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Meeting of the MAP Focal Points

Athens, Greece, 10-12 September 2013

Background Document on Marine Litter Regional Plan Measures and Indicative Cost Estimation of Measures Implementation

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Introduction

The problem of marine litter is steadily gaining importance in the last decade at the global, regional and national levels. It poses a complex and multi-dimensional challenge with significant implications for the marine and coastal environment and human activities all over the world. In the Mediterranean the problem of marine litter was identified a long time ago and UNEP MAP started with the active work on this problem almost thirty years ago.

An important step forward towards dealing with the marine litter problem was adoption of Decision IG.20/10 at the 17th Meeting of the Contracting Parties of the Barcelona Convention (Paris, February 2012) entitled "Adoption of the Strategic Framework for Marine Litter management". This decision mandated the Secretariat to prepare the Regional Plan on Marine Litter Management in the Mediterranean in the Framework of Article 15 of the LBS Protocol. The legal basis for the preparation of the Regional Plan were specific decisions of the meetings of the Contracting Parties; Protocols of the Barcelona Convention (particularly the LBS Protocol); and relevant global and regional decisions.

In order to implement the decision of the 17th COP Meeting the Secretariat prepared the initial draft of the Regional Plan on Marine Litter Management which was discussed at the Consultation Meeting with Partners (Athens, 26 March 2013) and on the basis of the discussion a new draft of the Regional Plan was prepared.

This draft was reviewed at the Government Designated Expert Meeting (Barcelona, 17-18 May 2013) and on the basis of the discussions at this meeting a new draft of the Regional Plan was prepared by the Secretariat.

This draft was submitted to the MED POL Focal Points Meeting (Barcelona, 18-21 June 2013) and this meeting reviewed the proposal and adopted it with amendments. On the basis of these amendments the Secretariat prepared new draft of the Regional Plan which will be considered at the MAP Focal Points Meeting (Athens, 10-12 Sept. 2013) with the view of subsequent submission to the 18th Contracting Parties Meeting (Istanbul, 6-9 Dec. 2013).

The MED POL Focal Points Meeting agreed during the review of the draft Regional Plan, that the "assessment of cost of measures implementation should be given high priority and every effort should be made to submit an indication of costs to the MAP Focal Points meeting in September 2013 together with the draft regional plan for their consideration".

In order to implement above decision and to assist the Contracting Parties to prepare for the implementation of the Regional Plan the Secretariat undertook extensive literature survey and collected relevant information. Such search through the literature resulted in large amount of information that is relevant to the marine litter management and to the estimation of costs for the marine litter management. Selection from such information is presented in this document in the following two parts:

(i) Background Information Relevant to the Regional Plan on Marine Litter Management; and

(ii) Background Information on the Estimation of Indicative Cost of Implementation of Measures of the Regional Plan on Marine Litter Management.

The list of references for the sources of information is presented at the end of this document.

1. BACKGROUND INFORMATION RELEVANT TO THE REGIONAL PLAN ON MARINE LITTER MANAGEMENT

1.1 Marine litter management shall be an integral part of the Solid waste management

Integrated 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 the waste. It is important to note that no one single treatment method can manage all the waste materials in an environmentally effective way. Thus all of the available treatment and disposal options must be evaluated equally and the best combination of the available options suited to the particular community chosen. Effective management schemes therefore need to operate in ways which best meet current social, economic, and environmental conditions of the municipality.

Marine litter and solid waste

Marine litter is an environmental, economic, health and aesthetic problem affecting all regions around the world. Marine litter includes any anthropogenic, manufactured, or processed solid material (regardless of size) discarded, disposed of, or abandoned that ends up in the marine environment. It includes, but is not limited to, plastics, metals, glass, concrete and other construction materials, paper and cardboard, polystyrene, rubber, rope, fishing nets, traps and pots, textiles, timber and hazardous materials, such as munitions, asbestos and medical waste. Marine litter may result from activities on land or at sea. Marine litter is a complex cultural and multi-sectoral problem that exacts tremendous ecological, economic, and social costs around the globe.

A good part of the marine litter from land-based sources results from unsustainable production, consumption, and poor waste management. Increased development, urbanization, and consumerism lead to increases in the use of disposable and non-degradable products and packaging, which results in increased generation of solid waste. Poor management or mishandling of waste materials creates the foundation for land-based sources of marine litter. Both legal and illegal waste handling practices contribute to marine litter. Marine litter is therefore part of a broader problem of solid waste management, which affects all coastal and upland communities including inland waterways and is closely linked to the protection and conservation of the marine and coastal environment and sustainable development. A lack of capacity and funding to effectively manage solid wastes is common, particularly in developing countries, and contributes to the problem of marine litter. Marine litter is often the result of poorly managed waste from human activities. Almost everything we do leaves behind some kind of waste, from everyday household trash to industrial and manufacturing waste. This waste can find its way into the oceans, where it becomes marine litter.

1.2 Proposed measures by the Regional Activity Centre on Cleaner Production in the Regional Plan on Marine Litter Management

Measures related to article 9.1

The separated collection of the organic fraction of municipal waste is of utmost importance to minimize the amount of waste that shall go to landfill or incineration, as it is the biggest fraction in weight of household wastes. If we have a relatively “clean” organic fraction, we can obtain good quality compost that can be used safely in agriculture, where the demand for organic fertilizers or amendments to improve its fertility and porosity is very high in the Mediterranean area, due to the poor organic content of the soils. Otherwise, if we have the organic fraction mixed with other urban waste, we will obtain a product (grey compost) that cannot be applied in agriculture due to its contents in heavy metals, toxic chemicals, etc and that can only be applied in very restricted and controlled situations or must be landfilled or incinerated. It is worth mentioning that the use of compost as fertilizer is also a sink of CO2, as much of the organic fractions remains mineralized in the soil, and minimizes the consumption of energy-intensive chemicals fertilizers.

Furthermore, if we do not separate at source the organic and the packaging fraction, we discourage the plastic waste minimization objective in line with SCP measures, which should be the basis for a marine litter minimization.

That’s why we stress that at least in the horizon 2025 the waste management programmes should have in place separate household waste collection schemes including the organic fraction.

Measures related to article 9.3 (a)

Promote Extended Producer Responsibility (EPR) programmes. Under an EPR scheme, legal responsibility for collection, recycling and end-of life management of products and packaging is given to producers, manufacturers, brand owners and first importers.

EPR programs can cover costs through fees applied per unit and fees are differentiated based on the cost to recycle or dispose of in an environmentally sound manner of the materials. In this way, the most interested in improving for waste reduction, reuse and recyclability (eco-design) of its products and packaging are the same producers.

Measures related to article 9.3 (b)

The Green Public Procurement (GPP) is a fundamental political instrument to promote sustainable development and to move towards a green economy that encourages the development of products and services that maximize social and environmental benefits, given the big percentage of the GDP that represents the public sector in most countries. The GPP has the potential to transform markets, increase the competitiveness of industries, save money, conserve natural resources and promote job creation. In this way, to introduce objectives of recycled plastic composition in the products purchased by the public administrations is crucial to facilitate the creation of markets in the country for the recovered plastic, which in turn boost the interest to recover plastic packaging, the main component of marine litter.

Measures related to article 9.3 (c)

This is also related to article 9.3 (a).

By a Deposit, return and restoration system (DRRS), 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 returned when the packaging is effectively returned. This system has demonstrated high rates of recovery. It is very suitable for example to 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.

The other waste management system to prevent waste generation is the Integrated Management System (IMS). In this case the packing company pays an amount for the quantity in weight of the packaging placed in the market to the managing company of the IMS. This money serves to finance the selective waste collection, and the transport and the selection of the different materials. This system is normally established on a mandatory basis for all the plastic packaging products producers.

