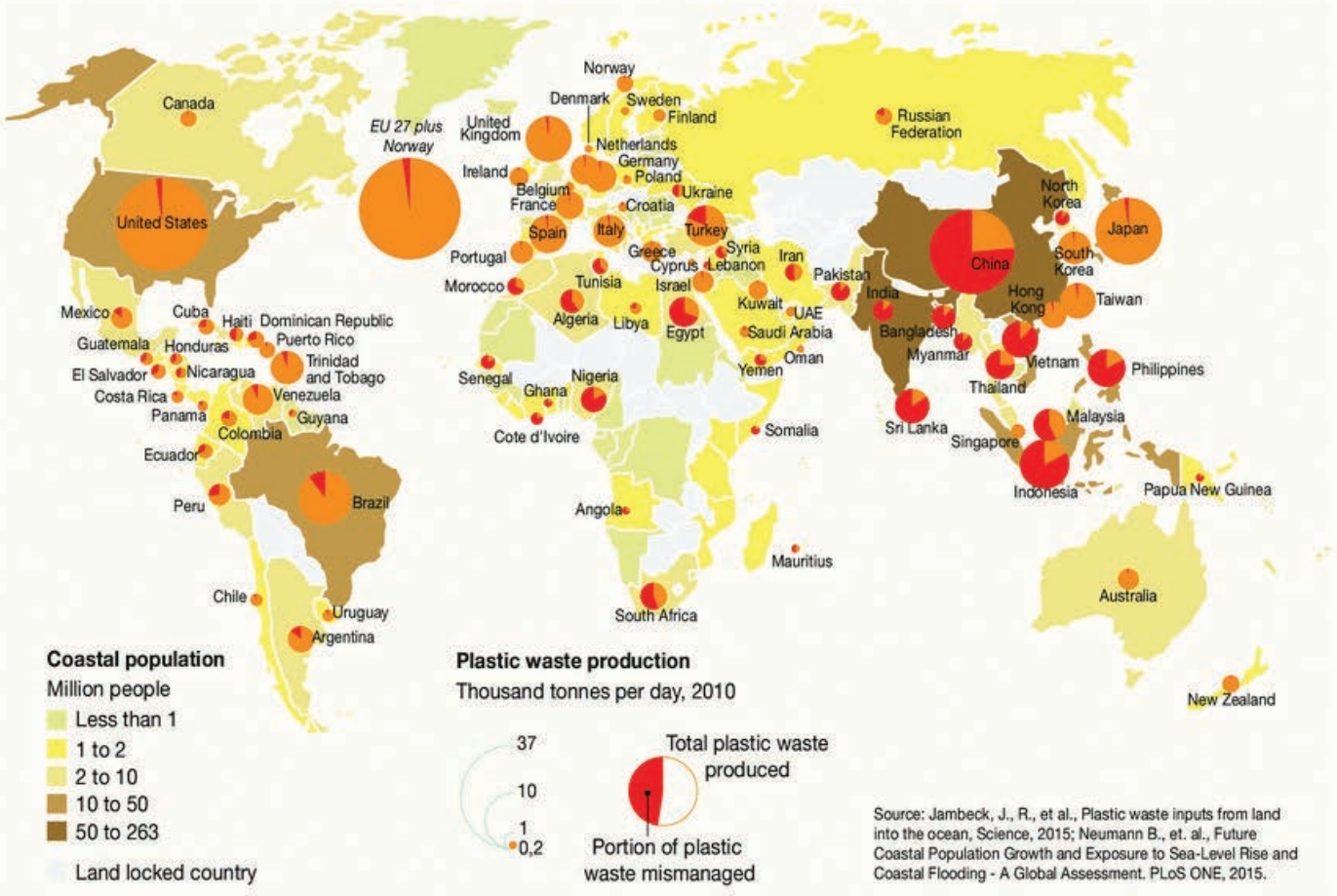
MARINE LITTER IN THE MEDITERRANEAN: KEY FACTS AND FIGURES

1.1

Marine Litter is globally acknowledged as a major societal challenge of our times due to its far-reaching environmental, economic, social, political and cultural implications. Marine litter negatively impacts coastal and marine ecosystems and the services they provide, ultimately affecting people's livelihoods and well-being (Gall and Thompson, 2015; Veiga et al., 2016). Marine litter, the vast majority of which is made of plastics, is defined as any anthropogenic persistent, manufactured or processed solid material discarded, disposed of, or abandoned in the marine and coastal environment (Galgani et al., 2013). Plastics have become the basic component for manufacturing numerous everyday products, and since the 1950s, their production has consistently grown, with their global production reaching 322 million tonnes in 2015 and expected to double by 2035 (Barra et al., 2018).

FIGURE 1 PLASTIC WASTE PRODUCED AND MISMANAGED (JAMBECK ET AL., 2015)



Plastic litter enters the ocean from diverse point and diffuse sources, which can be both land-based and ocean-based, while it can also be transported over long distances before being deposited on shorelines or settling on the bottom of the oceans and seas (Veiga et al., 2016). Inadequate urban and industrial solid waste management, discharge of inappropriately treated/untreated wastewater, agriculture, and tourism and recreational activities are considered to be the main land-based sources of marine litter while the sea-based ones include fisheries and aquaculture, shipping (merchant, leisure and recreational) and off-shore oil and gas platforms that may dispose of drilling equipment, pipes, etc. (Li et al., 2016; UNEP, 2018). It should be highlighted that plastic litter may find its way to the sea by being transported from land-based sources via pathways, including rivers, canals, drains, sewage outlets, storm water outflows, winds and tides.

