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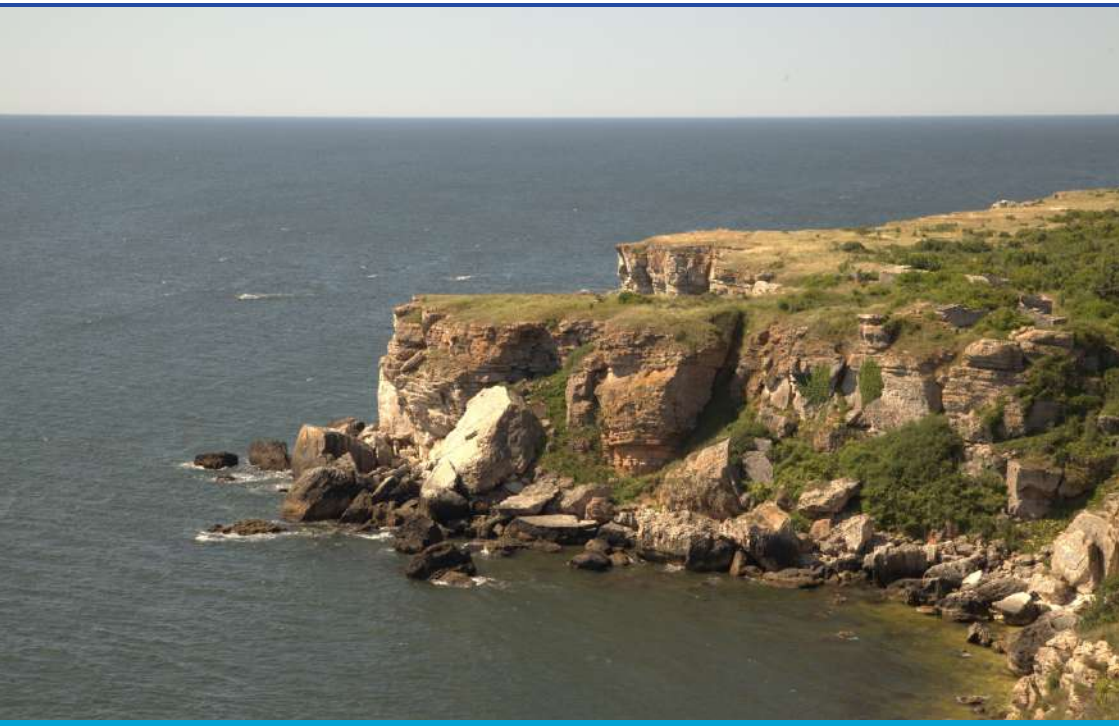

Guidebook on marine litter reduction

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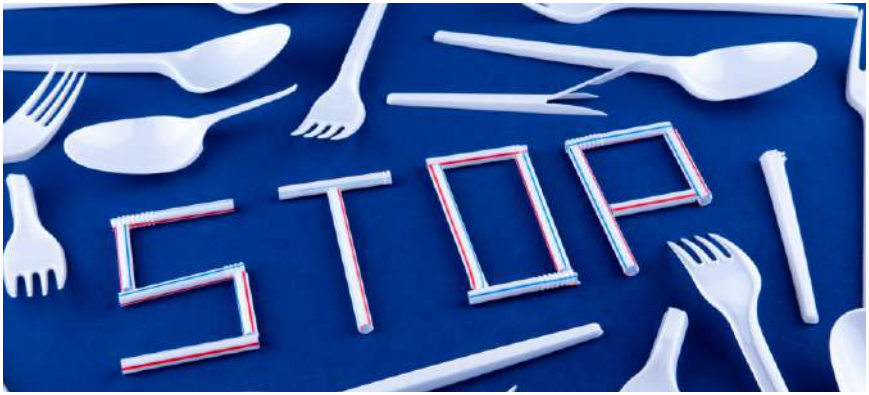
Introduction

Plastic pollution is a growing threat to all marine and freshwater ecosystems worldwide. It has emerged as a problem with the increasing adoption of synthetic polymers derived from petroleum since the 1950s. The wide application of plastics in many spheres of life has led to enormous growth in their production, overtaking most other man-made materials. It is estimated that 8.3 billion tonnes of virgin plastics have been produced to date. By 2015 about 6.3 billion tonnes of plastic waste had been generated: around 9% of them had been recycled, 12% incinerated, and 79% reached landfills or the natural environment. Packaging is responsible for around 3 billion tonnes of all produced plastic. This particular use of polymers has the shortest useful lifespan: from a few days to about a year. Substantial part of the problem of pervasiveness of plastic waste is that it takes a very long time for most types of plastic to degrade: from decades to centuries. Even when they turn into microparticles – less than 5 mm or smaller – they enter the food web in marine and freshwater ecosystems. While the impacts of microplastics are still under study, it is clear that they pose risks to the health of aquatic organisms and probably humans.

Recent assessments point that between 19 and 23 million tonnes of plastic waste reach the global water ecosystems each year, and the annual input of plastic into the seas, lakes and rivers may grow to 53 million tonnes per year by 2030. To slow down the accumulation of plastic in the environment, there is a pressing need for international action to reduce plastic consumption, increase waste collection and recycling, and support innovative sustainable solutions.



Various approaches to manage plastic waste are applied around the world. They include improved waste management practices, bans or levies on certain plastic products like bags and single-use products, introduction of alternatives to plastic packaging.
This guidebook provides an overview of the regulatory measures for prevention and reduction of plastic waste in the marine environment in Bulgaria, Georgia, Greece, Romania and Ukraine and highlights good practices and policy measures for the abatement of plastic pollution in the Black Sea Basin.

Regulatory measures for prevention and reduction of marine litter

Plastic waste reaching the seas and oceans makes up the foremost part of marine litter. Marine litter is any discarded or lost solid material found on beaches, floating in the sea or sunken to the sea bottom. Following this definition, marine litter comprises also metal, wooden, ceramic, glass, textile, paper or cardboard objects, apart from plastic items. Some of these materials degrade as part of natural process, while others may remain inert for a long time. The threats posed by plastic to the environment come from entanglement and ghost fishing, ingestion by marine organisms but also entry into the food web and release of chemicals used in the production of polymers. There are also economic and social impacts from marine litter, such as losses to fishery and aquaculture, costs to vessel owners and cleanup costs. Since plastic items comprise the majority of marine litter both by number and weight, and the production of plastic outpaces the rate of production of most other man-made materials, the focus is on plastic pollution in the marine environment.

The Black Sea shares a level of marine litter pollution similar to the other European seas. Likewise, the societies in the wider Black Sea Basin are concerned about the state of the sea and have adopted a number of legislative measures and practices to reduce and prevent pollution from marine debris.

Global conventions

The United Nations Convention on the Law of the Sea (UNCLOS) is the main international agreement regulating ocean related issues. It

requires contracting parties to protect the marine environment and address land-based and sea-based sources of pollution, among other matters. Since UNCLOS is a framework agreement, it does not contain specific provisions on marine litter.

The main international agreements related to marine litter are MARPOL, London Convention & Protocol and the Stockholm Convention.

The International Convention for the Prevention of Pollution from Ships (MARPOL) is the main international convention covering prevention of pollution of the marine environment by ships from operational or accidental causes. Especially Annex V of the Convention, dedicated to the prevention of pollution by garbage from ships, imposed a complete ban on the disposal of all forms of plastics into the sea. Annex V also requires each party to ensure the provision of facilities at ports and terminals for the reception of garbage. In addition, the Mediterranean and the Black Sea are designated as "special areas" by MARPOL, which prohibits the disposal of all plastics, as well as paper products, rags, glass, metal, bottles, crockery, dunnage, lining and packing materials, all kinds of food, domestic and operational waste, cargo residues, incinerator ashes, cooking oil, fishing gear and animal carcasses from all ships.

The London Convention is one of the first global conventions to protect the marine environment from human activities. Its objective is to prevent, reduce and where practicable eliminate pollution caused by dumping or incineration at sea of wastes or other matter. The Convention has been modernised through the London Protocol, which came into force in 2006. The parties to the London Convention and Protocol (LC/LP) encouraged action to combat marine litter in 2016. While all five countries, covered by the project, have ratified UNCLOS and MARPOL, the state of adoption of the London Convention and Protocol varies: Bulgaria has ratified both the Convention and the Protocol, Greece and Ukraine are parties to the London Convention, Georgia – to the London Protocol, while Romania is not a party to this international agreement.

The Stockholm Convention aims to protect human health and the environment from persistent organic pollutants (POPs). It is related to marine litter as it seeks to reduce or eliminate the emissions of unintentionally produced POPs, such as those released by plastic

materials as they degrade.
In 2016, the United Nations Environment Assembly recognised the presence of plastic litter and microplastics in the marine environment as a rapidly increasing serious issue of global concern that needs an urgent global response. As an answer to this call, the parties to the *Basel Convention* on the control of transboundary movements of hazardous wastes and their disposal adopted Plastic Waste Amendments, effective as of 1 January 2021. It is expected that these new regulations will lead to increased control of cross-border movements of plastic waste, environmentally sound management of waste, as well as its prevention and minimisation. They should diminish the likelihood that plastic waste is shipped to less developed countries, which lack the necessary management capacity and facilities to deal with it, and decrease the risk that plastics enter the marine environment.

Regional conventions

The Convention on the Protection of the Black Sea against Pollution (Bucharest Convention) signed in 1992 and ratified in 1994 involves the six Black Sea coastal countries: Bulgaria, Georgia, Romania, the Russian Federation, Turkey, and Ukraine. The appointed Commission on the Protection of the Black Sea against Pollution adopted in 2009 a Protocol on the Protection of the Marine Environment of the Black Sea from Land-Based Sources and Activities, whose aim is to prevent, control and to the maximum possible extent eliminate pollution from land-based sources and activities, including marine litter. In addition to this,

the Strategic Action Plan for the Environmental Protection and Rehabilitation of the Black Sea, adopted in 2009, includes several management targets related to marine litter:The Convention on the Protection of the Black Sea against Pollution (Bucharest Convention) signed in 1992 and ratified in 1994 involves the six Black Sea coastal countries: Bulgaria, Georgia, Romania, the Russian Federation, Turkey, and Ukraine. The appointed Commission on the Protection of the Black Sea against Pollution adopted in 2009 a Protocol on the Protection of the Marine Environment of the Black Sea from Land-Based Sources and Activities, whose aim is to prevent, control and to the maximum possible extent eliminate pollution from land-based sources and activities, including marine litter. In addition to this, the Strategic Action Plan for the Environmental Protection and Rehabilitation of the Black Sea, adopted in 2009, includes several management targets related to marine litter:

- Minimise ghost fishing caused by discarded, abandoned or lost fixed and floating nets, including those used in illegal/unregulated fishing activities
- Amend national waste strategies and national coastal zone management plans with the aim of coastal and marine litter minimisation
- Develop regional and national marine litter monitoring and assessment methodologies on the basis of common research approaches, evaluation criteria and reporting requirements
- Promote investment projects within national strategies or local plans to engineer, construct and install new solid waste recycling facilities, landfill sites and incineration plants, complying with the best available technologies
- Provide adequate port reception facilities for ship-generated wastes according to MARPOL
- Establish a harmonised fee or a cost recovery system on ship-generated waste.

The Black Sea Commission adopted in 2018 a *Black Sea Marine Litter Regional Action Plan*. The main objectives of the Regional Action Plan are to prevent and reduce to the minimum marine litter pollution in the Black Sea and its impact on ecosystem services, habitats, species, public health and safety, as well as to remove existing marine litter to

the possible extent in environmentally sound way. It aims to enhance knowledge on marine litter and to achieve sustainable management of marine litter in the Black Sea. An important goal is to coordinate activities with the Mediterranean Action Plan in order to achieve synergistic effects. Specific measures with a timetable for their implementation are part of the Plan.

The Convention for the Protection of the Marine environment and the Coastal Region of the Mediterranean, known as the Barcelona Convention, and its protocols together with the Mediterranean Action Plan form part of the United Nations Environment Programme (UNEP) Regional Seas Programme, under which the UNEP Marine Litter Initiative has been founded with numerous international conventions that directly address various aspects of marine litter. The Barcelona Convention includes eight protocols with different objectives, among which is to prevent and abate pollution mainly through dumping, runoff and discharges in the Mediterranean region. Greece is an active participant and contributor to Mediterranean Action Plan and hosts its coordinating unit.

Bulgaria, Romania and Ukraine are parties to the *Convention on Co-operation for the Protection and Sustainable Use of the Danube River* (1994). The International Commission for the Protection of the Danube River (ICPDR) supports work for the reduction of plastic waste in the large river basin, which ultimately has an impact on the state of the Black Sea ecosystem.

EU legislation

Three of the five countries represented in the project – Bulgaria, Greece and Romania – are implementing the environmental legislation of the European Union as its members. The EU legislation concerning marine litter often serves as a model and a benchmark for domestic reforms for the other Black Sea countries, as in the case of Georgia and Ukraine.

The Marine Strategy Framework Directive (MSFD) is the major binding legal instrument to protect the marine environment in Europe. Under the MSFD Directive member states are required to assess, monitor, set environmental targets and measures, to achieve a good environmental status (GES) of the European seas and oceans. The GES is expressed through eleven qualitative descriptors. Descriptor 10 focuses on marine litter and requires member states to ensure that "properties and quantities of marine litter do not cause harm to the coastal and marine environment". Following the provisions of the MSFD, each member state has to perform an environmental assessment every six years; set environmental targets; establish data collection and monitoring activities; and take action towards closing the distance to the good environmental status, including on marine litter.