Measures related to article 9.3 (d)

This point is of special interest because plastic carrier bags are one of the major wastes at sea. The measure was introduced on a voluntary basis with retailers by the Catalan Waste Agency 4 years ago and has accomplished a reduction of 45% in plastic carrier bags consumption, although some initial public opposition.

Measures related to article 9.3 (e)

This is a very specific measure addressed to the fishing sector in order to solve the problem of the EPS boxes. Due to its volume and light weight, Life cycle analysis of EPS shows that the cost of collection, cleaning, and recycling post-consumer EPS is greater than the value of the recycled product. EPS is of environmental concern in the marine medium, as Polystyrene is very brittle and it quickly breaks into small pieces. The introduction of a mandatory SDDR scheme in the sector would minimize the single-use culture of this big consume item.

Measures related to article 9.3 (f)

Heavy-rain spells that wash-up litter coming from the sewage system are very usual in the Mediterranean area. This washed-up litter could be prevented by including technical measures in the sewage system ranging from mechanical elements like grills to buffer storm tanks.

Measures related to article 17

It is important to have cooperation from the beginning of the private sector like tourism and fisheries. This was a remark made by NOWPAP expert, Mr. Tkalin, based on many years of experience in marine litter management.

1.3 Enhancement of the Port reception facilities around the Mediterranean[1]

At international level, with a view to assisting the States in the implementation of the provisions of the MARPOL Convention under national law, and to enforce the requirements of its technical annexes, IMO produced a manual entitled MARPOL: How to do it. Moreover, the Comprehensive Manual on Port Reception Facilities, published by the IMO, provides guidance on the provision of port reception facilities for ship-generated waste.

[1] Extracts from the document: *A Summary of REMPEC's Activities in the Mediterranean Region (2005).*

At regional level, in order to encourage further ratification and proper implementation and enforcement of the MARPOL Convention by the Mediterranean coastal States, a specific provision was included in the 2002 *Prevention and Emergency Protocol*. The Article 14 of the Protocol provides that reception facilities, including facilities for pleasure craft, meeting the needs of ships, shall be available in the ports and terminals of the Parties. The provision does not introduce regulations concerning the discharge of ship-generated waste. These regulations are already addressed in detail by the technical annexes of the MARPOL Convention. The aim of the Protocol is to facilitate the effective implementation and enforcement of these regulations in the Mediterranean region. Article 14 aims at facilitating the implementation by the Mediterranean coastal States of the provisions of MARPOL Convention related to port reception facilities.

The EC/MEDA technical assistance project, implemented from 2002 to 2004 in the framework of the Euro-Mediterranean Partnership, on *Port reception facilities for collecting ship-generated garbage, bilge waters and oily wastes* included the following ten beneficiary countries which are also Parties to the 1976/1995 Barcelona Convention, i.e. Algeria; Cyprus; Egypt; Israel; Lebanon; Malta; Morocco; Tunisia; Turkey; and Syria. The Project also involved four Mediterranean EU Member States (France, Greece, Italy and Spain) as EU Partners from whom full support to the Project was assumed in view of their experience in the field. The overall objective of the Project was to facilitate the implementation in the Mediterranean region of the MARPOL Convention, with respect to the provision of adequate port reception facilities. In order to address the issue of port reception facilities in the beneficiary countries, REMPEC primarily identified the existing situation and needs regarding port reception facilities in the relevant ports and oil terminals of the countries covered by the Project. This was attained through an assessment carried out in each relevant port/terminal of the beneficiary countries. In total, fifty-six ports/oil terminals were visited. With respect to garbage, adequate facilities are provided in all ports, with the exception of three ports where no facilities at all are provided. Project identified the need for each relevant port by the full evaluation of ship traffic movements and the estimated quantities of oil and garbage to be discharged, with reference to the MARPOL. It should be noted that the standard designs for port reception facilities are applicable to all ports/terminals of the Mediterranean. The drawings were conceived to cover a range of nine different types of facilities (three modules combined with three different capacities). Analogous complimentary activities were also carried out by the Centre in other Mediterranean coastal States which were not covered by the project namely, Albania, Croatia, Libya, Slovenia and Montenegro.

Results of the EC/MEDA Project were presented at the Regional Seminar at which participants adopted a Resolution endorsing the results of the Project and REMPEC's complementary activities and outlining further actions for their implementation at the national, bilateral, multilateral and regional level. One of the main concerns expressed by some Mediterranean countries which participated in the EC/MEDA Project, as well as in the complementary activities carried out by REMPEC in the field of port reception facilities was related to the public sector investment required for the establishment of reception facilities in their respective ports and terminals. In this regard, it should be noted that the MARPOL Convention states that the government of the State *undertake to ensure the provision of* the facilities. The requirement related to ensuring the provision of port reception facilities is addressed to the State, and is therefore an obligation that remains with the State, but this does not imply that the building and operation of the facilities shall be a duty of the public sector. The actual provision of port reception facilities can be undertaken by either the public and/or the private sector. An overview of the advantages and the disadvantages of public/private options can be found in Chapter 3 of the *Comprehensive Manual on Port Reception Facilities* published by IMO.

The role of a contracting Party to the MARPOL Convention is: (i) to implement MARPOL provisions, which implies the integration of these provisions into national law; and (ii) to

ensure compliance with MARPOL provisions, which implies that (i) legal; (ii) administrative; and (iii) technical conditions enabling enforcement are being met by the different administrations of the State involved. As far as the availability of port reception facilities is concerned, the State shall undertake to transpose the MARPOL relative requirements into its national law, i.e. that ports and terminals provide adequate port reception facilities to meet the needs of the ships. Moreover, the maritime administration shall ensure that the facilities are available in ports and terminals, and should follow up by reporting, inspecting and prosecuting in cases of non-compliance.

Possible measures and/or activities which could be undertaken in the future with regard to issues included in the Regional Plan on Marine Litter:

- Update of the assessment study of port reception facilities in the Mediterranean carried out under the Euro-Mediterranean Partnership Project on port reception facilities for collecting ship-generated garbage, bilge waters and oily wastes in the Mediterranean implemented by REMPEC between 2002 and 2004;
- Ranking of Mediterranean ports to be equipped in priority with port reception facilities established;
- Mediterranean Port Reception Facilities Regional Forum to facilitate exchanges between ship owners, port authorities and other interested parties with a view to addressing the issue of lack or inadequate port reception facilities in a practical manner established;
- Capacity building and awareness raising activities related to the new Annex V (Garbage) of MARPOL;
- Knowledge of Contracting Parties on port reception facilities best practices enhanced through a Regional Workshop on Port Reception Facilities in co-operation with European ports; and
- Take into consideration the Regional Plan on Marine Litter when reviewing the Regional Strategy for Prevention of and Response to Marine Pollution from Ships.

1.4 Marine litter in relation with the Biodiversity Protocol and SAPBIO

Pollution of marine and coastal areas is a recurrently cited problem threatening biodiversity. The SPA/DB Protocol provides provisions to address the issue of pollution in various articles such the 6.a. where “the Parties shall prohibit the dumping or discharge of wastes and other substances likely directly or indirectly to impair the integrity of the specially protected area”.
The pollution in genral is also identified as threat to several threatened species like marine turtles, monk seal, cetaceans and birds.

Most of the effects of pollution for Mediterranean biodiversity are treated in the “Strategic Action Plan to Address Pollution from Land-based Activities (SAP MED)”, implemented by UNEP MAP/MEDPOL2. The TDA MED and SAP MED identified 103 hot spots and 51 sensitive areas of regional importance in the Mediterranean basin.

