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Marine Litter: A Global Challenge

Ocean Conservancy
Start a Sea Change

Regional Seas

GPA

Marine Litter: A Global Challenge

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Preface

Marine litter is a global concern affecting all the oceans of the world. It poses environmental, economic, health and aesthetic problems that are rooted in poor solid waste management practices, lack of infrastructure, indiscriminate human activities and behaviours and an inadequate understanding on the part of the public of the potential consequences of their actions. The UNEP Global Initiative on Marine Litter has provided an effective framework for conducting regional activities addressing marine litter around the world, including those of the 12 participating Regional Seas programmes.

The objective of this document is (1) to present and analyse available information on marine litter discussed in documents produced by the 12 regional programmes with the help of regional consultants and technical experts and (2) to propose recommendations for addressing the problems associated with marine litter worldwide.

This document is not a comprehensive overview of global marine litter, but it does provide current information on the marine litter issue in participating regions (Baltic Sea, Black Sea, Caspian, East African Seas, Eastern Africa, Mediterranean, Northeast Atlantic, Northwest Pacific, Red Sea and Gulf of Aden, South Asian Seas, South Pacific, and Wider Caribbean).

Chapter 1, *Facing the global challenge of marine litter,* introduces the topic and the challenges marine litter poses to the international community. It describes the main sources and impacts of marine litter and how UNEP has begun to address these through its Regional Seas Programme and the Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (GPA), and the UNEP Global Initiative on Marine Litter. Finally it outlines the existing international and regional initiatives that address marine litter problems.

Chapter 2, *Review of regional assessments and regional action plans on marine litter*, presents summaries of the documents produced as part of the UNEP Global Initiative on Marine Litter, including 12 regional overviews and seven regional action plans. In addition, a summary of the International Coastal Cleanup (ICC) programme is presented, covering ICC events carried out in 132 countries of the world and in 73 countries of the 12 Regional Seas that are part of the UNEP Global Marine Litter Initiative.

Chapter 3, *Analysis of regional review documents and action plans on marine litter*, presents an analysis of the information and data presented in 12 regional assessment documents and seven Regional Action Plans summarized in Chapter 2 of this document.

Chapter 4, *The way forward*, provides a discussion of the general conclusions and proposed recommendations presented in this overview, and also offers conclusions and recommendations related to nine specific issues that are important for the understanding, control and reduction of the global problem of marine litter.

Executive summary

Introduction

About marine litter

Marine litter is an environmental, economic, human health and aesthetic problem. It poses a complex and multi-dimensional challenge with significant implications for the marine and coastal environment and human activities all over the world. These impacts are both cultural and multi-sectoral, rooted primarily in poor practices of solid waste management, a lack of infrastructure, various human activities, an inadequate understanding on the part of the public of the potential consequences of their actions, the lack of adequate legal and enforcement systems and a lack of financial resources.

Marine litter is found in all the oceans of the world, not only in densely populated regions, but also in remote areas far from obvious sources and human contact. Every year marine litter takes an enormous social and economic toll on people and communities around the world. The persistence of marine litter is the result of a lack of coordinated global and regional strategies and of deficiencies in the implementation and enforcement of existing programmes, regulations and standards at all levels – international, regional and national.

The UNEP Global Initiative on Marine Litter

The UNEP Global Initiative on Marine Litter provides a platform for the management of this problem through the establishment of partnerships, cooperative arrangements and coordination of joint activities. The main partners in the initiative include individual Regional Seas Conventions and Action Plans, government representatives, United Nations bodies, donor agencies and organizations, the private sector and NGOs. This partnership represents a unified effort within the wider context of the Global Programme of Action, the Regional Seas Conventions and Action Plans and the respective mandates of other regional stakeholders. Existing solutions may be tailored and replicated for specific regions, comprising innovative economic incentives to prevent litter and encourage the cleanup, prevention and management of abandoned, lost or otherwise discarded fishing gear, harmonization of monitoring and assessment systems, and establishment of adequate reception facilities for maritime garbage and wastes.

Participation of Regional Seas in the Global Initiative on Marine Litter

The UNEP Global Initiative on Marine Litter has been successful in organizing, implementing and promoting regional activities on marine litter around the world. Work in each participating region has proceeded according to agreements on the development of marine litter management activities concluded between the Regional Seas Coordinating Office and the Regional Coordinating Units (secretariats) of 12 Regional Seas programmes (Conventions and Action Plans): Baltic Sea, Black Sea, Caspian, East Asian Seas, Eastern Africa/WIO, Mediterranean, Northeast Atlantic, Northwest Pacific, Red Sea and Gulf of Aden, South Asian Seas, Southeast Pacific, and the Wider Caribbean. These activities and the collection of relevant information were carried out by regional and national consultants. The four main activities prescribed by the signed agreements included the (1) preparation of a review of the status of marine litter in the region; (2) preparation of the Regional Action Plan (RAP) or regional strategy on the sustainable management of marine litter; (3) organization of a regional meeting of national authorities and experts on marine litter; and (4) participation in a Regional Cleanup Day, within the framework of Ocean Conservancy's International Coastal Cleanup campaign.

The review documents on marine litter in the regions were to be prepared by a regional marine litter consultant, and were to include, among other tasks, the collection and review of existing institutional arrangements; capacities and funding resources; data and information on marine litter in the marine and coastal environment; legal and administrative instruments; programmes and initiatives; identification of gaps and needs related to marine litter management; and recommendations. This review document is based on national reports compiled by national experts/consultants and where possible based on standard questionnaires and other available documents and information such as relevant scientific literature.

A Regional Action Plan on the Sustainable Management of Marine Litter for each region was to include among other elements and when feasible: a programme of enhancement of national/regional legal and administrative instruments; development of regional and national strategies for integrated management of marine litter; recommended programmes of cooperation with civil society (private sector, NGOs the scientific community); information and outreach activities; sectoral activities, and fundraising activities.

All twelve participating regions prepared review documents by October 2008 and seven regions prepared Regional Action Plan documents, with the other five proposing actions necessary for the management of marine litter. Nine regions organized regional meetings of national authorities and experts on marine litter. All twelve regions participated in the International Coastal Cleanup campaign as part of this initiative.

International Coastal Cleanup

The information that is being collected and compiled through the International Coastal Cleanup (ICC) provides a valuable information base that can be used to help catalogue and analyse the main sources and activities responsible for marine litter pollution. The partnership between Ocean Conservancy and UNEP RSP provides a good base for working collectively to address marine litter issues worldwide – sharing information and strategies that can be adopted by regional groups and in facilitating cooperative arrangements between national government agencies and local NGOs. From the UNEP-assisted Regional Seas participating in the marine litter project, a total of 73 countries have participated in the ICC since 2006.

Documents on specific topics

In addition to activities in 12 Regional Seas programmes, UNEP commissioned preparation of the following documents on specific topics to be published by March 2009: (1) jointly with IOC: *Guidelines on Survey and Monitoring of Marine Litter*; (2) jointly with FAO: *Abandoned, Lost or otherwise Discarded Fishing Gear*, and (3) *Marine litter and market-based instruments*.

Main findings

Regional Action Plans on the management of marine litter

Seven of the 12 participating regions (Black Sea, East Asian Seas, Northwest Pacific, Red Sea and Gulf of Aden, South Asian Seas, Southeast Pacific and the Wider Caribbean) prepared Regional Action Plans (RAPs) on the management of marine litter as part of their regional efforts. The remaining five Regional Seas did not prepare formal plans, but have reported on actions relevant to the management of marine litter within their regions. The primary goal of the RAPs was to consolidate, harmonize and implement necessary environmental policies, strategies and measures to bring about sustainable integrated actions and activities to help mitigate marine litter in the respective regions. RAPs contain information on strategy; legislation, policy and enforcement; monitoring programmes; education and outreach; mitigation activities; and funding and sustainability.

Amounts

No systematic regional measurements of the amounts of marine litter were conducted in the 12 participating regions, and only the Baltic Sea, Black Sea, Mediterranean, Northeast Atlantic, Northwest Pacific and the Wider Caribbean provided some data on the amounts of marine litter in their respective regions. The great majority of these reported marine litter on beaches, some reported litter in open waters, and a few addressed marine litter on the sea floor. The use of differing methodologies to collect and measure marine litter did not allow valid comparisons among the participating Regional Seas or even systematic analysis of status and trends. However, an important and ongoing source of information on marine litter on coastlines and beaches of the world are the Ocean Conservancy's International Coastal Cleanup (ICC) events carried out since 1989 in many countries around the world, including 73 countries from the UNEP-assisted Regional Seas. The ICC results provide a base for the comparative analysis of the marine litter problem among the participating Regional Seas.

Impacts

Limited information on the effects and impacts of marine litter was provided by seven of the 12 Regional Seas participating in the marine litter initiative. This information revealed that there was no common denominator for marine litter impacts among the regions. Among the reported impacts were: (1) economic effects; impacts on aesthetics and tourism, human health and safety; habitat destruction, and effects on wildlife (Wider Caribbean); (2) effects on human health and tourism (Eastern Africa); (3) impacts on marine environment from illegal, unreported and unregulated fishing (Black Sea); (4) coastal tourism impacts (Red Sea); (5) impacts on wildlife, especially marine turtles, seabirds and similar species (South Asian Seas); and (6) impacts on marine environment of abandoned, lost or otherwise discarded fishing gear (East Asian Seas). Every year, marine litter results in tremendous economic costs and losses to individuals and communities around the world. It can spoil, foul and destroy the beauty of the ocean and the coastal zone. Further research and documentation on the impacts of marine litter is needed to assess this issue effectively.

Sources

The major land-based sources of marine litter include wastes from dumpsites located on the coast or banks of rivers; rivers and floodwaters; industrial outfalls; discharge from storm water drains; untreated municipal sewerage; littering of beaches and coastal picnic and recreation areas; tourism and recreational use of the coasts; fishing industry activities; ship-breaking yards; and natural storm-related events. The major sea-based sources of marine litter include shipping (merchant, public transport, pleasure, naval and research vessels) and fishing (vessels, angling and fish farming) activities; offshore mining and extraction (vessels, and oil and gas platforms); legal and illegal dumping at sea; abandoned, lost or otherwise discarded fishing gear; and natural disasters. Adequate quantitative and qualitative knowledge of the sources of marine litter is extremely important because it serves as the main basis for managerial decisions on actions to prevent, reduce and control problems caused by marine litter.

Institutional framework

With the growing recognition that marine litter poses global and regional problems for the environment and coastal communities, numerous institutional arrangements have emerged. An extensive global network exists among the many entities which deal with the creation, handling, abatement and prevention of marine litter. Through these programmes and initiatives, these organizations form a powerful base for effective interaction and collaboration in dealing with the many problems associated with marine litter. As marine litter is a significant component of the solid waste management issue, it is critical that there be an integration of marine litter management strategies with solid waste management strategies.

Legislation, policies and enforcement

At the global level, there are several conventions and agreements applicable to marine litter issues. At the regional level, there are no specific legal instruments dealing with marine litter, although litter is addressed in several regional conventions and protocols on controlling marine pollution. At the national level, only the Wider Caribbean and Northwest Pacific regions have countries with specific national legislation addressing marine litter. Marine litter is not usually dealt with in policies or laws as a separate category of waste, it is considered to be part of the general solid waste stream. A majority of the regions acknowledge the inadequacy of implementation and enforcement of existing laws and regulations related to solid waste management.

Monitoring programmes

The need for establishment of national marine litter monitoring programmes was identified by most of the regions so that information could be collected on a regular basis and used for programme development and assessment of interventions and reduction strategies. Data and research on marine litter can be used to help formulate management solutions, which must in turn be implemented by management agencies with support from the private sector. Policies could be developed through monitoring efforts to produce legislation or funding for source-reduction programmes and help enforce regulations. The challenges in addressing marine litter monitoring are only partly the result of insufficient data and public awareness of the problem; they mostly arise from the lack of standardization and compatibility between assessment methods used and results obtained in these projects.

Education and outreach

A majority of the participating Regional Seas reported that education and public awareness campaigns were essential tools for environmental protection, and that raising public awareness and encouraging people to change their attitudes and behaviours related to solid waste management were essential components in efforts to mitigate marine litter. The Regional Seas programmes also reported that numerous organizations and government groups routinely conduct public education campaigns to support their missions and programme objectives that include marine conservation issues and marine litter prevention. Over the years, outreach materials for marine litter have been developed by many coastal zone management and solid waste management programmes and conservation NGOs.

Mitigation activities

Current assessments of marine litter control and abatement have identified numerous linkages that are multi-sectoral. These range from integrated solid waste management approaches that result in more adequate waste management infrastructures, improvements in port reception facilities, better defined legislation that specifically addresses marine litter and improved compliance and enforcement, expanded public awareness efforts and economic incentives and controls to support a reduction and abatement of marine litter. Marine litter is only one part of the broader problem of solid waste management, but most national solid waste management programmes do not include specific activities related to marine litter management. It is critical to integrate marine litter management strategies with solid waste management strategies, as expressly noted for insular States that have very limited land areas for waste management facilities.

Economics of marine litter

Marine litter can cause serious economic losses to various sectors and authorities. Among the most seriously affected are coastal communities (increased expenditures for beach cleaning, public health and waste disposal), tourism (loss of income, bad publicity), shipping (costs associated with fouled propellers, damaged engines, litter removal and waste management in harbours), fishing (reduced and lost catch, damaged nets and other fishing gear, fouled propellers, contamination), fish farming and coastal agriculture. To date, very little information has been reported on the economic impacts of marine litter. This represents an area of research needed in order to better address this pollution issue in terms of policies, legislation and mitigation.

Funding and sustainability

The various approaches and strategies being developed to address marine litter in the Regional Seas face financial challenges compounded by the diversity of governmental structures and the current global economic condition. The fact that marine litter crosses institutional and administrative departments and funding infrastructures explains in part why it is so difficult to manage – an opinion voiced by most Regional Seas programmes. Most regions also reported an inadequacy in the funding necessary for sustaining basic systems and infrastructure for effective waste management at the national level. Research on the economic impacts of marine litter – especially as they relate to coastal tourism, fisheries and recreation – can help justify the financial outlays needed to deal with the litter problem. Economic incentives and measures and market-based instruments (taxes, fees, fines, penalties, liability and compensation schemes, subsidies and tradable permit schemes) have an important role to play in addressing the problem, when used as part of an integrated strategy.

Development of national and regional strategies

The development of both national and regional strategies was identified in the respective Regional Action Plans of most of the regional seas marine litter initiatives based on existing programmes and practices. Approaching marine litter issues requires a varied, comprehensive and integrated approach which encompasses the cultural and socio-economic aspects of this global problem. Although in many cases marine litter is a significant component of solid waste, waste management strategies in most regions do not include specific activities relating to marine litter. An integrated approach to solid waste management, including marine litter, is essential in dealing effectively with this global problem.

Similarities among Regional Action Plans on the management of marine litter

Regional Seas programmes, although working independently, have developed a number of similarities in their approaches to marine litter management. The main similarities are:

- All considered Integrated Waste Management efforts to be an important feature of their RAPs.
- Most acknowledged that existing legislation could be an umbrella for addressing marine litter issues, with some moodifications.
- Most acknowledged that existing laws needed to be better enforced.
- All mention education and outreach as an important strategy for dealing with marine litter.
- Behavioural changes are needed for this issue to be dealt with effectively.
- Almost all acknowledged the need to improve port reception facilities.
- Most acknowledged the need for marine litter control programmes to be implemented nationally.
- Most mentioned a lack of acceptable marine litter data.
- Most mentioned the need for a harmonized marine litter monitoring strategy.
- All mentioned the value in participating in the annual ICC event.
- Most mentioned the need for national funding of programmes with some international support.
- All mentioned the need to understand the economical impacts of marine litter.
- All mentioned the need for the implementation of economic instruments to help control marine litter.