The Waste Framework Directive provides important measures for the removal of litter and the improvement of water quality along with the MSFD. The updated version of this directive includes references to impacts on the marine environment and sets the goal of halting the generation of marine litter.

Specific legal acts that tackle the issue of plastic pollution are:

- the Packaging Directive, which harmonises national measures concerning management of packaging and packaging waste to prevent or reduce its impact on the environment
- the Plastic Bags Directive, which has set a target of reducing the number of lightweight plastic carrier bags to 40 per person by the end of 2025 and
- the Single-use Plastics Directive, requiring the replacement of ten single-use plastic products, such as cups, cutlery, plates, straws, cotton bud sticks, with sustainable alternatives from 2021 in order to reduce litter on the beaches.

The amendment of the *Port Reception Facilities Directive* from 2019

recognises the impact of derelict fishing gear on the environment and introduces provisions for collection of passively fished waste and discarded fishing gear in order to reduce the harm to marine organisms and the environment Broader documents as the EU's Circular Economy Action Plan include provisions for curbing plastic waste and reducing pollution of the marine environment.

National legislation

Bulgaria

As an EU member state since 2007, Bulgaria has transposed all relevant legislation concerning marine litter. The most important national legal acts concerning marine litter are the Waste Management Act (2012), Environmental Protection Act (2002), Waters Act (1999), and Maritime Spaces, Inland Waterways and Ports of the Republic of Bulgaria Act (2000). There are also a number of by-laws, related to the implementation of the above acts or international conventions, as for example Regulation No 15/2004 for delivery and reception of ship-generated waste and cargo residues from all ships. Marine litter, however, does not have a legal definition under Bulgarian legislation. Bulgaria was among the first EU members, which introduced a product fee on plastic bags in 2011. Since then, the fee per bag has increased several times. According to producers and governmental estimates this measure has diminished the total number of bags reaching the market by 50% compared to the period before the measure.
Currently, there is a National Plan for Waste Management 2021–2028. The Programme of Measures of the Marine Strategy of Bulgaria

2016–2021 includes regional level (implemented together with Romania) and national level measures. The relevant transnational measures are:

- Adoption of Regional Action Plan for Marine Litter for the Black Sea
- Improvement of the management of ship-generated waste
- Coordinated organising / supporting of annual campaigns to raise awareness of the business sector (merchants, beach concessionaires, beach users, fishermen, etc.) and the public (tourists, students, children, etc.) about the consequences for the marine environment caused by marine litter and the need for its recycling
- Amend existing legislation by introducing a permit regime for activities in the marine environment or other regulatory changes, if necessary.

There are two planned national measures:

- Ensure the phased implementation of the requirements of the MSFD by providing the necessary information, incl. financing mechanisms and management decisions
- Integration of "marine litter" in the existing legislation.

Georgia

Georgian legislation clearly specifies the importance of protection of water bodies and especially the Black Sea. According to the Water Law of Georgia, "Every person residing in Georgia shall ensure rational and sustainable use and conservation of water, and shall prevent its pollution, littering, and depletion" and the Law on Environmental Protection outlines environmental requirements for waste and states that "no waste may be disposed of in the sea and other water bodies". The basic legislation on waste is the Waste Management Code, adopted in 2014, and fully implemented since December 2019. The Code has been developed in line with the requirements of directives and regulations under the EU–Georgia Association Agreement (AA) and is based on four principles: precautionary principle, polluter pays principle, proximity principle and self-sufficiency principle. The Code does not regulate the issue of surface water pollution with waste. However, marine litter is closely linked to mismanagement of municipal waste, littering, unregulated illegal landfills, polluted rivers and flawed waste management mechanisms. Thus, the proper

implementation of the requirements of the Waste Management Code is one of the keys to regulating the amount of solid waste that ends up in nature and eventually in water bodies, before any regulations targeted specifically at marine litter are developed.

A National Waste Management Strategy for 2016-2030 and a National Action Plan for 2016-2020 are in place. The Ministry of Environmental Protection and Agriculture of Georgia (MEPA) is responsible for their implementation and is obliged to report every three years on the achieved progress. Each municipality is responsible for the development of a five-year plan for the management of municipal waste generated within its territory. Since large part of marine litter comes from land-based sources, proper management of household waste can be considered an important step towards the reduction of marine debris. Four municipalities have developed waste management plans for 2018–2022: Batumi, Ozurgeti, Keda and Kutaisi.

The first document to introduce the term “marine litter” in the Georgian legal framework will be the National Marine Environment Strategy and Action Programme of Georgia, which is under development and is expected to be adopted by 2022. According to the Proposal for a National Marine Environment Strategy and Action Programme of Georgia, a number of departments already work on environmental coastal and marine monitoring, most of which fall under the MEPA.

Greece

Greece as an EU member is implementing all directives and regulations of the European Union related to marine litter. Among the early national legal acts on the topic is Presidential Decree 55/1998 for the Protection of the Marine Environment in terms of shipping and ports. Law 2939/2001 on packaging and alternative management of packaging of other products, stipulates principles of sustainable management of packaging and waste systems, the obligations of packaging managers, and sets recovery and recycling targets at national level. It has established the Hellenic Recycling Agency. Municipalities and communities are obliged to provide a financial contribution to the Solid Waste Management Institutions on the basis of the cost of services provided to the municipalities and the quantities of solid waste corresponding to each municipality or community, including their respective residues from the Recycling Materials Selection Centres.

The National Waste Management Plan and the National Plan for the Prevention of Waste were adopted in 2015. These plans define waste management policies and strategies, and set specific targets and actions. Following the objectives set by the National Waste Management Plan, Regional Waste Management Plans have been established setting specific actions in each geographic unit of the country. The Hellenic Recycling Agency under the Ministry of Environment and Energy is responsible for the planning and implementation of recycling in Greece.

Law 2742/1999 for Spatial Planning and Sustainable Development, amended in 2018, defines management boards and their responsibilities in protected areas, and the activities allowed within these areas.

The National Strategy for the Protection and Management of the Marine Environment (2011) implements the EU Marine Strategy Framework Directive. Ministerial Decisions establish:

- environmental objectives and indicators for marine litter with the aim to reduce waste on the coasts and in the marine environment from anthropogenic sources
- national monitoring programmes for the continuous assessment of the environmental status of marine waters
- responsible institutions for the implementation of the monitoring

programmes of the quality of marine waters (Hellenic Centre for Marine Research, HCMR)
- approval of the Programme of Measures.

Romania

Romania, an EU member state, has the obligation to implement the requirements of the Marine Strategy Framework Directive into its marine waters, which are part of the Black Sea marine region.
The MSFD has been transposed into national legislation by Emergency Government Ordinance 71/2010 on establishment of Marine Strategy and approved by Law 6/2011, later amended by Law 205/2013.
Through Government Decision 432/2020, a Programme of Measures to achieve good environmental status of the Black Sea marine region was approved. The Programme of Measures includes common measures with Bulgaria emphasising regional cooperation.
There are 29 new measures and 5 measures for D10 Marine Litter that focus on:
RO-MN-023 Amendment of existing legislation, where necessary, to conduct economic activities in the marine environment (common measure with Bulgaria)
RO-MN-024 Improvement of ship waste management (common measure with Bulgaria)
RO-MN-025 Coordinated establishment and/or support of regular (annual) awareness-raising campaigns for the business environment (commercial agents, beach operators, fishermen, etc.) and the public (tourists, students, children, etc.) related to the sources and

consequences of marine litter on the environment and the need to recycle waste
RO-MN-026 Facilitating and implementing “fishing for litter” practices
RO-MN-027 Establishing plastic waste accumulation areas in the marine environment and elaboration of an action plan for their removal.
The proposed measures for Descriptor 10 Marine litter are sufficient to achieve GES, but they do not cover microplastics. It should be emphasised that information on this aspect of pollution is limited. Because of the insufficient data and transboundary impact of microplastics, Romania applies an exception under Art. 14 (a) of MSFD regarding the achievement of GES for marine litter.
The European Union adopted the Directive on single-use plastics to reduce the consumption of disposable plastic products, which have strong negative impact on the marine environment. Market restrictions and product marking are in force since July 2021, while product design requirements for bottles shall apply from July 2024, and extended producer responsibility measures shall apply from December 2024. Starting with July 2021, the sale of single use plastic products is prohibited, namely cutlery and disposable plates, cotton buds, straws and stirrers, sticks attached to balloons, products made of degradable plastic materials by oxidation and containers for fast food/drinks made of expanded polystyrene.
To this end, Member States should adopt legislation on measures to prohibit or restrict marketing of plastic products. In the meantime, however, the economic agents have already begun to adapt their business strategy to the provisions of the Single-Use Plastics Directive.

Ukraine

The first reference to marine litter can be traced to the Water Code of Ukraine (1995), which introduced a prohibition on dumping waste and rubbish in the water. The Code of Merchant Shipping of Ukraine, adopted the same year, excludes responsibility for discharging garbage as a result of emergency situations or port failures. However, already in 1996, in the Rules for the Protection of Inland Sea Waters and the Territory of the Sea from Pollution and Contamination, the registration of garbage handling operations is mandatory. A more detailed procedure of possible cases during the stay of ships and the handling of

waste in internal sea waters and the territorial sea of Ukraine is prescribed. The Waste Act (1998) dealing with waste management reconfirms the requirements for the storage and disposal of waste within the water protection zones and the zones of sanitary protection of water objects specified in the Water Code.

Starting from 2001 various rules and regulations have gradually introduced obligations to register hazardous substances in shipping and port operations; prevent pollution of the sea, inland waterways and port waters; treat solid waste generated in offshore oil and gas installation in the Black Sea and the Sea of Azov.

Amendments in the national waste legislation, in force since 2018, ban dumping of untreated household waste and introduce separate collection and treatment of specific waste flows. Burning of garbage is allowed only at specially designated enterprises for obtaining thermal or electrical energy. The law prohibits the design, construction and operation of landfills for household waste without the provision of groundwater protection systems, extraction and disposal of biogas and filtrate.

A National Waste Management Strategy 2030 has been adopted in 2017. Its goal is to create conditions for raising living standards by introducing a systemic approach to waste management at state and regional levels, reducing waste generation and increasing reuse and recycling. The Strategy defines the general tasks of waste management in Ukraine as well as the specific tasks for the various waste flows, including packaging. Three implementation stages are defined:

• Stage I (2017–2018): Institutional and implementation development;

drafting waste legislative package and development of the necessary technical regulations for waste management; R&D and awareness.

- Stage II (2019–2023): Development of standards, regulatory and methodology documents on waste management, measures related to the introduction of a new information system and development of information and educational programmes.
- Stage III (2024–2030): Ensuring the functioning of the information system, modernisation of the material and technical base of business entities for waste management; digitalisation of industries related to waste management and natural resource use.

Good practices

In addition to legal measures regulating waste management on land and at sea, various other approaches help to reduce marine litter. A selection of good practices at national and regional level suggests ways and ideas for applying working solutions and effective policies in the strive to limit plastic pollution. The proposed recommendations are grouped under the following categories: waste management, ship-generated waste and port reception facilities, fishing-generated waste and derelict fishing gear, awareness raising and actions.

Waste management

Several examples provide suggestions for good practices in solid waste management, especially plastic waste, that can eventually find its way to the sea. Those involve land-based sources of waste. Urban solid waste management should be based on reduction at source, applying the following waste hierarchy as a priority order in waste prevention and management legislation and policy: prevention, preparing for re-use, recycling, other recovery, e.g. energy recovery and environmentally sound disposal. The examples from the region and internationally reveal certain successful prevention and reduction at source measures and tools.

Plastic bag product fees

- Bulgaria introduced a product fee on plastic bags in 2011. It covered shopping bags produced from polymers with thickness of less than 25 μm and size equal or smaller than 390x490 mm. The initial fee was

0.15 BGN (0.08 €) per bag and was gradually increased to 0.55 BGN (0.28 €) in 2014. In June 2016 the product fee of 0.55 BGN was extended to all plastic shopping bags with thickness of less than 50 µm. It is paid by all producers and importers of shopping bags to the State enterprise for environmental protection activities. All economic agents releasing shopping bags are legally obliged to conduct public awareness campaigns about the negative impact of plastic bags on the environment. The plastic bag product fee has contributed to a 50% decrease in the usage of polymer bags according to the Ministry of Environment and Water. Surveys show that around 40% of customers avoid the use of thin plastic bags (under 50 µm) and have switched to multiple use bags (both plastic and textile) on a regular basis. While this has reduced the number of bags in the nature, there is no data about the impact on the marine environment since the introduction of the tool.

- Imposition of a fee on plastic bags purchased at all shops, excluding street markets and kiosks has been introduced in Greece. Initiating body was the Ministry of Environment. Starting from 2018 a charge has been introduced for the purchase of 50–70 µm plastic bags of 0.03 € + VAT, which has been increased to o.07 € + VAT in 2019.The stakeholders involved are numerous – traders, producers and importers of plastic bags, customers. The measure is applied in all shops besides kiosks and street markets. The success of the measure can be described as somewhat positive though it has been applied for a relatively short time to draw conclusions. Compliance seems higher in urban centres and in supermarkets, while it appears to be lower in rural areas and in the catering sector.
- Cyprus has also started collecting a tax of 0.05 € on all lightweight plastic bags since 2018. The initiating body was the Cypriot Government. Involved stakeholders include a wide range of categories: plastic bag producers and importers, supermarkets, traders, the general public. Funding source is the tax. The measure is too recent to assess its impact and what its influence on the terrestrial and marine environment may be.