Pollution of the coastal zone and its wetlands by solid and liquid domestic and industrial wastes by-products is reported, in the SAPBIO national reports, as a major problem by many Mediterranean countries, as the lack of appropriate treatment facilities is very common. In particular, chemical and petrochemical industries concentrated around major coastal cities are a major source of pollution4. To this is now added agricultural pollution from runoff containing high concentrations of fertilisers, pesticides and other agrochemicals. Their combined impact on the health of habitats and on particular species is often quite high. It should be noted, however, that this is not an irreversible effect, and that after the removal of the sources of pollution biodiversity can be re-established to a considerable degree.

Floating plastic objects and debris, considered as new important source of pollution, is cited as threats to marine species and communities affecting mainly affecting sea turtles, birds and marine mammals. Mucilaginous aggregates can sporadically appear in coastal waters. The appearance of these benthic aggregates shows a seasonal pattern, becoming noticeable in the field as small, yellowish tufts in early spring that go on, until the end of summer forming, under favourable environmental conditions, extensive patches at the seabed, causing local episodes of anoxia and hindering the feeding mechanism of filtering species. Depending on the topographical features of the rocky bottom and local hydrodynamic conditions, benthic mucilaginous aggregates may develop in a wide depth range growing on various algal communities, Posidonia oceanica meadows, gorgonians and other benthic organisms. The relationship between the appearance of these aggregates and episodes of eutrophication or organic pollution remains unclear.

The SAPBIO defined seven priorities among which the Assessing and mitigating the impact of threats on biodiversity. As far as the marine litter is concerned, SAPBIO identified under activity 19 concerning the assessment and elaboration of strategies to prevent the environment impact of sources of pollution to control the proliferation of floating plastic objects and debris. It is an long-term activity that concern the whole Mediterranean region and each participating country. It was considered as low-level activity because the logistic/economic/institutional conditions are not met. To this end, the following specific actions were identified:

a. Establish a regional programme to plastic proliferation in the organisations;
b. Geographical identification of priority areas likely to be affected by the proliferation of plastic debris in the sea;
c. Support international agreements about the dumping of plastics in the sea;
d. Enhance recuperation and recycling of plastics;
e. Promote the research and application of technology to produce photo- and bio-degradable plastics;
f. Promote and support beach-cleaning initiatives;
g. Establish awareness campaigns (oriented to users and the general public) about the use and waste of plastic debris in the sea;
h. This action should be implemented by regional organisations, national authorities and research institutes; and
i. The provisions of the Regional Plan on Marine Litter Management developed by the MEDPOL will be taken into account in the ongoing updating of the SAP BIO and the regional action plan for the conservation of threatened species adopted within the framework of SPA/DB Protocol.

1.5 Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS)

Cetaceans are known to be affected by marine litter through ingestion and entanglement; the phenomenon is well-known in the ACCOBAMS area, and substantive information exists from the monitoring of strandings in the Mediterranean and the Black Seas.

Also, the Agreement text, in particular its Annex 2 concerning the ACCOBAMS Conservation plan adopted by all Parties to the Agreement is requesting Parties to:

Paragraph 1 (Adoption and enforcement of national legislation):

.../ b) introduce or amend regulations with a view to preventing fishing gear from being discarded or left adrift at sea, and to require the immediate release of cetaceans caught incidentally in fishing gear in conditions that assure their survival;

d) regulate the discharge at sea of, and adopt within the framework of other appropriate legal instruments stricter standards for, pollutants believed to have adverse effects on cetaceans /...

Paragraph 2 (Assessment and management of human-cetacean interactions):

Parties shall, in co-operation with relevant international organizations, collect and analyse data on direct and indirect interactions between humans and cetaceans in relation to inter alia fishing, industrial and touristic activities, and land-based and maritime pollution. When necessary, Parties shall take appropriate remedial measures and shall develop guidelines and/or codes of conduct to regulate or manage such activities.

Projects were supported by ACCOBAMS regarding Marine Litter and Marine Mammals Conservation, in particular the "Involvement of Black Sea artisanal fisheries in anti-bycatch and anti-marine litter activities (implemented by Black Sea Council for Marine Mammals and Brema Laboratory, Ukraine; supported by Black Sea Commission, ACCOBAMS and UNEP/RSP)". A similar project was undertaken in Turkey: Project of cetacean bycatch and stranding related to turbot fishery and marine litter pollution in the western Turkish Black Sea coast (implemented by TUDAV, Turkey; supported by Black Sea Commission and UNEP/RSP).

Guidelines for fishermen on the prevention and mitigation of marine litter pollution and ghost fishing in the Black Sea region have been prepared in 20082. These guidelines were translated in Ukrainian and Russian. They have been prepared for the purpose of raising awareness of Black Sea fishermen and reminding them about their professional duties in respect of prevention and abatement of Marine Litter pollution including Ghost fishing. The guidelines are intended upmost to provide guidance to those segments of the commercial fishing industry that are involved in demersal and pelagic fisheries using a filtering-type fishing gear like bottom-set gillnets, trammel nets, purse seines, pelagic trawls, etc.

In addition, the Parties adopted in 2010 a Resolution on the contribution of ACCOBAMS to the implementation of the Marine Strategy Framework Directive (MSFD). In this process the descriptor 10 on Marine Litter was identified of high relevance for cetaceans The phenomenon is well known in the ACCOBAMS area and it is suggested to facilitate the flow of information between ACCOBAMS and the MSFD effort through the collection of data in monitoring cetacean strandings.

Finally the Scientific Committee noted the importance of continued research in the ACCOBAMS area in relation to chemical pollution and Marine Litter and stressed the importance to develop projects to evaluate potential threats caused by microplastics and ghost fishing.

In this context and according to an advice made by the Chair of the Scientific Committee, the ACCOBAMS Secretariat is proposing to develop collaboration with the MEDPOL program to envisage the preparation of a region-wide project on marine litter to:

[2] The guidelines were drafted in November 2008 by Alexei Birkun, Jr. (Black Sea Council for Marine Mammals) in frame of the Joint Programme of the BSC PS and ACCOBAMS PS on Marine Litter and Marine Mammals Conservation in the Black Sea. They are available in the ACCOBAMS web site (www.accobams.net)

Address the impact of marine litter (including ghost fishing nets, plastics, etc.) on marine mammals in the ACCOBAMS area; and

Produce guidelines on how to monitor and mitigate the problem. This project could be prepared and implemented in cooperation with IWC, ASCOBANS, MEDPOL, GFCM and BSC.

1.6 Participation of countries in the International Coastal Cleanup events

The annual International Coastal Cleanup (ICC) campaign, which is coordinated globally by Ocean Conservancy (a 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 in its 26 years, involving hundreds of NGOs, government agencies, various private sector and other civil society groups and organizations at the regional, national and local level. The ICC is unique in that its activities of collecting data on the composition and abundance of marine litter provides the only global database of this information worldwide. Starting in 1989, the ICC started to expand into countries on the African continent, the Americas, Asia, Europe, Mediterranean, Middle East, Pacific Rim and Wider Caribbean. 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. Eleven Mediterranean countries participated so far in the ICC event (annually, every September).

ICC has involved hundreds of thousands of volunteers and organizers who annually survey beaches and underwater sites around the globe for marine debris. Supported by government agencies, corporate partners and conservation and civic groups, these volunteers and supporters remove debris and record valuable information on the types and sources of this global pollution problem.

One of the primary goals of the International Coastal Cleanup is to help trace pollution to its source and work to help prevent it from occurring. To this end, volunteers record debris information using a standardized data card first developed in 1986 by Ocean Conservancy. The ICC data card includes 43 debris items and groupings targeting recognized debris-producing activities and sources. The result has been the creation of a unique, global database of information collected at beach and underwater cleanups around the world.

