



EFH-EG-3 Assessment of marine litter in the Egyptian Mediterranean coastline and proposed management options

Overview of the socio-economic implications of marine litter (EFH-EG-3, Task 4)

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| 1 | Overview of the socio-economic implications of marine litter (EFH-EG-3, Task 4) | Thomais Vlachogianni | Anis Ismail Michael Scoullas |



THE SWIM AND H2020 SUPPORT MECHANISM PROJECT (2016-2019)

The SWIM and H2020 SM is a Regional Technical Support Program, funded by the European Commission, Directorate General (DG) NEAR (Neighborhood and Enlargement Negotiations), that includes the following Partner Countries (PCs): Algeria, Egypt, Israel, Jordan, Lebanon, Libya, Morocco, Palestine, [Syria] and Tunisia. However, in order to ensure the coherence and effectiveness of Union financing or to foster regional co-operation, eligibility of specific actions will be extended to the Western Balkan countries (Albania, Bosnia Herzegovina and Montenegro), Turkey and Mauritania. The Program is funded by the European Neighbourhood Instrument (ENI) South/Environment. It ensures the continuation of EU's regional support to ENP South countries in the fields of water management, marine pollution prevention and adds value to other important EU-funded regional programs in related fields, in particular the SWITCH-Med program, and the Clima South program, as well as to projects under the EU bilateral programming, where environment and water are identified as priority sectors for the EU co-operation. It complements and provides operational partnerships and links with the projects labelled by the Union for the Mediterranean, project preparation facilities in particular MESHIP phase II and with the next phase of the ENPI-SEIS project on environmental information systems, whereas its work plan will be coherent with, and supportive of, the Barcelona Convention and its Mediterranean Action Plan.

The overall objective of the Program is to contribute to reduced marine pollution and a more sustainable use of scarce water resources. The Technical Assistance services are grouped in 6 work packages: WP1. Expert facility, WP2. Peer-to-peer experience sharing and dialogue, WP3. Training activities, WP4. Communication and visibility, WP5. Capitalizing the lessons learnt, good practices and success stories and WP6. Support activities.



Sustainable Water Integrated Management and Horizon 2020 Support Mechanism

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TABLE OF CONTENTS

| | | |
|----------|---|-----------|
| 1 | GENERAL INTRODUCTION..... | 7 |
| 2 | AIM AND SCOPE OF THIS DELIVERABLE | 8 |
| 3 | DEFINITIONS AND POLICY CONTEXT | 8 |
| 4 | THE SOCIO-ECONOMIC IMPLICATIONS OF MARINE LITTER | 10 |
| 4.1 | <u>Introduction.....</u> | <u>10</u> |
| 4.2 | <u>Tourism and recreation.....</u> | <u>11</u> |
| 4.3 | <u>Fisheries</u> | <u>12</u> |
| 4.4 | <u>Aquaculture</u> | <u>13</u> |
| 4.5 | <u>Shipping.....</u> | <u>14</u> |
| 4.6 | <u>Agriculture</u> | <u>14</u> |
| 5 | REFERENCES/RESOURCES | 15 |
| 6 | ANNEX I. THE DEFISHGEAR STUDY ON THE SOCIO-ECONOMIC IMPLICATIONS OF MARINE LITTER IN THE ADRIATIC-IONIAN MACROREGION | 17 |



LIST OF FIGURES

| | |
|--|-----------|
| <i>Figure 1. The Marine Litter Ecological Objective and the respective Indicators within the framework of the Barcelona Convention Ecosystem Approach and the Integrated Monitoring and Assessment Programme.</i> | <i>9</i> |
| <i>Figure 2. The Marine Litter Descriptor, Criteria, and respective Indicators within the framework of the EU MSFD.</i> | <i>9</i> |
| <i>Figure 3. Economic sectors affected by marine litter.</i> | <i>10</i> |
| <i>Figure 4. Distribution of direct and indirect costs arising from marine litter in the fisheries sector (per fishing vessel/per year).</i> | <i>12</i> |
| <i>Figure 5. Distribution of direct and indirect costs arising from marine litter in the aquaculture sector (per aquaculture farm unit/year).</i> | <i>13</i> |