It is widely accepted that the Mediterranean Sea is one of the most affected seas by marine litter worldwide. Indicatively, the median beach macrolitter density at Mediterranean level was found to be 659 items per 100-metre of coastline (range: 128-2002 items/100m) (UNEP/MAP, 2015). This value is 5 times higher than the threshold value for beach litter set within the UNEP/MAP Integrated Monitoring and Assessment Programme (130 items/100m). This value is 33 times higher than the threshold value for macrolitter on beaches set within the EU Marine Strategy Framework Directive (20 items/100m). Even in pristine environments of the Mediterranean, such as coastal and marine protected areas, marine litter is building up threatening habitats and species and inhibiting sustainable development. The median beach macrolitter density for coastal and marine protected areas has been found to be from 7 to 147 times higher than the threshold value for macrolitter on beaches set within the Marine Strategy Framework Directive (Fossi et al., 2022).

A large amount of the litter items found on Mediterranean beaches are single-use plastics, such as cigarette butts and filters, plastic caps and lids from drinks, cotton bud sticks, drink bottles, crisps packets and sweets wrappers, etc. (UNEP, 2017). In order to address the issue of single-use plastics, Mediterranean countries have reached a consensus to focus their efforts on tackling specific single-use items that hold paramount importance for the region (see Table 1-1) (UNEP/MAP, 2021).

TABLE 1 | MEDITERRANEAN PRIORITY LIST OF SINGLE-USE PLASTICS

GROUP OF ITEMS	ITEMS
PACKAGING	BAGS
SMOKING-RELATED	CIGARETTE FILTERS
FOOD AND BEVERAGE PACKAGING	DRINK BOTTLES, CAPS AND LIDS, CRISP PACKETS AND SWEET WRAPPERS
ON-THE-GO FOOD AND BEVERAGE PACKAGING	CUTLERY, PLATES AND TRAYS, STRAWS AND STIRRERS, DRINKS CUPS AND CUP LIDS, FOOD CONTAINERS INCLUDING FAST FOOD PACKAGING
WC FLUSHED ITEMS	SANITARY APPLICATIONS, INCLUDING COTTON BUDS, WET WIPES AND SANITARY TOWELS
PERSONAL PROTECTIVE EQUIPMENT	MASKS AND GLOVES

With regard to the sources of marine litter in the Mediterranean, it mainly comes from land-based sources; however, sea-based sources also contribute with significant litter inputs. Some 40-50% of litter items found on beaches, the sea surface and the seafloor are generated on land, mainly from tourism and recreational activities and poor waste management practices (UNEP/

MAP, 2015). The contribution of fisheries and aquaculture related items to the total number of items collected on European beaches has been found to be 15% (Addamo et al., 2017). The contribution of fisheries and aquaculture related items to the total number of items collected by seafloor trawl surveys has been found to be 17% at the Adriatic and Ionian Seas basin (Vlachogianni et al., 2017).

Growing scientific literature documents the threats that marine plastic litter poses to wildlife and ecosystems, with impacts varying from entanglement and ingestion, to bio-accumulation and bio-magnification of toxics either released from plastic items (e.g. PBDEs, phthalates, Bisphenol A) or adsorbed and accumulated on plastic particles (e.g. POPs, PAHs); 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) (Fossi et al., 2019, Vlachogianni et al., 2020). The Interreg Med Plastic Busters MPAs research data have confirmed the high impact of plastic contamination on the Mediterranean biodiversity. Results show that 96% of the 1280 samples of 46 bioindicator species (i.e. invertebrates, fishes, turtles, cetaceans, etc.) analysed had ingested marine litter (including microplastics) (Fossi et al., 2022).

THE PLASTIC BUSTERS CAP IN A NUTSHELL

1.2

Plastic Busters CAP aims to facilitate decision-makers and stakeholders in effectively tackling the problem of marine litter by integrating EbM (Ecosystem-Based Management Approach) into ICZM (Integrated Coastal Zone Management) planning towards good environmental status. The project seeks to consolidate and fully exploit the knowledge obtained by five relevant projects in order to develop tailored-made capitalization actions that will create the enabling conditions for a societal shift towards sustainable consumption and production patterns, and a truly circular and green economy. In the long-term, the project will contribute to enhancing ecosystem services via a reduced leakage of marine litter and marine plastic pollution in the Mediterranean Sea and reduced emissions of greenhouse gases by a wise-use and sustainable disposal of plastics.

THE MAIN EXPECTED RESULTS OF THE PROJECT ARE:

- 4 NATIONAL HANDS-ON TRAINING ACTIVITIES ON MARINE LITTER MONITORING AND ASSESSMENT
- 1 E-COURSE ON MARINE LITTER MONITORING AND ASSESSMENT
- 4 PILOT MARINE LITTER MONITORING AND ASSESSMENT CAMPAIGNS
- 4 NATIONAL HANDS-ON TRAINING ACTIVITIES ON MARINE LITTER PREVENTION AND MITIGATION MEASURES
- 1 E-COURSE ON MARINE LITTER PREVENTION AND MITIGATION MEASURES
- 4 DEMOS SHOWCASING MARINE LITTER PREVENTION AND MITIGATION MEASURES
- 1 ROADMAP ON MARINE LITTER POLICY PRIORITIES
- 1 COASTAL CITIES NETWORK FOR A LITTER-FREE MEDITERRANEAN

Plastic Busters CAP is a 24 month-long project, with a total budget of €1.109.976,27 million and is co-funded by the European Union under the ENI CBC MED Programme 2014-2020. It brings together partners from 7 countries of the Mediterranean region, namely Egypt, Greece, Italy, Jordan, Lebanon, Spain and Tunisia.