The data collected and analyzed has been used locally, nationally and internationally to help influence 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.

1.7 Development and implementation of the Fishing for Litter system

Fishing for Litter is one of the most innovative and successful concepts to tackle marine litter at sea. This imaginative yet simple initiative aims to reduce marine litter by involving one of the key stakeholders, the fishing industry. The initiative not only involves the direct removal of litter from the sea, but also raises awareness of the problem inside the industry as a whole. The North Sea Directorate of the Dutch Government in co-operation with the Dutch Fisheries Association originally started the Fishing for Litter initiative in March 2000 before it expanded by KIMO (Kommunenes Internasjonale Miljøorganisasjon, Local Authorities International Environmental Organisation) to Denmark, UK, Netherlands, Isle of Man and Sweden in 2004.

The initiative clears litter from the seabed by providing vessels with large (1 m3) hardwearing bags to collect marine litter that accumulates in their nets as part of their normal fishing

activity. Operational or galley waste generated on board, and hence the responsibility of the vessel, continues to go through the established harbour waste management system. Full bags are deposited on the quayside where the participating harbours monitor the waste before moving the bag to a dedicated skip for disposal. This reduces the volume of debris washing up on our beaches and also reduces the amount of time fishermen spend untangling their nets. The project provides the bags and covered the waste costs and the fishermen and harbours volunteer their time. KIMO believes that Fishing for Litter is one of the best practical measures that can be implemented, not only to reduce to the input of litter to the marine environment from the fishing industry, but also to remove existing litter from the marine environment.

The concept has been endorsed by European Environment Ministers at the Ministerial Meeting of the OSPAR Commission in the Bremen Statement 2003 and the Göteborg Declaration 2006. (Para 22. Ministers request competent authorities to investigate methods through EU Directive 2000/59/EC, or if this proves not to be possible, through fishing for litter initiatives, to enable the fishing industry to contribute more positively to reducing the amount of litter in the sea, especially litter which is hauled up with their nets. If this approach proves not to be feasible, Ministers request the competent authorities to develop financially supported fishing for litter initiatives for the landing of non-operational waste.)

KIMO has also shown the cost to the fishing industry of marine litter, which can be up to £30,000 per boat each year through contamination of catches, broken gear and fouled propellers. It is therefore essential that urgent action be taken to reduce what is currently a significant marine pollution problem.

South Korea is implementing a Buyback Programme which is very efficient and which is basically a Fishing for Litter programme but fishermen when they deliver the bag with derelict fishing gear they get a small financial compensation for it.

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

"No-special-fee" system is defined as a charging system where the cost of reception, handling 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 otherwise charged to the ship irrespective of whether wastes are delivered or not. The "no-special-fee" system is not restricted to any specific type of ship-generated waste.

"No-special-fee" system constitutes a system with the dual purpose of encouraging ships to deliver waste ashore and to avoid undesirable waste streams between ports, thereby encouraging a sound sharing of the waste burden.

Every sea-going ship's obligation to pay for reception, handling and disposal of oil residues, sewage and garbage is deemed to arise with the arrival of a ship in any port of the participating countries, irrespective of whether or not that particular ship will actually make use of the reception facilities, which are available there. The fee covers the waste collecting, handling and processing including infrastructure and shall be distributed among ships and collected as part of or in addition to the port dues.

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.

1.9 Adopt a Beach system and Beachwatch

Adopt-a-Beach is a concept when a school, or local community, or an NGO, or a group of volunteers “adopt” (not in a legal sense) a beach and takes care of that beach by regular cleanup events. In a way they are “guardians” of that beach.

Marine Conservation Society (MCS), UK, co-ordinates a range of projects that encourage public participation in marine conservation, including Adopt-a-Beach and Beachwatch, the biggest beach clean and litter survey projects in Europe. MCS has been collecting data on marine litter through Beachwatch 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. Beachwatch 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.

According to MCS Beachwatch litter surveys, UK beach litter levels have increased over the past 16 years. In fact, average beach litter levels following Beachwatch 2008 were 90% above 1994 levels. Plastic litter levels have increased by 146% since 1994.

Each year, thousands of volunteers demonstrate their concern for the state of the marine environment and the problems caused by marine litter by participating in MCS’s Adopt-a Beach project and the annual Beachwatch litter survey and clean-up. In Beachwatch 2008, a total of 374 beaches, covering over 170 km of coastline in England, Scotland, Wales, Northern Ireland and the Channel Islands were cleaned and surveyed by over 5,000 volunteers, indicating that litter is still an issue of great public concern. The data is analysed by MCS to identify the quantities, types and sources of litter affecting the UK coastline and the impacts of litter on marine life, human health and local economies, providing evidence that can be used to target specific polluters and pollutants at local, national and international levels. The results of the surveys carried out during Beachwatch are published every Spring and are the only annual statistics on beach litter produced in the UK.

Public participation in the MCS projects and other community initiatives plays an important 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. Through the Adopt-a-Beach project, local people volunteer to undertake quarterly beach cleans and litter surveys of their chosen beach. As well as traditional beach clean-ups, MCS works alongside Project AWARE and PADI (Professional Association of Dive Instructors) dive centres to organise underwater beach cleans. These underwater clean-ups are invaluable as they remove plastic, netting, cans, old buoys and general rubbish that has already made it into the marine ecosystem.

1.10 Blue Flag

The Blue Flag is a certification by the Foundation for Environmental Education (FEE) 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 consisting of 65 organisations in 60 member countries in Europe, Africa, Oceania, Asia, North America and South America. FEE's Blue Flag criteria include standards for water quality, safety, environmental education and information, the provision of services and general environmental management criteria. The Blue Flag is sought for beaches and marinas as an indication of their high environmental and quality standards. Certificates, which FEE refers to as awards, are issued on an annual basis to beaches and marinas of FEE member countries. The awards are announced yearly

on 5 June for Europe, Canada, Morocco, Tunisia and other countries in a similar geographic location, and on 1 November for the Caribbean, New Zealand, South Africa and other countries in the southern hemisphere. In the European Union, the water quality standards are incorporated in the EC Water Framework Directive. The Blue Flag was created in France in 1985 as a pilot scheme where French coastal municipalities were awarded the Blue Flag on the basis of criteria covering sewage treatment and bathing water quality.

1987 was the "European Year of the Environment" and the European Commission was responsible for developing the European Community activities of that year. The Foundation for Environmental Education in Europe (FEEE) presented the concept of the Blue Flag to the Commission, and it was agreed to launch the Blue Flag Programme as one of several "European Year of the Environment" activities in the Community. The French concept of the Blue Flag was developed on European level to include other areas of environmental management, such as waste management and coastal planning and protection. Besides beaches marinas also became eligible for the Blue Flag. There have been increases in the numbers of Blue Flags awarded each year. The criteria have during these years been changed to more strict criteria. As an example, in 1992 the Programme started using the restrictive guideline values in the EEC Bathing Water Directive as imperative criteria, and this was also the year where all Blue Flag criteria became the same in all participating countries. In 2010 over 3450 beaches and marinas globally were awarded the Blue Flag. 12 Mediterranean countries are currently participating in the Blue Flag Programme.

1.11 Clean up the Med - Legambiente - Seas at Risk

The annual Mediterranean beach clean-up, as organised by Seas At Risk member Legambiente, takes place every May.

The event has been running since 1995, when the campaign ‘Clean Up the Med’ was born. In 2009, over 100,000 volunteers took part in over 1,500 locations.