ABBREVIATIONS

| | |
|----------|--|
| ATR | Attenuated Total Reflectance |
| COP | Conference of the Parties |
| D10 | Descriptor 10 |
| EC | European Commission |
| EO | Ecological Objective |
| EU | European Union |
| FTIR | Fourier-Transform Infrared Spectroscopy |
| GES | Good Environmental Status |
| GPS | Global Positioning System |
| H2020 | Horizon 2020 |
| ICZM | Integrated Coastal Zone Management |
| IMAP | Integrated Monitoring and Assessment Programme |
| LBS | Land-Based Sources |
| MSFD | Marine Strategy Framework Directive |
| NaCl | Sodium chloride |
| NAP | National Action Plan |
| NGO | Non-Governmental Organization |
| NKE | Non-Key Expert |
| ROVs | Remotely Operated Vehicles |
| SCUBA | Self-contained underwater breathing apparatus |
| TG | Technical Group |
| UNEP/MAP | United Nations Environment Programme/Mediterranean Action Plan |



1 GENERAL INTRODUCTION

Marine litter -any persistent, manufactured or processed solid material discarded, disposed of or abandoned in the marine and coastal environment- is globally acknowledged as a major societal challenge of our times due to its significant environmental, economic, social, political and cultural implications. Marine litter negatively impacts coastal and marine ecosystems and the services they provide, ultimately affecting people's livelihoods and well-being.

Marine litter related information in the Mediterranean, remains limited, inconsistent and fragmented, however it is widely accepted that it is one of the most affected seas by marine litter worldwide. Effective measures to tackle marine litter in the region are seriously hampered by the lack of reliable scientific data. Within this context the need for accurate, coherent and comparable scientific data on marine litter in the Mediterranean countries is evident in order to set priorities for action and address marine litter effectively, thus ensuring the sustainable management and use of the marine and coastal environment of the region.

Within the framework of the SWIM-H2020 SM Egypt has asked for an Expert Facility Activity (EFH-EG-3) in order to assess marine litter in the Egyptian Mediterranean coastline and come up with targeted management options. This activity will support the implementation in Egypt of the obligations and measures relevant to the Regional Plan for Marine Litter Management in the Mediterranean of the Barcelona Convention and will contribute to Integrated Coastal Zone Management (ICZM) within the framework of the implementation of the regional ICZM Protocol of the Barcelona Convention. More specifically, the action will support Egypt in: integrating marine litter measures into the LBS National Action Plan in line with Article 7 of the Regional Plan; assessing marine litter in the Egyptian Mediterranean coastline in line with Article 11 of the Regional Plan; designing a marine litter monitoring programme in line with Article 12 of the Regional Plan; supporting the implementation of Regional Plan through technical assistance and capacity building in line with Article 15 of the Regional Plan.

The assessment of marine litter in the Egyptian Mediterranean coastline and the proposed management options based on the results would trigger positive changes in the design and implementation of the relevant national institutional, policy and regulatory frameworks, which should incorporate marine litter prevention and reduction measures. Furthermore, it will strengthen the regional coherence and cooperation in approaches to marine pollution prevention and control, and sustainable waste management. The areas addressed/covered by the proposed activity include a study/assessment, technical assistance and capacity building.

The overall Activity entails the following tasks:

- Task 1: Carry out marine litter pilot surveys (including a workshop) on the Med Coast of Egypt along with a literature review focusing on strengthening the evidence base concerning marine litter and in particular plastics.
- Task 2: Compile a document with 'best' available techniques and methodologies for monitoring marine litter in the coastal and marine environment and short listing of best environmental practices for management of marine litter.



- Task 3: Carry out a literature review on the degradation process for plastics.
- Task 4: Review the socioeconomic implications of marine litter.