The backbone of Plastic Busters CAP is the Interreg Med Plastic Busters MPAs; both projects deploy the multidisciplinary strategy and common framework of action developed within the Plastic Busters initiative led by the University of Siena and the Sustainable Development Solutions Network Mediterranean. This initiative frames the priority actions needed to tackle marine litter in the Mediterranean and was labelled under the Union for the Mediterranean (UfM) in 2016, capturing the political support of 43 Euro-Mediterranean countries.

METHODOLOGY OF THE DOCUMENT

1.3

This document provides a comprehensive overview of the issue of marine litter in the Mediterranean Sea, identifies contributing factors, and presents a set of main recommendations. Each main recommendation is further elaborated with detailed strategies for implementation, offering a practical guide for addressing the challenges posed by marine litter in the region.

PARTNERS IN PROTECTION: EXPLORING RECOMMENDATION SYNERGIES BETWEEN PLASTIC BUSTERS MPAS, COMMON, AND PANACEA

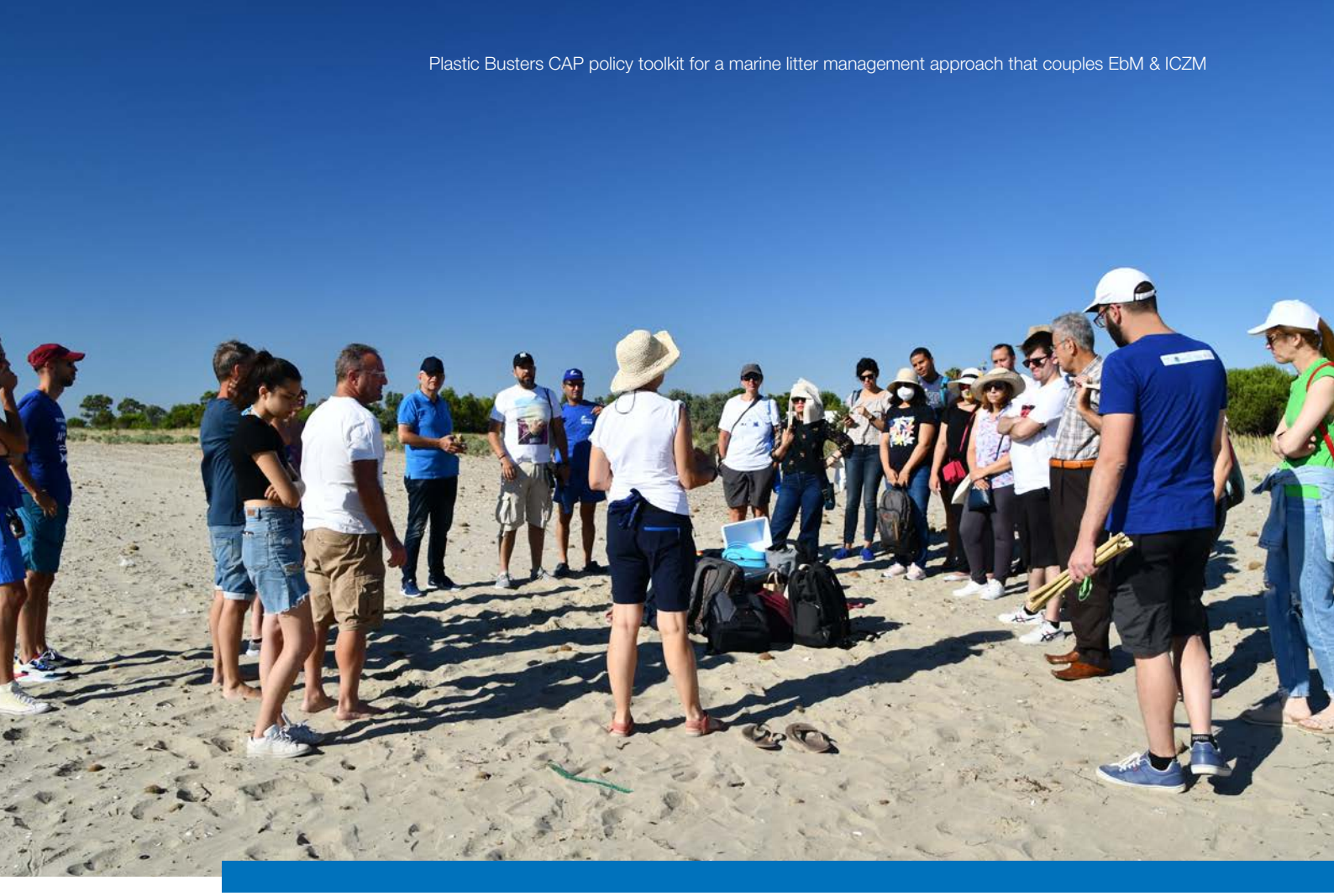
2

RECOMMENDATIONS FROM THE PLASTIC BUSTERS PROJECT 2.1

The Plastic Busters MPAs project was a 4-year initiative funded by the Interreg Mediterranean program that aimed to address the growing problem of marine litter in Mediterranean marine protected areas (MPAs). Through pilot mitigation and monitoring actions across 9 MPAs, the project formulated evidence-based recommendations for improving marine litter management tailored to these sensitive coastal environments.