Over 400 organisations, spread across almost every country that borders the Mediterranean Sea, have been involved in the past as volunteers and commit themselves to removing as much litter as possible from both popular seaside places and sensitive marine reserves.

With the assistance of the Secretariat, the Contracting Parties shall encourage and support the Clean Up the Med events. These activities may become where appropriate an integral part of the National Action Plan on Marine Litter.

1.12 Marine Litter Monitoring Programmes in the Mediterranean

Herewith are presented, in chronological order, surveys of marine litter that have taken place in the Mediterranean.

Marine Litter Monitoring Programmes in the Mediterranean

Deep sea monitoring in 4 major gulfs along the western coast of Greece

A study of the University of Patras conducted a deep water marine litter monitoring programme in collaboration with volunteer fishermen in four major gulfs along the western coast of Greece and collected 3,318 items of marine litter in an overall area of 20 Km^2 and reaching depths of 300 m. The results showed that the major sources of the collected litter were from land-based activities while the predominant items were plastics (56%). The most burdened area was that of the Gulf of Patras (major urban center as well as fishing hub and commercial port) with a recorded number of items ranging between 188-437 per Km^2.

The Gulf of Thessalonica and Piraeus /Greece

The program for collection and estimation of floating litter in the Gulf of Thessalonica started in 2007 by the Company “North Aegean Slops” (Member of Clean up Greece) on behalf of the Ministry of Macedonia & Thrace, supported by the department for sustainable development and protection of the coastal areas and sea of the Gulf of Thermaikos (Ministry of Macedonia & Thrace, 2008). The collection of Marine Litter was effected with a special technical equipped boat and an additional rubber boat for unreachable coastal areas.

HELMEPA member company, Environmental Protection Engineering S.A. provided data on the volume of marine litter recovered from the sea surface of the port of Piraeus for a two-year period (2006-2007), which was processed and analyzed by HELMEPA. The daily collection of floating debris from the port sea area (including the passenger and container port) was carried out by specialized skimmer vessels and/or manually from auxiliary boats.

The volume of marine litter fluctuated from 1.47 m3 per day to 3.46 m3 per day, while the average volume was estimated to be 1.89 m3 per day. During the summer season when the operation of the passenger port is extremely high (it should be noted that Piraeus is the largest port in Europe and the third largest in the world in terms of passenger transportation, servicing 19,000,000 passengers annually) the volume of marine litter is significantly higher reaching an average of 2.96 m3 per day. Although quantitative information in respect of the origin of the debris does not exist, it appears that domestic garbage from passengers and litter ending up to sea via urban sewers are the prevailing categories.

The coastline of Israel (“Clean Coast” Program)

One hundred and eighty five km of Israeli coastline suffers from accumulation of marine litter. Located in the easterly part of the Mediterranean, current and wind regimes are responsible for the deposition of significant quantities of waste from the eastern Mediterranean basin on the Israeli coast, especially during winter and summer storms. Approximately 130 km, from the total coastline length are non-declared bathing beaches, which are open to the public for leisure activities.

In June 2005, the Israeli Ministry of Environmental Protection (MoEP) launched the "Clean Coast" program, applying the "Environmental Problem Solving" concept. The program that was devised included four modules: Continuous cleaning; Education activities; Enforcement actions; Advertising and Public Relations. Based on a quantifiable index (CCI index), the results showed a significant improvement of the coastal cleanliness. While at the starting date, June 2005, only 27% of the beaches were defined as "clean" or "very clean," in December 2006, 80% of the coastal length was "clean" and above. This was achieved in cooperation with inspectors of the Marine and Coastal Environment Division, wide-scale media coverage and long-term educational plans and cooperation with organizations such as EcoOcean, Clean up Israel, the Society for the Protection of Nature in Israel and Associations of Towns and municipal units for the environment.

The main objective of the "Clean Coast" program was achieved (Alkalay et al., 2007). As the program shows, the litter problem can only be solved by introduction of a holistic mechanism, backed up by a measurement index, applied over the long-term. Some argue that a country should not embark on a solution to the marine litter problem until the sources of the litter have been analyzed and identified. However the "Clean Coast" program shows that "Action First" by countries, may be the key. A strategy pursued for a long enough time, will create a self - perpetuating mechanism that will generate success, not only for the residents of a country but for neighbouring countries as well. A combined international action of such kind may be the beginning of a turnover in reducing marine and coastal litter.

Balearic Islands/Spain (Martinez-Ribes et al., 2007)

The abundance, nature and possible sources of litter on 32 beaches on the Balearic Islands (Mediterranean Sea) were investigated in 2005. Mean summer abundance in the Balearics reached approximately 36 items per m^{-1}, with a corresponding weight of 32±25 g per m^{-1}, which is comparable to the results of other studies in the Mediterranean. Multivariate analyses (principal component analysis and redundancy analysis) confirmed strong similarities between islands and a statistically significant seasonal evolution of litter composition and abundance. In summer (the high tourist season), debris contamination expressed as item abundance was double that in the low season and showed a heterogeneous nature associated with beach use. Cigarette butts were the most abundant item, accounting for up to 46% of the objects observed in the high tourist season. In contrast, plastics related to personal hygiene/medical items were predominant in wintertime (67%) and natural wood was the most important debris by weight (75%). In both seasons, litter characteristics suggested a strong relationship with local land-based origins. While beach users were the main source of summer debris, low tourist season litter was primarily attributed to drainage and outfall systems.

Island of Sardinia/Italy

Removal of beach-cast Posidonia oceanica seagrass litter, called ''banquettes,'' is a common practice on Mediterranean shores to allow the recreational use of beaches. Ongoing removal practices of P. oceanica banquettes were analyzed on the island of Sardinia in 2004 to quantify this phenomenon on a broad scale and to evaluate the potential environmental impacts of banquette removal and dumping on the coastal zone (De Falco et al., 2007).

Wastes from beaches are considered solid urban wastes by Italian law (DL n. 22, 5 February 1997, art. 7). Regional governments authorize the ‘‘cleaning’’ of the beaches to local agencies, coastal municipalities, and private companies.

Those authorizations generally do not distinguish between waste and P. oceanica banquettes. Consequently, the banquettes are normally removed. 46% of the removed material is deposited behind dunes, 34% in unauthorized plants and only 20% in authorized plants. No separation of common litter and P. oceanica has been made.

Coasts of El-Mina and Tripoli/Lebanon

The project aimed at validating a methodology to identify the quality and quantity of solid waste accidentally caught in the nets of fishermen. Ten fishermen were selected to collect all marine litter caught in their nets on a daily basis, store them in plastic bags and record date, name of the fishing vessel and the location of fishing activities. Marine litter was divided in six categories: 1) Cloth; 2) Fishing material; 3) Glass; 4) Metal; 5) Paper; and 6) Plastic, volume estimated, data entered and processed in a specially designed Geographical Information System, percentages calculated and maps identifying the location of marine litter generated. All six categories were present in the waters of El-Mina/Tripoli in the following percentages: 1) Cloth: 1.74%; 2) Fishing material: 1.74%; 3) Glass: 1.16%; 4) Metal: 16.81%; 5) Paper: 0.87%; and 6) Plastic: 77.68%. Litter was mostly found in areas of high anthropological stress, mainly at the mouth of the Abou Ali River, the fishing and commercial ports, the conglomeration of rocks off the El-Mina headland and around the Palm Island Reserve. The results revealed the influence of human activities and river inputs. Temporal trends indicated the presence of plastic and metal over the whole period of collection, while all other categories were collected sporadically. This passive method for monitoring marine litter at minimal costs has been validated and can be applied to other areas around the Mediterranean.