2 AIM AND SCOPE OF THIS DELIVERABLE

The overarching aim of this document is to present a brief overview of the socio-economic implications of marine litter. It introduces the difficulties in measuring the economic costs of marine litter and reviews those sectors where these costs are notable. Worldwide, there are very few studies that have focused on assessing the socio-economic implications of marine litter in a comprehensive way, while in the Mediterranean there has been only one study that addresses the issue at sub-basin level. This study has been carried out within the framework of the IPA-Adriatic DeFishGear project, a best practice project featured in the 2017 Mediterranean Quality Status Report of the UN Environment/MAP. The EU-funded DeFishGear project was a 3-year long project piloting coordinated and harmonized actions on the science-policy-society interface for litter-free Adriatic and Ionian Seas. It carried out a comprehensive assessment of the status (amounts, composition, impacts) of marine litter (macro-litter & micro-litter) in the Adriatic and Ionian Seas through harmonized and coordinated monitoring activities. Furthermore, it investigated in a consistent and comprehensive way the socio-economic implications of marine litter in the Adriatic-Ionian macroregion. The present document takes stock of the results and findings of the DeFishGear socio-economic implications study, in an effort to establish a common understanding within the project partnership on the issue and provide valuable insights. It should be highlighted that currently the UN Environment/MAP is elaborating a document on the socio-economic implications of marine litter in the Mediterranean.

3 DEFINITIONS AND POLICY CONTEXT

Within this document marine litter is defined as any persistent, manufactured or processed solid material discarded, disposed of or abandoned in the marine and coastal environment. Marine litter can be classified in size classes as follows: macrolitter referring to items above 25mm in the longest dimension; mesolitter from 5mm to 25 mm; and microlitter from 1µm to 5mm. Sometimes the later size class is further broken down to large microplastics from 1mm to 5 mm and small microplastics from 1µm to 1mm. The main legislative frameworks related to marine litter in the Mediterranean are: the Barcelona Convention Regional Plan for Marine Litter Management in the Mediterranean (UNEP/MAP IG.21/9) and the Ecosystem Approach (COP19 IMAF Decision IG.22/7); the EU Marine Strategy Framework Directive (2008/56/EC, 2010/477/EC, 2017/848/EC) and the EU Plastics Strategy (COM(2018)).



Figure 1. The Marine Litter Ecological Objective and the respective Indicators within the framework of the Barcelona Convention Ecosystem Approach and the Integrated Monitoring and Assessment Programme.

Marine Litter and the Barcelona Convention Ecosystem Approach

Ecological Objective 10 (EO10): Marine and coastal litter do not adversely affect the coastal and marine environment.

IMAP Common Indicator 22:

Trends in the amount of litter washed ashore and/or deposited on coastlines (including analysis of its composition, spatial distribution and, where possible, source).

IMAP Common Indicator 23:

Trends in the amount of litter in the water column including micro plastics and on the seafloor.

IMAP Candidate Indicator 24:

Trends in the amount of litter ingested by or entangling marine organisms focusing on selected mammals, marine birds, and marine turtles.

Figure 2. The Marine Litter Descriptor, Criteria, and respective Indicators within the framework of the EU MSFD.

Marine Litter within the EU MSFD

Properties and quantities of marine litter do not cause harm to the coastal and marine environment (Descriptor 10)

Criteria D10C1 - Primary:

The composition, amount and spatial distribution of litter on the coastline, in the surface layer of the water column, and on the seabed, are at levels that do not cause harm to the coastal and marine environment.

- ✓ amount of litter washed ashore and/or deposited on coastlines, including analysis of its composition, spatial distribution and, where possible, source (10.1.1)
- ✓ amount of litter in the water column (including floating at the surface) and deposited on the seafloor, including analysis of its composition, spatial distribution and, where possible, source (10.1.2)

Criteria D10C2 - Primary:

The composition, amount and spatial distribution of micro-litter on the coastline, in the surface layer of the water column, and in seabed sediment, are at levels that do not cause harm to the coastal and marine environment.

- ✓ amount, distribution and, where possible, composition of microparticles (in particular microplastics) (10.1.3)

Criteria D10C3 - Secondary:

The amount of litter and micro-litter ingested by marine animals is at a level that does not adversely affect the health of the species concerned.

- ✓ amount and composition of litter ingested by marine animals (10.2.1)

Criteria D10C4 - Secondary:

The number of individuals of each species which are adversely affected due to litter, such as by entanglement, other types of injury or mortality, or health effects.