The project advocates for a multi-pronged strategy encompassing legislative reform, economic instruments elaboration, infrastructure development, technological innovation, educational programs and participatory initiatives. Specifically, it recommends that Mediterranean countries implement legal frameworks to curb plastic pollution in MPAs, including bans on single-use plastics along with fines for littering. Harmonized marine litter monitoring methodologies should be promoted regionally. Deposit-refund schemes are advised to enhance extended producer responsibility, along with certification programs incentivizing "zero plastic" tourism businesses. "Adopt-a-Beach" schemes with public participation can facilitate regular beach cleanups, while fishing gear management schemes should address derelict gear. Awareness-raising campaigns targeting key stakeholders are also important.

In summary, the combination of preventative, mitigative and curative measures provides a comprehensive framework to address the complex issue of marine litter in Mediterranean MPAs. Success relies on multi-sectoral collaboration and political commitment. The Plastic Busters MPAs project makes a valuable contribution in outlining practical, evidence-based recommendations for reducing the impacts of marine litter in these unique and threatened environments: the marine protected areas.



RECOMMENDATIONS FROM THE COMMON PROJECT

2.2

The COMMON project provides a robust science-based framework to systematically address the pressing issue of marine plastic pollution across the Mediterranean region.

It recommends implementing standardized monitoring protocols across multiple environmental matrices including surface water, seawater columns, seabed sediment, shorelines and biota. This enables building comparable datasets to quantify litter volumes, map accumulation zones, identify hotspots and assess ecological impacts across the region. Furthermore, adopting a “threefold approach” combining analyses of plastic ingestion, associated chemical additives and metabolites, and effects on organismal and sub-organismal biomarkers allows for rigorous evaluation of eco-toxicological impacts.

The project highlights the need to promote and fund further research to fill critical knowledge gaps regarding sources, hydrodynamic transport behaviors, seasonal/spatial accumulation trends, and chronic ecological effects of marine microplastics and associated chemical contaminants. Engaging citizens in participatory science can aid data collection while raising public awareness.

Establishing collaboration networks between major stakeholders including scientists, policymakers, industry leaders, civil society groups and local communities can enable integrated governance and maximize the scope and effecti-

veness of initiatives. Formalizing partnerships between global institutions and local actors can facilitate development of tailored policies and grassroots solutions.

Comprehensive education and outreach programs involving seminars, training workshops, school curricula integration, social media campaigns and citizen science initiatives can help share best practices, foster behavioral change and build stakeholder capacity.

The project advocates developing evidence-based policies and regulatory frameworks informed by current scientific research and aligned with existing protocols under the Barcelona Convention. It promotes scaling up proven mitigation strategies coupled with emerging technological innovations, emphasizing circular economy and waste minimization approaches.

In summary, the COMMON project recommends a multi-level, science-centric strategy based on systematic research, monitoring, education and policy reform to curb marine plastic pollution through coordinated efforts from diverse stakeholders across the Mediterranean region.

RECOMMENDATIONS FROM THE PANACEA PROJECT

2.3

The PANACeA project provides comprehensive science-based recommendations to advance ecosystem-based management and effective biodiversity protection in Mediterranean Marine Protected Areas (MPAs).

A core recommendation is implementing web-based geospatial platforms and data portals to facilitate information sharing, inform management decisions, and enable coordinated strategies across MPAs at the regional scale. Adopting standardized ecological and socioeconomic monitoring protocols across the MPA network is critical to generate comparative datasets and assess the impact of conservation strategies.

Guidelines and conceptual models for governance plans should be developed to enhance individual MPA performance while also allowing cross-site analyses. Building collaboration between scientists and MPA managers is crucial to foster knowledge exchange and integrate scientific evidence into management plans.

Strategic partnerships must be forged to expand existing observation networks and address critical data gaps regarding land-sea interactions, climate change impacts, invasive species spread, and human pressures on MPAs. Solutions developed via local pilots should be replicated across the Mediterranean to maximize impact.

Comprehensive training programs on utilizing new tools and implementing best practices are essential to build critical capacity among MPA staff. Sustained funding mechanisms need to be instituted to support long-term coordinated observation, knowledge sharing, and administration of shared infrastructure.

Overall, PANACeA outlines a comprehensive science-driven strategy to systematically strengthen MPA management, harness synergies, fill knowledge gaps, and advance ecosystem-based approaches across the Mediterranean - aligning with the Barcelona Convention's Ecosystem Approach roadmap.

CONNECTING THE DOTS: INTEGRATING RECOMMENDATIONS FOR MARINE CONSERVATION IN THE MEDITERRANEAN

2.4

The Plastic Busters MPAs, COMMON, and PANACeA projects, while distinct in their specific focus, put forth several aligned recommendations that collectively provide a framework for integrated, ecosystem-based management in the Mediterranean basin.
All three projects emphasize the need for standardized ecological, environmental, and socioeconomic monitoring protocols and data sharing platforms to systematically track marine litter, assess biodiversity, characterize human pressures, and inform adaptive management decisions across scales from local MPAs to the region. They consistently highlight the importance of multi-stakeholder collaboration and public participation through initiatives like cleanup campaigns, citizen science, and creating networks amongst scientists, authorities, businesses, and civil society. Building institutional capacity via training programs and integrating science into policy and management is encouraged. They promote replicating locally proven mitigation strategies more widely across the Mediterranean, while tailoring solutions to local socio-environmental contexts.

While the projects are grounded in their distinct pilot experiences, the alignment regarding key principles and approaches is notable Plastic Busters MPAs' technical mitigation solutions could be scaled up through the policy frameworks recommended in COMMON and sustained via PANACeA's proposed administration, monitoring, and financing structures. A shared repository of spatially explicit data as PANACeA promotes could accelerate replication of pilots like Plastic Busters MPAs. Integrative collaboration could enhance the impact.