Analysis of the data also revealed that the occurrence of the different litter categories occurred at different frequencies according to the month of sampling. Plastic and metal were present over the five month period while the other litter categories occurred in some months and not others. The lowest percentages were recorded in the month of October, coinciding with the end of the tourism season and dry weather. August and September experience high tourism activities, while the first rains start at the end of October and intensify in November and December. This might explain the difference in percent waste collected during the five month period.

Ligurian Sea/Italy (Aliani et al., 2003)

Results from visual sightings of large floating debris are presented, taken in the Ligurian Sea, a sub-basin of the north-western Mediterranean Sea, which belongs to the recently stated ‘‘Cetacean Sanctuary’’. Data have been collected during three oceanographic cruises, during the summer of 1997 and 2000. Results for the 1997 data suggest a debris density of the order of 15–25 objects km^2, while for the 2000 data, a lower density of the order of 3–1.5 objects km^2 is found. The West Corsica Current (WCC) runs along the western side of Corsica while the warm and salty Tyrrhenian current (TC) goes through the Corsica Channel. The two waters merge to the north of Corsica and they flow together along the Ligurian coast toward the Gulf of Lions.

Deep sea floor off the French Mediterranean Coast

The distribution and abundance of large marine debris were investigated on the continental slope and bathyal plain of the northwestern Mediterranean Sea during 3 oceanographic cruises undertaken in June 1994, July 1995 and April 1996 (Galgani et al., 1996). Different

types of debris were enumerated, particularly pieces of plastic, plastic and glass bottles, metallic objects, glass and diverse materials including fishing gear. The results showed considerable geographical variation, with concentrations ranging from 0 to 78 pieces of debris/ha. In most stations sampled, plastic bags accounted for a very high percentage (more than 70%) of total debris. In the Gulf of Lions, only small amounts of debris were collected on the continental shelf. Most of the debris was found in canyons descending from the continental slope and in the bathyal plain, with high amounts occurring to a depth of more than 500 m.

The Contracting Parties may consider as appropriate that all monitoring programmes presented above shall become an integral part of the Mediterranean Marine Litter Monitoring Programme.

2. BACKGROUND INFORMATION ON THE ESTIMATION OF INDICATIVE COST OF IMPLEMENTATION OF MEASURES OF THE REGIONAL PLAN ON MARINE LITTER MANAGEMENT

2.1 Economic Aspects Relevant to Marine Litter Management

Damage from marine litter

In 2008, marine debris was estimated to have directly cost the 21 Asia-Pacific Economic Cooperation (APEC) member economies approximately US$ 1.265 billion. (APEC)

Takehama (1990) estimates that damage from marine debris in Japan is 0.3% of the annual gross value of the fishing industry catch. If we apply this observed percentage to the value of different sectors in the marine economy, we can estimate that damage from marine debris across the APEC region for the fishing, shipping and tourism industries is US$ 1.265 billion annually. (APEC)

The total APEC GDP in December 2008 was US$ 29,329 billion at current prices (Department of Foreign Affairs and Trade (DFAT) 2008). Of this total for all economies, the value of the marine economy across APEC economies is approximately 3% of total GDP (McIlgorm 2004)—a sum of US$ 879 billion at 2008 price levels. Within this, the total APEC GDP for the fishing, shipping and marine tourism sectors is estimated at 48% of the marine economy or US$ 421.9 billion (McIlgorm 2004). It is this US$ 421.9 billion of GDP generated by marine industries that is vulnerable to being impacted by poor control of marine debris in the APEC region. (APEC)

From data on the marine economy and damage estimate from Japan, the damage from marine debris on the fishing, shipping and marine tourism sectors is estimated to have a damage value of US$ 1.265 billion per annum in the APEC region. The marine debris damage is estimated as US$ 364 million to the fishing industry, US$ 279 million to shipping and US$ 622 million to marine tourism. (APEC)

In the most significant debris-related incident, beaches along the Jersey shore were affected by a serious pollution event in 1998. This event was estimated to have cost the New York economy US$ 1 billion (Ofiara and Brown 1999). (APEC)

Cost to clean-up litter

In Israel the annual cost of "Clean Coast Program" (June 2005 - June 2012) was € 1,155,000. (ISRAEL)

In France a campaign on the fight against plastic in the marine environment was carried out in 2013 for 19th time with the estimated average cost for one year of € 250,000 (Expenses 50/50 Human Resources and Production/logistics). (FRANCE)

The quantified amounts for 90 cities in California, Oregon, and Washington watersheds for spending to clean up litter and prevent trash from entering our oceans show that West Coast communities are spending an estimated US$ 520 million each year to control litter and avoid marine debris. (EPA)

Cleansing of the Swedish Skagerrak coast in 2006 was estimated to cost 15 million SEK (about € 1.5 million) and took approximately 100 people 4 months to complete (OSPAR 2009). (KIMO)

Research in Poland found that the cost of removing marine litter from the shoreline of 5 municipalities and 2 ports amounted to € 570,000 (Naturvårdsverket 2009). (KIMO)

In England and Wales, local authorities, industry and coastal communities spent approximately US$ 30 million a year to clean up coastal marine litter (Environment Agency, 2004). (ALDFG)

Cho (2005) and (Hwang and Ko 2007) report an average clean-up cost of US$ 1,300 per tonne over a six-year period. These values are confirmed by data from outside the APEC region. (APEC)

From available cost information, the average cost of clean-up in the APEC region for typical shoreline clean-up is approximately US$ 1,500 per tonne in 2007 terms. This is likely an under-estimate for urbanised areas in developed countries and an over-estimate for less developed countries. (APEC)

The contribution of NGOs is clearly seen in each of the APEC economies. This can be valued on the basis of the imputed value of a volunteer day multiplied by a shadow price for a day's volunteer's labour. For example, for the 314 207 persons volunteering one day this has a value of US$ 15.71 million @ US$ 50 per day, a value of US$ 31.42million @ US$ 100 per day, and a value of US$ 47.13 million @ US$ 150 per day. Given there was 2284 tonnes of debris collected, this had an average clean-up value per tonne of between US$ 6879 and US$ 20,636 per tonne, depending on assumptions. (APEC)

Structure of costs associated with marine litter management

Israel "Clean Coast Program" (June 2005 - June 2012). Total annual cost € 1,155,000. Structure of cost:

- Average annual cleanup operations (by municipalities): € 675,000€;
- Average annual measurement efforts of the Clean Coast Index: € 100,000;
- Annual dedicated coastal advertisement and PR efforts: € 135,000;
- Annual average cost of pedagogic efforts done in elementary schools: € 155,000; and
- Coordination and administration: € 90,000. (ISRAEL)

KIMO suggests a breakdown of costs per year to fishers of marine litter as: time mending nets (US$ 20,000), cost of net repairers (US$ 20,000), time clearing nets (US$ 14,000), time cleaning equipment (US$ 2000), fouled propellers (US$ 1400) and gearbox inspections (US$ 100). (ALDFG)

USA West Coast cities spend on average:

- US$ 664,580 a year sweeping their streets;
- US$ 165,811 a year purchasing storm water capture devices;
- US$ 294,935 annually on storm drain cleaning and maintenance;
- US$ 304,545 annually on manual litter cleanup; and
- US$ 80,927 annually on public education relating to litter and waste disposal. (EPA)

Cost per km of coast cleaned

Information on cost per km of coast cleaned from marine litter ranged from € 4000-8000 per km (APEC for French coast) and € 8000 per km (Israel); to € 205,000 per km (EPA, USA

West Coast). The coastline of the Mediterranean is about 45,000 km and if a provisional figure of € 10,000 per km is applied that will mean that the annual expenditure for cleaning the Mediterranean coast will be about € 450 million. Estimating the cost by coastal length of individual countries results range from € 150 million for Greece (15,000 km of coastal length) to € 40,000 for Monaco (4 km of coastal length).