The way forward

Conclusions

There is an increasingly urgent need to approach the issue of marine litter through better enforcement of laws and regulations, expanded outreach and educational campaigns, and the employment of strong economic instruments and incentives. Although a number of countries have taken steps at the national level to deal with marine litter, the overall situation is not improving.

Prevention is generally more effective and efficient than remedial action. In many cases, preventive mechanisms and the authority to enforce them are already implicit in existing global or regional conventions and action plans, even when marine litter is not specifically mentioned. When political agreements address the need to protect coastal habitats, sustain the health and productivity of seas and coastal areas, pursue integrated coastal zone management and sustainable development of seas and coastal zones, and raise environmental awareness, the issue of marine litter is covered.

Review and analysis of 12 regional assessment documents on marine litter, seven Regional Action Plans on the management of marine litter and the three global reviews on specific topics (marine litter monitoring; abandoned, lost or otherwise discarded fishing gear; and economic instruments) revealed a widespread lack of systematic scientific knowledge on the amounts, sources, fates, trends and impacts (social, economic and environmental) of marine litter, which hampers development and implementation of effective mitigation actions. This deficiency, in combination with the lack of specific legislation, adequate law enforcement and funding, are the primary reasons why the problem of marine litter is far from being solved. Unless effective action is taken, the global marine litter problem will only continue to worsen in the years to come.

Recommendations

On the basis of the documents prepared by the 12 participating Regional Seas the following strategic recommendations are presented:

- Each Regional Sea programme should develop a Regional Action Plan or Strategy to address the problem of marine litter, either within the framework of their regional convention or protocol or as an independent instrument and document. Those Regional Action Plans should be sustainable and long-term in nature, incorporating basic principles of preventive actions and strategies, and they should be routinely updated according to changing circumstances or conditions.

- Marine litter is a global problem and mitigation actions should be developed around a global framework, coordinated at the regional level and implemented at the national level through development and implementation of national action plans or strategies.

- National action plans or strategies should be based on development, implementation and enforcement of national legislation for waste management that includes marine litter, enhancement of national institutional mechanisms, strengthening of public, governmental and private sector partnerships, raising public awareness and education; and development of a framework for engaging key stakeholders and partners.

- Regional and national marine litter monitoring programmes, based on internationally accepted methodology, should be developed and implemented.

- Port reception facilities for handling ship-generated wastes and old or damaged fishing nets should be improved. The disposal of fishing gear at sea and in coastal areas should be minimized.

- Financial resources and essential funds for the management of marine litter should be identified.

- Responsible United Nations organizations (e.g. UNEP, IMO, FAO, IOC) should enhance and coordinate their efforts to work on the marine litter problem This work must be carried out in close cooperation with civil society, including academia, the private sector and NGOs.

Chapter 1
Facing the global challenge of marine litter

Introduction

Marine litter is found in all the oceans of the world, not only in densely populated regions, but also in remote places far from obvious sources and human activities.

Marine litter is a complex issue with significant implications for the marine and coastal environment and human activities all over the world. The problems it causes are both cultural and multi-sectoral, rooted in poor solid waste management practices, extensive use of marine resources, lack of infrastructure, indiscriminate human activities and behaviours, and an inadequate understanding on the part of the public of the potential consequences of their actions.

Marine litter produces a wide variety of negative environmental, economic, safety, health and cultural impacts. Most marine litter has a very slow rate of decomposition, leading to a gradual, but significant accumulation in the coastal and marine environment.

For the purposes of 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 consists of items that have been made or used by people and deliberately discarded into the sea or rivers or on beaches; brought indirectly to the sea with rivers, sewage, storm water or winds; accidentally lost, including material lost at sea in bad weather (fishing gear, cargo); or deliberately left by people on beaches and shores.

Despite several international, regional and national efforts to reverse this trend, the problem continues to grow. As a result, there is an increasingly urgent need to attack this issue through more efficient and effective enforcement of laws and regulations, coordinated and expanded outreach and educational campaigns, and the employment of strong economic instruments and incentives for prevention and abatement.

Because marine litter originates from both ocean- and land-based sources, efforts to reduce or prevent its introduction and accumulation in the marine and coastal environment need to be implemented in coastal communities and across all sectors of society. This implies changing the attitudes and ultimately the behaviours of individuals in many different circumstances.

Sources and impacts

Human behaviours and actions – accidental or intentional – are the sources of marine litter. The majority of sea or ocean-based sources of marine litter come from merchant shipping, ferries and cruise liners; fishing vessels; military fleets and research vessels; pleasure craft; offshore oil and gas platforms and drilling rigs; and aquaculture installations. Marine litter dispersion and deposition are strongly influenced by ocean currents, tidal cycles, regional-scale topography, including sea-bed topography and wind.

Land-based sources of marine litter originate from coastal or inland areas including beaches, piers, harbours, marinas, docks and riverbanks. Municipal landfills (waste dumps) located on the coast, water bodies such as rivers, lakes and ponds that are used as illegal dump sites, riverine transport of waste from landfills and other inland sources, discharges of untreated municipal sewage and storm water, industrial facilities, medical waste, and coastal tourism involving recreational visitors and beach-goers, are the primary sources of land-based marine litter. Natural storm-related events such as hurricanes, tsunamis, tornadoes and floods can all create large amounts of materials that are washed from coastal areas that can end in the marine environment. High winds, large waves and storm surges produced by these natural events cause land-based items to be introduced into the marine environment (NOAA, 2008) (http://ocean.ceq.gov/about/docs/SIMOR_IMDCC_Report.pdf)

Marine litter is an environmental, economic, health and aesthetic problem. Marine litter can kill or maim unsuspecting wildlife. Entanglement and ingestion are the primary forms of direct damage to wildlife caused by marine litter. Other threats to wildlife and habitats from marine litter include smothering of the seabed and disturbance of benthic communities by mechanical scouring. Pieces of marine litter can also

transport invasive species between oceans. Medical and sanitary wastes constitute a health hazard and can seriously injure people.

Every year, marine litter results in tremendous economic costs and losses to individuals and communities around the world. It can spoil, foul and destroy the beauty of the ocean and the coastal zone.

Marine litter washed ashore in northern Japan. © NOWPAP

Damage to people, property and livelihoods caused by marine litter can be grouped into a number of general categories. These include damage to fisheries, fishing boats and gear; damage to cooling-water intakes and blocking water-flow in power stations and desalination plants; contamination of beaches (requiring cleaning and removal operations and beach closures for public health reasons); contamination of commercial harbours and marinas (resulting in cleaning and removal operations); and contamination of coastal grazing land, causing injury to livestock. Problems with propeller fouling, blocked engine intake pipes and damaged drive shafts have also been attributed to marine litter. Marine litter-related damage to people also includes safety risks at sea (resulting in rescue services) due to fouling of propellers, accidents involving SCUBA divers and snorkelers who encounter submerged debris, as well as damage to people's health (physical injuries, disease) from litter on beaches and in bathing water, including medical waste.

The public often perceives the quality of recreational water to be very different from its actual microbial quality. It has been reported that good microbial quality has been perceived as poor by the public because of aesthetic pollution. Poor aesthetic recreational water and beach quality may, however, also imply poor microbial water quality.

Additional information on the types, amounts, sources and impacts of marine litter in the participating Regional Seas is presented in Chapter 2.

Possible solutions

The persistence of the marine litter problem results from both a lack of global and regional strategies and deficiencies in the implementation and enforcement of existing international, regional and in particular national programmes, regulations and standards. A number of countries have taken steps at the national level to address the marine litter problem through legislation and enforcement of regional and international agreements through national regulations, provision of appropriate reception facilities for ship-generated wastes (including damaged fishing gear and nets), cooperative action within the fishing sector to prevent the abandonment and discarding of old fishing gear, improvements in waste management practices and beach cleanups, underpinned by information, education and public awareness programmes. However, much more information on the scope and prevention of the marine litter problem is needed. There are

many areas where no information on marine litter types, amounts, sources and impacts has been collected. With the continued presence and increasing impacts of this global problem, it is evident that current efforts are not adequate to abate this pollution issue.

Prevention is generally more effective and efficient than remedial action. In many cases, preventive mechanisms and the authority to enforce them are already implicit in existing global or regional conventions and action plans, even when marine litter is not specifically mentioned. They often include, for example, measures to decrease or eliminate the discharge of ship-generated waste, stop the discharge of solid wastes from land-based sources, protect rivers from pollution, and reduce the loss of fishing gear from fishing vessels. Similarly, when political agreements address the need to protect coastal habitats, sustain the health and productivity of seas and coastal areas, pursue integrated coastal zone management and sustainable development of seas and coastal zones and raise environmental awareness, the issue of marine litter is included. It is critical that these regional and international instruments are made effective through improved legislation, regulations, enforcement and compliance at the national level.

Based on the recommendations proposed by the various Regional Seas in their action plans, review of ongoing research and other programme activities, potential strategies are presented in Chapter 4 as suggestions to the regions and national governments in dealing more effectively with marine litter issues.

UNEP's response to the global challenge

Recognizing the severity of the problem, UNEP initiated activities related to marine litter in 2003 through the work of the Regional Seas Programme (RSP) and the Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (GPA). Numerous activities on the regional and global levels were conducted and they are described below.

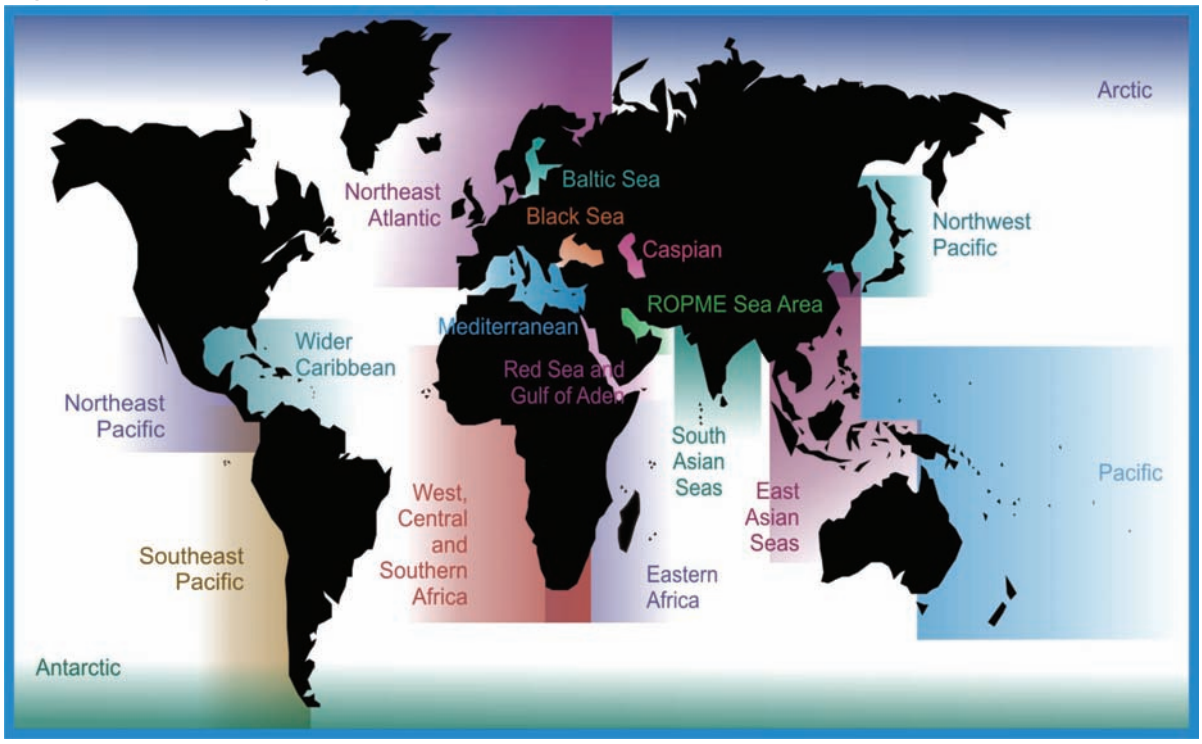
Activities at the regional level

Regional Seas Programme of UNEP (RSP)

UNEP's Regional Seas Programme, initiated in 1974, provides a legal, administrative, substantive and financial framework for the implementation of Agenda 21 (in particular chapter 17 on Oceans), for the Plan of Implementation of the World Summit on Sustainable Development (2002) and for the Bali Strategic Plan (2004). The Regional Seas Programme aims to address the increasing degradation of the world's oceans, coastal and marine areas, through the sustainable management and use of these environments, by engaging member countries to cooperate in comprehensive and specific actions for the protection of their shared marine environment.

The Programme reaffirms that sustainable development of the oceans requires effective coordination and cooperation at global and regional levels and between relevant bodies. UNEP's Regional Seas Programme is based on regional Action Plans related to the environmental conservation and management of a common body of water. These plans are usually adopted by high-level intergovernmental meetings and implemented, in most cases, within the framework of a legally binding Regional Seas Convention and its specific protocols, under the authority of the respective Contracting Parties or Intergovernmental Meetings.

Figure 1. The 18 Regional Seas



Currently, 18 regions (Figure 1) are covered by the Regional Seas family. Thirteen regional seas programmes have been established under the auspices of UNEP. The Southeast Asia (COBSEA), Eastern Africa (Nairobi Convention), Mediterranean (Barcelona Convention), Northwest Pacific (NOWPAP), West and Central Africa (Abidjan Convention) and Wider Caribbean (Cartagena Convention) programmes are directly administered by UNEP. The Black Sea (Bucharest Convention), Northeast Pacific (Antigua Convention), Red Sea and Gulf of Aden (Jeddah Convention), ROPME Sea Area (Kuwait Convention region), South Asian Seas (SAS, SACEP), Southeast Pacific (CPPS, Lima Convention) and South Pacific (SPREP, Noumea Convention) programmes are independently administered by their regional secretariats. Furthermore, five regional partner programmes are in place: in the Antarctic (CCMLAR), Arctic (PAME), the Baltic Sea (Helsinki Convention, HELCOM), Caspian (Tehran Convention), and Northeast Atlantic (Oslo Paris Convention, OSPAR). Plans for a new programme in the Southwest Atlantic are under consideration.

Altogether, more than 140 countries participate in at least one Regional Seas Action Plan (or convention) working for sustainable use and management of the ocean and coastal areas. In 12 of the Regional Seas, the Parties have also adopted a legally-binding convention setting out what governments must do to implement the Action Plan. These regional agreements have been effective in influencing participating governments' policies.

Each of the RSP's Action Plans is based on the respective region's particular environmental concerns and challenges, as well as its socio-economic and political conditions. Most RS Programmes evolved around a common axis and their identified shared priorities include: (a) land-based sources of marine and coastal pollution; (b) ship-generated marine pollution (oil, chemicals, litter); (c) increased urbanization and coastal development causing destruction of ecosystems and habitats; (d) conservation and management of marine and coastal ecosystems; (e) Integrated Coastal Area Management (ICAM) and Integrated Coastal Area and River Basin Management (ICARM); (f) over-exploitation and depletion of living marine resources, including fisheries; and (g) monitoring, reporting and assessment of the marine environment. Other emerging issues include the impacts of climate change, conservation of deep sea biodiversity, and increasing incidences of marine invasive species.