Overall, these projects showcase how targeted initiatives related to marine litter, MPAs, and biodiversity protection can feed into a broader vision for science-driven, ecosystem-based management in the Mediterranean. They collectively offer replicable pilot initiatives, policy recommendations, and governance frameworks to bridge knowledge gaps and scale up conservation solutions region-wide. Exploring synergies between the complementary recommendations underscores their shared ambition of supporting more integrated, effective, and sustainable marine resource management.

RECOMMENDATIONS FOR ADDRESSING MARINE LITTER IN THE MEDITERRANEAN

3

Marine litter poses a significant challenge in the Mediterranean Sea. The region is plagued by a wide range of waste materials that are abandoned or dispersed in the marine environment, with disastrous consequences for marine life and coastal ecosystems. In particular, plastic is one of the major contributors to the contamination, accounting for a significant proportion of marine litter. The presence of marine litter is fueled by various factors, including high population density along the coasts, heavy tourism, inadequate waste management systems, and limited resources for effective monitoring and enforcement. Addressing this challenge requires an integrated approach that includes improvements in public education, waste management, international cooperation, and technological innovation. In order to tackle the issue of marine litter in the Mediterranean Sea, a comprehensive set of recommendations can be implemented. These recommendations aim to address the underlying causes of marine litter and provide practical solutions to mitigate its impacts.

After identifying ten main recommendations they have been grouped in four main themes; **Waste management and public awareness,** that consider to strengthen waste management systems, Improve port and shipping waste management and Promote public awareness and education; **International cooperation and legal framework,** that consider Enhance international cooperation, Strengthen legal frameworks, Strengthen international agreements; **Circular economy and sector engagement** that consider Promote circular economy principles, and Engage the fishing and aquaculture sectors; **Research, monitoring, and innovation,** that consider Support research and monitoring and Foster innovation and technology.

WASTE MANAGEMENT AND PUBLIC AWARENESS 3.1

The accumulation of waste materials, particularly from land-based sources, has reached alarming levels. Addressing this issue requires a comprehensive approach that combines effective waste management systems and increased public awareness.

MAIN RECOMMENDATION

STRENGTHEN WASTE MANAGEMENT SYSTEMS: improving waste management infrastructure in coastal communities is crucial. This involves implementing effective recycling programs, promoting the use of eco-friendly packaging, and reducing the consumption of single-use plastic items. Adequate waste collection, recycling, and disposal facilities must be established to prevent litter from entering the marine environment.

IMPROVE PORT AND SHIPPING WASTE MANAGEMENT: implement stricter regulations for waste management on ships, including proper disposal of waste at port facilities. Encourage the use of waste reception facilities and incentivize ships to adopt environmentally friendly practices. Promoting responsible waste management within the shipping industry can significantly reduce the amount of litter entering the sea.

PROMOTE PUBLIC AWARENESS AND EDUCATION: conduct public awareness campaigns to educate individuals about the detrimental impact of marine litter and the importance of responsible waste disposal. Encourage behavioral changes such as reducing plastic consumption, properly segregating waste, and participating in beach clean-up activities. Engaging the public and fostering a sense of responsibility is vital for long-term behavioral change.

SPECIFIC RECOMMENDATIONS

- Strengthen waste management systems by improving infrastructure and establishing adequate waste collection, recycling, and disposal facilities.
- Implement effective recycling programs and promote the use of eco-friendly packaging.
- Implement fishing gear tagging and deposit return systems to incentivize retrieval of lost equipment like nets and traps. Reduce ghost gear.
- Develop waste reception facilities at small fishing ports lacking infrastructure to properly contain and dispose of collected litter. Engage local industry.
- Reduce the consumption of single-use plastic items through awareness campaigns and education.
- Encourage the public to properly segregate waste and participate in beach clean-up activities.
- Foster partnerships with local communities, NGOs, and businesses to implement sustainable waste management practices.
- Implement cigarette butt recycling stations and awareness campaigns at beaches, marinas, and piers. Curb one of the most prevalent marine litter items.
- Use marine debris collected through cleanups to create art installations for public education on

the issue. Raise awareness creatively.

- Run school outreach programs on protecting marine ecosystems from litter and microplastics pollution. Instill stewardship values from a young age.
- Run tourist education campaigns on responsible waste disposal and avoiding plastic usage when visiting Mediterranean coastal regions and islands. Engage travelers.

SYNERGIES WITH THE REGIONAL PLAN FOR MARINE LITTER MANAGEMENT IN THE MEDITERRANEAN

The Regional Plan emphasizes the critical need for upgraded waste management infrastructure. It advocates increasing storage capacities at ports, enhancing waste transfer facilities, providing specialized vessels for collection of marine litter and procuring recycling equipment suited for managing coastal tourism waste streams.

Accordingly, the recommendations call for establishing adequate collection, sorting, recycling and disposal systems tailored to coastal municipalities. This includes providing accessible public waste bins, improving capacity and maintenance of landfills, and integrating marine litter considerations into municipal waste management plans.

Further, the Regional Plan highlights the importance of phasing out certain problematic and unnecessary disposable plastics through redesign and substitution policies as well as economic instruments. The recommendations align with this by suggesting bans, levies or takeback requirements for packaging and items like cutlery, cups, straws, bags and cigarette butts.

Additionally, the Regional Plan stresses large-scale multimedia campaigns targeting tourists, fishermen, recreational boaters, businesses and the general public to promote responsible disposal, plastic reduction and regular beach clean-up participation. The recommendations supplement this by advising integration of marine litter education into school curricula and community outreach programs.