Cost per person to control litter

USA West Coast cities spend on average an estimated € 10 per person to control litter (EPA). Coastal population of the Mediterranean is estimated to be about 130 million (total population of the Mediterranean countries is about 427 million) which means that if the € 10 per person is applied about € 1300 million would be needed to control litter in the Mediterranean coastal region.

Costs associated with tourism

Research from Sweden suggests that marine litter inhibits tourism there by between 1-5% resulting in a loss of £ 15 million in revenue and 150 person-years of work (Ten Brink et al 2009). (KIMO)

Marine litter can lead to the closure of beaches, as was the case in New Jersey and New York in 1988. This was estimated to cost the regional economy between US$ 379 million and US$ 3.6 billion in lost tourist and other revenue (Committee on the Effectiveness of International and National Measures to Prevent and Reduce Marine Debris and Its Impacts et al 2008). (KIMO)

Survey respondents from New Jersey and North Carolina were willing to pay between US$ 21 and US$ 72 (1993 USD) annually to improve beach quality by reducing the amount of debris (Smith et al. 1997). (NOAA)

Studies in the APEC region have shown the value of the marine economy and the marine tourism sector in particular (NOEP 2005; McIlgorm 2004). The 23.6% of the value of the marine economy (US$ 207.3 billion) is the GDP attributable to the marine tourism industry in the APEC region. It is estimated that damage by marine debris to the tourism sector in APEC is US$ 622 million. (APEC)

A survey of visitors to the Cape Peninsula suggested that a drop in standards of beach cleanliness could result in the loss of up to of 52% of tourism revenue (Balance et al. 2000). (NOAA)

2.2 Cost of Beach Cleaning

UK municipalities spend approximately € 18 million each year removing beach litter, which represents a 37% increase in cost over the past 10 years. (KIMO). *Comment: UK coastline length is approx.15,000 km (€ 1200 per* km)

Research in 2000 found that 56 UK local authorities spent a total of £ 2,197,138 a year on beach cleansing, taking into account the cost of collection, transport, disposal charges, workforce, equipment and administration (Hall 2000). More recent estimates suggest that the total cost of marine litter removal to all UK local authorities is approximately £ 14 million (€ 16.4) per year (Environment Agency 2004 cited in OSPAR 2009). (KIMO). *Comment: UK coastline length is approx. 15,000 km (€ 1093 per* km)

Removing beach litter costs municipalities in the Netherlands and Belgium approximately € 10.4 million per year. (KIMO). *Comment: Coastline length of Belgium and Netherlands is approx. 520 km (*€ 20,000 per km)

Los Angeles County's 31 miles (50 km) of beaches cost US$ 4.2 million (€ 3.28 million) to clean in 1994. (NOAA). *50 km cost € 3.28 million* (approx. € 65,600 per km)

USA West Coast cities spend on average US$ 56,688 a year on beach and waterway cleanups. (EPA)

In the UK each volunteer contributes the equivalent of € 16.23 of their time each year on average to removing marine litter. Volunteer involvement in 2 of the largest clean up schemes in the UK, MCS Beachwatch and KSB National Spring Clean, is therefore worth approximately € 131,287.47, which suggests that the total cost of voluntary action to remove marine litter could be considerable. (KIMO)

2.3 Costs Associated with Fishing and Fishing Gear

Costs associated with fishing

Marine litter costs the Scottish fishing fleet between € 11.7 million and € 13 million on average each year, which is the equivalent of 5% of the total revenue of affected fisheries. (KIMO)

Marine litter costs the Shetland economy between € 1 million and € 1.1 million each year. The fishing industry shoulders the highest burden of costs and losses due to marine litter with the industry losing between € 637,110 and € 709,105 as a result of marine litter each year. (KIMO)

Research focusing on the Shetland fishing fleet found that marine litter could cost a vessel up to £ 30,000 a year (Hall 2000). (KIMO)

Losses of up to US$ 21,000 in lost fishing gear and US$ 38,000 in lost fishing time were experienced by a single trap fisher in 2002 (Watson and Bryson 2003 cited in Macfadyen et al 2009). (KIMO)

Ghost fishing in the tangle and gillnet fisheries is equivalent to less than 5% of EU commercial landings (Committee on the Effectiveness of International and National Measures to Prevent and Reduce Marine Debris and Its Impacts et al 2008). (KIMO)

In the USA, an estimated US$ 250 million worth of marketable lobster is lost to ghost fishing annually (Allsopp et al 2006). (KIMO)

The Laboratory of Sea Fishing states that cost depends on e.g. the size and extent of damages on the trawl, a new trawl costs about 150,000 SEK. (Sweden)

KIMO suggests a breakdown of costs per year to fishers of marine litter as: time mending nets (US$ 20,000), cost of net repairers (US$ 20,000), time clearing nets (US$ 14,000), time cleaning equipment (US$ 2000), fouled propellers (US$ 1400) and gearbox inspections (US$ 100). (ALDFG)

Using a different data set of fishing catch values in the APEC region, an estimate of damage of US$ 268.2 million was made for the fishing industry. This supports the previous estimates made from aggregate marine economy data. (APEC)

Costs associated with fishing gear

Gear retrieval programmes are varied in their scope and duration, and comparative costs across different retrieval programmes (for example, based on costs per tonne or length of net retrieved) are often difficult. Wiig (2005) attempted such a comparison and found a range of between US$ 65 per tonne and US$ 25,000 per tonne, but the extent to which such a huge range really demonstrates differing cost effectiveness is far from clear. (ALDFG)

Information collected over the four years (2004–2007) during the Northwest Straits Initiative's ALD fishing gear survey and removal programme in Puget Sound, Washington, suggested that the costs of ALD net survey and removal totalled US$ 4960 per acre of net removed. Costs of survey and removal of ALD pots/traps totalled US$ 193 per pot/trap (Natural Resources Consultants, Inc., 2007). (ALDFG)

Annual Swedish costs associated with a retrieval programme in the Baltic Sea are estimated at US$ 70,000, while Norway's annual costs are thought to be in the order of US$ 260,000. A pilot retrieval programme for the deepwater fishery in the Northeast Atlantic was estimated at around US$ 185,000 (Brown et al., 2005). (ALDFG)

It is reported that in an expedition in 2004 to retrieve lost gear along the south coast of Sweden, it cost a stern trawler made for pelagic trawling US$ 800 to retrieve each kilometre of lost net (Tschernij and Larsson, 2003). (ALDFG)

A 2003 expedition in north Hawaii retrieved 120 tonnes of net; the major expense was the cost of two chartered boats for US$ 10,000 per day (Wiig, 2005). (ALDFG)

For example, losses of up to US$ 21,000 in lost fishing gear and an estimated US$ 38,000 worth of lost fishing time for 2002 was reported by one trap fisher (Watson and Bryson, 2003). (ALDFG)

Woolaway's "Points for Pounds" programme encouraged fishers to bring debris into the Kaneohe Bay pier. The effort yielded 3 tonnes at a cost of US$ 7400, for an average of US$ 2467 per tonne (Wiig, 2005). (ALDFG)

The Northwest Straits Commission, acting on information provided by fishers, cleared 3 to 4 tonnes of floating net from a 12-acre sanctuary at a cost of US$ 35,000, for an average of US$ 10,000 per tonne (Wiig, 2005). (ALDFG)