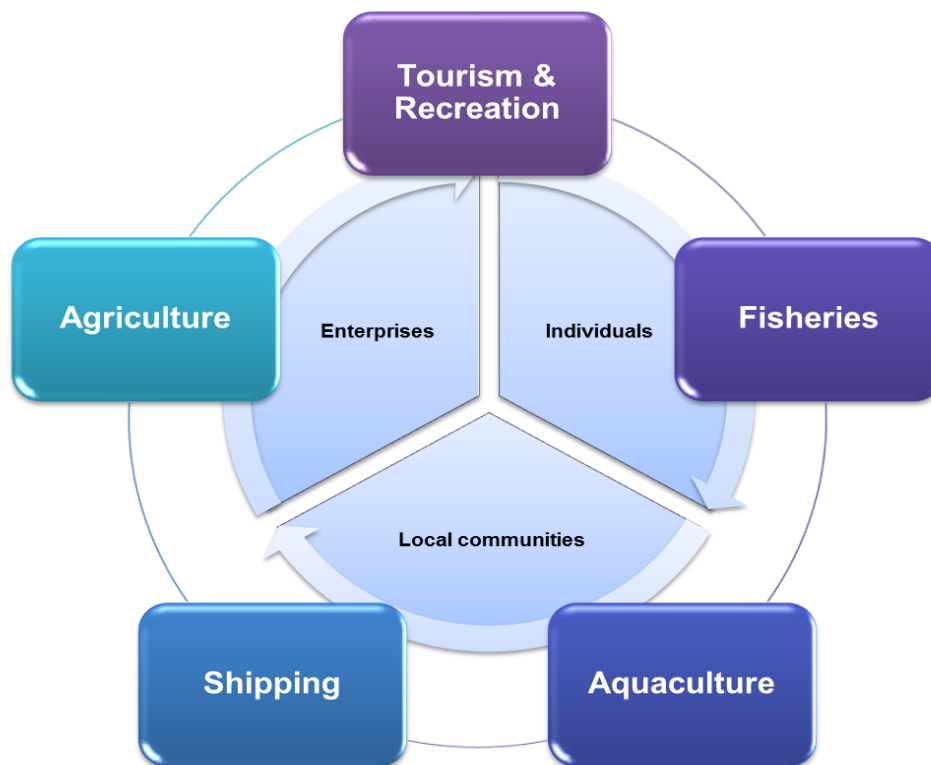


4 THE SOCIO-ECONOMIC IMPLICATIONS OF MARINE LITTER

4.1 Introduction

Understanding the full economic significance of the impacts of marine litter still remains relatively limited, however it is well known that every year, marine litter results in tremendous economic costs and significant losses for the economic sectors involved, such as tourism and recreation, fisheries, aquaculture, maritime transport and navigation, agriculture, and infrastructure and services for individuals, local communities and enterprises (Mouat et al., 2010; Leggett et al., 2014, Werner et al., 2016).

Figure 3. Economic sectors affected by marine litter.



The wide diversity of marine litter implications makes measuring the full economic cost resulting from marine litter extremely complex. Measuring the full economic cost of marine litter is challenging due to a wide range of economic, social and environmental impacts, the range of sectors impacted and the geographic spread of those affected (Scoullos, 2014; Newman et al., 2015).



Direct economic impacts such as increased litter cleansing costs are clearly easier to calculate than indirect economic and social costs, such as ecosystem degradation or reduced quality of life. Moreover, establishing the economic costs of marine litter is complicated by the wide variety of approaches available for valuing the environment and detrimental anthropogenic impacts. However despite the inherent limitations there is a growing body of evidence on the negative externalities created by marine litter (Mouat et al, 2010; Brouwer et al, 2015; Watkins et al, 2016).

The sections below feature the results obtained by the DeFishGear survey-based assessment (Vlachogianni, 2017) of the socio-economic implications of marine litter for the Adriatic-Ionian macroregion. The assessment was carried out in all seven countries sharing the Adriatic and Ionian Seas, namely: Albania, Bosnia & Herzegovina, Croatia, Greece, Italy, Montenegro and Slovenia. The methodology that was used deployed a sector-based approach to investigate the increased costs (e.g. cost of repairs of damaged nets or other equipment; cost of divers to cleanup aquaculture facilities, etc.) and potential losses of revenue associated with marine litter for vital economic sectors, such as tourism and recreation, fisheries, aquaculture and shipping. In addition, on paragraph features the impacts of marine litter on agriculture based on the results of a similar study carried out in Shetland islands (Mouat et al., 2010). It should be highlighted that methodology used in the DeFishGear study didn't address the economic and social costs linked to the degradation of the ecosystem services and the reduced quality of human welfare and therefore the findings do not address the full spectrum of the socio-economic costs of marine litter.