Putting prominent emphasis on the effort to address the issue of marine litter, UNEP's Regional Seas Programme could function as a platform for developing common regional strategies, promoting synergies and coordinated regional implementation. Although several initiatives are being undertaken worldwide, primarily at the national level, to prevent, reduce and/or remove marine litter, regional and international cooperation are of vital significance for the development of a common jurisdiction for the prevention, as well as the eradication of the problem, because of its trans-boundary nature.
http://www.unep.org/regionalseas/About/default.asp

UNEP-assisted marine litter-related activities in the Regional Seas

The Regional Seas Programme of UNEP took an active lead on the marine litter issue and in 2005 began organizing and implementing regional activities on marine litter in 12 Regional Seas (Baltic Sea, Black Sea, Caspian, East Asian Seas, Eastern Africa, Mediterranean Sea, Northwest Pacific, Northeast Atlantic, Red Sea and Gulf of Aden, South Asian Seas, Southeast Pacific, and Wider Caribbean). The regional activities were arranged through individual agreements concluded between the Regional Seas Regional Coordinating Unit (RCU) and UNEP/RSP on the development of activities related to the management of marine litter in the region. The activities and collection of information were carried out by regional and national consultants. Each of the regions has a customized programme and a work plan based on the same concept. Agreements were signed with five regional organizations in 2005, another five in 2006 and with two more during 2007 and 2008. Four main activities detailed in the agreements were (a) preparation of a document *Review of the Status of Marine Litter in the Region;* (b) preparation of the *Regional Action Plan (or regional strategy) on the Sustainable Management of Marine Litter;* (c) organization of a regional meeting of national authorities and experts on marine litter; and (d) participation in a Regional Cleanup Day, within the framework of the International Coastal Cleanup campaign.

All 12 participating Regional Seas prepared documents on *Review of the Status of Marine Litter in the Region* and seven of the participating Regional Seas prepared document *Regional Action Plan on Management of Marine* Litter. Nine regions organized regional meetings of national authorities and experts on marine litter. Eleven regions also participated in the annual International Coastal Cleanup campaign in 2007, which has been a long-time activity in many regions.

The Review documents on marine litter in the regions were prepared by a regional marine litter consultant, and included, among other things, the collection and review of existing institutional arrangements; capacities and funding resources; data and information on marine litter in the marine and coastal environment; legal and administrative instruments; programmes and initiatives; identification of gaps and needs in coverage of marine litter management; and proposals for changes and recommendations. These review documents were based on national reports (compiled by national experts/consultants and preferably based on standard questionnaires) and other available documents and information, such as relevant scientific papers and other literature.

A Regional Action Plan on the Sustainable Management of Marine Litter for each region was to include, amongst other elements and when feasible, the following: (a) a programme of enhancement of national/regional legal and administrative instruments; (b) development of regional and national strategies for an integrated management of marine litter; (c) recommended programmes of cooperation with civil society (private sector, NGOs and the scientific community); (d) information and outreach activities; (e) sectoral activities; and (f) fundraising activities.

An overview of the aforementioned regional activities is presented in Chapter 2 of this document – *Review of Regional Documents and Regional Action Plans on Marine Litter.*

Regional strategies for the sustainable management of marine litter

At the request of the Regional Seas, the Regional Seas Programme office prepared in November 2006 *Guidelines for the Development and Implementation of Regional Strategies for Addressing Marine Litter*. The development and implementation of a Regional Strategy would occur through the following three phases: Phase I – Assessment of the regional situation; Phase II – Preparation of the Regional Strategy through consultations culminating in a regional meeting of experts and national authorities; and Phase III – The integration of the Regional Strategy into the Programme of Work and the legal instruments of the respective Regional Seas programmes and the implementation of the Regional Strategy.

Activities at the global level

The UNEP global initiative on marine litter

According to the report entitled "*The State of the Marine Environment: Trends and Processes",* commissioned by the UNEP GPA Coordination Office in preparation for the second session of the Intergovernmental Review Meeting on the GPA (IGR-2; Beijing, China, October 2006), the current status of action for litter, as one of the nine source categories of GPA, is as follows:

Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (GPA)

The United Nations Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (GPA) was adopted in 1995 by over 100 countries participating at the Intergovernmental Conference. GPA is a programme that addresses the impacts of land-based sources and activities on coastal and marine environments and human well-being. The goal of the GPA is to prevent the degradation of the marine environment from land-based activities by facilitating the realization of the duty of States to preserve and protect the marine environment. It is designed to assist States in taking actions individually or jointly within their respective policies, priorities and resources, which will lead to the prevention, reduction, control and/or elimination of the degradation of the marine environment, as well as to its recovery from the impacts of land-based activities.

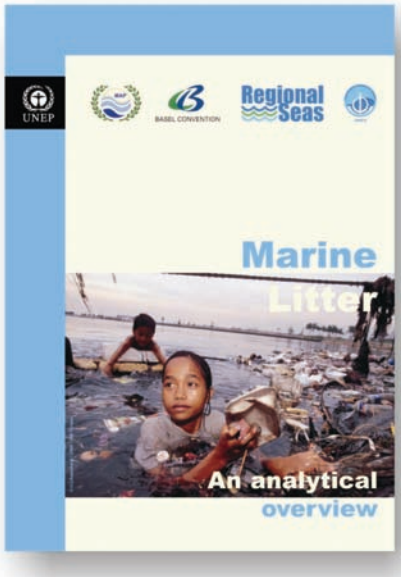
Litter is one of the nine source categories of the GPA and as such is important for its implementation. In the recent years many regional and global actions on marine litter were developed. Through them the relevance to the GPA is continuously increasing. The objective/proposed target of GPA regarding marine litter is *"to reduce significantly the amount of litter reaching the marine and coastal environment by the prevention or reduction of the generation of solid waste and improvements in its management, including collection and recycling of litter."*

"Ecosystems and wildlife, human health and safety, cultural and aesthetic values and economic activities all suffer as a result of litter. Since most of this litter is non-degradable, or only breaks down very slowly, it inevitably accumulates over time. Thus, the problem is continually worsening, in spite of both national and international efforts to control it. As the problem has largely cultural roots (current attitudes and behaviour demonstrate that people do not feel responsible), building awareness and providing information offers some hope for the future."

During *Partnership Day* at the IGR-2 a new partnership named "Marine litter – a global challenge" was created. This initiative provides a global platform for the implementation of the UNEP *Global Initiative on Marine Litter* through the establishment of partnerships, cooperation and coordination of activities for the control and sustainable management of marine litter. The main partners in the "*Global Initiative on Marine Litter"* include individual Regional Seas Conventions and Action Plans, government representatives, UN agencies, relevant bodies and organizations, donor agencies and organizations, the private sector and NGOs.

This partnership represents a unified effort in the wider context of the Global Programme of Action, the Regional Seas Conventions and Action Plans and the respective mandates of other stakeholders. Existing solutions could be tailored and replicated for specific regions, including innovative economic incentives to prevent litter and encourage cleanup, prevention and management of lost and abandoned fishing gear, harmonization of monitoring and assessment systems and establishment of reception facilities marine garbage and waste.

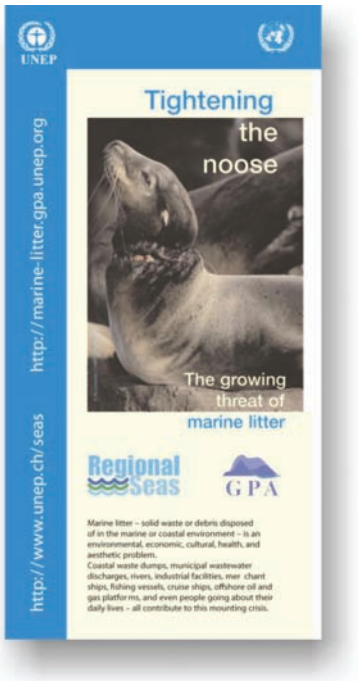
An analytical overview



In 2005 UNEP's GPA and Regional Seas Programme published the study *Marine Litter: An Analytical Overview*. This document assessed the threat posed by marine litter worldwide and examined the efficacy of instruments, programmes and initiatives that address this global threat.
http://www.unep.org/regionalseas/marinelitter/publications/default.asp

Brochure "Tightening the noose"

In 2005 UNEP's GPA and Regional Seas Programme issued a brochure "*Tightening the noose: The growing threat of marine litter"* that in popular language presented basic information on the extent of the problem of marine litter, listed main ongoing efforts on the international level and called for coordinated action.



UNEP/IOC guidelines on the survey and monitoring of marine litter

One of the significant barriers to addressing marine litter is the absence of adequate science-based monitoring and assessment programmes for marine litter at national, regional and global scales. The lack of needed information on the status, quantities and trends of marine litter worldwide was recognised by the UN General Assembly, which in its Resolution A/RES/60/30, "*notes the lack of information and data on marine debris and encourages relevant national and international organizations to undertake further studies on the extent and nature of the problem".*

Changes in accumulation rates and composition, trends over time and the effectiveness of management systems are also hard to assess without good monitoring methodologies. Although monitoring of marine litter is currently carried out within a limited number of countries and regions around the world, the methods of survey and monitoring used tend to vary, thus preventing comparisons and harmonization of data across regions or time-scales.

In order to address this problem, and in order to provide a long-term platform for scientific monitoring of marine litter, the UNEP Regional Seas Programme launched, in cooperation with the Intergovernmental Oceanographic Commission (IOC) of UNESCO, the development of the *UNEP/IOC Guidelines on Survey and Monitoring of Marine Litter* (Cheshire et al., 2009). Such guidelines, scheduled for publication in March 2009, will assist policy makers and efforts by NGOs, regions, countries, and other relevant organizations to address the problem of monitoring and assessment of marine litter.

FAO/UNEP report and joint action on abandoned, lost or otherwise discarded fishing gear (ALDFG)

The UN GA Resolution 59/25 of 17 Nov. 2004 on sustainable fisheries addresses the issue of marine litter and fisheries and "*calls upon States, the FAO, the IMO, the UNEP, in particular its Regional Seas Programme, regional and sub-regional fisheries management organizations and arrangements and other appropriate intergovernmental organizations, that have not yet done so, to take action to address the issue of lost or abandoned fishing gear and related marine debris, including through the collection of data on gear loss, economic costs to fisheries and other sectors, and impacts on marine ecosystems.*"

The problem of abandoned, lost and otherwise discarded fishing gear (ALDFG) has emerged as a serious threat to marine ecosystems and to human activities at sea and cannot be approached effectively without

the cooperative efforts of the international community. Although several initiatives are being undertaken worldwide, primarily at the national level, to prevent, reduce and/or remove ALDFG, regional and international cooperation are of vital significance for the prevention and eradication of the problem, because of its transboundary nature.

With a view to encourage a more concerted and comprehensive response from national governments as well as relevant industries, UNEP and FAO joined forces, commissioning Poseidon Aquatic Resource Management Ltd., to undertake the global review: *Abandoned, lost or otherwise discarded fishing gear (ALDFG)* (Macfadyen et al., 2009). The objective of this work was to review available relevant information and assess the feasibility of the development of joint programmes, activities, capacity building, education and public and sectoral outreach between Regional Fisheries Management Organizations (RFMOs) and Regional Seas programmes (RSPs), focusing on abandoned/lost fishing gear, taking into account the respective mandates, objectives and scope of the RSPs and RFMOs. The document was scheduled for publication in March 2009.

Marine litter and market-based instruments

UNEP supported a project with the Institute for European Environmental Policy (IEEP) and Sheavly Consultants to develop guidelines on the use of market-based and economic instruments to address the problem of marine litter. The main objective of this project was to provide policy makers, managers, Regional Seas programmes and other relevant organizations with clear advice and guidance on the practical and operational options for the selection, establishment, application and implementation of market-based and economic instruments (MBIs) to address the problem of marine litter. The study addresses key marine litter issues, both land- and ocean based. Examples of some case studies demonstrate the success of MBIs in addressing marine litter. The report should serve as a practical 'reference guide' for decision makers and relevant organizations on how to select, apply and implement MBIs relevant to local marine litter issues. The document *Guidelines on the Use of Market-Based Instruments to Address the Problem of Marine Litter* (ten Brink et al., 2009) was scheduled for publication in March 2009.

Global initiatives and policies

Successful management of the marine litter problem requires the development and implementation of policies effective enough to deal with it, supported by international and regional treaties and conventions. The conventions that address marine litter issues and other concerns are listed in each of the Regional Seas summaries presented in Chapter 2. These conventions and agreements support the development and implementation of national legal frameworks needed to address environmental challenges.

This section presents an overview of some of the programmes and legal instruments that provide a foundation for UNEP's Global Marine Litter Initiative.

Resolutions of the United Nations General Assembly

UNGA Resolutions A/RES/60/30 and A/RES/63/111 on Oceans and the law of the sea (29 November 2005 and 5 December 2008)

The problem of marine litter was recognized by the UN General Assembly, which in its Resolution A/RES/60/30 - Oceans and the law of the sea, articles 65 - 70 (29 November 2005) calls for national, regional and global actions to address the problem of marine litter. This GA resolution noted the lack of information and data on marine debris, encouraged relevant national and international organizations to undertake further studies on the extent and nature of the problem, also encouraged States to develop partnerships with industry and civil society, urged States to integrate the issue of marine debris within national environmental strategies, and encouraged States to cooperate regionally and sub-regionally to develop and implement joint prevention and recovery programmes for marine debris. Also, the GA invited the International Maritime Organization (Article 67), in consultation with relevant organizations and bodies, to review Annex V to the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto, and to assess its effectiveness in addressing ocean-based sources of marine debris.

In Resolution A/63/111 of 2008, the need to raise awareness of and support the implementation of improved waste management practices was addressed in Article 16. Special emphasis was given to

small island-developing States in regard to the impact of marine pollution from land-based sources and marine debris. In Article 106, further development of partnerships with industry and civil society in cooperation with relevant UN bodies and organizations were encouraged in relation to UNEP's marine litter activities to raise awareness of the extent of the impact of marine debris on the health and productivity of the marine environment and consequent economic loss. The integration of the marine litter issue into national strategies dealing with waste management in the coastal zone, ports and maritime industries, including recycling, reuse, reduction and disposal was encouraged, as well as the development of appropriate economic incentives to address this issue (Article 107).

UNGA Resolutions A/RES/60/31 and A/RES/63/112 on sustainable fisheries (29 November 2005 and 5 December 2008)

Close cooperation and coordination is encouraged, as appropriate, between States, relevant intergovernmental organizations, UN programmes and other bodies, such as the FAO, IMO, UNEP, GPA, and Regional Seas arrangements, regional and sub-regional fisheries management organizations and arrangements and relevant stakeholders, including NGOs, to address the issue of Abandoned and Lost Fishing Gear (ALFG) and related marine debris problems (A/RES/60/31). Through initiatives such as the collection of data on gear loss, the economic costs to fisheries and other sectors, impact on marine ecosystems, the analysis of the implementation and effectiveness of existing measures relevant to the control and management of derelict fishing gear and related marine debris, the development and implementation of targeted studies to determine the socio-economic, technical and other factors that influence the accidental loss and deliberate disposal of fishing gear at sea, the assessment and implementation of preventive measures, incentives and/or disincentives relating to the loss and disposal of fishing gear at sea, the development of best management practices, development and implementation of joint prevention and recovery programmes, establishment of a clearing-house mechanism to facilitate the sharing of information between States on fishing net types and other fishing gear, the regular, long-term collection, collation and dissemination of information on derelict fishing gear, and national inventories of net types and other fishing gear, as appropriate.

Marine debris is a global transboundary pollution problem. Due to the many different types and sources of marine debris, different approaches to their prevention and removal are necessary.
UNGA resolution 63/112 recognizes the importance it attaches to paragraphs 77 to 81 of resolution 60/31 concerning the issue of lost, abandoned, or discarded fishing gear and related marine debris and the adverse impacts such debris and derelict fishing gear have on, *inter alia*, fish stocks, habitats and other marine species, and urges accelerated progress by States and regional fisheries management organizations and arrangements in implementing those paragraphs of the resolution.