In the Republic of Korea, (Captain Dong-Oh Cho, APEC, 2004) a subsidy is paid to local government for coastal clean-up, while the Korean central government's programme pays fishers US$ 3.50 per 40-litre bag of marine debris, and the Inchon Municipal Government pays fishers US$ 5.23 per bag (Wiig, 2005). The Inchon Municipal Government previously did the marine clean-up itself at a cost of between US$ 1685 and US$ 3075 per tonne. (ALDFG)

The Sea Fisheries Institute in Poland carried out a net retrieval programme in 2004 (Anon, 2004). The project was conducted for ten days at an estimated cost of US$ 19,000. (ALDFG)

A report in 1995 (Bech, 1995, as reported in Brown et al., 2005) undertaken by the Fisheries and Marine Institute of Memorial University for the Department estimated the cost of lost gear retrieval as follows: design and testing of practical retrieval equipment US$ 305,000 (€ 198,250); ghost gillnet retrieval (Atlantic-wide programme) US$ 800,000 per year (€ 520,000 per year). (ALDFG)

In Alaska, there are reports of beach-clearance of heavy nets on St Paul Island in the Privilofs, at a cost of about US$ 1000 per tonne, held down mainly to the presence of “free” heavy machinery and some volunteer labour (Wiig, 2005). (ALDFG)

Clean up cost data estimates in the APEC region range from US$ 100 per tonne under volunteer labour (Hwang and Ko 2007) to US$ 25,000 per tonne for derelict fishing gear (Raaymakers 2007). (APEC)

The economic impact of derelict fishing gear is high in the United States. It has been estimated that US$ 250 million of marketable lobsters are lost each year from the United States (Raaymakers 2007). The cost of retrieving derelict fishing gear in Puget Sound has been estimated from data collected over a number of years by Natural Resource Consultants (2007). These authors estimated the cost of retrieving nets at US$ 4960 per acre of net removed. (APEC)

Furthermore, the cost of retrieving fishing traps and pots was US$ 193 per trap. Moreover, these authors estimated the economic benefits of retrieving derelict fishing gear, and calculated that the value of catch saved from derelict fishing gear was US$ 248 per year for traps, and US$ 6285 per net, and thus the cost-benefit ratio was positive (i.e., the benefit was more than the cost). (APEC)

The cost of retrieving derelict fishing gear from the North-West Hawaiian Islands has been estimated at US$ 25,000 per ton (Raaymakers 2007). Between 2001 and 2005, the multiagency removal program had funding between US$ 2-3 million. After this, the debris collection program was changed to a maintenance program and the allocation was reduced in 2006 to US$ 500,000 per year. (APEC)

Total annual loss of Dungeness crab due to derelict pots/traps has been estimated at 372,000 crabs with an ex-vessel value of US$ 1.2 million, representing 30% - 40% of the annual commercial catch (NWSF 2007). (NOAA)

Derelict gill nets removed from Puget Sound between 2004 and 2007 with support from the NOAA Marine Debris Program are estimated to have killed commercial and recreational species valued at approximately US$ 1.06 million (NWSF 2007). (NOAA)

Over 30,000 derelict pots have been removed from the Chesapeake with support from the NOAA Marine Debris Program, allowing as many as US$ 1.5 million market sized crab, worth approximately US$ 500,000 at the dock, to remain in the system (Slacum 2009, Havens et al., in press). (NOAA)

2.4 Other Costs

Agriculture

Marine litter cost each croft an average of € 841 per year and the vast majority of these costs are incurred during the removal of marine litter, although harm to livestock and damage to machinery can result in high costs when these incidents occur. (KIMO)

Marine litter costs the agricultural industry in Shetland approximately € 252,331 per year. (KIMO)

A project in 2000 focusing on agriculture in Shetland found that 96% of responding farmers had 21 experienced problems with debris blowing onto their land and this could cost them up to £ 400 a year (Hall 2000). KIMO

Aquaculture

Marine litter presents fewer problems for aquaculture producers and therefore the total cost to the aquaculture industry was comparatively low at approximately € 155,548 per year. KIMO

A study in 2000 found that on average one hour per month was spent removing debris and disentangling fouled propellers could cost up to £ 1200 per incident (Hall 2000). KIMO

Floating litter

Washington DC spent an average of US$ 319,000 per year (2006-2009) to operate and maintain two skimmer boats that remove floating debris from its waterways. (NOAA)

Harbours

Marine litter costs harbours in the UK a total of € 2.4 million each year with an average cost of € 8034 per harbour, although these costs are considerably higher for larger facilities and busy fishing ports. While Spanish harbours experienced similar issues to the UK, the economic cost of marine litter was almost 7 times higher than in the UK. (KIMO)

For harbours in the UK, the removal of debris could cost up to £ 15,000 a year with manual clearance of the harbour required up to four times per week. (KIMO)

Some marinas had to be manually cleaned on a daily basis at a cost of up to £ 10,000 a year (Hall 2000). (KIMO)

Harbour authorities also have to pay for the costs of keeping navigational channels clear of litter, with United Kingdom harbour authorities spending up to € 55,000 per year in some ports, to clear fouled propellers and remove debris from the water (Hall, 2001). (ALDFG)

Invasive species

The introduction of the American comb jellyfish into the Black Sea during the 1990s, for instance, is widely accepted to have caused the collapse of the anchovy fisheries with economic losses of € 240 million (Naturvårdsverket 2009). (KIMO)

The means by which the carpet sea squirt reached Holyhead Harbour are unknown but eradication and monitoring program over the next 10 years is expected to cost approximately £ 525,000. The costs of inaction, however, could amount to up to £ 6,875,625 over the same period for the nearby mussel fisheries alone and could be significantly higher were the carpet *sea* squirt to become established elsewhere in UK waters (Holt 2009). (KIMO)

Power stations

Anecdotal evidence suggests that marine litter can cost companies up to £ 50,000 to remove with additional costs for pump maintenance (Hall 2000). (KIMO)

Shipping

In 2005, the US Coastguard made 269 rescues to incidents involving marine litter resulting in 15 deaths, 116 injuries and US$ 3 million in property damage (Moore 2008). (KIMO)

Research in 1998 found that 230 rescues were undertaken to vessels with fouled propellers in UK waters at a cost of £ 2200 to £ 5800 per incident, depending on the type of lifeboat

required. This amounted to an overall cost of between £ 506,000 and £ 1,334,000 for that year (Hall 2000). (KIMO)

The value of debris damage to shipping is reported as US$ 279 million per annum. (APEC)

Vessels

The total cost for fouled propellers, blocked intake pipes, damaged nets and destroyed catch following from marine litter was estimated to € 0.74 million 2007 per year along the Swedish west coast. (Sweden)

Johnson (2000) reported that in 1992 Japan's maritime safety agency estimated that its fishing industry spent JP¥4.1 billion in vessel repairs following damage caused by marine debris. (ALDFG)

The costs of marine litter to fishers are not at all well reported, but KIMO suggests that marine litter could cost each vessel studied in Shetland up to US$ 60,000 per year in lost time, damage to nets, fouled propellers and contaminated catches. (ALDFG)

Takehama (1990) estimated the cost of damage to fishing vessels caused by marine debris, based on insurance statistics available through the Japanese fishing insurance system. Such damage includes accidents, collisions with debris, entanglement of floating objects with propeller blades and clogging of water intakes for engine cooling systems. Losses in 1985 across all fishing vessels less than 1000 gross tonnage (GT) were ¥6.6 billion. Takehama estimates that the annual vessel damage of ¥6.6 billion is 0.3% of total national fishery revenue in Japan. (APEC)

Takehama (1990) noted that fishing vessels damage is 0.3% of the value of the Japanese fish catch. It was found that for a total catch value of US$ 89.4 billion by APEC economies in 2006 the imputed cost of damage to vessels is US$ 268.2 million across the APEC region. (APEC)

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