The comprehensive waste management and awareness-raising measures outlined in the recommendations strongly reinforce the Regional Plan's strategies to reduce waste leakage into the marine environment and drive public engagement on plastic pollution issues, thereby generating positive synergies.

INTERNATIONAL COOPERATION AND LEGAL FRAMEWORK

3.2

International cooperation and a strong legal framework play a crucial role in addressing the issue of marine litter in the Mediterranean. The following recommendations aim to enhance collaboration and strengthen legal mechanisms to effectively tackle this problem:

MAIN RECOMMENDATION

ENHANCE INTERNATIONAL COOPERATION: facilitate collaboration among Mediterranean countries to develop and implement joint strategies for marine litter prevention, monitoring, and enforcement. Sharing best practices, research findings, and technological advancements will help create a coordinated and effective response. Collaborative efforts can lead to the development of common guidelines and protocols for addressing marine litter.

STRENGTHEN LEGAL FRAMEWORKS: develop and enforce legislation that specifically targets marine litter, including regulations on single-use plastics, littering, and waste management. Ensure that penalties and sanctions are in place for non-complian-

ce to deter improper waste disposal. Consistent enforcement of laws and regulations is crucial for achieving effective marine litter management.

STRENGTHEN INTERNATIONAL AGREEMENTS: advocate for the inclusion of marine litter reduction goals within international agreements, such as the Barcelona Convention and the European Union's Marine Strategy Framework Directive. Promote the ratification and implementation of relevant conventions and protocols at national and regional levels. Strong international commitments provide a framework for coordinated action and reinforce the importance of addressing marine litter.

SPECIFIC RECOMMENDATIONS

- Launch public awareness campaigns through media, schools, and community events focused on reducing single-use plastic consumption, proper waste disposal practices, and participation in coastal cleanup initiatives at Mediterranean level.
- Establish a Mediterranean marine litter monitoring and research coordination network to standardize data collection, share findings, and identify regional research priorities.
- Develop a Mediterranean marine litter reduction strategy with clear targets and timelines, to be adopted by all coastal countries in the region.
- Introduce region-wide bans on the most problematic single-use plastic items such as bags, straws, and cutlery.
- Implement deposit return schemes for plastic bottles and incentives for responsible fishing gear disposal.
- Increase penalties for illegal dumping, littering, and non-compliance with waste management regulations.
- Establish a Mediterranean marine litter data platform to report on progress towards reduction targets and foster transparency.
- Advocate for the inclusion of quantitative marine litter reduction targets in the next iteration of the Barcelona Convention and EU Marine Strategy Framework Directive.
- Increase funding for waste management infrastructure improvement, port reception facilities, and litter cleanup operations, particularly in areas with high pollution levels.

SYNERGIES WITH THE REGIONAL PLAN FOR MARINE LITTER MANAGEMENT IN THE MEDITERRANEAN

The Regional Plan highlights the need for greater collaboration between Mediterranean countries to develop joint strategies and protocols to address marine litter.
Accordingly, the recommendations call for facilitating cooperation to share best practices, research findings, and technological solutions. This can lead to common guidelines, standardized monitoring, and integrated policies between countries. Additionally, the Regional Plan emphasizes strengthening legal and regulatory mechanisms by incorporating marine litter considerations across policy areas.

Aligned with this, the recommendations include advocating for binding marine litter reduction targets within relevant international agreements and conventions. Domestically, legislation and enforcement should be enhanced to regulate single-use plastics, littering, and waste management.
By promoting international cooperation and bolstering legal frameworks as outlined in the recommendations, in conjunction with the Regional Plan, significant progress can be made towards regional governance of marine litter and binding commitments from countries.

CIRCULAR ECONOMY AND SECTOR ENGAGEMENT 3.3

Circular economy principles and sector engagement play a vital role in addressing marine litter in the Mediterranean. The following recommendations focus on promoting circular economy practices and engaging specific sectors:

MAIN RECOMMENDATION

PROMOTE CIRCULAR ECONOMY PRINCIPLES: encourage the transition to a circular economy by promoting the use of recyclable materials, supporting eco-design initiatives, and implementing extended producer responsibility programs. Encourage businesses to adopt sustainable practices and develop innovative solutions for reducing plastic waste. Emphasizing the concept of waste prevention and resource efficiency is essential for long-term sustainability.

ENGAGE THE FISHING AND AQUACULTURE SECTORS: promote responsible fishing practices and encourage the adoption of fishing gear that minimizes ghost fishing and plastic debris in the Mediterranean. Support sustainable aquaculture practices that minimize the release of litter into the marine environment. Collaboration with these sectors is essential for mitigating their contribution to marine litter.

SPECIFIC RECOMMENDATIONS

- Provide tax incentives for companies to design products and packaging for recyclability, reuse or composting.
- Implement government procurement policies favoring recyclable, eco-designed goods to drive market demand.
- Develop certification programs for sustainable fishing and aquaculture practices that minimize litter.
- Establish a deposit-refund system for transport packaging materials to encourage recovery and recycling.
- Require all large ports to provide reception facilities for fishing gear, e-waste, and hazardous waste disposal.
- Digitize ship waste disposal documentation and tracking to improve compliance monitoring and transparency.
- Offer discounted harbor fees for ships that meet best practice waste management criteria at ports.
- Run educational campaigns targeting leisure boaters on proper disposal of packaging waste.
- Set up public recycling stations at marinas to support circular waste management.
- Fund pilot projects to test novel fishing gear attachments that avoid ghost gear losses.
- Provide subsidies for fishermen to retrieve and return discarded gear to shore for recycling.
- Support decentralized composting of fish market and processing organic waste.
- Incentivize restaurants to adopt reusable container schemes for seafood products.