FAO Code of Conduct for Responsible Fisheries

The FAO Code of Conduct for Responsible Fisheries is a guidance document, stating that fishing should be conducted in accordance with the IMO's requirements (e.g., MARPOL Annex V) to protect the marine environment and prevent loss of fishing gear. This Code sets out principles and international standards of behaviour for responsible practices with a view to ensuring the effective conservation, management and development of living aquatic resources, with due respect for the ecosystem and biodiversity. The Code recognises the nutritional, economic, social, environmental and cultural importance of fisheries, and the interests of all those concerned with the fishery sector. The Code takes into account the biological characteristics of the resources and their environment and the interests of consumers and other users.

International conventions

There are numerous international conventions that directly address various aspects of marine litter and form the foundation of the UNEP Marine Litter Initiative. The three primary conventions most relevant to marine litter are the *International Convention for the Prevention of Marine Pollution from Ships* (MARPOL 73/78) and its *Annex V* (which prohibits the at-sea disposal of plastics and garbage from ships), the *Convention for the Prevention of Marine Pollution by Dumping of Wastes and other Matter* (London Convention) and the *Convention on the Trans-boundary Movements of Hazardous Wastes and Their Disposal* (Basel Convention).

The International Maritime Organization (IMO) plays a particularly crucial role in the protection of the marine environment from litter through the implementation of its two important international conventions --

the *International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78)* and the *Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972 (London Convention) and the 1996 Protocol to the Convention (London Protocol).*

Annex V of the MARPOL Convention

Annex V (*prevention of pollution by garbage from ships*) of the MARPOL 73/78 Convention prohibits ocean dumping of all ship-generated plastics and regulates the dumping of other garbage. Annex V is of particular importance to the maritime community, including shippers, oil platforms, fishers, recreational boaters and cruise lines, as it prohibits the disposal of plastic at sea and regulates the disposal of other types of garbage at sea. Under Annex V of the Convention, garbage includes all types of food, domestic and operational wastes (excluding fresh fish), generated during the normal operation of the vessel and liable to be disposed of continuously or periodically. This annex also requires ports and terminals to provide garbage reception facilities for ships. As of 16 February 2009, 139 countries have ratified Annex V controlling the disposal of plastics and garbage from ships into the oceans.

'*Special Areas*' are designated by MARPOL Annex V as locations where, due to the site's unique oceanographic, ecological or traffic conditions, all overboard discharges of garbage (except ground-up food wastes) are prohibited. Food wastes may not be discharged within 12 nautical miles of the nearest land in 'Special Areas.' The status of Special Areas was adopted and entered into force for eight areas (Mediterranean Sea, Baltic Sea, "Gulfs" area, North Sea, Antarctic area, Black Sea, Red Sea and Wider Caribbean region, including the Gulf of Mexico): It is in effect for the first five but not for the latter three sea regions because of lack of notification of the existence of adequate reception facilities by MARPOL Parties whose coastlines border the relevant special areas.

The Marine Environment Protection Committee (MEPC) of the International Maritime Organization (IMO) at its 55th session (October 2006) established an intersessional Correspondence Group to develop the framework, method of work and timetable for a comprehensive review of MARPOL Annex V *Regulations for the prevention of pollution by garbage from ships* and the associated *Revised Guidelines for the implementation of MARPOL Annex V*. A review of MARPOL Annex V and its Guidelines is still in progress. It is likely that some changes to Annex V or its Guidelines may be proposed in the final report in July 2009.

London Convention and Protocol

Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972 (London Convention) and the 1996 Protocol to the Convention (London Protocol) do not deal directly with marine litter. They are aimed at addressing, minimizing and regulating dumping at sea of waste and materials loaded on vessels with the purpose of being dumped at sea. However, the London Convention and Protocol are legal instruments which regulate activities that might become litter at sea.

The London Convention focuses on preventing the dumping of wastes and other materials into the sea and the 1996 London Protocol updates the Convention. Discharges from vessels, aircraft, platforms, or other human-made structures at sea are not considered dumping if their wastes are generated during 'normal operations'; however, they are considered by the Convention and the Protocol if the discharged materials were transported for the purpose of disposal at sea. Other provisions of the Protocol prohibit the at-sea incineration of wastes covered under the Protocol and also prohibit the export of wastes to other countries for subsequent dumping or incineration at sea.

A key difference between the Convention and the amended Protocol is that where the Convention allows dumping unless specifically prohibited (a so-called "black list" approach), under the 96 Protocol, at-sea dumping is prohibited unless the material has been specifically included on an approved list (a "reverse list" or "white list" approach). The Protocol also incorporates a precautionary approach to protecting the marine environment from dumping activities by requiring preventive action.

Basel Convention

The main objective of the Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Basel Convention, 1992) is 'environmentally-sound management', the aim of which is to protect human health and the environment by minimizing hazardous waste production whenever possible. This means addressing the issue through an 'integrated life-cycle approach', which involves strong controls, from the generation of a hazardous waste to its storage, transport, treatment, reuse, recycling, recovery and final disposal. Any hazardous (in the sense of the Convention) marine litter from land-based sources would fall under the scope of the Convention. Some non-hazardous, land-based marine litter would also fall under the scope of the Convention under the categories of wastes requiring special consideration. In this context, a number of technical guidelines for the environmentally sound management of hazardous and other wastes, adopted by the Parties to the Convention, would be relevant to the marine litter problem.

Initiatives at the regional level

Regional Seas conventions, protocols and agreements

Countries within the Regional Seas are Parties to regional agreements and conventions developed within the framework of Regional Seas programmes. Numerous conventions and international legal instruments are relevant to the management and mitigation of the marine litter problem. These tools help form the base upon which UNEP's Global Marine Litter Initiative has been deployed and implemented. There are also a host of other instruments that have an indirect connection to the control and abatement of marine litter and can play a significant role in the management of this global pollution problem. These instruments include three UNEP Regional Seas Protocols that require parties to prevent dumping from aircraft and ships ratified by the Mediterranean Sea, the South Pacific and Black Sea. In addition, there are seven Regional Seas Conventions that have developed Protocols for the Protection of the Marine Environment from Land-based Sources and Activities (LBS Protocols), with three additional Regional Seas Conventions in various stages of development, implementation and revision of LBS Protocols and two other Regional Seas Conventions addressing land-based sources of pollution in other conventions.

An important regional instrument that includes marine litter is Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive).

Understanding the economic benefits and costs of controlling marine debris in the Asia-Pacific Economic Cooperation (APEC) region

Marine litter is a significant issue in each of the 21 APEC member economies with the more recent years seeing an increase in the diversity, the distribution and the volume of all types of litter. In response the Marine Resource Conservation Working Group (MRC) of APEC was requested in 2004 to develop a study to *"improve awareness amongst governments, communities and industry within the APEC region of the economic implications of marine debris and provide guidance and practical advice for governments, communities and industry within APEC Economies on targeting resources to mitigate the impacts of marine debris and adopting economic instruments.*" The study focused on the APEC member economies, but also used non-APEC economic information if pertinent (McIlgorm et al., 2008).

The approach taken in the study indicated that controlling marine litter had three stages for the policy maker to consider: litter generation and entry to the sea; observations of the ambient marine litter stock levels at sea; and cleaning up litter once it is in the ocean or on the coasts. Overall, the study concluded that a diverse strategy of regulations, market-based instruments and community initiatives are required to address the marine litter problem.

Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR)

Protection of the Antarctic marine environment is a matter of concern to CCAMLR since the general health of the environment affects the species covered by the Convention. As a consequence, the monitoring of marine debris and its impact on marine biota is a permanent item on the Commission and SC-CAMLR agendas. CCAMLR has adopted and implemented measures to monitor marine

debris and to mitigate its impact on marine biota in the Convention Area. Members annually submit information on marine debris beach surveys, debris associated with seabird colonies, mammal and seabird entanglements, and hydrocarbon soiling of mammals and seabirds. CCAMLR has also instituted a number of initiatives to educate fishers and fishing vessel operators about pollution from marine debris and its impact on marine animals. At present CCAMLR members continually monitor marine debris at several locations on the Antarctic Peninsula and other Antarctic and Sub-Antarctic islands. The Secretariat houses the CCAMLR Marine Debris Database which contains data from 12 sites. Information on the CCAMLR marine debris initiative is available at www.ccamlr.org.

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Chapter 2
Review of regional assessments and regional action plans on marine litter

Introduction

The UNEP Global Initiative on Marine Litter – a cooperative activity of UNEP/GPA and the Regional Seas Programme (RSP) – has succeeded in organizing and implementing regional activities on marine litter around the world. Work in each region has proceeded according to agreements on the development of marine litter management activities concluded between the RSP Coordinating Office and the Regional Coordinating Units (secretariats) of 12 Regional Seas: Baltic Sea, Black Sea, Caspian, East Asian Seas, Eastern Africa, Mediterranean, Northeast Atlantic, Northwest Pacific, Red Sea and Gulf of Aden, South Asian Seas, Southeast Pacific, and Wider Caribbean. (See http://www.unep.org/regionalseas/)

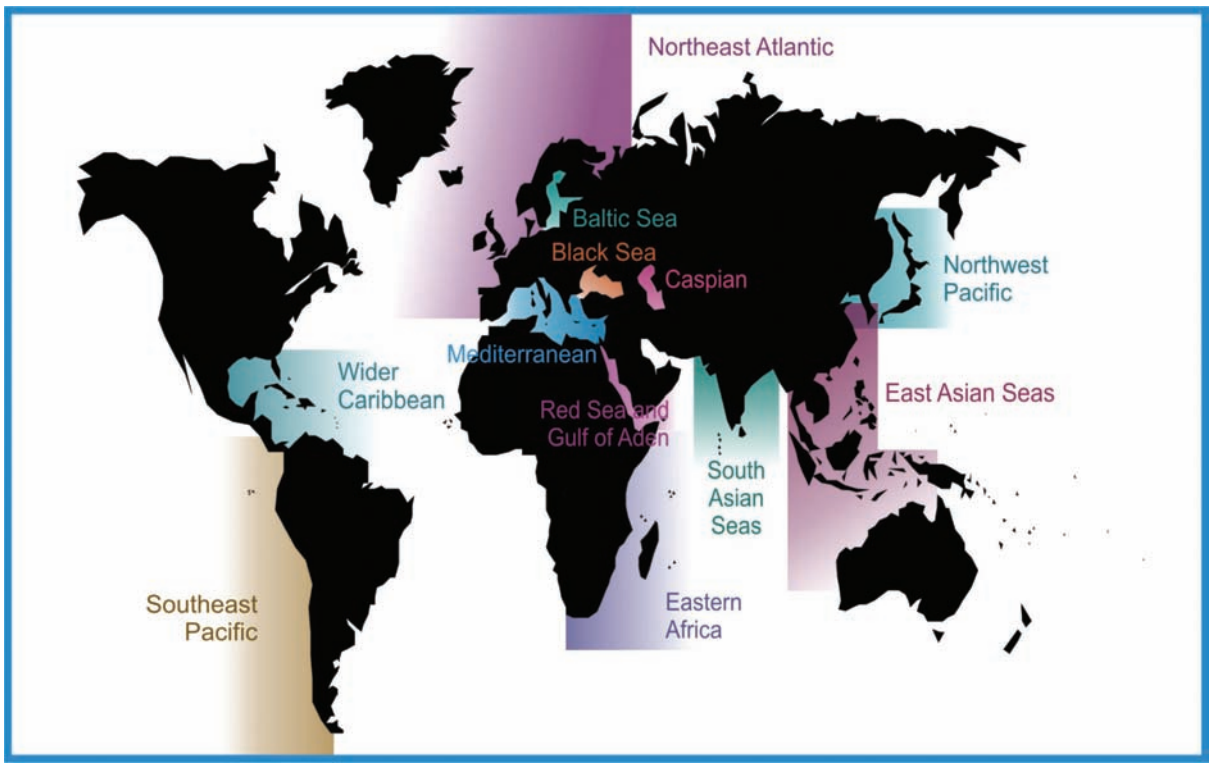
The Global Initiative consists of the following main activities and outputs: (a) preparation of a review and assessment of the status of marine litter in each region; (b) organization of a regional meeting of national authorities and experts on marine litter; (c) preparation of a regional action plan (or a regional strategy) on the sustainable management of marine litter in each region; and (d) participation in a regional cleanup day within the framework of the International Coastal Cleanup Campaign.

All 12 regions prepared review documents, seven regions prepared regional action plans; nine regions have organized regional meetings of national authorities and experts on marine litter; and all 12 regions have participated in the International Coastal Cleanup Campaign.

This Chapter will present summaries of the regional documents generated through UNEP's Global Initiative on Marine Litter. Summaries are presented for each region and each summary includes an overview document, as well as a regional action plan, for the regions that developed such plans.

In addition, an overview of the International Coastal Cleanup (ICC) activities and results in the 12 Regional Seas participating in UNEP's Global Initiative on Marine Litter are presented in Chapter 2.

An analysis of the regional overviews and action plans is given in Chapter 3 of this document.



The 12 Regional Seas participating in UNEP-assisted marine litter activities

Marine litter in the Baltic Sea region
Overview and recommendations for action

Introduction

The Baltic is a young sea and home to many species of plants, animals and micro-organisms that occupy a variety of different habitats. With more than 200 large rivers bringing fresh water into the almost totally enclosed sea and usually limited inflows of saline water through the Danish Straits, it is one of the world's largest bodies of brackish water, where marine and freshwater organisms co-exist successfully. The Baltic Sea has approximately a surface area of 422,000 km^2, a volume of 21,000 km^3, an average depth of 55 m and a coastal length of 8,000 km. The Baltic Sea is bordered by Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland, the Russian Federation and Sweden.

In 1974, all the Baltic Sea coastal countries signed the Convention on the Protection of the Marine Environment of the Baltic Sea Area, also known as the Helsinki Convention. This was a pioneering agreement on many fronts. It was the first regional agreement ever to cover all sources of pollution, whether from land, sea or air. In the light of political changes in Europe, and developments in international environmental and maritime law, a new updated convention was signed in 1992 by all the states bordering on the Baltic Sea, and the European Community.

The Helsinki Commission, or HELCOM, is the governing body of the Helsinki Convention. HELCOM works to protect the marine environment of the Baltic Sea from all sources of pollution through intergovernmental co-operation among the Baltic Sea countries. The Commission has unanimously adopted Recommendations for the protection of the marine environment, which the governments of the Contracting Parties must act on in their respective national programmes and legislation. HELCOM's vision for the future is a healthy Baltic Sea environment with diverse biological components functioning in balance, resulting in a sound ecological state and supporting a wide range of sustainable economic and social activities.

To date, marine litter has not been seen as a major problem in the Baltic. However, there have not been any comprehensive studies on this topic and the lack of comparable and reliable data has been a significant obstacle to addressing marine litter issues in the region. Information is dispensed and has been collected using a variety of methodologies depending on the reporting organization or authority. Some scattered information is available in a few member states.

The HELCOM marine litter project, co-funded by UNEP, is the first effort in the region to study the scale of the problem, assess the availability of information, and determine the actions needed in order to develop and implement a regional strategy for addressing marine litter.