The EU Plastic Bags Directive envisions that the annual consumption level should not exceed 40 lightweight plastic carrier bags per person by the end 2025. The first report on the annual consumption of plastic

bags in the European Union with data for 2018 is expected at the end of 2021.

Marine litter management as an integral part of solid waste management

Integrated Solid Waste Management (ISWM) takes an overall approach to creating sustainable systems that are economically affordable, socially acceptable and environmentally effective. An effective ISWM system considers how to prevent, recycle, and manage solid waste in ways that most effectively protect human health and the environment. The marine litter management should be an integral part of the solid waste management system. An integrated solid waste management system involves the use of a range of different treatment methods, and key to the functioning of such a system is the collection and sorting of waste. It is important to note that no single treatment method can manage all waste materials in an environmentally effective way. Thus all available treatment and disposal options must be evaluated and the best combination, which is suitable for a particular community chosen. Effective management schemes, therefore, need to operate in ways which best meet current social, economic, and environmental conditions of the municipality.

In addition, improving plastics recycling technology and infrastructure is a significant step to substitute and tackle plastic material, and produce recycled material of high-quality plastic and capable of being used for similar high-end and long-term applications. A number of projects are aiming at the improvement of quality recyclates, focusing

mainly on plastic packaging, waste produced from the construction and automotive sectors, waste from electrical and electronic equipment, agriculture or textiles.

Examples of best practices:

- Selective collection system: In 2017, Târgu Lăpuș, a small town in northern Romania had a recycle rate between 40–60%, ten times more than the rest of the country. This was possible after the implementation of a selective collection system. The municipality bought the bins and made them available to the inhabitants, who were obliged to use them. If someone from a unit of flats refused to use them, the entire unit was fined. Additionally a mechanical biological treatment station, which converts household waste into compost, was installed.
- Modernising solid waste management: Georgia has set targets for the improved management of landfills. These targets include establishment of new modern landfills with transfer systems or modification of existing landfills in accordance with EU standards considering separate cells for some specific waste types (e.g. asbestos, non-hazardous animal waste, etc.) by 2025, closing existing landfills by 2023, closing and remediating dumpsites by 2020, and minimisation of disposal of municipal biodegradable waste at the landfills by 2025.

  The country is working on closing existing landfills and opening new, sanitary landfills. One of the most important projects include the Tsetskhlauri regional landfill project, planned within the solid waste management project of Adjara region. Two landfills are to be closed in the Black Sea coastal cities of Batumi and Kobuleti and a new landfill is to be opened in Tsetskhlauri, 45 km north of Batumi. The project is financed by the European Bank of Reconstruction and Development (EBRD) and the Swedish International Development Cooperation Agency. Construction of a gas extraction system is also planned for installation after three to five years of operation.
- Removal of floating litter: Romania has a new tool that helps keep water clean: Ebisu. This is an entirely electric boat, which can collect plastic, metal, glass, textile litter with a width of up to 80 cm from the water surface, which is sorted and then recycled. The boat was

designed from scratch and assembled in Romania by collaborators of Act for Tomorrow Association.

- Collection of riverine litter: Illegal dumping by the population and illegal landfills present an important source of litter in the Black Sea in Georgia. The insufficient number of modern landfills and the abundance of illegal dumpsites, especially on riverbanks, pose a serious risk to the marine environment and the state of the rivers that carry a lot of domestic waste. As a result, marine litter is present along the entire coastal zone. At several rivers measures to prevent the litter from entering the sea are applied. At the mouth of the Supsa river a litter catching boom is installed and a waste collecting net is periodically placed in three Adjaran rivers: Bartskana, Mejinstkali and Kubastkali.
- Sorting waste as a social initiative: A sorting station accepting household waste has been opened in the Lyman district of Odesa region since August 2020. Part of the waste is recycled and part is used for energy recovery by high-temperature incineration. The sorting station is located at the parking lot of a shopping centre, where separate waste collection takes place. The project is a social initiative supported financially by the resale of materials to recycling companies. The station accepts clean and dry paper, glass, metal, and different types of plastic items.

  Katya Grechko, founder of the sorting station project, spent a lot of effort on its implementation. Funds for the project were raised through a crowdfunding platform. The site for the sorting station was chosen after negotiations with local authorities. As a result, the

residents of Lyman district have more opportunities to sort garbage properly and take care of the environment.

- Recycling batteries: The Ukrainian project "Batteries, give up!" organises recycling of batteries. The collected batteries are processed at the GreenWEEE plant in Romania. Boxes for batteries with the hologram “guaranteed processing” from “Batteries, give up!” are placed in shopping malls and stores in Odesa. The public is regularly informed about the recycling process through photo reports published on the project website.
- Integrated Solid Waste Management: The County of Aschaffenburg, Germany, implements a weight-based collection of residual waste, bio waste, and bulky waste, as well as the separate collection of paper from all households. In nearly all of its 32 municipalities the County operates collection centres (also known as “container parks” or “civic amenity sites”) to separately collect recyclable waste fractions such as glass and metals, and the County composts green cuttings. In addition, woody fractions are sent to biomass-fired power plants, residual waste is incinerated according to Best Available Technique (BAT) standards, biowaste is anaerobically digested, and subsidies are provided to households for home composting and for using re-usable nappies, and to households with incontinent persons. The ISWM system required considerable effort to acquire and process data for billing, accounting, and system optimisation purposes.
- Collection and sorting of waste: The city of Copenhagen now collects over 2,000 tonnes of plastic waste each year, intercepting 15% of all plastic packaging used by households thanks to Plastic ZERO funded by EU LIFE financial instrument. Nevertheless, addressing the technological challenges posed by difficult-to-sort plastics is of extreme importance. Types of waste, such as plastic films used in packaging or black plastic in computer monitors and other electronic equipment increase the difficulty of achieving success in this field. Given that there are large quantities of both types of waste, new sorting technologies are ready to be scaled up. However, creating viable markets for recycled and renewable plastics is not possible without a guaranteed stream of waste of the right quality, and thus better collection and sorting systems and uniform legislation is also required.

- Recycling technology: Petrochemical producer Total is field-testing a new recycling process to transform expanded polystyrene (EPS) from fish boxes into plastic clean enough for food contact packaging, aiming to broaden the options for plastic converters and support EU efforts to protect public health through its food safety policy. The fish boxes have been collected from supermarkets across Catalonia, Spain. They have been washed, treated and shipped to a chemical reactor in which their molecular building blocks will be torn apart. By mixing this recycled feedstock with fresh material to make polystyrene sheets the producer aims to provide transformed usable plastic of quality as virgin polystyrene, which is suitable for new yoghurt pots and meal trays. Once production has been optimised, project partners will run health and safety tests on the plastic and apply to the European Food Safety Authority (EFSA) to launch it on the food market. There are some attempts also in developing innovative methods of recycling material that contains hazardous substances, or finding new end uses for plastic waste that is currently non-recyclable. Other projects are upcycling polystyrene packaging into new food containers that meet food safety standards in partnership with major retailers (LIFE EPS SURE).
- Substitution and tackling of plastic material: Bio-based materials can substitute plastics in a range of applications. Attempts have been made for designing and manufacturing biodegradable and compostable plastics, bringing them to market or close to market. End uses include coffee capsules, food packaging, netting, adhesives and mulching films for agriculture. For instance the LIFE BREAD4PLA

project turned bakery waste into bags to pack bakery products, addressing EU policy on food waste and highlighted that the new bioplastic was found to extend shelf life. Viable business opportunities are also being created through projects that are upcycling plastic waste and putting it back in the loop to produce new products, for instance in the construction, automotive, logistics (pallets) and footwear industries.

- Processing of non-recyclable plastic waste: using non-recyclable plastic waste from the automotive, electronics and packaging sectors are bombarded with highly energised particles that turn polymers into gas, a process called catalytic hydro-gasification with plasma (CHGP), turning plastic waste into high-quality methylal. CHGP is more efficient, versatile, cleaner and has lower investment costs than other technologies that are normally complementary to traditional mechanical recycling. Methylal is a colourless liquid that is used as a chemical solvent and fuel additive. It's a lucrative business, with a market worth an estimated €5.2 billion per year. Yet only 6% of the 800,000 tonnes or so used annually in Europe is made in the EU. The pilot study is developed in the framework of the LIFE ECOMETHYLAL project in Spain, and aims to reduce landfilling, add value to plastic waste and decrease imports of materials derived from fossil fuels from non-EU countries.

Measures for prevention and reduction of solid waste by producers

The promotion of the circular economy through increased resource efficiency facilitating sustainable consumption and production patterns, including cradle-to-cradle life cycle design, high quality recycling and sustainable packaging, encouraging extended producer responsibility and environmentally responsible fishing and maritime transport practices, are crucial components for the prevention and management of marine litter. Increasing capacity building and sharing of experiences and good practices between countries and stakeholders on marine litter monitoring, is another factor that could assist in addressing the issue.

- Extended Producer Responsibility schemes (EPR): Under an EPR policy approach producers, manufacturers, brand owners and first importers bear the legal and financial responsibility for collection, recycling and

end-of-life management of products and packaging. Assigning such responsibility could provide incentives to prevent waste at the source, promote product design for the environment and support the achievement of public recycling and materials management goals. EPR programmes can cover costs through fees per unit, which may vary depending on the cost to recycle or dispose of in an environmentally sound manner a product at the end of its life. Within the EU the trend is towards the extension of EPR to new products, product groups and waste streams such as electrical appliances and electronics. The approach is also part of the National Waste Management Programme of Georgia.

- New packaging technology: The Coca-Cola system in Romania is taking another step to get closer to its vision of a circular economy. The company announced that it has invested 2 million euros in the factory in Timișoara and brings KeelClip technology to Romania, replacing the plastic foil used for the dose boxes with a collective packaging made of biodegradable and recyclable cardboard. The impact of the investment is reflected in a decrease of 100 tonnes of plastic placed on the market for 2021, and in the coming years this figure will double. It also reduces energy consumption used during production by one sixth.
- Recycled plastic in the retail sector: Lidl Romania, together with PreZero, the environmental division of the Schwarz Group, introduced from the beginning of 2021, for the first time in its assortment of in-and-out products, household items made of at least 95% recycled plastic. Plastic waste from households is collected by PreZero,

cleaned, shredded, and then processed into regranulated plastic, which creates new, high-quality, environmentally friendly products. Over 1,400 tonnes of recycled plastic have already been used in the manufacture of household items available in Lidl stores worldwide.

- Green Public Procurement: The Green Public Procurement (GPP) is a fundamental political instrument to promote sustainable development and to move towards a green economy, which encourages the development of products and services that maximise social and environmental benefits, given the big share of the economy that represents the public sector in most countries. GPP has the potential to transform markets, increase the competitiveness of industries, save money, conserve natural resources and promote job creation. The introduction of targets for recycled plastic composition in products purchased by the public administration is crucial to facilitate the creation of markets for recovered plastic, boosting the demand for used plastic packaging, the main part of marine litter.
- Deposit, Return and Refunding System: the packager or the seller establishes a system to physically recover their packaging. To guarantee this recovery, the packager or the seller collects an amount by way of deposit from the customer and this amount is reimbursed when the packaging is effectively returned. This system has demonstrated high rates of recovery. It is a suitable example for fast food chains and take-away restaurants, services that tend to generate problems of littering when located near the beach. As this system is not always easily applicable, it is recommended to be established on a voluntary basis with the sectors involved.
- Integrated Management System (IMS): an important measure for preventing waste generation, according to which the packaging company pays for the weight of the packaging placed in the market to the managing company of the IMS. The collected funds finance the selective waste collection, as well as the transportation and separation of the different materials. This system is normally established on a mandatory basis for all producers of products with plastic packaging.

Measures to prevent and reduce solid waste generated by consumers

Approaches aiming to introduce sustainable consumption patterns include some of these activities:

- Provide free reusable alternatives as a solution in order to present realistic scenarios of reducing waste, such as single-use plastics
- Promote agreements for waste management, provide recycling certificates and eco-labels that may stimulate the market to reduce waste, particularly in the tourism industry
- Increase awareness of key actors, residents and the general public regarding the impacts of marine litter in the economic, social and environmental aspect, and provide examples of good practices adjusted to the local needs, history and culture of an area. Raising awareness and advising citizens how to recycle plastic waste promoted with the active contribution of local authorities is important.
- Facilitate participation of stakeholders in networks committed to take action to prevent, reduce, monitor and manage marine litter
- Increase participation of all relevant stakeholders, residents and the general public in cleanup campaigns, monitoring actions, and decision-making processes. It is important to communicate results to the public and provide positive feedback about changing consumer habits. For instance, demand for environmentally-friendly packaging is growing as shoppers pay increasing attention to the waste streams of their supermarkets.