4.2 Tourism and recreation

Marine litter has an impact on the aesthetic value of coastal areas and clean coastlines are mostly preferred by tourists. Therefore marine litter can act as a deterrent to tourists. On the other hand tourism and recreation activities are one of the main sources of marine litter on coasts and at sea as also highlighted by the DeFishGear marine litter assessment (Vlachogianni et al., 2017). More specifically, shoreline, tourism and recreational activities contributed 33.4%-38.5% of the amount of litter found in the different marine compartments of the Adriatic and Ionian Seas. A large fraction of the top 20 items found in the Adriatic and Ionian Seas were short-lived single-use plastic items related to tourism and recreational activities such as plastic cups/lids from drinks, crisp packets and sweet wrappers, food wrappers and fast food containers, straws and stirrers, cups and cup lids, shopping bags, drink bottles, etc.

Coastal communities and the tourism industry are affected financially by marine litter, primarily through the direct cost of keeping beaches clear of litter. The direct costs of marine litter for the tourism sector include the collection, transportation and disposal of litter, and administrative costs such as tendering processes and managing bids and contracts (contract management). Littered beaches can discourage visitors, reduce their numbers and lead to reduction in revenues and loss of jobs in the tourism sector (ten Brink et al., 2016).

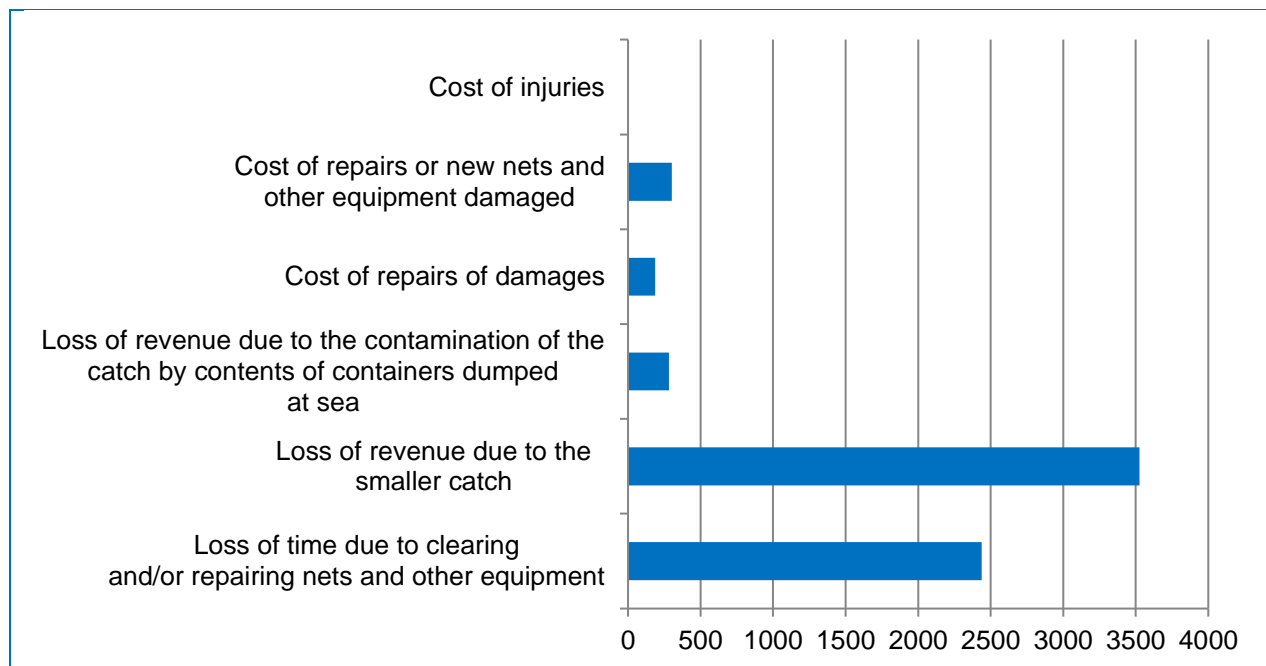


According to the DefishGear results, the average annual amount invested in keeping beaches litter-free per tourism related business of varying size and type was calculated to be € 5,685 per year, which can be considered as a substantial expense. The total cost of removing beach litter reported by the 32 municipalities was € 6,724,530 per year, with an average of € 216,920 per year per municipality. On average, the municipalities spent some 5% of their budget for marine litter cleanup operations.