The first step in the project was to collect all readily available information on marine litter in the Baltic Sea by reviewing the literature and contacting relevant organizations able to provide data on marine litter. The project also prepared a questionnaire to gather information on the amounts, types and sources of marine litter in the Baltic Sea countries. The questionnaire was sent out in November 2006 to the appointed marine litter contact persons or the official contact persons of the HELCOM Maritime Group. Additionally, several relevant non-governmental organizations (NGOs) and associations as well as individuals were given the questionnaire. Replies were received from six countries out of nine (Denmark, Estonia, Latvia, Lithuania, Poland, and Russia).

The objective of this chapter is to present a summary of the document *Marine Litter in the Baltic Sea Region: Assessment and priorities for response (HELCOM, 2009)* that was prepared by HELCOM.

Types of litter collected from a harbour in the Baltic region. © Metsähallitus 2007

Assessment of the status of marine litter

Amounts

There is a certain amount of information already available on the amounts of litter found on the beaches along the Baltic coasts, gathered by NGOs (WWF and Ocean Conservancy) and municipalities along the Baltic coast. However, no statistically-based monitoring has been carried out, and there is no common method for reporting this data, which makes comparison of the results difficult. Beach cleanups usually report the litter as pieces per length of coastline (500 m), while municipalities report the total amount of litter as kilograms (kg) or cubic metres (m^3).

The amounts reported by the countries and the information provided by NGOs in the questionnaires suggest that there is no clear descending or ascending trend in the occurrence of marine litter found on coasts of the Baltic Sea. The amounts can be substantial at some sites near the sources of litter (e.g. shipping routes, rivers, and public beaches). In the data from the Baltic Sea, the highest amounts found were between 700 and 1200 pieces per 100 m of coastline, which is similar to the level found on the beaches of the northern North Sea, as reported in the *Final Report of OSPAR Pilot Project on Monitoring Marine Beach Litter* (OSPAR, 2007). However, in many cases the average amount of litter found on the coasts varied between 6 and 16 pieces of litter per 100 m of coast. It can thus be said that littering is not as big problem in the Baltic Sea as in the North Sea area. Yet attention should be paid to the specific points were littering is more extensive and has harmful effects on the environment, or creates a risk of economic losses to the people using or living at the coast.

Amounts found at beaches

WWF has collected information on litter through the Naturewatch Baltic network (www.naturewatchbaltic.org/). Their annual reports (1998-2005) describe the amounts of litter found in the coasts and beaches of the Baltic Sea (Figure 1). The amount of litter is presented as litter pieces found per 500 m of coast. The differences between countries are great. The information collected by Naturewatch does not describe the general situation in the coasts of the Baltic Sea. It describes a situation at a certain moment in particular areas. The number of people taking part in Naturewatch also affects the results significantly.

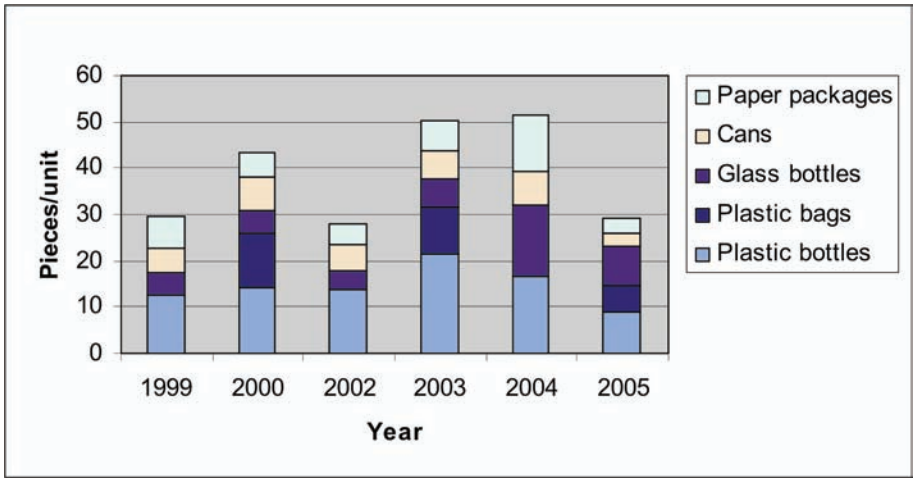


Figure 1. Averages of different types of litter found on beaches by WWF Naturewatch Baltic, measured as pieces of litter per 500 m of coastline.

The Finnish study (Tuomisto, 1994) revealed that the average amount of litter found on 15 beaches in Finland was 11 kg (260 pieces)/100 m of coastline. Findings ranged from a minimum of 1 kg (21 pieces)/ 100m to a maximum of 45 kg (691 pieces)/100 m.

The International Coastal Cleanup (ICC) that is organized annually by an international NGO, Ocean Conservancy, found out that almost 58 percent of the litter can be attributed to shoreline activities, including recreational activities such as beach-picnickers and general littering (Ocean Conservancy, 2004, 2005). In the Baltic Sea countries the amount of litter varied between 2-328 kg (4-181 pieces)/500 m of coast in 2004 and 2005.

Estonia reported in their responses to the questionnaire that within the project Coastwatch Estonia (participating in the ICC) where school pupils had collected litter found on beaches in 1995 to 2006, no clear decreasing or increasing trend in the amounts of litter could be found (Figures 2 and 3). Year 2004 was a peak year during both autumn and spring, but the fewest areas were surveyed that year. Experts in Estonia estimated the amount of litter per 500 m to be in the level of 20 kg. In some areas much more than that could be found. State Forest Management Centre of Estonia (RMK) has surveyed and collected litter in Hiiumaa region in Putkaste and Kärdla districts. The amounts per 500 m of coastline varied between 90 and 316 kg on average (Figure 4).

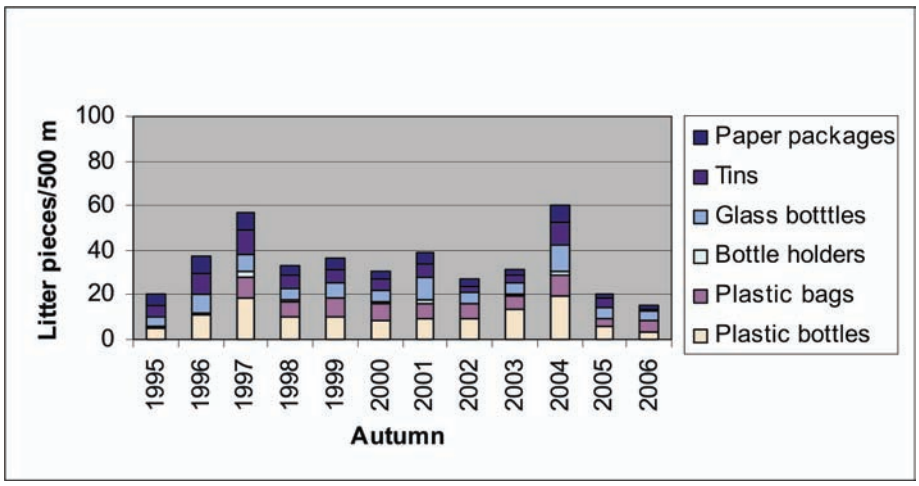


Figure 2. Amount of litter pieces per 500 m of beach found during autumn, 1995-2006. Data provided by Coastwatch Estonia.

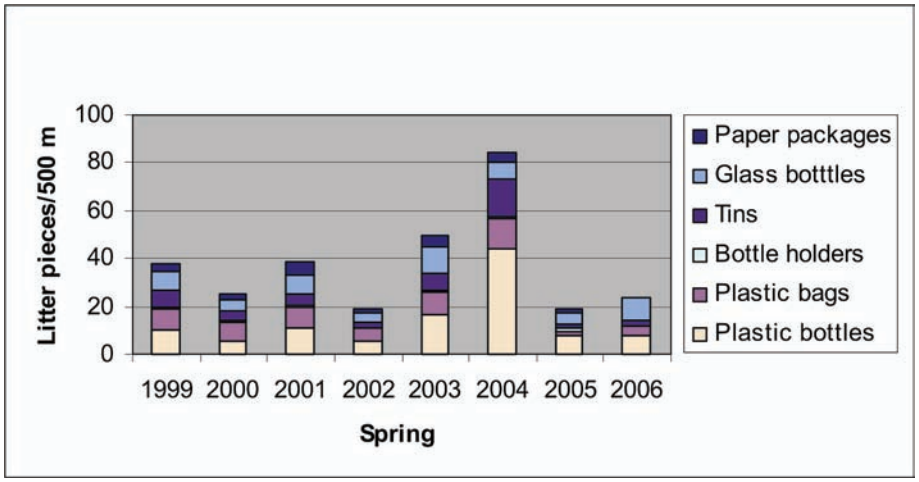


Figure 3. Amount of litter pieces per 500 m of beach found during spring, 1999-2006. Data provided by Coastwatch Estonia.

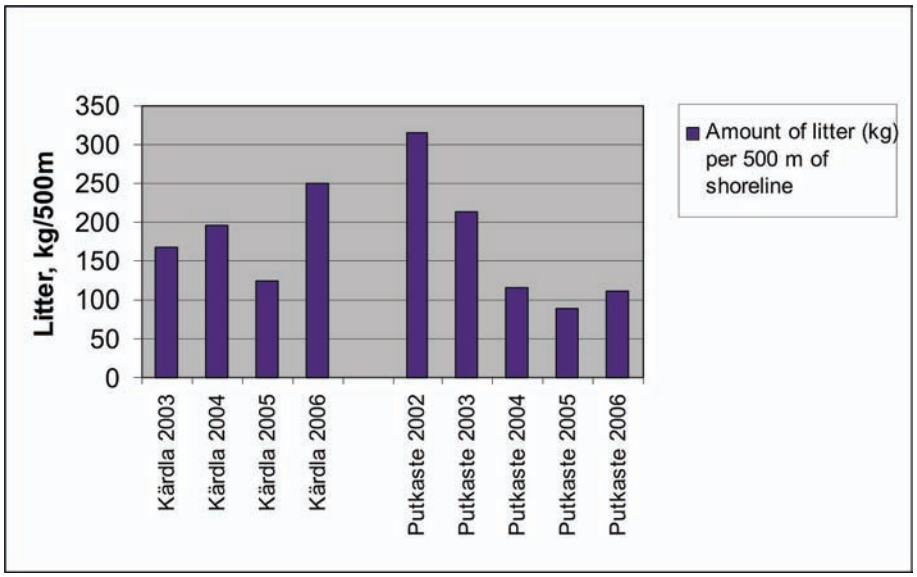


Figure 4. Amount of litter as kg/500 m of coast in Kärdla and Putkaste districts in Hiiumaa area, Estonia. Data provided by State Forest Management Centre (RMK), Estonia (based on personal communication).

In Putkaste, the amount of litter has decreased in recent years, whereas in Kärdla the amount of litter has increased. This could be due to normal variations in the amount of litter. Yet it is interesting that at different sites of the same island the situation can be quite the opposite.

In Poland, the amount of marine litter found on beaches is 12 000 kg/500 m, but this includes the contents of waste baskets on the beaches as well as beach litter that has been collected. The amount of beach litter found and collected in the seven largest Latvian coastal towns over a 10-month period in 2006 was 9537 m^3, of which 63 percent was paper, packaging material (other than plastic), glass and clothing.

According to the national questionnaire, the amount of litter collected in the city of St. Petersburg in Russia (including the banks of the Neva River) in 2006 was 1128 m^3, of which 48 m^3 was seaweed. The size of the area from which litter was collected was 540 m^2.

Amounts found at sea

In the waters of the western Baltic Sea the litter was collected from the water by trawling in 1996. The study found 1.26±0.82 items of litter per hectare (Galgani *et al*., 2000) amounting almost to the same level of litter found in the North Sea.

In the Pärnu region it is estimated that the amount of marine litter at the sea has decreased from 100-200 tons in 1995-1996 to 1 ton in 2006 (estimate based on personal communication with Pärnu city authorities). The main component of marine litter in this area is cargo wastes from ships, especially timber and plywood.

Some collection of marine litter was carried out in four Polish ports in 2006 as reported in the questionnaire. The total amount of marine litter collected in the summer months was 9,300 kg. The mean value per hectare was 23 kg.

According to the national questionnaire in 2005, the amount of litter collected in the port waters of St. Petersburg was 1016 m^3, in Vyborg/Vysotsk 19 m^3 and in Kaliningrad 132 m^3.

Types of marine litter in different parts of the Baltic Sea

The annual report of Naturewatch Baltic network (WWF, 1998-2005) also describes the types of litter found on the coasts and beaches of the Baltic Sea (Figure 1). Plastic bottles were the most common type of litter collected (31-43 percent). In another study of marine litter on the sea floor along European coasts (Galgani *et al*., 2000), plastic bottles were the most common items found (36 percent). Plastic bags were registered only in some years of Naturewatch Baltic and constituted 19-27 percent of all the litter when reported. Plastic items constituted 50-63 percent of all the litter when both plastic bags and bottles were reported. In a study conducted by Tuomisto (1994) plastic items constituted 54 percent of litter pieces found on 15 beaches along the coast of Finland and 33 percent of the total weight.

Five countries reported tourism- and recreation-related litter to be the most common type of litter in their responses to the questionnaire. This includes plastic and glass bottles, plastic bags and packaging materials made of plastic, polystyrene, paper and cardboard as well as cans and tins. In the data from Coastwatch Estonia plastic items constituted on an average 52 percent of all the litter items. Another common type of litter on the coast of Estonia is plywood, although its amount is decreasing while the amount of plastic bottles continues to increase. According to the information provided by the Fisheries Protection Board of Poland, 48 percent of the total weight of litter consisted of plastic items (bottles, bags, ropes, and packaging materials).

Other common materials found on Baltic coasts included fishing-related litter (fishing nets, fishing floats), wood, food waste, sanitary and sewage-related litter, clothing and rubber. The amounts of these items are uncertain. Three countries also mentioned detached vegetation (sea grass, seaweed or thatch) accumulating on the shore to be a major problem in certain areas.

Impacts

There is not much information available about the effects of marine litter in the Baltic Sea region.

The Swedish Board of Fisheries has surveyed the problem of lost fishing nets in studies made from 2000 to 2004 (Larsson *et al.* 2003, Tschernij and Larsson 2003, and Swedish Board of Fisheries 2004). An estimate of the amount of lost cod nets has been made as well as an estimate of the mortal effect of the lost nets on stocks of cod and other species. During the study, searches were concentrated in specific areas where the risk of losses was high (for example, extensive ferry traffic) and where no trawling is practiced, which would affect the amount of fishing gear found. In 2004, 24 km of lost fishing nets were found. This research emphasizes that although the damage to wildlife from lost fishing nets is quite moderate, it is unnecessary and harmful to species that are already at risk.

Sources

Marine litter enters the sea from both land-based sources and from ships and other installations at sea. Marine litter can also be brought indirectly to the sea or coast by rivers, sewage, storm water or wind. Recognized sea-based sources of marine litter are shipping (commercial, recreational and other) and the fishing industry. Possible land-based sources are riverine transport of litter, tourism or recreational visitors to the coast, landfills and waste dumps located in the coast, sewage overflows and other industrial discharges.

The primary land-based sources of marine litter indicated by five countries are tourism and recreational usage of the coasts. All reported major sea-based sources in the Baltic Sea are commercial shipping (e.g. fishing boats, cargo ships, tankers, and passenger ships), recreational fishing boats and pleasure craft. The significance of a particular source varies in different areas of the Baltic Sea.

The most common type of litter in the Baltic Sea is related to the most common land-based sources, namely tourism and recreation. Other common materials found on coasts throughout the Baltic are fishing-related litter, wood, food waste, sanitary and sewage-related litter, clothing and rubber. Detached vegetation accumulating on the shore can also be a major problem in certain areas, but is not considered marine litter. Plastic items are the most common type of material found in many areas. The amount of plastics is a good indicator of marine litter trends, according to the data provided by the countries and information found in the literature, since plastics make up 30-60 percent of litter both by unit and by weight.