Examples of best practices:

- Constanța Municipality prohibited the use of single use plastic products during actions and events organised by the Municipality, as well as by public institutions subordinated to the Local Council of Constanța. The decision from December 2019 is the outcome of a Mare Nostrum initiative.
- In August 2019, Brașov County Administration voted to ban plastic dishes, glasses, and cutlery at public events. From October 2019, in all kinds of events are used dishes made of biodegradable and compostable materials, certified according to EN 13432. In case of non-compliance, the event organiser will no longer be able to participate in other events that will take place within Brașov Municipality.
- LIFE DEBAG project arranged an intensive awareness campaign in Syros island, Greece, to prevent and reduce plastic bag pollution in the marine environment targeting mainly residents and actors from tourism (hotels, shops, supermarkets etc.). Over 10,000 reusable cotton shopping bags were distributed as a provision of free reusable alternatives, over 6,000 students in 56 schools were informed, and persuaded more than 200 shop owners to sign a voluntary agreement to reduce the use of single-use plastic bags. Monitoring of awareness was accomplished through surveys of supermarket customers, counting of plastic bags during beach cleanup campaigns, airborne drone and underwater camera surveys. In addition, a series of national consultation forums with all relevant stakeholders to define policy agreements for single-use plastic bags was arranged to provide policy recommendations, many of which were incorporated into the law for lightweight plastic bag fee. During the first two years of the project a 70% reduction in plastic bags on the beaches of Syros was recorded, as well as a 30% reduction in plastic bags on the seafloor in Ermoupolis Bay.
- Responsible beach bars project launched by the Spanish Fundación Biodiversidad aimed to encourage pro-environmental behaviour and sustainable economic development in traditional beach bars “chiringuitos” serving food, snacks or drinks on the beach. A “Decalogue of Good Environmental Practices” emphasising sustainable use of energy, water, and local products, proper waste management,

responsible employment practices, as well as environmental education and awareness provided guidelines for the operations of chiringuitos. To support compliance with the Decalogue the Foundation launched the "Responsible Chiringuitos Awards" with the main objective to reward the efforts of beach bars to improve their own sustainability and relationship with the environment. During four editions of the award from 2012 to 2015 a total of 263 beach bars participated with more than 500 initiatives and 62,500 € in prizes were distributed among the 24 winners. In 2016 the award was replaced by a non-monetary recognition of the best environmental initiatives. The project later transformed into a clean beaches initiative and had a lasting impact on the conservation and protection of the coast. Its example can be replicated in many Mediterranean and Black Sea countries, aiming to stimulate environmental and social responsibility in businesses working on the beaches.

Ship-generated waste and port reception facilities

The disposal of ship-generated waste poses a significant threat to the marine environment. It has an impact on human health and has substantial economic impact. Although land-based sources are the main causes of waste in marine waters, marine sources are responsible for a significant part of marine litter, with their share in the EU estimated at about 32% and reaching 50% in some sea basins.

A major change concerning marine litter collected during regular fishing operations at sea is the addition of a new waste stream to be treated in European ports. The EU's Port Reception Facility Directive

establishes the right of delivery of passively fished waste or waste collected in nets during fishing operations at EU ports starting from the second half of 2021. The Directive also calls for the introduction of a cost recovery system based on an indirect fee for waste delivered at port. That indirect fee should be due regardless of the delivery of waste and should give the right of delivery of the waste without any additional direct charges. Since the fishing and recreational sector, contribute to the generation of marine litter, they should be also included in the cost recovery approach. These changes come as a result of the accumulated experience in several EU states, as well as within a number of projects.

Application of No-special-fee system to ship-generated waste and marine litter caught in fishing nets

The "No-special-fee" is a charging system where the cost of reception, handling and processing (including infrastructure) and disposal of ship-generated wastes, originating from the normal operation of the ship, as well as of marine litter caught in fishing nets, is included in the harbour fee or is charged to the ship irrespective of whether waste is delivered or not. It encourages ships to deliver waste ashore and to avoid undesirable waste streams between ports, thereby encouraging a sound sharing of the waste burden. The fee for reception, handling and disposal of waste and garbage is paid with the arrival of a ship in any port of the participating countries as part of or in addition to the port dues – irrespective of whether or not that particular ship will make use of the reception facilities. The "No-special-fee" system constitutes one of the prerequisites for a substantial decrease in the number of operational and illegal discharges and thus for the prevention of pollution of the marine environment from ships. All these types of measures require a strong enforcement and control system.

Indirect Fee System for the Collection of Ship Waste in Cyprus

The Cypriot Port Authority has implemented an Indirect Fee System which means that every ship that enters Cypriot ports is charged a fee that gives it the right to dispose of its waste (solid waste, sludge and sewage), regardless of whether or not the ship will actually dispose of any waste. The quantity of waste that these ships are allowed to

dispose of is defined as “reasonable” for the specific type of ship. The Indirect Fee System provides an incentive for ships to deliver their waste to ports rather than to dispose of it at sea.
The treatment of the collected waste in Cyprus depends on its type. Recyclables are collected separately and sent for recycling, mixed waste is sent for disposal and, where possible, sewage waste is sent to sewage treatment facilities in Cyprus.

Waste generated by fishing and aquaculture

Each year huge amounts of plastic items enter the seas and oceans, with fishing-generated waste and derelict fishing gear accounting for a significant part of them. How this gear and waste get into the sea: through intentional disposal or in the event of an accident when fishing gear is lost at sea, and through abrasion when small pieces of plastic are chipped or broken away and fall into the water.
Around one fifth of fishing nets and gear owned by EU ships are intentionally thrown away or lost in accidents, which is estimated at 640,000 tonnes per year. Over a quarter of all marine litter on beaches comes from fishing nets and gear but only 1.5% of old fishing nets and gear are recycled.
The negative environmental, economic and social impact of discarded or lost fishing gear and nets is well documented. It ranges from ghost fishing – entangling and strangling of marine life in abandoned nets – to seabed pollution and smothering, as well as ingestion of microplastics by zooplankton and filtering organisms. Shipping, fishery and aquaculture industries are also affected from damage to machinery and

repair costs. The tourist sector is also facing substantial costs for cleaning beaches.

Collection and recycling of fishing nets and gear

How to directly and efficiently reduce marine litter from the fishing industry, what kind of waste from fishing can be recycled and how to organise the participants in the process of waste collection and recycling and the use of the resulting product? The answer naturally relates to fishing and the conservation of marine biodiversity. One of the most harmful and dangerous types of marine litter is the lost or abandoned fishing nets and fishing gear. Many marine species and birds are entangled, injured and killed, and the phenomenon is known as "ghost fishing". Many of the nets are of high-quality fibre that is successfully recycled.

Collecting and recycling fishing gear after the end of their useful lives and returning them to the production cycle with a successful business model is a task that has first been accomplished by some NGOs. They helped create and establish an inclusive business model engaging various directly involved stakeholders. These are fishing communities, local authorities, other local agencies and various businesses. The beginners were World Animal Protection, Fathoms Free, Living Sea, International Fund for Animal Welfare, launching initiatives to tackle the problem of ghost fishing on a global scale. In the beginning, they collected and recycled old fishing nets that they took from fishermen, and in return they gave them goods – shoes, socks, T-shirts, backpacks, sports accessories – made of fibres and materials from recycled nets and other fishing gear waste. The value of the nets received by fishermen was being returned to their community in the form of commodities.

Gradually systems of incentives for fishermen have been created to promote awareness and the benefits of responsible environmental behaviour. The collection of old nets has been facilitated, floats with bells and marking buoys for nets have been distributed, and fishermen have been involved in trawling projects for litter and drifting nets. In addition, local authorities and the general public have brought in diversity and revenue with supportive events such as festivals, musicals and artistic events, such as sculpture or installation from old nets.

Targeted recovery of ghost nets and establishment of derelict fishing gear management schemes

On the basis of the Regional Plan for Marine Litter Management in the Mediterranean a "Fishing for Litter" (FfL) protocol has been proposed as one of the most important reduction and removal measures of marine litter from the marine environment (mainly from the seafloor), by involving the key sector of fishing industry. There are two types of "Fishing for Litter" practices: active and passive. Active practices are specifically performed to remove marine litter and fishermen involved are paid. Passive practices are carried out by fishermen during their normal fishing activities without financial compensation. In active practices the following can be considered:

(1) Marine litter removal practices during specific fishing trips to remove litter from hotspots with marine litter accumulation or from protected areas with financial compensation of the fishermen involved

(2) Retrieval of derelict (abandoned, lost or otherwise discarded) fishing gear at sea where individual fishermen are contracted to retrieve nets.

The FfL initiative may have multiple benefits in terms of monitoring, environmental, social, economic and scientific benefits. This type of practices substantially contributes to raising awareness about the problem within the fishing sector, in other sectors and the general public, and about the need for better waste management. It has the potential to gain the support of the fishing industry, harbour authorities and local authorities.

According to the FfL protocol the retrieved litter is registered by

number, type and total weight. The tasks of recording the composition and weight of waste brought ashore might be developed daily on the quayside by qualified personnel and monthly data might be reported to the FfL practice coordinator accordingly. Composition is recorded in order to identify sources of marine litter, and the weight to ensure the final waste management. Weight and composition of marine litter collected in each of the participating harbours, as well as data related to harbour details (number of participating vessels, main vessel type) might be reported to the national competent authority for the protection of the marine environment on a monthly or annual basis. This information might be periodically reviewed by the competent authority to evaluate the success of FfL initiatives, and might look at such factors as costs, benefits and governance. It may also help to locate accumulation areas and support an optimised strategy to further focus on hot spots.

FfL is mainly considered at local scale and putting the fishing industry, coastguards, port authorities, local authorities and waste management companies together creates a value chain for this type of litter.

Since marine litter is a transboundary problem, a coordinated, harmonised and coherent approach is the best way to tackle it. At all levels, cooperation in FfL practices should be based on the exchange of relevant information and on addressing significant transboundary marine litter issues. Agreements should be made so that any vessel involved in the FfL practice can land non-operational waste at participating harbours in Mediterranean countries and other neighbouring countries.

A Guide on best practices for Fishing for Litter in the Mediterranean was adopted in 2016. The objective of this guide is two-fold: to provide technical guidance on the mechanism to remove litter from the sea in an environmentally friendly manner, ensuring negative impacts on marine environment and ecosystems are avoided, and to provide guidance on the process of involving the stakeholders responsible for the implementation and coordination of FfL practices.

Examples of best practices:

- Fishing for Litter activities have been widely applied mainly in the North-eastern Atlantic Ocean, and specifically in the North Sea. FfL

actions in the Baltic Sea and in the Mediterranean Sea have been undertaken more recently. At global level, one project is under development in the United States aiming energy recovery from the collected fishing gear. In the Mediterranean, it has been implemented by the projects Ecological bags on board (Spanish East Coast), Ecopuertos (Andalusian Coast, Spain), DeFishGear (Adriatic Sea), Port of San Remo (Ligurian Coast, Italy) and Port of Rovinj (Northern Adriatic Sea, Croatia). Fishing boats in places like Galicia and Sardinia are bringing used nets and other plastic gear back to port rather than dumping them at sea. They are happy to be fishing for litter as a direct result of the stakeholder engagement efforts of projects like Clean Sea LIFE and 3-R Fish.

- DeFishGear project and the Healthy Seas initiative have been conducting targeted recovery of ghost nets and collecting nets from fishing and aquaculture industries for regeneration and up-cycling by turning them into high-quality materials and textile products. Operations were conducted in all countries of the Adriatic Sea and Mediterranean countries and provide background knowledge and skills for the sustainable valorisation of collected materials.
- UNEP/MAP conducted a survey-based regional assessment of abandoned, lost or discarded fishing gear and ghost nets (ALDFG), as well as marine litter, relying on information collected mainly from fishermen in eleven Mediterranean countries. The target groups were fishermen, sailors, skippers, vessel owners, divers, representatives of unions and cooperatives of fishermen, etc. The overall aim of the survey was to (a) collect data on marine litter and fishing gear; (b)

provide opinion-based assessment of current trends related to ALDFG, as well as marine litter; (c) provide information on practices that contribute to the problem but could be part of the solution; (d) take stock of available information on measures and regulations that are in place concerning the management of ALDFG; (e) provide insights into opinions, behaviours and perceptions of fishermen and the other fisheries related target groups on the issue; (f) capture what the fishermen think about their role in the management of ALDFG and assess their intentions to engage themselves in "Fishing for Litter" schemes. The survey contributed some valuable insights and findings, and confirmed that that there is a problem in the region. Further work is needed to make accurate estimates of the extent of the problem for the Mediterranean at local, national and regional level in order to facilitate effective decision making and management responses.

The most precious catch

The Bulgarian company Black Sea Catch, producer of seafood preserves from bonito and bluefish, launched a fishing for litter project together with a fishing association. The initiative named "The most precious catch" collected over 7 tonnes of fishing nets with a total length of 50 km during the period 31 October 2020 – 15 April 2021 from Bulgarian coastal waters. In the initiative were involved 25 fishing ships and it provided information about the distribution of floating debris and concentration patches. The collected nets were recycled with the help of the Precious Plastic community. The outcome of the initiative demonstrated that larger amounts of plastic require industrial scale approaches that can turn the collected waste into a valuable material with new applications. Black Sea Catch invests one percent of its revenue for supporting projects, working for the improvement of the environmental state of the Black Sea.