- Enact regulations restricting the use of single-use plastics in seafood processing and packaging.
- Require large-scale fish farms to invest in technologies preventing gear losses and litter releases.
- Promote integration of extractive aquaculture to filter microplastics from the surrounding waters.
- Develop a collaborative initiative between port authorities, ship operators and waste management firms to enhance circular resource flows.
- Organize hackathons bringing together IT experts, engineers and green companies to find solutions to sea-based plastic waste.
- Enforce marina “no single-use plastic” policies and improve waste management facilities for boaters. Target recreational vessels.
- Set up community plastic recycling hubs to support circular economy solutions and reduce waste mismanagement in coastal towns. Tackle onshore waste.

SYNERGIES WITH THE REGIONAL PLAN FOR MARINE LITTER MANAGEMENT IN THE MEDITERRANEAN

The Regional Plan advocates transitioning towards a circular economy model by promoting recyclable materials, eco-design, and extended producer responsibility.
Aligned with this, the recommendations include supporting product redesign, takeback programs, and startups to bolster circular systems. Economic instruments like deposit return schemes can also incentivize waste reduction.
Additionally, the Regional Plan focuses on engaging pollution-intensive sectors like fishing, aquaculture, maritime transport and tourism.
Accordingly, the recommendations advise implementing port waste management standards, fishing gear buyback programs, and financial incentives for adopting sustainable practices across these sectors.
By promoting circular economy principles and targeted engagement strategies in conjunction with the Regional Plan, businesses and key industries can be influenced to reduce waste, increase resource efficiency, and develop innovative solutions tailored to the Mediterranean context.

RESEARCH, MONITORING, AND INNOVATION

3.4

Research, monitoring, and innovation are essential components in effectively addressing the issue of marine litter in the Mediterranean. The following recommendations focus on supporting research, monitoring, and fostering innovation:

MAIN RECOMMENDATION

SUPPORT RESEARCH AND MONITORING: invest in scientific research to gain a better understanding of the sources, distribution, and impacts of marine litter in the Mediterranean. Develop standardized monitoring programs to assess the effectiveness of mitigation measures and track progress over time. This knowledge will inform evidence-based decision-making and enable targeted interventions.

FOSTER INNOVATION AND TECHNOLOGY: support research and development of new technologies and innovative solutions to prevent, monitor, and remove marine litter. This includes advancements in waste collection and recycling technologies, as well as the development of eco-friendly alternatives to single-use plastics. Encourage the private sector and startups to invest in sustainable solutions that can be scaled up.

SPECIFIC RECOMMENDATIONS

- Establish a multinational research fund to support studies on microplastics pollution pathways and impacts on marine ecosystems. This will build scientific knowledge for evidence-based policies.
- Develop low-cost, open-source monitoring kits for citizens to sample and analyze marine litter in their communities. Crowdsourced data can complement official monitoring.
- Deploy AI-enabled underwater drones to autonomously identify and collect ghost nets and other debris hotspots across coastal areas. This increases monitoring efficiency.
- Provide grants for startups developing biodegradable alternatives to single-use plastics such as food packaging, straws, bags, and cutlery. Accelerate adoption of eco-solutions.
- Launch an annual tech competition for innovators tackling marine plastic waste, with cash prizes and support to develop winners' ideas. Stimulate emerging technologies.
- Install real-time remote sensing systems on ferries, cruise ships and other vessels to detect and map floating marine litter. Leverage existing transport routes.
- Partner with major ports to implement on-site plastic pellet containment systems to prevent spillage into waterways during transport. Stop a major source.
- Create a mobile app for fishermen to easily log litter collected in nets for researchers to analyze sources and pathways. Engage industry stakeholders.
- Develop Edible seaweed-based packaging as an alternative to non-biodegradable plastic for coastal food businesses and vendors. Demonstrate localized solutions.

- Install stormwater capture devices like trash booms in urban rivers to intercept litter before it reaches the sea. Focus on upstream prevention.

- Incorporate marine litter reduction into sustainability criteria for Blue Flag beaches and marina eco-certifications. Mainstream best practices.

- Invest in Research and Development at universities to develop new biodegradable materials from agricultural waste or algae.

- Launch incubator programs to support startups creating innovative waste-reducing technologies or products.

- Promote the use of innovative waste management technologies.

- Establish country-level reduction targets and a Med-wide summit to catalyze political commitments and regional coordination.

SYNERGIES WITH THE REGIONAL PLAN FOR MARINE LITTER MANAGEMENT IN THE MEDITERRANEAN

The Regional Plan stresses the need for more research on sources, accumulation zones and ecological impacts of marine litter to inform evidence-based policies. It also advocates monitoring initiatives to map litter hotspots.
In line with this, the recommendations call for investing in studies to expand understanding of marine litter patterns, trends and effects. Standardized regional monitoring programs should also be developed to evaluate mitigation efforts.
Additionally, the Regional Plan encourages technological innovation to prevent and remove marine litter.
Accordingly, the recommendations promote research and development of novel solutions from waste sensors to biodegradable alternatives. Emerging technologies can be supported through research grants and private sector partnerships.
By aligning research, monitoring and innovation efforts with the priorities of the Regional Plan, critical knowledge and technological gains can be achieved to underpin impact-driven marine litter management in the Mediterranean region.