The sources indicated in the Finnish study (Tuomisto, 1994) that in the Gulf of Bothnia and in the Åland Islands most of the litter that could be identified originated from cruise liners transiting between Finland and Sweden and recreational boating. In the western Gulf of Finland, the origin of the litter could be recognized from the printed markings on the individual items about 30 percent of the time – it was primarily from cargo ships. Forty percent of the litter was from Russia, Estonia, Latvia, and Lithuania and 21 percent was Polish in origin. In the eastern Gulf of Finland the largest component of the litter also originated from the shipping industry. Items of litter from fishing activities were abundant throughout the Baltic Sea region.

The countries were asked about garbage delivery to the ports. Garbage constitutes approximately three to ten percent of the total amount of waste delivered to the ports based on four responses. Two countries indicated that the 'No-Special-Fee' system has had an effect on the amounts of garbage delivered to the ports, whereas one responded that the system has had no effect at all. Most of the countries do not collect any relevant data at the central level, so it was difficult to assess the effectiveness of the system.

Economics

Marine litter can cause serious economic losses to various sectors and authorities (Hall, 2000). Sectors that can be economically affected by marine litter are communities (beach cleaning, public health, waste disposal), tourism (local business, publicity), shipping (fouled propellers, broken engines, removal of litter in harbours, waste management in harbours), fishing (reduced catch, damaged nets, fouled propellers, contamination), fish farming and agriculture by the coast.

In Bohuslän on the west coast of Sweden, it was estimated that the costs for cleaning the beaches is at least 10 million SEK (1, 125, 000 €) in 1997. Near the city of Göteborg 11,464 plastic bags were removed manually from the coast throughout the year (Hall, 2000).

Poland reported in the questionnaire that the costs for beach cleaning and removal of litter from harbour waters was 570,000 € in 2006. This amount of money was also spent in five communes and two ports in Poland to remove litter from the beaches and port waters.

Legislation, policies and institutional arrangements

Relevant global conventions, agreements and initiatives

The following international convention, agreements, and programmes are of relevance to the marine litter issues in the Baltic Sea region:

- United Nations Convention on the Law of the Sea (UNCLOS) and General Assembly (GA) Resolutions;
- Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (UNEP GPA);
- International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) and its Annex V on regulations for the prevention of pollution by garbage from ships;
- Convention on the Prevention of Maritime Pollution by Dumping of Wastes and Other Matter (London Convention 1972) and 1996 Protocol Thereto;
- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal;
- Agenda 21 and the Johannesburg Plan of Implementation;
- Convention on Biological Diversity, with the Jakarta Mandate;
- FAO Code of Conduct for Responsible Fisheries;
- Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP);
- International Coastal Cleanup; and
- Clean Up the World.

European and regional legislation and policies relevant for the Baltic Sea

There are a number of EU directives that directly or indirectly address marine litter. As eight of the HELCOM countries are also EU member states, the EU legislation greatly supports solving the problems of marine litter in the Baltic.

One of the most important recent legislative developments addressing protection of the marine environment is the Directive of the European Parliament and of the Council establishing a Framework for Community Action in the field of Marine Environmental Policy (Marine Strategy Framework Directive). The Directive requires Member States to take the necessary measures to achieve or maintain good environmental status in the marine environment by the year 2020 at the latest. Qualitative descriptors for determining 'good environmental status' include a requirement that properties and quantities of marine litter should not cause harm to the coastal and marine environment.

The OSPAR Convention has responsibility for the protection of the North Sea area, neighbouring the Baltic Sea. HELCOM collaborates with the OSPAR Commission, e.g. through implementation of the joint ministerial declarations. Three HELCOM countries are also parties to OSPAR.

HELCOM

Since the late 1990s, the HELCOM Member States have been implementing the complex set of measures known as the *Baltic Strategy on Port Reception Facilities for Ship-generated Wastes* (the Baltic Strategy) to prevent illegal discharges of waste into the Baltic Sea and to ensure environmentally sound treatment of ship-generated wastes when these wastes are delivered to port reception facilities ashore.

Today, all discharges into the Baltic Sea of garbage as defined in Annex V to MARPOL 73/78 are prohibited. This prohibition stems from the international designation of the Baltic Sea as a 'Special Area' under Annex V of MARPOL 73/78. To uphold this prohibition, HELCOM requires all ships to deliver all garbage to reception facilities before leaving the port. To further encourage delivery, the countries bordering the Baltic Sea have agreed that ships should not be charged for using such reception facilities. Costs are covered for instance by general harbour fees or general environmental fees. The system is called the 'no-special-fee' system. The Baltic Strategy has been elaborated through a number of HELCOM Recommendations and has proven to be an effective tool for addressing ship-generated waste.

The land-based sources of marine litter are also well covered by the HELCOM regulations, i.e. provisions of the Helsinki Convention and HELCOM Recommendations. HELCOM Recommendation 24/5, providing for measures for proper handling of waste and land filling to prevent pollution of the Baltic Sea from landfills and dumping sites, is one of approximately thirty recommendations addressing specific land-based industries with Best Available Technology (BAT) and Best Environmental Practice (BEP) implementation.

Valid HELCOM recommendations addressing marine litter issues

HELCOM Recommendation 28E/10 (2007) "Application of the no-special-fee system to ship-generated wastes and marine litter caught in fishing nets in the Baltic Sea area" notes that the port authorities are responsible for providing reception facilities for wastes covered by Annex I (oil), II (noxious liquid substances), IV (sewage) and V (garbage) of MARPOL 73/78, and recommends that the Governments of the Contracting Parties apply the Guidelines for the establishment of a harmonized 'no-special-fee' system for the operation of reception facilities in their ports for ship-generated wastes, including garbage and litter caught in fishing nets.

HELCOM Recommendation 24/5 (2003) "Proper handling of Waste/Landfilling" provides for harmonized requirements on proper handling of inert, non hazardous and hazardous waste, and requires introduction of modern landfill techniques and the phasing out of improper dumping sites.

HELCOM Recommendation 23/1 (2002) "Notification of Ship's wastes" requires notification by ships of the intended use of a reception facility as a prerequisite to ensure the use and efficient operation of port reception facilities.

HELCOM Recommendation 22/3 (2001) "Unified interpretations to ensure a harmonized and effective implementation of the strategy for port reception facilities for ship-generated wastes and associated issues" provides guidelines on the interpretation of certain provisions of the Baltic Strategy.

HELCOM Recommendation 19/16 (1998) “Co-operation in investigating violations or suspected violations of discharge and related regulations for ships, dumping and incineration regulations” requires application of detailed guidelines on co-operation between the countries when investigating violations or suspected violations of the discharge provisions of e.g. Annex V to MARPOL 73/78.

HELCOM Recommendation 19/13 (1998) “Basic Principles of Ashore Handling of Ship-Generated Wastes” gives guidelines concerning basic principles of ashore handling of ship-generated wastes.

HELCOM Recommendation 19/12 (1998) “Waste Management Plans for Ports”, supplemented with Recommendation 22/3, states that the Governments of the Contracting Parties should ensure that waste management plans are developed for the ports according to the guidelines.

HELCOM Recommendation 19/9 (1998) “Installation of the Garbage Retention Appliances and Toilet Retention Systems and Standard Connections for Sewage on Board Fishing Vessels, Working Vessels and Pleasure Craft”, supplemented with Recommendations 22/1 and 22/3, requires from the Governments of the Contracting Parties to ensure that all fishing vessels, working vessels and pleasure craft are equipped with garbage retention appliances suitable for collecting and, wherever possible, separating garbage on board.

HELCOM Recommendation 14/7 (1993) “Guidelines for Provisions of Facilities for the Handling, Storage and Processing of Shipboard Garbage” gives guidelines for shipboard garbage handling, storage and processing facilities for ships.

HELCOM Recommendations 13/6 (1992) “Definition of Best Environmental Practice” and 12/3 (1991) “Definition of Best Available Technology” require application of BEP and BAT in the HELCOM area.

HELCOM Recommendation 10/7 (1989) “General Requirements for Reception of Wastes”, supplemented with Recommendation 19/12, puts some requirements on the Governments of the Contracting Parties concerning reception of wastes, including garbage.

HELCOM Recommendation 10/5 (1989) “Guidelines for the Establishment of Adequate Reception Facilities in Ports”, supplemented with HELCOM Recommendation 19/8, recommends the Governments of the Contracting Parties to promote the use of shore reception facilities for residues and wastes from ships by making such facilities and services available at reasonable cost or without charging special fees to the individual ships.

National legislations and policies

There is no specific national legislation addressing marine litter in any of the Baltic Sea countries. There are general statutory orders, regulations, bylaws and acts governing primarily waste handling and port reception facilities. In some countries the municipalities act on collection of litter from beaches. The regulations on wastes from ships seem to be better enforced than legislation addressing littering of the beaches.

In the questionnaire one country expressed the opinion that dealing with marine litter was problematic as this issue was covered and implemented by several authorities (e.g. maritime authorities, environmental authorities). Coordination of enforcement is therefore essential. Two countries reported the general legislation to be insufficient and some of the present regulations to be too vague or difficult to understand for the people working with marine litter in practice. Political commitment in the Baltic countries is essential. Improving relevant legislation for the land-based sources is important.

Strengths, gaps, and needs

From the national reports as well as other information sources it can be concluded that the lack of data is a major gap with regard to marine litter in the Baltic Sea. No regular monitoring of marine litter is conducted. Some surveys are carried out occasionally, mostly to assess the amount of litter found on beaches. Another obvious observation was the difference in practices in sampling and reporting marine litter in the Baltic Sea area. There are several ways to sample beach litter. The litter is reported as pieces, weight and volume depending on the practices of the reporting organization. Also in the beach cleaning campaigns, different lengths of the coast have been surveyed. The information collected in different initiatives is not comparable. Therefore, it is difficult to draw conclusions about the former and present situation. No trends could be seen in the data provided by the Contracting States. To get a comprehensive picture of the problem in the Baltic Sea a similar method should be used as often as possible.

Blue Flag. © HELCOM

If progress is to be made in approaching the litter problem in the Baltic Sea, more clear information on the scale of the problem should be delivered to the public, government officials and policy makers. However, a wide scale monitoring programme is not considered to be a cost-effective measure in the region. Nevertheless, it is thought that the various initiatives of local and volunteer groups will be able to provide sufficient data once survey practices have been harmonized.

The questionnaires revealed that there are gaps in the most basic tools needed to address the litter problem in many countries. For example, there is a lack of waste baskets in quays and coastal areas and there are problems in sorting the litter in ports. Ship owners and ship personnel should be educated on marine litter issues. Some land-based sources (industries, municipalities) are well covered by different regulations, recommendations and legislation. Yet the primary land-based source of litter – tourism and recreation-related litter – is not covered at all. The only way to address this type of litter is by raising public awareness, especially about the environmental and economic impacts of marine litter.

Economic incentives have been introduced in the Baltic Sea area. The *Baltic Strategy on Port Reception Facilities for Ship-generated Wastes* has been implemented and has probably affected the amount of marine litter in the Baltic Sea. The main strength in the HELCOM area is that the sea-based sources are well covered by the Strategy, and work should focus on enforcement of existing requirements. Detailed data on the amount of garbage delivered to reception facilities per number of calls into major Baltic ports of different types of ships would be needed in order to asses the effectiveness of legislation in place and its enforcement.

General trend indicators of marine litter could be used in the Baltic Sea area as broad-scale obligatory monitoring is not going to be organized. The suggested indicators are amount of plastic bottles, caps and lids, and plastic pieces up to a size of 50 cm per survey of reference beach. Similar indicators have been proposed by the OSPAR Pilot Project 2000-2006 on Monitoring Marine Beach Litter (OSPAR, 2007). It should be kept in mind, though, that these indicators do not cover all possible sources. The amount of plastic materials is a good indicator according to the data provided by the countries and information found from the literature, because they usually comprise 30-60 percent of litter by both unit number and weight. Some indicators should probably be set locally, since there are large differences between areas. In some areas fishing-related litter can be the major component, whereas in others the origin is clearly cargo ships and tankers or passenger ships. Recreational use of the coastal areas is a significant source throughout the region. Different kinds of packaging materials as well as food and drink containers comprise the major part of this type of litter. Regardless of the source, the proportion of plastics is high.

Proposals for action

Based on the results of the project, two HELCOM Recommendations addressing marine litter have been developed:

(1) Recommendation concerning surveying of marine litter found on beach (HELCOM Recommendation 29/2) was adopted at 29th Meeting of the Helsinki Commission (HELCOM 29/2008, 5-6 March 2008, Helsinki, Finland).

(2) HELCOM Recommendation 28E/10 "Application of the 'no-special-fee' system to ship-generated wastes and marine litter caught in fishing nets in the Baltic Sea area", has been included in the HELCOM Baltic Sea Action Plan (BSAP) and adopted at the HELCOM Ministerial Meeting on 15 November 2007 in Krakow, Poland.

In recognition of the importance of public awareness in diminishing the problem of marine litter in the Baltic Sea as highlighted by the Project, the Contracting Parties have also agreed to include in the BSAP some other specific provisions addressing marine litter. The Governments of the Baltic Sea countries agreed to take actions to raise public awareness on environmental and economic effects of marine litter, including 'ghost fishing' of lost fishing nets, and to mobilize the participation in the beach cleanup initiatives, such as a Regional Cleanup Day within the framework of the International Coastal Cleanup Campaign.

HELCOM Recommendation on marine litter within the Baltic Sea region

The Recommendation addresses the harmonization of methods of sampling and reporting the amount and type of marine litter on the beach within the Baltic Sea region, including also a survey form for reporting marine litter, in order to get more harmonized data from different initiatives in the future. The method has originally been used in the OSPAR area (OSPAR, 2007) and for the Baltic Sea needs it has been adjusted to reflect the regional conditions. The Recommendation will be kept updated following global guidelines on monitoring of marine litter to be developed by UNEP/IOC in order to ensure further harmonization.

Recommendation

The Commission recommends to the Governments of the Contracting Parties to the Helsinki Convention to recognize one unified method of sampling and reporting of marine litter found on beach as provided in the attached Guidelines and to call upon different marine litter survey initiatives to use it in order to achieve comparable results.

Monitored area

The selection of areas to be monitored should be done according to the following criteria:

- composed of sand or gravel and exposed to the open sea;
- being subject to onshore winds and onshore drift;
- visually and/or frequently littered (large marine litter items);
- accessible for ease of marine litter removal;
- over one km in length; and
- not located near other input sources of waste; such as rivers.

However, the expert judgment and knowledge about the coastal area and marine litter situation should also be utilized when making the final selection of the reference beaches.

A standard length of 100 m should be used for detailed surveys of marine litter. The monitored section on the beach should be marked and reported using permanent reference points in order to ensure that the same section can be used repeatedly. Where the characteristics of the coast allow, a one km long stretch of the same beach can be surveyed for larger marine litter items (a large item is larger than 50 cm in any direction). The 100 m sites should be situated within the one km areas. The area should be surveyed from the waterline to the region where terrestrial vegetation clearly begins.

Units for amounts

The amount of beach litter should be reported as a number of pieces as a most common way to report the beach litter and if possible, as the weight unit (kg). In case reporting of a number of pieces is neither possible nor applicable, the latter should be used.

Indicators

The following items should be used as indicators to show general marine litter trends as their occurrence is the most frequent and in sufficiently large numbers: plastic bottles, caps and lids, and small plastic pieces up to a size of 50 cm. In order to quantify and determine the relative importance of different sources the amount of items of specific material as listed in a Survey Form should be evaluated.