Transportation of old fishing nets and gear and further processing

Various organisations have been added to the joint efforts to build a comprehensive inclusive business model with many stakeholders involved. A major challenge has been the logistics of collecting and storing old fishing nets. The nets must be cleaned of remnants of fish

and marine organisms, stored in containers and transported to the processing plants that are not close by. Only two plants in the EU are specialised in recycling of fishing nets – in Slovenia and Denmark. Although plastic recycling has been around for decades, not everyone is as specialised. Therefore, long-distance transport and customs clearance of containers are also elements of logistics.
Transportation, mechanisation and further processing – chemical repolymerisation or mechanical shredding and recycling – include additional business units. Business models have been expanding, most often to public-private partnerships that also engage manufacturers, researchers, marketing platforms for new high-quality products, new materials, brands, marine sports and activity consumer groups, and others.
These successful business models are better known by their project names, initiatives and products, all related to the recycling of fishing nets. They return resources to the fisheries communities, create a zero-waste cycle, foster a responsible attitude to nature, generate business profits and create conditions for sustainable use of marine resources.

Successful brand names and products
Bureo participates in a partner network for marketing, known for the implementation of products from NetPlus material produced from recycled fishing nets. It is committed to persuading industry leaders to integrate NetPlus products into their supply chains. Together with other organisations seeking to bring a new dimension to industry

standards, Bureo works closely with these partners to expand and replicate responsible materials and production solutions for the benefit of the ocean and coastal communities. An iconic item is a skateboard with a top made entirely of recycled fishing nets off the coast of Chile. Fourth Element is among the world leaders in the production of various swimwear. Its centre is in Cornwall, South West England, a region with surf clubs, divers, sailing and water sports enthusiasts, and many volunteers for diving and environmental campaigns. Fourth Element uses the Ocean Positive concept for marketing and engagement with marine environmental issues. The company's swimwear is made of Econyl, a 100% recyclable nylon fibre, with a significant portion coming from recycled fishing nets. It is produced by the Italian company Aquafil, which has refined its manufacturing technology to produce high-quality nylon fibre mainly from recycled nets (78%) with other nylon waste additives. Based on this fibre, the British company produces a wide range of products.

Technological solutions - improvement in the opportunities for recycling

RETRAWL is a particularly interesting technological project of Plastix Denmark and partners using innovative recycling technology that converts fishing waste and gear, mainly old fishing nets, trawls, ropes and steel elements, into high quality new products. It closes production cycles up to international standards and contributes to the transition from a linear to a circular maritime economy. At the same time, technology offers enormous potential for a global solution to some of the marine litter problems, namely ghost fishing, which not only causes severe damage to marine life and the marine environment, but also entails significant economic losses. Innovative technology and processes solve a serious waste stream problem, contribute to a circular blue and green economy and reduce waste disposal, marine pollution, CO_2 emissions and the loss of valuable resources, while meeting the objectives of enhancing the capacity and viability of economy. The project partners seek to extend the exploitation of the technology to other European and global markets with an initial focus on Spain and to explore and implement a closed or near-closed cycle, suitable as a business model for the maritime industry.

Awareness raising and actions

Awareness raising activities aim to bring the issues raised by the growing plastic pollution of the seas and oceans to public attention. Targeted actions direct community efforts in areas, such as:

- Motivate citizens, environmental NGOs and students to participate in citizen science beach litter monitoring and cleanups of beaches to help collect data and protect the coastal and marine environment
- Mobilise local coastal communities for awareness raising on prevention of marine litter
- Raise public awareness for sustainable management of marine litter and create mechanisms for marine litter reduction.

Examples of good practices

- Since the mid-1990s beach cleanups have been a popular form of awareness raising on the environmental state of the Black Sea. Since 1996 International Black Sea Day October 31st has regularly involved beach cleanup activities of the coastal communities in all littoral countries. The date is now firmly established in the environmental calendar of all Black Sea states.

  With the implementation of the MSFD governments and the third sector have been working for the creation of mechanisms that enable society to perceive the impact of litter on the marine environment, to identify land-based activities that are sources of pollution and collectively arrive at solutions to reduce that impact – in particular solutions that can be implemented locally but have a regional effect.

  Initiating bodies of the campaigns have been governments,

environmental NGOs, scientific institutes, businesses and Black Sea local authorities. Involved stakeholders included governments, NGOs, businesses, educational and scientific institutions, concerned citizens, local communities.

Funding sources have been various, mostly funding from EU and national programmes, as well as volunteer work.

- Mare Nostrum NGO marks every year the Black Sea International Action Day by organising public campaigns to inform coastal communities, authorities, and the public about the importance of marine and coastal ecosystems for local and regional development and the problems that may arise there. Starting from 2016 Mare Nostrum is organising a cross-country running with the aim to raise awareness on the impact of marine litter. It includes three routes: one for children and their parents, one of 4 km and one of 7 km. The number of participants increases each year and in 2018, 1,500 runners accepted the proposal to run for the Black Sea. Also in 2018 a new challenge for all participants was launched: to prove their civic sense by gathering cigarette butts from the beach during their run and bring them to the "Mucometru", a new unit of measurement specially designed to record the amount of cigarette butts. The participants responded enthusiastically and collected 25 units, equal to about 2,500 cigarette butts.

  More and more NGOs dedicate their awareness efforts to recycling and sustainable waste management practices. Moreover, many companies started to do cleanup activities as part of their Corporate Social Responsibility actions.
- On World Environment Day 2021, a "moving" recycling campaign took place in 15 European countries to promote circular economy. The European Recycling Tour aimed to remind people that maintaining cleanliness in public spaces is a real joint effort. The campaign, launched by Every Can Counts encourages the recycling of aluminium cans. Volunteers participating in the European Recycling Tour were seen in Austria, Czechia, France, Greece, Hungary, Ireland, Italy, Montenegro, the Netherlands, Poland, Romania, Serbia, Slovenia, Spain and the United Kingdom.
- Scorțoasa School from Buzău County, Romania, received tablets as a

result of the involvement of over 150 students of the Mihai Viteazu National College, Bucharest, volunteers of the “Floare de Colt” Ecological Foundation, who selectively collected over 900 kg of waste. This helped the school to offer the same quality of education under the new reality of online courses. The students involved in the project, lasting for three months, selectively collected 920 kg of waste, over 9 kg of plastic bags, metal cans, paper and cardboard, batteries, etc. They uploaded photos of the collected litter on a dedicated platform, and the litter was exchanged at the end of the campaign for the tablets.

Adopt-a-Beach, Beach-watch and title award for protection of citizenand groups

Concepts such as titles and certificates for the protection of marine environment have always been beneficial. Public participation in these types of projects and community initiatives plays a significant role in increasing general understanding of the litter issue. Such schemes enable people to become actively involved in practical measures to reduce marine litter and raise awareness of the need to prevent coastal pollution. Certificates and various types of recognition promote the responsibility and stimulate local people to volunteer and undertake quarterly beach cleans and litter surveys of their chosen beach.

“Adopt-a-Beach” is a concept when a school, a local community, an NGO or a group of volunteers “adopts” a beach and takes care of that

beach by regular cleanup events. Marine Conservation Society (MCS), UK, co-ordinates a range of projects that encourage public participation in marine conservation, including “Adopt-a-Beach” and “Beach-watch”, the biggest beach clean and litter survey projects in Europe. MCS has been collecting data on marine litter through “Beach-watch” since 1993 and “Adopt-a-Beach” since 1999 and has thus amassed a large bank of data detailing both type and source of litter to be found in the UK. The protocols and methodology used are compatible with other systems on a European and worldwide basis. “Beach-watch” provides data for the International Coastal Cleanup on litter surveys and beach cleans over the same weekend in September, providing information on the global extent of marine litter. “Adopt-a-Beach” data is fed into the OSPAR project on marine litter. The methodology used by OSPAR is based on the Adopt-a-Beach surveys. Beach Ambassador title aims to encourage sustainable behaviour and support the public to take personal responsibility in public places by preventing littering, encouraging “pack it in, pack it out” concept to reduce overflowing bins and recycling. Beach Ambassadors are mainly locals so they are able to share stories and local knowledge with the community and the general public they engage with. The Beach Ambassador concept has been adopted in several marine reserves, touristic areas and beaches.

Marine and coastal environment quality certificates

Particularly important for coastal countries, which attract touristic flows due to their sea and sun provisions, are beach certificate types and efficient recognition of the quality of beaches and bathing waters they provide. Certificates widely recognised at international or national scale (Blue Flags, Bathing Water Identity Registry etc.) are an important stimulus for promoting the good quality of the marine and coastal environment. In addition, these awards are a dynamic way for promoting consistent monitoring and assist in immediate management responses to prevent coastal pollution.

Blue Flag was created in France in 1985 as a pilot scheme, under which coastal municipalities were awarded the Blue Flag on the basis of criteria covering sewage treatment and bathing water quality. In the

European Union, the water quality standards are incorporated in the Water Framework Directive. The Blue Flag is a certification by the Foundation for Environmental Education (FEE), launched under the Blue Flag Programme, attesting that a beach or marina meets its stringent standards. The Blue Flag is a trademark owned by FEE which is a not-for-profit, non-governmental organisation with members in 49 countries all over the world. The Blue Flag criteria include high and strict standards for water quality, safety, environmental education and information, provision of services and general environmental management criteria. The Blue Flag certification is sought for beaches and marinas as an indication of their high environmental and quality standards. Certificates, or "awards", are issued on an annual basis to beaches and marinas. In 2021 over 4,800 beaches and marinas globally were awarded the Blue Flag. Most countries in the Mediterranean and the Black Sea participate in the Blue Flag Programme.

Raising awareness and cleanup campaigns

Awareness-raising and cleanup campaigns apart from their direct benefits for the environment through the removal of litter, empower citizens to become part of the solution. Participating in beach cleanups may result in increased well-being – through a sense of satisfaction, increased value and personal reward – and marine awareness for the individuals engaging in the act. Such actions often encourage continued commitment to that activity and enhance pro-environmental behaviour models in other aspects of daily life, such as personal transport choice

or energy use. When organising a cleanup campaign, it is important to record the types and quantities of collected items, to try to identify the potential sources, communicate the results to the public and provide positive feedback on changing consumer habits.

Examples of best practices:

- The annual International Coastal Cleanup campaign, which is coordinated globally by Ocean Conservancy (US-based ocean conservation NGO) and its many global partners, has been operating since 1986 in the US and globally since 1989. The ICC has engaged 132 countries and territories for over 30 years, involving hundreds of NGOs, government agencies, various private sector and other civil society groups and organisations at regional, national and local level. The ICC involves hundreds of thousands of volunteers and organisers who annually survey beaches and underwater sites to remove debris around the globe and record valuable information on the types and sources of marine debris using a standardised data. The cleanup now includes activities along the banks of rivers, lakes and streams, as well as underwater sites along the coast and inland water bodies. A number of Mediterranean countries participate in the ICC. The ICC is unique in that its activities of collecting data on the composition and abundance of marine litter provide the only global database of this information worldwide, and its outputs are used to assist policy decisions. The ICC data provides the basic framework for action at numerous levels of the government and within the private sector to help reduce marine debris and to educate civil society about litter and pollution prevention.
- Removal of litter from the sea bottom is also an important parameter of cleanup campaigns. For instance, the Project AWARE – a growing movement of scuba divers protecting the oceans – and PADI (Professional Association of Dive Instructors) dive centres, organise underwater beach cleanups with volunteer divers. These underwater cleanups are valuable as they remove plastic, netting, cans, old buoys and general rubbish that has already made it into the marine ecosystem. Dive Against Debris is a year-round, underwater debris and data collection effort. Divers are encouraged to report on locations,

types and quantities of litter that they see and remove underwater. Divers wishing to participate are asked to choose a site that they are familiar with and where they find marine litter regularly, and organise with friends to collect and report that litter. A training manual, a data card, a marine debris ID guide, along with other supporting tools, are available at the project website. The collected litter is categorised based on type of material: plastic, glass/ceramic, metal, rubber, wood, cloth, paper/cardboard, mixed materials and other debris items. Individual items are then recorded within the relevant category using the Dive Against Debris Data Card and ID Guide. Information about amounts and types of collected litter, survey location, dive duration, depth, number of participants and entangled animals encountered is then reported into an online database. Divers are asked to repeat the survey of their chosen dive site as often and as regularly as they can in order to help identify trends at their chosen location.

- The campaign "Keep the Mediterranean Litter-free" launched by MIO-ECSDE, the Hellenic Marine Environment Protection Association (HELMEPA) and Cleanup Greece with the support of UNEP/MAP MEDPOL and the Mediterranean Pollution Assessment and Control Programme of UNEP/MAP in 2008 aimed to raise public awareness on the causes and impacts of the pollution of the sea from solid waste, but also to highlight the role and responsibilities of all related actors. The campaign included a range of various activities (beach cleanups, exhibitions and workshops, photo contests) in several Mediterranean

countries and involved a wide range of participants such as educators and students, seafarers and staff of ships' managing companies, national and local authorities, port authorities, NGOs and the civil society at large. Apart from the information materials produced in ten languages, the campaign published a set of sector-based guidelines for the main stakeholders: agriculture, industry, the tourism and maritime sectors, regional, national and local authorities, and civil society. These components have been widely disseminated and are used by a very large number of organisations in their awareness raising efforts to date.