4.3 Fisheries

The fishing sector is more commonly viewed as a source of marine litter, but it is also subject to economic costs itself. Direct economic impacts faced by the sector arise from the need to repair or replace gear that has been damaged or lost due to encounters with marine litter; repairing vessels with tangled propellers, anchors, rudders, blocked intake pipes, etc.; loss of earnings due to time diverted to deal with marine litter encounters; and loss of earnings from reduced or contaminated catches resulting from marine litter encounters including ghost fishing. The sector also experiences indirect losses of earnings due to the impact of loss and abandoned fishing gear on fish stocks (MacFayden et al. 2009). Economic costs from marine litter can arise for fishermen who wish to responsibly dispose of the marine litter and derelict fishing gear that they encounter during operations. The cost of port reception facilities can be high, especially for non-ship generated waste which is often subject to a direct fee (Werner et al., 2016).

Figure 4. Distribution of direct and indirect costs arising from marine litter in the fisheries sector (per fishing vessel/per year).



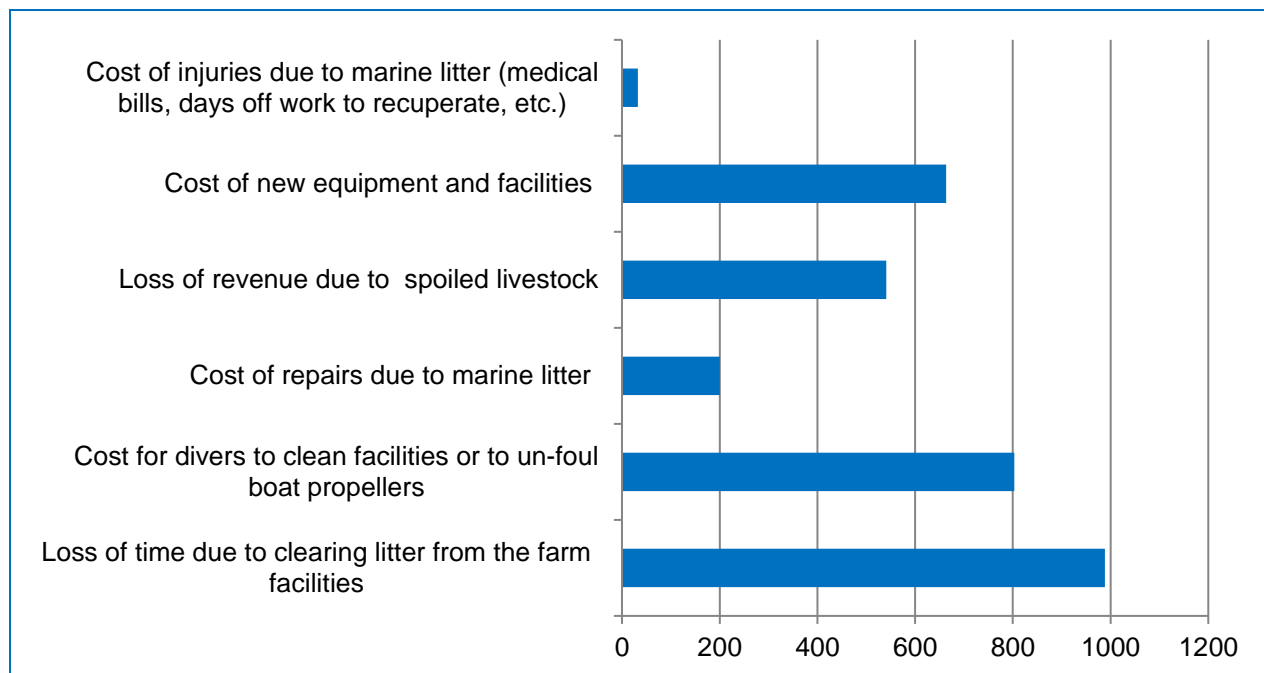


The DeFishGear results for the fisheries sector indicate that the average annual cost of marine litter per vessel reaches € 5,378 (cost of repairs of damages, loss of revenue due to the smaller catch, loss of time spent on clearing and repairing nets, etc., reported by fishermen per fishing vessel per year), an amount much higher than the one reported for EU vessels. Given this, the total losses to the fisheries sector in the Adriatic-Ionian macroregion were calculated to be € 18.19 million per year, which represents one third of the marine litter costs to the EU fishing fleet (€ 61.7 million per annum) (Vlachogianni, 2017; Acoleyen et al, 2013).