Reporting

For documentation a survey form attached to the Recommendation should be used.

The Commission recommends also:

- that all the Baltic Sea States should support beach litter monitoring activities and beach cleanup campaigns and should cooperate with local authorities and NGOs in this matter;
- that all the Baltic Sea States; in cooperation with local authorities, raise public awareness on negative effects of marine litter on coastal and sea ecosystems; and
- possible incentives to encourage fisherman to transport litter caught in their fishing nets to port reception facilities are taken into account.

The Contracting Parties agree to keep the issue of marine litter under regular review and take, when appropriate, additional measures to make sure that the quantities and properties of marine litter do not cause harm to the coastal and marine environment, and to update this Recommendation according to international developments on this issue to ensure harmonized approach on a global scale.

HELCOM Recommendation 28E/10 Application of the 'no-special-fee' system to ship-generated wastes and marine litter caught in fishing nets in the Baltic Sea area

HELCOM Recommendation 28E/10 amends the HELCOM Recommendation 28/1 on application of the 'no-special-fee' system for ship-generated wastes in the Baltic Sea area with provisions on marine litter caught in the fishing nets and trawls of fishermen to be part of the 'no-special-fee' system. The Recommendation text is available at http://www.helcom.fi/Recommendations/en_GB/rec28E_10/.

Recommendation

The Commission recommends that the Governments of the Contracting Parties apply the Guidelines attached to the Recommendation for the establishment of a harmonised 'no-special-fee' system for the operation of reception facilities in their ports as of 1 January 2000 for ship-generated wastes covered by Annex I (oily wastes from machinery spaces) of MARPOL 73/78 and as of 1 January 2006 for wastes covered by Annex IV (sewage) and Annex V (garbage) of MARPOL 73/78,

The Commission recommends also that the litter caught in fishing nets be covered by the 'no-special-fee' system and requests the Contracting Parties to support or seek active co-operation with the North Sea States for the purpose of establishing a similar 'no-special-fee' system also in the North Sea Region. The Governments of the Contracting Parties shall report on the implementation of this Recommendation and the Guidelines in accordance with Article 16(1) of the Convention.

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Marine litter in the Black Sea region
Overview and draft Strategic Action Plan

Introduction

The Black Sea is one of the most isolated inland seas in the world. It is situated between south-eastern Europe and Asia Minor and has a surface area of approximately 430,000 km^2 and a volume of about 540,000 km^3. The total length of the coastline is about 4,200 km. The estimated total catchment area of the Black Sea drainage basin is approximately 2,000,000 km^2 covering partially or entirely the territories of 22 countries. The Black Sea is boarded by six countries (Bulgaria, Georgia, Romania, Russia, Turkey, and Ukraine) and the coastal population is estimated at about 18 million, with >12 million living in Istanbul.

In 1992, six Black Sea (BS) countries signed the Convention for the Protection of the Black Sea against Pollution (Bucharest Convention), and later established a Commission on the Protection of the Black Sea Against Pollution (BSC) and its Permanent Secretariat (PS) to help with the regional implementation of the Convention and its Protocols. In 1996 BS countries adopted a Strategic Action Plan for the Protection and Rehabilitation of the Black Sea (BS SAP, 1996).

Among numerous activities organized by BSC PS, the *Regional Activity on Marine Litter*, supported by UNEP, was launched at the end of 2005. Main outputs of this activity, which were completed in mid-2007, were the documents *Marine Litter in the Black Sea Region: A Review of the Problem (Review Document)* and the *Strategic Action Plan for Management and Abatement of Marine Litter in the Black Sea Region*.

It was decided that the *Review Document* should include: the data on marine litter in the marine and coastal environment; the analysis of existing institutional arrangements, legal and administrative instruments, programmes and initiatives; the identification of gaps in knowledge and needs in the coverage of marine litter management; and specific proposals and recommendations for changes for the better. Also it was agreed that the *Review Document* should be based on appropriate national marine litter reports prepared on the basis of a standard questionnaire.

In addition to national marine litter reports, other available documents and information, such as relevant scientific papers and other literature were used in the preparation of the *Review Document.* The BSC PS has designated one regional and six national consultants on marine litter (one specialist from each Black Sea country) and asked them to collect, analyze and present available information. The questionnaire was prepared in early 2006 and national marine litter reports were completed by the mid-summer 2006.

The first draft of the *Review Document* was reviewed, commented upon, and essentially adopted by participants of the Special Session on marine litter of the 15th Meeting of the BSC Advisory Group on Pollution Monitoring and Assessment (Istanbul, 9-10 October 2006). Results of that session were supported by the 15th Ordinary Meeting of the BSC (Istanbul, 20-21 November 2006). The second draft, improved in accordance with comments by the national consultants and recommendations of the marine litter session, was submitted to the BSC Secretariat in December 2006 and in January 2007 to the UNEP Regional Seas Coordinating Office. The final draft of the *Review Document* was submitted to UNEP in July 2007. As a parallel activity, the *Draft Strategic Action Plan for Management and Abatement of Marine Litter in the Black Sea Region (BS-ML-SAP)* was prepared. A subsequent revised draft was prepared, based on discussions at the Advisory Group meetings and comments received by Georgia, Romania, Russia and Turkey.

The objective of this chapter is to present a summary of the document *Marine litter in the Black Sea region: A review of the problem (BSC, 2007)* that includes a review of the situation and the Draft Strategic Action Plan for the Management and Abatement of Marine Litter in the Black Sea Region (BS-ML-SAP).

A review of the problem

Assessment

National marine litter consultants were requested to provide their expert evaluations regarding the state of marine litter pollution in their countries. They responded to the following four questions:

1. How do you assess levels of marine litter pollution in the last year (2005)?

2. How do you assess general trend of marine litter pollution during the last decade?

3. Can you specify five primary sources of marine litter and five all-important 'hot spots'?

4. Can you specify five principle items (constituents) composing marine litter?

The answers on these questions are summarized in tables presented below:

Table 1. Level of marine litter pollution in 2005 in the marine (M) and coastal (C) environments.

Country	Low	Moderate	Sustainable	High	Very high
Bulgaria		Yes (M)	Yes (C)		
Georgia		Yes (M & C)			
Romania		Yes (M & C)			
Russia			Yes (M)	Yes (C)	
Turkey		Yes (M)		Yes (C)	
Ukraine			Yes (M)	Yes (C)	

Note: The medium scores for marine environment (M) probably reflect general uncertainty due to a lack of solid scientific data about actual levels.

Table 2. General trends of marine litter pollution during last 10 years (1996-2005) in marine (M) and coastal (C) environments.

Country	Decrease	Growth	No significant variation	No comment
Bulgaria			Yes (M & C)	
Georgia			Yes (M & C)	
Romania	Yes (M & C)			
Russia		Yes (C)	Yes (M)	
Turkey	Yes (C)			Yes (M)
Ukraine		Yes (M & C)		

Note: The continuing accumulation of solid wastes in the uncontrolled landfills may cause a growth of marine litter in the marine environment (M) due to spontaneous release of the wastes from the dumps into the sea by erosive factors such as waves, rains and winds. At the same time, the sea currents and winds play a role of marine litter dissemination factors contributing to the transboundary transport of floating wastes.

Table 3. Primary sources of marine litter ranked according to the experts' scores

Source	Bu	Ge	Ro	Ru	Tu	Uk	Total
Municipal garbage/sewage (household waste)	5	5	5	5	3	4	**27**
Marine transport and ports (shipping waste)	4	3	2	3	5	5	**22**
Recreation activities in coastal area (litter produced by local population and tourists)	3	4	3	4	1	3	**18**
River run-off	1	–	–	5	5	–	**11**
Industry (incl. shipyard works)	1	–	1	–	4	–	**6**
Fishery (incl. abandoned nets)	1	1	4	–	–	–	**6**
Coastal construction (incl. house-building)	2	2	–	2	–	–	**6**
Agriculture	–	–	–	–	2	–	**2**
Transboundary transfer of floating marine litter	–	–	–	1	–	–	**1**

Comment: The marine litter transfer by sea currents seems to be not less important in the Black Sea region than marine litter discharged by rivers.

Table 4. Marine litter hot spots indicated by the national consultants

Country	Marine litter 'hot spots' (ranked in order of their importance)
Bulgaria	1. Coastal cities (including seaside, resort complexes) 2. Ports 3. Navigation routes 4. Industrial zones along the beaches of Bourgas and Varna 5. Wild beaches and estuaries of the rivers
Georgia	1. Batumi landfill 2. Port of Batumi 3. Port of Poti 4. Kobuleti landfill 5. Mouth of Chorokhi river
Romania	1. Coastal cities 2. Fishing areas 3. Recreation areas 4. Navigation routes 5. Shipyards in Constantsa and Mangalia
Russia	1. River valleys and mouths 2. Beaches 3. Ports and anchorage areas (coal and scrap-iron) 4. Nearshore bottom of urbanized areas (sunk vessels and abandoned gear) 5. Coastal waters between Sochi and Tuapse
Turkey	1. Yesilirmak delta and basin 2. Samsun area (including Samsun harbour) 3. Kizilirmak delta and basin 4. Industrial areas (Zonguldak and Giresun) 5. Touristic areas (Sinop)
Ukraine	1. Coastal cities (Odessa, Sevastopol, Kerch) 2. Recreation areas in Crimea (Yalta, Sudak, Alushta, Balaklava, etc.) 3. Unofficial beaches of the Crimea peninsula 4. Sandy spits of the north-western Black Sea and northern Azov Sea 5. Estuaries of rivers (Danube, Dnieper, Boug, etc.)

Table 5. Basic groups of marine litter ingredients ranked according to the experts' scores

Type of marine litter items	Bu	Ge	Ro	Ru	Tu	Uk	Total
Plastic wares (bottles, bags, etc.)	5	5	5	5	5	5	**30**
Paper and carton (including various packaging materials and cigarette butts)	4	–	4	–	4	4	**16**
Food wastes	2	–	–	–	5	2	**9**
Metal objects (tins and cans, scrap metal)	3	–	–	4	–	–	**7**
Rubber goods (including old tires)	1	2	–	3	–	–	**6**
Textile rags	1	–	3	1	–	–	**5**
Wooden objects	1	4	–	–	–	–	**5**
Glass (bottles, etc.)	1	–	–	–	–	3	**4**
Medical wastes	1	–	–	–	3	–	**4**
Leather (old shoes, etc.)	–	3	–	–	–	–	**3**
Abandoned fishing and sailing gear	–	1	–	2	–	–	**3**
Hazardous wastes	–	–	–	–	2	–	**2**

Amounts

During the last decade, some governmental and private institutions and NGOs in Bulgaria, Romania, Russia, Turkey and Ukraine conducted marine litter research using different approaches and methods. However, national reviews on marine litter in the Black Sea region are still scarce.

The first attempt to estimate approximate levels of marine litter pollution in the Black Sea marine environment was performed in August 2002, when aerial marine litter surveys were carried out in the Azov Sea, Kerch Strait and northeastern shelf area of the Black Sea. The relative intensity of marine litter pollution in the Kerch Strait turned out to be almost as high as in the southern Azov Sea and twice as high as in the Black Sea waters off the northern Caucasus and eastern Crimea. The results of these aerial surveys suggested that a major quantity of marine litter comes to the Russian Black Sea in late spring and early summer probably as the result of the level of river run-off in this area.

Vessel-based line transect surveys have been carried out to study levels of marine litter pollution in Ukrainian part of the Kerch Strait and within the entire 12 mile-wide territorial waters of Ukraine in the Black Sea. As a result, quantitative values of floating plastic marine litter were estimated as 6.6 and 65.7 pieces/km^2 in the Ukrainian Black Sea and Kerch Strait.

A series of underwater surveys for marine litter was undertaken at different sites within the boundaries of Istanbul city. Most items of litter were composed of glass (31 percent), plastic (25 percent) and metal (21 percent). Solid wastes covered the seabed and local communities of benthic organisms. Abandoned fishing nets were found and removed. Some representatives of marine fauna (including cephalopods and crustaceans) were found to have been entangled in the discarded and abandoned nets ('ghost' fishing).

There was an overwhelming predominance of plastics (80-98 percent) in the litter in comparison with glass (2–20 percent) on the remote beaches of Crimea, Ukraine during different seasons. The density of beachfront pollution by synthetic wastes varied from 333 to 6,250 kg/km², while the density of glass litter fluctuated between 222 and 1,455 kg/km². The concentration of marine litter collected at different sites the Turkish Black Sea coast varied from 58 to 1,395 kg per linear kilometre of the coastline.

Numerous 'spontaneous heaps' of marine litter have been sighted during aerial surveys conducted in 2003-2005 along unpopulated (but visited by unorganized tourists) portions of the Russian Black Sea and Azov Sea coasts. Such marine litter deposits are known to be present on the sandy northeastern coast of the Kerch Strait and also in the Anapa and Novorossiysk areas. In May 2004, during snowmelt floods and

before the tourist season, a total volume of marine litter on the coast near Sochi was estimated at 12,000 m^3.

Rubbish from dumps often reaches the sea. © Levan Kherkheulidze/UNEP

Since 2002, the Turkish Marine Environment Protection Association (TURMEPA, Istanbul) has represented Turkish environmental NGOs in the International Coastal Cleanup Campaign (ICC, 2002). Following this initiative, every year from 5,000 to 6,000 volunteers, organized by TURMEPA and its partners, have taken part in coastal cleanup operations in the populated areas along the Turkish coasts of the Mediterranean, Aegean, and Black Seas and the Turkish Straits system. In 2003 and 2004, such operations were carried out in 27-31 cities and settlements, including eight localities on the Black Sea coast. The volunteers collected marine litter items upon selected coastal plots (mainly public beaches) of known length, and sorted, weighed and recorded them. In 2003 a total of 2009 individuals collected 8,215.4 kg of marine litter along 21.3 km of the Black Sea shore, with average of 385.7 kg/km (in comparison with 326.0 kg/km for all Turkish sites examined), however, the concentration of marine litter collected in different places varied widely, from 58.4 kg/km in Rize to 1,395.1 kg/km in Trabzon.

Impacts

The marine litter problem is closely linked to major problems of public health, conservation of the environment and sustainable development in the Black Sea region. Marine litter originates from various land- and sea-based sources as a result of diverse human activities, and evidently causes a wide variety of negative impacts on the human population, wildlife, landscape and some sectors of the economy. Floating litter and items suspended in the water column are transported by currents and winds across maritime borders and throughout the sea to become a basin-wide problem.

It is generally acknowledged that the Black Sea and its coasts are subjected to high levels of solid waste pollution (Mee and Topping, 1998), although very few special studies of its extensiveness, sources and patterns have yet been made. Illegal marine dumping has been known for all Black Sea coastal states for years, although only specifically reported for Turkey and Georgia (Mee and Topping, 1998; Yildirim *et al.*, 2004; Berkun *et al.*, 2005). In spite of a current prohibition by Black Sea coastal states of waste dumping at sea (except for dredged spoils), illegal dumping still occurs. The narrowness of certain strips of the Georgian and Turkish coasts has led to the washing of landfill contents into the sea. Maps reveal a number of disposal sites for explosive objects off the Crimea (Ukraine) coast and in the Gulf of Taganrog (Russia). Navigation charts also show the distribution of sunken vessels and other scrap metal over the shelf area.

Floating marine litter and abandoned fishing nets represent a particular threat to marine mammals (Zaitsev, 1998) which may ingest them or become entangled. A number of foreign bodies have been collected from the stomachs of Black Sea common dolphins (*Delphinus delphis*), including coal slag, pieces of wood and paper, bird feathers, cherry stones, and even a bunch of roses (Kleinenberg, 1956).