- MARLISCO is an example of a project that aimed at informing, educating and promoting awareness to key stakeholders and the general public with issues related to marine litter. Within the framework of the MARLISCO project various types of informative materials were produced. It was one of the first projects that targeted directly marine litter. The MARLISCO educational pack on marine litter "Know, feel, act! To stop Marine Litter: Activities and lesson plans for middle level students" developed by MIO-ECSDE/MEdIES, aimed to inform, sensitise and enable teachers and students to take action to tackle the problem of litter in the seas and on the coasts, was translated in 15 languages. It combined updated scientific information and practical tips for young consumers, hands-on and reflection activities on marine litter. The material has been designed in such a way that it's flexible and adaptable to be used by schools or in non-formal education settings as NGOs, museums, youth groups and associations. In addition, the "MARLISCO Guide for Reducing Marine Litter: Get Inspired and Become Innovative Through Best Practices" aimed to provide an overview of the types of activities that different key stakeholders can implement reporting more than 70 practical examples of best practices, clustered into 14 wider categories, to reduce marine litter from around the world. Finally, the brochure developed under the MARLISCO project provided essential information on marine litter (sources, composition and impacts) and suggestions on how one can contribute to tackling this growing pressure. The brochure targeted citizens and their professional capacity but also as individuals, and specific economic sectors aiming

to inform but also to foster a sense of empowerment and take up individual and collective actions.

All-Ukrainian Youth Movement "Let's Do It Ukraine"

"Let's do it Ukraine" has been operating in 24 regions of Ukraine for six years thanks to the efforts of activists, local governments, businesses and media. The organisation's activities have already brought together more than 2.5 million participants in different all-Ukrainian and local projects. The organisation is part of the international movement "Let's Do It World", which unites 180 countries and more than 20 million members to care for the environment and the cleanliness of our planet.

The World Cleanup Day was attended by citizens, commercial and non-profit organisations, companies and government agencies (whose employees joined the action as part of corporate social responsibility), the media, pop-stars, and public opinion leaders. In 2015, more than half a million participants joined the action in 24 regions at 2,832 locations. In 2017 "Let's Do It Ukraine" brought together more than 1.1 million participants in 4,760 locations across the country. Schoolchildren, students, officials, artists, activists, responsible citizens, and media representatives cleared more than 2,138 locations in 24 regions and 243 settlements in 2020. By joint efforts, 763.7 tonnes of garbage and 182 tonnes of recyclable materials were collected. Residents of the "red" quarantine zones during the Covid-19 pandemic took part in digital cleaning, removing 1,586 gigabytes of unnecessary information from phones, computers, and cloud storage.

The National Map of Recycling Points is an online platform that allows citizens to find, add, or remove collection points anywhere. Each point on the map contains up-to-date information about working hours, address, and contacts. There are also recommendations on the platform: basic rules for separating materials, details of labelling and debunking of myths. It helps to avoid common mistakes, saves time, and increases the efficiency of environmentally oriented citizen actions.

The long-running project "Clean beaches together!" is designed to create a culture of cleanliness, proper waste management on beaches and at recreation areas. During 2021–2023, the organisers will be helping to avoid the accumulation of garbage on beaches and recreation areas, unite the efforts of the community and local municipalities, and establish cooperation. The initiative is filled with a large number of environmental activities: expeditions, monitoring studies of beach waste, sociological research, sorting, information and educational activities, workshop groups of experts, training, camps, and the formation of eco-patrol teams.

Together with the International Youth Movement "School Recycling World" the organisation has created an online recycling course that provides step-by-step instructions for proper waste management, economical, conscious consumption, and the introduction of recycling at home and at school. The programme contains lessons on responsible consumption, sorting, project management, documentation, advice on forming eco-patrols and the introduction of a sorting system, instructions, and practical recommendations. All necessary teaching materials, posters, and promotional materials useful on the way to "zero waste" are published on the platform.

Monitoring

Monitoring data usually serve to inform management and policy, but it is also of interest to a wide audience of stakeholders including resource managers, scientists, policy makers, and the public. Good practices often touch upon additional recommendations for measures and actions regarding marine litter: support to science, use of citizen science, often employing innovative methods, waste management, transboundary contacts.

In order to address the issue of marine litter with its numerous implications for marine life, habitats, safety of navigation, economy and human health, we need to understand the sources, movements, and impact of litter along the coasts and in the marine environment. Development of marine litter monitoring programmes seeks to gain this understanding through the collection of data. This data can answer important research questions, such as what and where are marine litters sources, are there depositional patterns, and what are the most common or most damaging types of marine litter. Answering such questions can then inform the development of management and policy strategies that address the problems of marine litter on a local, regional, national as well as international scale.
The examples of good practices seek to illustrate how sound science provides information of the sources, threats and solutions surrounding the problem. Science can also highlight findings from the analysis of marine litter monitoring programmes and interpret data to demonstrate the behaviour, abundance, movements and impacts related to marine litter. Other examples demonstrate how data findings have led to the development of new management or policy strategies for agencies, campaigns, businesses, industry, and others. Additionally, the descriptions exhibit how monitoring programme data can evaluate the effectiveness of existing marine debris related strategies, such as plastic bag bans, by tracking the presence of plastic bags within our seas and coastlines over time. Developing policies and management procedures is arguably one of the most effective means for truly reducing marine litter in our environment. Learning about how

data leads to the development of new, or restructuring of existing, strategies highlights the importance of monitoring programmes and will likely guide marine debris reduction and prevention strategies in order to protect the future of our marine resources.

Marine LitterWatch communities and monitoring in combination with cleanups

Marine LitterWatch is an initiative of the European Environment Agency (EEA) that aims to combat the marine litter problem. Through a participatory science approach this initiative empowers individuals and communities to take up action and fill in the data gaps that hamper the implementation of essential measures towards litter-free coasts and seas. The mobile application Marine LitterWatch has been produced under the auspices of EEA and used by the Black Sea NGO Network as registered community since 2014.

Marine LitterWatch offers a unique opportunity to individuals and communities to join forces towards providing reliable, accurate and comparable marine litter data. The data collected feed directly into the European Environment Agency database underlining the need for urgent action and strengthening policy implementation at local, national, European and Regional Seas Conventions level in meeting targets and commitments set in tackling marine litter.

Marine LitterWatch community members in the Black Sea coastal countries have done a lot toward providing a baseline value for marine litter on the coastal beaches providing results comparable to and consistent with the results of scientific surveys.

One-month pilot beach surveys, conducted annually in the whole EU, employ a harmonised monitoring approach, following the “Guidance Document on Monitoring of Marine Litter in European Seas” developed in 2013 by the Technical Group on Marine Litter. Citizen science concerning beach litter monitoring has performed a dual role, a combination of monitoring and awareness raising. The Marine LitterWatch Month is an initiative carried out in close collaboration with research and environmental organisations as Arhus University, Roskilde University, Black Sea NGO Network, Keep Sweden Tidy, Swiss Litter, HELMEPA, Legambiente, Marine Conservation Society, Mare Nostrum, MARNOBA, MIO-ECSDE, Plastic Change, Portuguese Association

of Marine Litter, EMBLAS+ and Surfrider Foundation Europe. Involved communities have collected more than one million beach litter items with 2,340 beach surveys and registered them to the Marine LitterWatch database during six years. Four fifths of these items were plastics. The most often registered items are cigarette butts, plastic pieces, plastic cups and lids for drinks, polystyrene pieces, as well as glass and ceramic fragments.

Citizen science: divers survey marine litter deposited on the seabed of the Israeli Mediterranean coast

Public participation in scientific research, citizen science, has long been used to tackle research questions that would otherwise not have been addressed due to lack of resources, time or geography. Marine litter survey programmes worldwide are a good example of information collection relying on citizen science. In 2015, scientists joined forces with the Society for the Protection of Nature in Israel and the Israeli Diving Federation to establish the divers' volunteer programme "Mishmar Hayam" (Sea Guard), which supports marine conservation through citizen science. During 2016–2017, eleven surveys were conducted in seven different sites in the northern part of Israel. Additional data was collected during 20 supervised underwater cleanups. Surveys found that plastic was the most common material on the seafloor, up to 84% of the items. Debris at four sites was primarily fishing-related marine litter and all the sites are used for recreational fishing, suggesting that most litter originates from the adjacent coast. The information collected by the divers will help document the extent

of marine debris along the Israeli coast and is crucial to understanding of litter sources and finding solutions to the problem.

Assessment of seabed litter in the Adriatic Sea

The National Research Council of Italy – Institute of Marine Science, Italy has been involved in monitoring of seabed litter in the Northern and Central Adriatic Sea over six years. Temporal and spatial occurrence of anthropogenic debris on the seabed is much less investigated compared to the sea surface and shores, due to sampling difficulties and costs. However, detecting marine benthic litter is fundamental for developing policies aimed at achieving good environmental status in European seas, as required by the Marine Strategy Framework Directive.

In this context, the researches aimed to estimate seafloor litter abundance, composition, spatial distribution and main sources in the North-Central Adriatic Sea over a six-year period. It represents the longest data set available on this issue up to date in the basin.

The sampling area has a surface of 36,742 km^2 and extends from the Italian coast to the 12 nm limit of the Croatian national waters. Six surveys were conducted from 2011 to 2016 and 67 stations were sampled each year, distributed over the area following a depth-stratified random design (0-30 m; 31-50 m; 51-100 m).

Litter items were collected using a “rapido” trawl, a modified beam trawl commonly used by the Italian fishermen to catch benthic species. Marine litter in the catches was classified in six major categories: plastic, metal, glass, rubber, wood, other. Plastic was dominant in terms of weight. The highest concentration of litter was found close to the coast likely due to high coastal urbanisation, river inflow, extensive navigation and the morphological-hydrological features of the basin. These data provide useful information to implement necessary measures to manage marine litter and minimise this type of anthropogenic pollution in the Adriatic region. The systematic monitoring of marine litter on regional scale may be also useful to evaluate the effectiveness of national and international regulations.

Marine litter research on Turkish north-eastern Mediterranean beaches

Scientists from the Middle East Technical University, Turkey, have sampled several Turkish beaches along the north-eastern Mediterranean for litter analyses in 2015 and 2016. Beach litter studies revealed not only the composition and abundance of the litter accumulating on the beaches but also their sources for different seasons. Direct deposition at the beaches was identified as the most important vector compared to transportation from other regions. Litter abundance was higher either in areas of proximity to debris-polluted waters or to the city centre. In all cases plastics constituted the bulk of total litter. Among plastics, PET bottles and their lids were the most prominent items especially during the summer tourist season. Manufacturing was found to be the main sector producing litter compared to others through the percentage of general snack packaging and fishing-related items collected. Cigarette smoking related litter items were also estimated in high quantities. Results from the study combined with those from marine litter literature, as well as other relevant studies and activities (on protected areas, protected turtle species, awareness programmes etc.) enable the team to suggest region-specific management recommendations for decreasing the litter problem. These include deposit schemes to reduce PET bottle consumption, the expansion of public drinking water fountains; deployment of innovative cigarette stub collectors, establishment of litter collectors in rivers and most importantly large-scale awareness raising programmes, especially incorporating local scientific community knowledge. Therefore, close

cooperation between scientists and decision-makers is increasingly important in producing prompt managerial actions.

A wooden, scientific "message in a bottle"

German university team researches sources and dispersal of macroplastics through large-scale public participation experiment. Regular beach cleanups provide insight into quantitative and qualitative changes of litter over time and are a tool to raise public awareness. Yet there is agreement that it is necessary to combat plastic waste at its sources. Since 2016, an interdisciplinary project (Macroplastics Pollution in the Southern North Sea – Sources, Pathways and Abatement Strategies) from the University of Oldenburg, Germany, has been researching the input and dispersal of macroplastics. Combining numerical models with monitoring, experimental field work, stakeholder analysis and citizen science, it aims to identify the origins of plastic pollution along the German North Sea coastline, the major tributaries Ems, Weser and Elbe, and in the German Bight. The goal is to provide governmental and non-governmental organisations with solid data and improved knowledge of the sources, pathways and accumulation areas of marine debris in order to devise acceptable and effective abatement strategies. A core component of this project is the release of wooden drifters – 9,000 to 10,000 per season – over a two-year period at selected locations which are likely plastic litter source points. Each drifter is branded with an individual ID and a message in German and English, inviting every finder to report ID, date and location via the project website. Almost 50% of the over 24,000 drifters released so far have been registered from places in Germany, the Netherlands, Denmark and Norway. These data are used to validate and improve drift models, identify litter hotspots, and infer the possible sources of beached litter due to the known release points of the wooden drifters (back-tracking). The scientific team has developed GIS-based results of report patterns and experiences from this unique, large-scale public participation experiment.

Citizen science and increased knowledge on marine litter: from the global and regional to the Black Sea

Oceanographer Prof. Emil Stanev, from the scientific team of the Oldenburg University that carried out the “message in a bottle” experiment, recommends use of the transferrable skills and knowledge to quantify the sources of marine litter in the Black Sea and address the challenges associated with 3-dimensionality and bottom deposition. The problems facing the world ocean apply to the Black Sea as well. Mismanaged plastic waste enters the Black Sea and available methods and knowledge can be used to quantify the amounts. What makes abatement of pollution difficult is the fact that it is associated with complex oceanographic processes. Drifters and Argo floats can help understand the patterns of movement and deposition of plastics in the Black Sea. It is clear that marine debris in the Black Sea has peculiarities different from deposition patterns in the ocean. Accumulation of marine litter from rivers has been studied. Further research is necessary to establish accumulation areas, reasons for the accumulation, seasonal variations etc. Research and monitoring results can support management decisions for the sea basin and the rivers discharging into the Black Sea.