4.4 Aquaculture

Marine litter may impact the aquaculture industry with additional costs arising particularly from time spent removing litter from around fish farm sites and costs associated with fouled propellers on work boats (Mouat et al, 2010). However, the aquaculture sector may in turn contribute to the marine litter pressure as shown by the results of the DeFishGear project in the Adriatic-Ionian region. The DeFishGear marine litter assessment highlighted the emerging issue of mussel nets ranking in the 7th position of the top 20 items found on beaches, while in Italy these items were the 3rd most abundant items recorded on the seafloor (8.4%) (Vlachogianni et al., 2018; Fortibuoni et al., 2019). Marine litter can result in costs to the aquaculture industry, through entangling propellers and blocking intake pipes, time spent removing litter from and around fish farm operations, and injuries caused by marine litter.

Figure 5. Distribution of direct and indirect costs arising from marine litter in the aquaculture sector (per aquaculture farm unit/year).





On average, the annual direct and indirect marine litter related costs for the aquaculture sector in the Adriatic and Ionian macroregion were assessed to be € 3,228 per aquaculture farm unit. In general, most costs were incurred because of: loss of time due to clearing litter from the farm facilities (989 €/year); costs for divers to clean facilities or to un-foul boat propellers (803 €/year); cost of new equipment and facilities (663 €/year); loss of revenue due to spoiled livestock (541 €/year); costs of repairs due to marine litter (200 €/year); cost of injuries due to marine litter (32 €/year).

4.5 Shipping

Historically ships have been a major source of marine litter via dumping garbage at sea. In response to global concerns about marine pollution, the International Marine Organization in 1973 adopted the International Convention for the Prevention of Pollution from Ships, known as MARPOL 73/78. Annex V of the MARPOL Convention addresses garbage and its proper management and disposal. The shipping industry also experiences economic impacts as a result of marine litter pollution, with harbours and marinas incurring the cost of removing marine litter from their facilities in order to keep them safe and attractive to users, and vessels experiencing interference with propellers, anchors, rudders and blocked intake pipes and valves. On occasion, some of these vessel encounters pose navigational hazards that require the rescue services to become involved, thereby increasing costs dramatically.

The DeFishGear estimated the average annual cost of managing marine litter to be € 8,518 per harbour. This average is similar to the average reported for the ports and harbours industry in the UK, which equals to € 8,034 per year (Mouat et al, 2010).

4.6 Agriculture

As a terrestrial economic activity, agriculture is not the most obvious sector to suffer economic losses because of marine litter. Indeed, similarly to the fishing sector it is more frequently seen as a source of marine litter (Newman et al., 2015). Typical agriculture related litter items are: fertilizer and animal feed bags, agro-chemicals containers, greenhouse sheets, etc. In some locations, however, marine litter can blow, drift or get washed up on coastal farmland, causing damage to property, equipment and presenting a risk to livestock through ingestion and entanglement. These impacts may all lead to economic losses in addition to the cost of preventative litter removal.

The DeFishGear project didn't investigate the impacts of marine litter on the agricultural sector however a relevant study has been carried out for the Shetland Isles. Hall (2000) estimated annual losses to be €500 per farmer, and a total of €770,000 for islands as a whole. This comprised time spent cleaning land, clearing ditches, freeing entangled animals, additional vet bills, and repairs to fences damaged by litter. Mouat et al. (2010) estimated that marine litter cost each smallholding an average of €841 per year and the agricultural industry of the Shetland Islands as a whole a total of approximately €252,000.



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6 ANNEX I. THE DEFISHGEAR STUDY ON THE SOCIO-ECONOMIC IMPLICATIONS OF MARINE LITTER IN THE ADRIATIC-IONIAN MACROREGION