FROM AMBITION TO IMPACT: BOLSTERING THE REGIONAL PLAN THROUGH INTEGRATED RECOMMENDATIONS

4

The comprehensive recommendations outlined in this document strongly reinforce the ambitions and strategic priorities identified in the hypothetical Regional Plan for Marine Litter Management in the Mediterranean.

The Regional Plan similarly emphasizes the need to establish adequate waste management infrastructure by increasing port reception capacities, improving storage facilities, and providing recycling programs suited to coastal municipalities. It advocates large-scale public awareness campaigns through multimedia platforms, school education, and community events to inform tourists, youth, and the general public about responsible consumption, waste disposal, and preventing litter leakage.

Additionally, the Regional Plan calls for policy and regulatory reform to phase out problematic single-use plastics via bans, levies, and redesign mandates. It recommends implementing extended producer responsibility schemes, deposit return systems, and taxes to drive business accountability. The plan also stresses adopting a circular economy approach by supporting eco-design, takeback programs, and startup incubators for waste solutions.

Further, the Regional Plan highlights supporting research on marine litter impacts, sources and accumulation patterns to inform evidence-based decision-making. It encourages regional scientific collaboration and integrating citizen science for comprehensive monitoring. The plan also advocates developing technological innovations from waste sensors to biodegradable alternatives.

Moreover, it focuses on engaging the fishing, aquaculture, maritime transport and coastal tourism sectors through port waste management standards, fishing gear buyback programs, and financial incentives for sustainability practices. Additionally, the Regional Plan calls for integrating marine litter objectives across policy areas and formalizing national commitments along with collaborative governance between local, national and regional authorities.

The comprehensive recommendations outlined in this document further reinforce the Regional Plan's multi-faceted strategy to curb plastic pollution through concrete mitigation actions, stakeholder engagement, awareness-raising, research, innovation, policy reform and integrated governance. Implementing these recommendations in conjunction with the Regional Plan would catalyze impact-oriented action to protect marine ecosystems across the Mediterranean basin.

COLLABORATIVE EFFORTS TO COMBAT MARINE LITTER IN THE MEDITERRANEAN: PAST EVENT HIGHLIGHTS

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The Plastic Busters CAP workshop for integrating marine litter into local and national planning was held back-to-back with the Plastic Busters CAP online side event targeting the Coastal Cities Network for a litter-free Mediterranean. The latter meeting, organized by LEGAMBIENTE, aimed to strengthen the involvement of local authorities and local communities in the collective fight for a litter-free Mediterranean and ensure that local governance perspectives were effectively streamlined into the Plastic Busters CAP technical workshop.

The overarching purpose was to contribute to a comprehensive marine litter management approach that effectively combines Ecosystem-based Management (EbM) and Integrated Coastal Zone Management (ICZM) strategies. An essential contributor to this event was the MedCities network, originally established in Barcelona in 1991, which has evolved to encompass 73 local authorities from various Mediterranean shores. Its transformation into a legal association has significantly augmented its operational capacity, enabling it to be a potent advocate for urban sustainable development throughout the Mediterranean region.

The event was structured around three pivotal topics, each delving into crucial aspects of tackling the marine litter problem:

1. PREVENTION AT SOURCE

This segment focused on strategies to prevent marine litter at its source. It emphasized the principles of the circular economy and the strategic implementation of waste reduction measures. The barriers identified included challenges such as a lack of policies to minimize waste generation, and insufficient support to develop waste reduction policies in municipalities. Actions to overcome these challenges included the creation of a one-stop-shop platform for knowledge dissemination, the formation of a dedicated working group, and the establishment of an independent agency to coordinate policy implementation.

2. INSTITUTIONAL CAPACITY BUILDING AND POLITICAL WILLINGNESS AT LOCAL LEVEL

Recognizing the vital role of local governments and their commitment, this segment emphasi-

zed the necessity of strengthening institutional capacities at the local level. The barriers included a lack of central coordination among different departments and the fragmentation of competences related to waste management. Actions recommended encompassed the creation of a working group to guide policy implementation, the establishment of an independent agency for coordinated policy execution, and the development of a shared circular strategy for waste reduction.

3. IMPROVEMENT OF WASTE MANAGEMENT INFRASTRUCTURE AND TECHNOLOGIES

In this segment, the discussion revolved around the enhancement of waste management systems. Key barriers identified included a lack of political interest in investing public funds in innovative technologies and infrastructure, as well as local resistance to adopting new waste management solutions. The recommended actions included organizing training for technical resources, implementing real-time monitoring systems, promoting the adoption of efficient waste management technologies, and encouraging the use of digital tools for waste management.

In conclusion, the event underscored several critical takeaways. First, it emphasized the need for a regional approach to addressing marine litter, recognizing that the problem transcends individual municipalities. Second, it stressed the importance of comprehensive training across various levels, encompassing not only municipal employees but also key local stakeholders, including educators, the private sector, and economic entities. Third, it called for centralizing management to combat the fragmentation and separation of competences and departments within local governance entities. Finally, the event emphasized the significance of increased financial support at the local level to enable and fortify effective measures against marine litter in coastal cities. The collective goal of this event was to drive change and action on a regional scale, forging a united front against the mounting challenge of marine litter in the Mediterranean, incorporating a comprehensive set of actions and strategies to overcome the identified barriers.

Plastic Busters CAP

Fostering knowledge transfer to tackle marine litter in the Med by integrating Ecosystem-Based Management Approach (EBA)into Integrated Coastal Zone Management (ICZM)

www.enicbcmed.eu/projects/plastic-busters-cap

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