Stakeholder involvement in marine litter abatement

Bulgaria

For both solid waste management and legislative actions, management, monitoring related to the marine environment, and MSFD implementation the key authority at national level is the Ministry of Environment and Water. It also represents the country in bilateral and regional cooperation forms, such as the Bucharest Convention. The Ministry of Transport, Information Technology and Communications is in charge of decision making and implementation of maritime transport policy. The Ministry of Regional Development and Public Works is responsible for coastal zone management and is party to regional cooperation agreements (e.g. Black Sea JOP). The Ministry of Tourism also plays a role in planning, formulation and development of tourism policy. It is responsible for leasing and control of beaches.
At local level the most important sectoral agencies are the Regional Inspectorates of Environment and Water in Varna and Burgas with regulatory and control functions on environmental policy, including waste. The Black Sea Basin Directorate is in charge of planning, monitoring, management and information about water resources along the coast and in the sea. The Executive Agency Maritime Administration is responsible for the protection of the marine environment from pollution from ships, while the Executive Agency for Fisheries and Aquaculture implements policies and exercises control in its sectoral field. Coastal municipalities organise financing, administration and management of solid waste and environmental factors within their territory.

The authorities responsible for the organisation and implementation of the monitoring programme on marine litter are the Ministry of Environment and Water and its water management unit, the Black Sea Basin Directorate, based in Varna. The monitoring of marine waters is performed by the Institute of Oceanology at the Bulgarian Academy of Sciences (IO-BAS). Other research units as the Technical and Medical Universities of Varna, as well as the Institute of Fish Resources and the Institute of Biodiversity and Ecosystem Research are also involved in the process.
Business stakeholders, such as packaging waste recovery organisations, provide services for separate packaging waste collection to municipalities. Associations of tourist companies, fishermen and other maritime business association have an important role in the introduction of good practices for abating marine litter.
The contribution of environmental NGOs, which conduct cleanup campaigns, provide data through citizen science initiatives, promote awareness, or engage in advocacy is essential in monitoring and litter management actions. Finally, citizens and visitors of coastal areas exert substantial influence on the state of the environment through daily activities and are important actors in the collaborative efforts towards reducing marine litter pollution.

Georgia
The Ministry of Environmental Protection and Agriculture of Georgia (MEPA) is a key stakeholder, responsible for the development and implementation of state policy in the areas of environmental protection, as well as for the elaboration and implementation of a unified state strategy for managing waste and chemicals. MEPA's Department of Environmental Supervision (DES) exercises control over fishing activities and has the capacity to monitor illegal dumping of solid waste and discarded fishing gear and trigger efficient action against marine pollution. The Ministry of Regional Development and Infrastructure is responsible for construction, management and closing of non-hazardous waste landfills and the Ministry of Economy and Sustainable Development's competency is to issue admission certificates to transport hazardous waste.
Municipalities have the authority to manage municipal waste in

accordance with Local Self-government Code, this includes the development of a municipal waste management plans. The construction, operation and closure of non-hazardous waste landfills within the administrative borders of the Autonomous Republic of Adjara and the city of Tbilisi fall within the authority of the relevant bodies of these two administrative units.

Other stakeholders include the representatives of regional authorities tasked with planning, responding to pollution, and its prevention, as well as environmental protection, healthcare, and tourism.

Administrations of national authorities, including environmental protection, water, maritime transport, ports, fisheries, forestry, tourism, healthcare are the bodies that have access to various data on national level.

Educational institutions, universities and schools are also important stakeholders. Many of them are engaged with environmental issues in extracurricular activities. Marine litter is one of the most important issue raised by children and teachers in the recent years. Schools often participate in cleanup actions that have become a tradition during the past 5-6 years.

Business representatives from the hospitality and tourism industry, water sports, as well as aquaculture are involved in activities for reduction of solid waste that may reach the marine environment.

Non-governmental organisations working on solid waste issues, environmental protection of aquatic and marine habitats, coastal zone management, and regional cooperation deal with different aspects of marine litter. A number of stakeholders have been working on

awareness raising among the general public through various activities and campaigns. Examples include “Keep Georgia Tidy” campaign, organised by the Greens Movement Georgia every year, and “Keep Georgia Beautiful” – a large-scale environmental campaign initiated within the Waste Management Technologies in Regions, Phase II programme, implemented by CENN and funded by USAID. The aim of this campaign is to clean littered areas and to keep them clean in cooperation with private, public and civil society sectors. The programme covers also the Adjara region, bordering the Black Sea. Within the campaign, different interested parties select a specific area and assume responsibility for its care after the initial cleanup is organised together with CENN.

Educational activities are implemented by various environmental projects. A good example of this is the Ecosystem Training Programme prepared within the ZEWSGES project, which provides information about the ecosystems within the Supsa river basin, and covers different issues such as sources of pollution within the river basin, measures to protect the river and activities for reducing solid waste pollution.

A number of campaigns serving awareness raising on marine litter issues have been carried out across the Georgian part of the Black Sea coastline within the MARLITER project, including training on marine litter at four schools in Batumi, Kobuleti, Ureki and Poti. The campaign “No to Marine Litter” raised awareness on marine litter and its impact on sea life through art installations placed on the beaches of Batumi, Kobuleti and Ureki beaches.

Various environmental projects are also implemented by LLEP Environmental Information and Education Centre of the Ministry of Environment Protection and Agriculture, the entity responsible for facilitating environmental and agricultural education and raising public awareness.

Interviews with different stakeholders, including representatives of public authorities, sectoral agencies, business organisations, research institutions and educational organisations have shown the need for reliable information and data on marine litter and waste in general. It is seen as a prerequisite for the development and implementation of sound policies in the field of environmental protection and waste management.

Greece

At national level the key institution is the Ministry of Environment and Energy (MEE), holding responsibility for all issues and aspects related to waste management. MEE's main responsibilities include the acceleration of legislation, harmonisation with EU Directives, monitoring and enforcement, the drafting of the National Waste Management Plan, the overall coordination of waste management, as well as ensuring the achievement of quantitative and qualitative objectives set by current legislation. However, other ministries such as the Ministry of Tourism and the Ministry of Shipping and Island Policy are also important actors for litter with respect to their sectors, which have been identified as important sources of waste.

Local administration (regions, municipalities and communities) holds increased responsibilities in waste management. In accordance to the National Waste Management Plan, local authorities are entitled to develop and implement waste management plans, including the management of all specific waste flows in their area. Regarding packaging, local authorities work closely with the collective packaging waste management system Hellenic Recovery Recycling Corporation (HERRCO), which currently manages the majority of packaging in Greece.

The Hellenic Recycling Agency (EOAN) under the supervision and control of the MEE, is responsible to design and implement the national recycling policy and alternative waste management systems in Greece. In addition, the coastguard and port authorities are responsible for the implementation of all policies that target marine pollution: port

reception facilities, surveillance and control of activities at sea. Shipping industry and associations related to fishing are also related to litter that directly enters the marine environment, such as packing and lost fishing gear. Agencies active in the development of tourism such as the Greek National Tourism Organisation (EOT) with mission to enhance the value of Greek tourism in cooperation with the tourism industry, hoteliers and beach users should also join forces in terms of awareness and actions regarding marine litter, since tourism in Greece has a significant contribution to the production of waste particularly during summer.
The organisations responsible for the monitoring of litter in the marine environment and biota are the Hellenic Centre for Marine Research (HCMR) under the supervision of the General Secretariat for Research and Technology (GSRT) of the Ministry of Education, Research and Religious Affairs, and the Institute of Fisheries Research (IFR) which is under the supervision of the Ministry of Rural Development and Food. The contribution of several NGOs that conduct cleanup campaigns each year with volunteers and provide their data, promote awareness, or conduct research projects that assist in monitoring and litter management actions is also very important. Finally, users of plastic, such as residents and visitors of coastal areas, and producers in the packaging industry in Greece are also considered actors for marine litter that should be engaged to join forces under a collaborative action for addressing the issue of marine litter in the country.

Romania

The Ministry of Environment, Waters and Forests is responsible for implementing the Marine Strategy Framework Directive, which aims to achieve and maintain GES in the marine environment in all EU marine regions, including the Black Sea. To achieve this goal Romania has adopted and implements a Programme of Measures, which includes already existing measures, new measures and exceptions. Of the 29 new measures, 16 are joint measures with Bulgaria. Five of the 29 new measures are related to marine litter and aim to achieve a good environmental status of the Black Sea, respectively the protection and conservation of marine biodiversity by reducing and eliminating pressures generated by maritime activities. All authorities involved in

this kind of activities are engaged in carrying out these protection measures. The next steps at national level are to assess the implementation status of the measures, update the monitoring programme, establish new measures, enhance the cooperation at national and regional level and to implement the Single-Use Plastics Directive. The Ministry has developed also the National Strategy for Waste Management 2014–2020 with specific targets.

The National Institute for Marine Research and Development "Grigore Antipa" is responsible for the monitoring, assessment, planning, implementation, and reporting of the requirements set out in the MSFD. It is involved in international projects that tackle marine litter and has performed pilot studies related to it. The project "A comparative study of marine litter on the seafloor of coastal areas in the Eastern Mediterranean and the Black Sea" (2014) involving investigation of the abundance, spatial distribution, and qualitative composition, of benthic marine litter in five areas from the Eastern Mediterranean and the Black Sea (Saronikos, Patras and Echinades Gulf, Limassol Gulf, Constanta Bay) is an example of such research. NIMRD has performed monitoring of beaches with the use of the mobile app Marine LitterWatch since 2015. The main litter items were cigarette butts and plastic containers. With reference to the litter categories identified, artificial polymer materials were by far the most common category of litter items on European beaches, as well as on the Romanian beaches investigated, which once again confirms the fact that plastic and related materials are the most severe threat to the marine and coastal environment. Monitoring of marine litter in the

water column and deposited on the sea floor has been done with the use of bottom and beam trawl for a decade and the data is available on the EMODNET platform. NIMRD coordinated the project "Assessing the vulnerability of the Black Sea marine ecosystem to human pressures (ANEMONE)", which had dedicated activities to marine litter and its reduction.

The National Institute for Research and Development on Marine Geology and Geo-ecology – GeoEcoMar established nine beach sectors situated in the southern part of the Romanian coastline in front of the following Marine Protected Areas (MPAs) – *Underwater sulphur springs from Mangalia* (ROSCI0094), *Cape Aurora* (ROSCI0281), *Sea area around Cape Tuzla* (ROSCI00273), *Submerged beach Eforie Nord – Eforie Sud* (ROSCI0197) and *Black Sea* (ROSPA00076) – and surveyed them for beach litter identification and quantification.

Non-governmental actors play an important role in resolving the problem of marine litter by influencing stakeholders to change their course of action. To reach their goals, NGOs use different approaches: advocacy, awareness raising, analysis, capacity building, evaluation and monitoring, all having the same aim – to prevent marine litter.

Marine litter became a priority for Mare Nostrum NGO in 2005, when the organisation started to develop a Coastwatch programme. The goal of Coastwatch is the protection and sustainable use of coastal resources, and informed public participation in environmental planning and management. Moreover, since 2014, Mare Nostrum is applying the protocol for beach litter included in the "Guidance on Monitoring of Marine Litter in European Seas", 2013. Ten sectors are monitored, three times per year (spring, autumn, and winter). The data is reported through Marine LitterWatch and EmodNET Chemistry.

Mare Nostrum NGO was also part of the ANEMONE project, which included a marine litter monitoring component in four riparian countries: Romania, Bulgaria, Ukraine, and Turkey. It was task leader and prepared the methodology applied by all partners.

Beside the current MARLITER project in 2020 Mare Nostrum started implementation of the project "Raising Public Awareness and Reducing Marine Litter for Protection of the Black Sea Ecosystem – LitOUTer" coordinated by the Marine Science Faculty of Karadeniz Technical University, Turkey, which primarily focuses on identification,

management and mitigation of waste sources and raising citizens' awareness. Mare Nostrum NGO prepared and delivered to partners the methodology for training of stakeholders on marine litter, including ways of reducing it.

Mare Nostrum NGO is organising each year awareness campaigns on Romanian beaches using different methods as direct talks with tourists, campaigns for beach operators, interactive informative panels or public events as Green Week and Black Sea International Action Day.

An initiative with a large impact was started by Constanta Municipality in cooperation with Act for Tomorrow Association: the campaign "Exchange PET for Ticket". It allows residents and tourists to travel by public transport, paying for their transport fare with PET and aluminium cans. Three litter items would pay for a trip.

The programme "We Act for Water – APA", initiated by Act for Tomorrow Association together with Kaufland Romania and supported by the Romanian Waters Administration Dobrogea Littoral aims to mobilise communities to get involved in preventing and combating water pollution in Romania and to bring this topic on the public agenda.

There are plenty of business organisations that are working towards a marine litter free Black Sea by developing CSR programmes that tackle this issue. OMV Petrom is a Romanian integrated oil company that invests in environmental projects and education for sustainable development. Within these projects programmes for sustainable development dedicated to stakeholders were developed. They included workshops with engaging educational activities (games, drawings,

stories, debates), which ensured a great openness to the concept of marine litter and the desire to put into practice the information delivered. There were also awareness campaigns on beaches with interactive hand-made panels. The company got involved also in removal of ghost netsghost nets and assisted organisations to get closer to the fishing industry and to reduce the probability to accidentally lose or discard nets in the sea.

GreenPoint Management is an organisation that implements liabilities concerning the producer's extended responsibility with respect to management of packing and packaging waste. It was involved in "Let's do it, Romania" contributing more the 25,000 green bags, specially designed for waste collection from natural environment. Its collaborators collected 7,000 kg of waste and conducted awareness campaigns with more than 50,000 tourists with the help of 130 volunteers, covering 17 km of beaches. In line with EU policies, the organisation is committed to developing and implementing new packaging waste management solutions to help companies achieve their environmental goals, including the European "zero waste" target. It also aims, as an integral part of the field of waste recycling in Romania, to facilitate the transition to a circular economy, in which waste generated by one industry becomes raw material for another industry.

The National Agency for Environmental Protection is obliged to ensure a healthy environment for the population in harmony with the economic development and the social progress of Romania. Its main functions are strategic environmental planning, monitoring of environmental factors, authorisation of activities with environmental impact, implementation of environmental legislation and policies at national and local level, and reports the European Environment Agency on air quality, climate change, protected areas, soil contamination and water. The agency also prepares and delivers regular monthly and annual reports on the state of the environment. These reports contain information on waste generation and management: trends, impacts, and forecasts.

The National Administration "Romanian Waters" manages the waters of the public domain of the state and the infrastructure of the National Water Management System consisting of reservoirs, flood protection

dams, canals, inter-basin diversions, water intakes and other specific works for the purpose of knowledge and unitary management throughout the country, surface, and groundwater resources. This institution has a branch in Constanta, Romanian Waters Administration Dobrogea Littoral which is the administrator of Romanian Black Sea coast beach. Its responsibilities are the exploitation and maintenance of the beaches. The main activities are preparing the beaches for the summer season (February 15 – May 1), maintenance of beach areas during the summer season (May 1 – September 30) and preservation of the beach for the cold season (October 1 – December 15). The administration is concerned about the marine litter problem and performs manual cleaning works (waste collection and disposal), but also mechanised cleaning works with specialised equipment, collection and loading in trailers or containers. Following the necessary activities for the preparation of the beach sectors, 700 tonnes of waste were collected and 80 tonnes of algal mass, deposited at the shoreline, were discharged in 2021. The entire amount of waste collected and discharged from the beach areas during the beach preparation period, the summer season and the preparation period for the cold season varies between 10,000 to 40,000 tonnes per year.

Ukraine

At national level a key decision-maker is the Ministry of Ecology and Natural Resources. Until recently, the Ministry was responsible both for the development and implementation of environmental policy. The plans within the framework of an ongoing public administration reform

are to focus the Ministry's efforts on expert and analytical work, which will consist in the development of policy decisions for environmental protection. Implementation will be entrusted to various government agencies, services or local authorities.
The application of the National Waste Management Strategy is coordinated by the Ministry of Ecology and Natural Resources. Other responsibilities include environmental protection, environmental supervision, state property management, international activity, regulatory actions. The Ministry of Infrastructure of Ukraine is also an important stakeholder in solid waste management policies.
Local administration (regions, municipalities and communities) holds increased responsibilities in waste management. In accordance to the Waste Law, local authorities participate in the development of national programmes for rational use of materials after the useful life of products and implement measures for the introduction of low-waste and energy-saving technologies. They are in charge of the development and implementation of regional and local waste management programmes, and ensure the operation of national programmes. Among their activities is coordination and promotion of business activities in the field of waste management; control over the activities of waste management facilities; organisation and assistance in creation of specialised enterprises of all forms of ownership for collection, processing, utilisation and removal of waste, and also for production. Part of their tasks is securing the financing for the construction of new and reconstruction of existing waste management facilities, as well as other waste disposal solutions.
Maritime administrations license the provision of services for transportation of passengers and cargo, including hazardous waste, by sea and river. They monitor the compliance with the existing domestic and international rules for the prevention of pollution of water bodies with solid waste or the release of marine litter.
Monitoring and inspection are carried out by the central executive body that implements the state policy on state supervision in the field of environmental protection, rational use, reproduction and protection of natural resources; the central executive body that implements state policy in the field of sanitation and epidemic well-being of the population; the state sanitary-epidemiological service, local

governments and inspections. The monitoring of litter in the marine environment and biota is performed by the Ukrainian Scientific Centre of Ecology of the Sea (UkrSCES) under the supervision of the Ministry of Environment and Natural Resources of Ukraine (MENR) and the Institute of Fisheries of the National Academy of Agrarian Sciences.
NGOs play an important role by conducting annual cleanup campaigns with volunteers. They provide data collected with the help of citizen science as part of research projects incorporating monitoring and litter management actions. Environmental organisations have been engaged for years in activities for raising awareness about marine litter.
Finally, users of plastic, such as residents and visitors of coastal areas, as well as producers in the packaging industry in Ukraine are central stakeholders that should be engaged to join forces under a collaborative action for addressing the issue of marine litter problem in the country and the wider Black Sea Basin.

Recommendations and policy measures for reduction of marine litter

The review of regulatory measures in the Black Sea Basin clearly outlines the common direction in which all five countries involved in this project are moving. Certainly, this happens at different pace, depending on the social, economic and political conditions in Bulgaria, Georgia, Greece, Romania and Ukraine. The policies in the EU member countries follow the framework set by the directives and regulations related to solid waste management, reduction of plastic pollution and improvement of the environmental status of the seas and oceans. Comparable steps are taken in Georgia and Ukraine, based on the existing Association Agreements between the EU and the two Black Sea countries.

The time lags between the implementation of specific policies and measures in the different countries may provide valuable lessons about the success of certain practices and the difficulties encountered in their implementation. The exchange of experience between the countries of the region holds the promise of more effective achievement of the common goal of reducing the amount of litter reaching the sea.

In the short term, preventing littering, improving waste collection services, including waste collection coverage and efficiency as well as improving final disposal or stopping open disposal have been identified as working solutions. Although the above short-term strategies can bring a swift impact to substantially reduce plastic waste leakage into the environment and marine ecosystems, it is important to identify

more appropriate – economically viable, environmentally friendly, and socially acceptable – alternative treatment and recycling methods in the medium-term. New approaches are required in order to use plastic waste in an optimal way as a resource or for energy recovery before final disposal.

There is a need for long-term strategies and actions to promote circular economy and sustainable lifestyles. It would take radical changes to shift from the current linear production model to more sustainable plastic production and consumption patterns.

Governments, companies, business associations and civil society should create initiatives to strengthen resource-efficient consumption and production patterns. Such initiatives should include the design of products for reuse and recyclability, as well as the development of resource-efficient production processes. Transitioning to a more environmentally friendly and sustainable production and consumer attitudes is not an easy task not just for the Black Sea countries. This will be a lengthy process, which will require inventiveness, institutional capacity, as well as common understanding and actions by all stakeholders.

Long-term solutions lie in reducing plastic usage, adopting reusable packaging or package free products, recycling, and most importantly, investing in modern waste management infrastructure and developing markets for recycled materials.

A sound guidance in developing policies and drafting measures provides the waste hierarchy:

- Reduce – avoid or reduce the production of potential waste
- Reuse – use products or parts of them more than once for the same purpose
- Recycle – turn used materials into new resources
- Recover – use energy content to substitute fossil fuels
- Dispose – in a responsible manner when all other options are exhausted.

At Black Sea level the main recommendations are directed at:

Leadership and meaningful commitment from the national governments, local authorities, governors, and mayors to develop holistic and integrated waste management strategies and actions

including ambitious marine litter reduction, reuse and recycle targets. This would entail also accelerated steps towards the installation of effective institutional and financial systems to address marine debris pollution from land-based sources.
The marine litter management strategies and action plans should be part of the overall waste management systems developed and implemented by the respective national and local governments and based on local contexts, such as political, environmental, social, and economic aspects. Respective government authorities at national or local level can lead the development of strategies, but need to involve all key stakeholders, including businesses, citizens and the research community.
Lost and abandoned fishing gear and aquaculture installations pose a special challenge. Raising awareness about the consequences of ghost fishing and finding sustainable solutions for the removal and recycling or safe disposal of this type of marine litter requires the concerted efforts of fishermen, state agencies, port authorities and recycling organisations.

Some additional recommendations for measures and actions regarding marine litter include:

- Improvement of the marine litter policy and regulatory framework by systematically exploiting the full potential of relevant EU Directives (such as the Waste Framework Directive, the Packaging and Packaging Waste Directive, the Landfill Directive, the Port Reception Facilities Directive, etc.) and by ensuring their full coherence and appropriate

synergy with the Marine Strategy. This measure includes the required political willingness to implement ambitious strategies against marine litter.

- Fostering collaboration with global, regional and sub-regional organisations, to address the transboundary aspects of marine litter and enhance the effectiveness of multilateral initiatives aimed at preventing, reducing and managing marine litter. This measure includes also agreements and collaboration for common actions between EU and non-EU countries that share the marine environment, but also countries that are related through rivers, which are considered an additional source of litter in the marine and coastal environment.
- Establishment and effective implementation of Regional Action Plans on marine litter in all European seas.
- Establishment of joint or coordinated monitoring programmes at sea-basin or sea sub-basin level to address shortcomings and gaps related to marine litter. Full exploitation of synergies with Regional Conventions on monitoring programmes and sharing of results.
- Establishment of comprehensive national marine litter programmes in accordance with the recommendations of the MSFD and the existing Marine Litter Regional Action Plans.
- Adoption by the countries of ambitious targets to reduce marine litter at all relevant levels, giving priority to “lower hanging fruits” but also to sources of marine litter with the strongest impact, such as for example microbeads or plastic bags.
- Improvement of separate waste collection through extensive awareness raising amongst citizens.
- Promotion of plastic recycling and support for the development of recycling value chain.
- Encouragement of beach users and organisers of events on the beach to use alternatives to disposable plastic items.
- Placement and regular cleaning of ashtrays and bins on beaches by beach operators, municipalities or other authorities responsible for the beach sector.
- Control of beach sectors at the end of the summer season and sanctioning of beach operators who do not bring the beach to a good state of cleanliness.

- Reduction of the amount of litter that enters gullies and the drainage system through regular cleaning activities.
- Carrying out of beach cleanup activities in coastal areas where public access is limited or non-existent and beach management is not covered by private operators, as in the case of the Danube Delta Biosphere Reserve.
- Encouragement of participatory science initiatives and improvement of scientific knowledge on sources, amounts, pathways, distribution, trends, nature and impacts of macro-, micro- and nano-litter, including the effects of microplastics and their additives and absorbed substances on marine biodiversity and human health. Better utilisation of relevant research results to enhance marine litter data.

Bibliography

Black Sea Commission, 2018. Black Sea Marine Litter Regional Action Plan. http://www.blackseacommission.org/Downloads/BS_Marine_Litter_RAP_adopted.pdf

Borrelle, S et al., 2020. Predicted Growth in Plastic Waste Exceeds Efforts to Mitigate Plastic Pollution. Science, 369(6510), 1515–18. doi:10.1126/science.aba3656.

European Commission, 2020. A new Circular Economy Action Plan: For a cleaner and more competitive Europen, COM(2020) 98 final.

European Commission, MSFD Technical Subgroup on Marine Litter. 2013. Guidance on monitoring of marine litter in European seas. Luxembourg, Publications Office. doi:10.2788/99475.

Galgani F, Hanke G, Maes T, 2015. Global Distribution, Composition and Abundance of Marine Litter. In: Bergmann M, Gutow L, Klages M (eds) Marine Anthropogenic Litter. Springer, Cham.

Geyer, R et al., 2017. Production, Use, and Fate of All Plastics Ever Made. Science Advances, 3 (7), p. e1700782. doi:10.1126/sciadv.1700782.

Jambeck JR et al., 2015. Plastic waste inputs from land into the ocean. Science, 347:768-771.

Lau, W et al., 2020. Evaluating Scenarios toward Zero Plastic Pollution. Science, 369(6510), 1455–61. doi:10.1126/science.aba9475.

LIFEDEBAG, 2016. Current status of the plastic bag issue. Action A.1. Deliverable. Integrated information and awareness campaign for the reduction of plastic bags in the marine environment. LIFE14 GIE/GR/001127.

Orthodoxou D, Loizidou X, Loizides M, 2014. The MARLISCO Guide for Reducing Marine Litter: Get Inspired and Become Innovative Through Best Practices, ISOTECH LTD.

UNEP, 2016. Marine Litter Legislation: A Toolkit for Policymakers. UNEP, Nairobi.

UNEP, 2016. Marine plastic debris and microplastics – Global lessons and research to inspire action and guide policy change. UNEP, Nairobi.

UNEP/GRID-Arendal, 2016. Marine Litter Vital Graphics. United Nations Environment Programme and GRID-Arendal. Nairobi and Arendal. www.unep.org, www.grida.no

UNEP-MAP, 2015. Marine Litter Assessment in the Mediterranean. United Nations Environment Programme, Mediterranean Action Plan. Athens.

UNEP/NOAA, 2012. The Honolulu Strategy – A Global Framework for Prevention and Management of Marine Debris. http://www.unep.org/gpa/documents/publications/honolulustrategy.pdf

Veiga JM et al., 2016. Identifying Sources of Marine Litter. MSFD GES TG Marine Litter Thematic Report; JRC Technical Report; EUR 28309; doi:10.2788/018068

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