In particular, in the Spring of 1991 a total of 194 dead dolphins and harbour porpoises (*Phocoena phocoena*) along with 18,424 turbots (*Psetta maeotica*), 143 sturgeons (*Acipenser* spp.), 401 spiny

dogfishes (*Squalus acanthias*) and 1,359 rays (*Raja clavata* and *Dasyatis pastinaca*) were found entangled in 6,416 bottom-set gillnets approximately 640 km long in Ukrainian waters (Birkun, 2002). In April 2002, 35 by-catch harbour porpoises were recorded in the abandoned illegal gill and trammel nets (30.2 km) in the Exclusive Economic Zone of Romania (Radu *et al.*, 2003). Additional information on 'ghost' fishing in the Istanbul Strait is presented in this report.

Sources

The widespread occurrence of illegal, unreported and unregulated (IUU) fishing activities in the Black and Azov Seas can be considered as an important source of marine litter because of the countless illegal nets and nets which were discarded or abandoned, resulting in 'ghost' fishing. In some areas, the high concentrations of fixed and floating IUU fishing gear has resulted in the reduction of habitat space, the presentation of obstacles on migration routes and an increase in incidental mortality (by-catch) of cetaceans, fishes and crustaceans. Although no special research on abandoned nets has been conducted in the Black Sea region, the problem of 'ghost' fishing undoubtedly exists, at least in the shelf area.

Important data on permanent sources of marine litter have been published by Turkish experts. Solid waste management is one of the main environmental problems in the Black Sea region (Celik, 2002). It was reported that at the southern coast of the Black Sea, many municipal and industrial solid wastes, mixed with hospital and hazardous wastes, are being dumped on nearby lowlands and river valleys, directly on the seashore or even at sea (Berkun *et al.*, 2005).

Such practices have also spread to Georgia. Most uncontrolled coastal landfills and dumping sites are not protected from waves and thus serve as stationary sources of unknown (but admittedly large) quantities of marine litter. The continuing accumulation of solid wastes on the coast may cause an increase in marine litter when the wastes are carried from the dumps into the sea by erosive factors such as waves, rains and winds. Sea currents and winds also play a role in the transport and dissemination of floating litter. Therefore, land-based solid wastes continue to constitute the major component of marine litter for the Black Sea overall. This problem most likely represents a transboundary concern in the region.

Legislation, policies and institutional arrangements

Legislation and policies

Regional level

The Black Sea states are parties to several conventions and international legal instruments related to marine litter management and mitigation. These instruments include the Convention on the Protection of the Black Sea Against Pollution (the Bucharest Convention), the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78), the Convention for the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (the London Convention), the Convention on the Transboundary Movements of Hazardous Wastes and Their Disposal (the Basel Convention), and other instruments with an indirect relation to the control of marine litter. The Bucharest Convention, MARPOL 73/78 and the Basel Convention have been ratified by all six Black Sea states. A list of international and regional instruments which are relevant (directly or indirectly) to the prevention and mitigation of the Black Sea marine litter problem is presented in the *Regional Review*.

The most relevant international legal instrument for marine litter management in the Black Sea is the Bucharest Convention (1992). Its main objective is to prevent, reduce and control any kind of pollution within the territorial sea and Exclusive Economic Zone of all Black Sea states. The Bucharest Convention and its Protocols (Protocol on the Protection of the Black Sea Marine Environment Against Pollution from Land-based Sources; Protocol on Cooperation in Combating Pollution of the Black Sea by Oil and Other Harmful Substances in Emergency Situations; and Protocol on the Protection of the Black Sea Marine Environment Against Pollution by Dumping) are all applicable to the marine litter management problem. Three lists of hazardous substances and materials, which are annexed to the Convention and to the Protocols on the Pollution from Land-based Sources and by Dumping, include *"persistent synthetic materials which may float, sink or remain in suspension"* or, in other words, those materials which constitute marine litter.

In accordance with the Protocol on the Pollution from Land-based Sources, the Black Sea states should prevent, reduce and control pollution caused by discharges from any sources on their territories such as rivers, canals, coastal establishments, other artificial structures, outfalls or run-off. Each Black Sea state

should also carry out *"monitoring activities in order to assess the levels of pollution, its sources and ecological effects along its coasts"*, in particular, with regard to the hazardous substances and matter (e.g., persistent synthetic materials).

The Protocol on Pollution by Dumping prohibits dumping in the Black Sea of wastes or other matter which contain the hazardous substances. At the same time, *"dumping in the Black Sea of all other wastes or matter requires a prior general permit from the competent national authorities."* Such permits may be issued after consideration of (a) characteristics and composition of the matter intended for dumping, (b) characteristics of the proposed dumping site and disposal method, and (c) possible negative effects of the dumping and practical availability of alternative disposal methods. The BSC should be informed by the contracting parties about such national permits as well as about all casual dumping events forced by emergency situations.

In some way, the marine litter problem can be managed also through the Black Sea Biodiversity and Landscape Conservation Protocol to the Bucharest Convention (which was signed by Bulgaria, Romania, Turkey and Ukraine and ratified by Turkey and Ukraine). In accordance with this protocol the Black Sea states should *"co-operate in developing and harmonizing their laws, regulations and procedures relating to liability, assessment of and compensation for damage caused by human activities and/or pollution of the marine environment of the Black Sea, in order to ensure the highest degree of deterrence and protection for the biological and landscape diversity of the Black Sea as a whole".* The scope of this protocol embraces maritime and coastal areas of the Black Sea and the Sea of Azov.

National level

On the national level the marine litter problem is regulated partially in Black Sea countries by a number of instruments concerned with various fields of public administration, social life and different human activities. Lists of such legal and administrative instruments, containing relevant national documents generated by central governments and respective subordinate administrative documents, are presented in the *Review Document* and consist of over 140 titles of heterogeneous documents which were adopted by the governments, mainly during the last decade. These instruments deal with various fields of public administration, social life and different human activities. The detailed comparative analysis of these instruments should be done in the future, and appropriate recommendations on the harmonization and improvement of national legislation should be developed as a result. The most important points reflecting the present situation are the following:

- All six Black Sea states are in a transition process of developing and updating their national instruments aimed at combating marine pollution including the marine litter and solid waste component. The actual rate of this process and concrete instruments developed are quite different in different countries.
- However, certain general trends in this process with regard to marine litter are common in all Black Sea states: (a) to prohibit any deliberate discharge of potential marine litter at sea and on the shore; (b) to improve solid waste collection, processing, storage, disposal and recycling facilities; and (c) to enhance governmental control of activities mentioned in (a) and (b).
- National policies in the Black Sea states are aimed at waste minimization, reuse, recycling and recovery of landfills. The major legislative and regulatory tools for waste management are adequately developed in the Black Sea countries, and include basic laws and regulations. Bulgaria and Romania, which were accepted to the EU in January 2007, transpose relevant EU directives and standards into their national legislation.
- One of the main management problems affecting most Black Sea countries consists in the lack of ability to apply the existing laws and regulations. Being declared once, they should be implemented in proper way, but often this is not the case.

Institutional arrangements

Among the intergovernmental organizations the *Commission on the Protection of the Black Sea against Pollution and its Permanent Secretariat (BSC PS)* is dealing with various regional activities connected to pollution and development problems of the marine and coastal environment, among those related to marine litter. The main activity of the BSC is implementation of the Bucharest Convention and its Protocols and the Strategic Action Plan for the Rehabilitation and Protection of the Black Sea (BS SAP). A number of other international organizations are involved in activities relevant to the marine environment of the Black Sea, including marine litter, including UNEP, IMO, IOC, FAO, WHO, EU, GESAMP and CIESM.

The Commission on the Protection of the Black Sea Against Pollution and its Permanent Secretariat consolidate the regional activities on marine litter and other types of marine pollution as a contribution to

the implementation of the Bucharest Convention and its Protocols, and the Strategic Action Plan for the Rehabilitation and Protection of the Black Sea.

There are seven BSC Advisory Groups which contribute their expertise and information support to the Commission and Secretariat on the following items: (a) pollution monitoring and assessment; (b) control pollution from land-based sources; (c) development of common methodologies for integrated coastal zone management; (d) environmental safety aspects of shipping; (e) conservation of biological diversity; (f) environmental aspects of the management of fisheries and other marine living resources; and (g) information and data exchange. Advisory Groups (a), (b), (c) and (d) seem to be the most pertinent to addressing the marine litter problem, although the other advisory groups are also concerned with matters relating to marine litter sources, effects and management. In addition, two *ad hoc* working groups have been set up for the promotion of the European Water Framework Directive and for the implementation of the Memorandum of Understanding between the BSC and Danube Commission (the Danube/Black Sea Joint Technical Working Group).

A wide variety of governmental organizations, NGOs and business establishments are concerned with marine and coastal pollution in the Black Sea states at the national and local level. Most of those entities, represented by ministerial and municipal structures and services, marine and sanitary inspectorates, research institutions and universities, port administrations, various agencies, companies and enterprises, and amateur ecological associations, are involved (or can be involved) in the activities to address and combat problems related to marine litter. Six separate sub-sections of the *Review Document* are dedicated to national features of the institutional arrangements in each Black Sea country. The list of organizations and specialists related to marine litter management, research, monitoring, cleanup operations and public education in the region is annexed to the *Review Document*.

Programmes and initiatives

To date, there has been no Black Sea regional strategy, action plan or basin-wide programme that specifically addresses the marine litter problem. However, during the period from 1996–2007 there were several international and Black Sea regional programmes and projects which were partly or marginally concerned with marine litter. The BS SAP (1996, amended in 2002, currently under revision) seems to be the most appropriate framework that could be supplemented with specific provisions for addressing marine litter issues of regional significance. This document already forms the basis for cooperative actions on the conservation and improvement of the Black Sea environment, and includes a series of cognate paragraphs relating to the reduction of pollution from land-based sources, vessels and dumping; waste management; and the assessment and monitoring of marine pollution.

The 15th Regular Meeting of the BSC (Istanbul, 20-22 November 2006) considered the progress achieved to date in implementing the Black Sea Regional Activity on Marine Litter, and approved the BSC Workplan for the year 2007. Among other things, this workplan includes Paragraph 12 “Updating of the BS SAP”, with the final aim to adopt the new version of this strategic document at the Ministerial Meeting in 2009. The marine litter actions were incorporated in the updated SAP in 2008.

National consultants on marine litter presented their comments regarding the priority of the marine litter problem in the Black Sea region, and relevant strategic approaches in their respective countries. Most experts confirm that this problem constitutes a priority issue on the national level. However, up to now there has been no national strategy, action plan or programme specifically devoted to the marine litter problem in any Black Sea state. At the same time, some strategic documents of national significance (e.g., environmental strategies for the coastal zone and waters, waste management programmes, etc.) are concerned with the marine litter problem at least in part. Additionally, several marine litter-related projects were implemented during the last decade by environmental NGOs on voluntary basis.

Strengths, gaps, and needs

According to the expert assessment by national consultants on marine litter (see Table 6), at least seven actions or groups of actions deserve high priority at the national level: improvement of legal and administrative instruments; correction of waste management policy; development of sustainable marine litter management; development of marine litter monitoring methodology; national assessment of marine litter pollution; preparation of proposals to prevent and reduce marine litter; and preparation of awareness and educational tools.

Table 6. Identification of priorities by national consultants on marine litter.
(**P** – primary, **S** – secondary, **U** – unimportant, "—" – not assessed)

Actions	Bulgaria	Georgia	Romania	Russia	Turkey	Ukraine
Improvement of legal and administrative instruments	P	P	P	S	P	P
Correction of waste management policies	P	P	P	P	P	P
Development of sustainable marine litter management	P	P	P	S	P	P
Development of marine litter monitoring methodology	P	P	P	S	P	P
Organizing and maintaining marine litter monitoring facilities	S	P	S	P	S	P
National assessment of marine litter pollution	P	P	P	S	P	P
Preparation of proposals to prevent and reduce marine litter	S	P	P	P	P	P
Development of campaigns/services for marine litter collecting	S	P	S	U	S	P
Elaboration of marine litter collecting technologies/devices	S	S	S	U	S	P
Elaboration of marine litter processing technologies/devices	S	S	S	P	S	P
Development of port reception facilities for garbage	P	P	S	S	S	P
Involvement of stakeholders in anti-marine litter partnership	P	S	S	S	—	P
Training of officers involved in marine litter management	S	S	P	U	S	S
Preparation of professional *sectoral* guidelines	P	S	P	S	S	P
Preparation of awareness and educational tools	P	P	P	P	P	S
Preparation of 'responsible citizenship' guidelines	S	S	P	P	S	S
Initiation of awareness-raising campaign in media	P	S	P	S	P	S
Promotion of public participation in cleanup activities	S	P	P	U	P	S
Research of social and economic costs of marine litter	P	—	—	—	—	—
Implementation of 'polluter pays' principle for marine litter	P	—	—	—	—	—

The major gaps were identified by means of questioning national consultants on marine litter regarding the outputs of marine litter-related projects and other relevant activities implemented in their countries from 1996–2006. Based on available knowledge, the national consultants were requested to set priorities – 'primary', 'secondary' and 'next to 0' (least important) – in the proposed checklist of 18 actions which can promote, in theory, addressing and mitigation of the marine litter problem. Results of the prioritization provided by the national consultants are shown in Table 6.

The Special Session on marine litter of the 15th Meeting of the BSC Advisory Group on Pollution Monitoring and Assessment (Istanbul, 9-10 October 2006) agreed that the major gaps and needs in coverage of marine litter management at the regional level are:

- lack of development of waste management policies and, particularly, the incompleteness and low efficiency related to marine litter issues;
- imperfection and lack of balance of legal and administrative instruments developed for solid waste and marine litter management;
- lack of a common marine litter monitoring and assessment approach based on the standardized methodologies and assessment criteria;
- deficiency of practical measures needed to prevent and reduce marine litter pollution;
- technological lag in respect of contemporary methods and devices for collection, processing, recycling and disposal of solid wastes and marine litter;
- insufficiency of public awareness/education regarding the marine litter problem;
- low level of involvement of the general public and private sector in combating marine litter pollution; and
- gaps in professional knowledge on marine litter issues among managers and authorities involved in the protection of the Black Sea against pollution.

Proposals for action

Regional level

Participants of the 15th Meeting of the BSC Advisory Group on Pollution Monitoring and Assessment (Istanbul, 9-10 October 2006) agreed that principal actions and activities which should be included in the Action Plan are as follows:

- improvement of national waste management policies (to introduce measures to reduce marine litter pollution into national waste management policies);
- improvement of legal and administrative instruments for marine litter as a part of national waste management policies (to introduce necessary amendments related to marine litter into new LBS protocol of the Bucharest Convention);
- development of the regional and national marine litter assessment and monitoring schemes using common methodologies and assessment criteria (to develop methodologies for monitoring and assessment of floating, submerged and coastal litter; to organize and maintain marine litter monitoring facilities);
- developing and implementing measures to prevent and reduce marine litter pollution (to prepare proposals and relevant implementation programmes; to construct and improve port reception facilities for garbage; to close down dumping sites and landfills in the coastal water protection zone as defined in national legislation; to address and mitigate ghost fishing);
- raising public awareness and improvement of public education (to prepare awareness and educational tools; to organize public campaigns; to initiate awareness-raising campaign in media; to prepare 'responsible citizenship' guidelines);
- strengthening public/private partnership in combating marine litter pollution;
- implementation of the best available technologies in order to collect, process, recycle and dispose marine litter; and
- improvement of professional skills and knowledge on the management of marine litter (to prepare professional *sectoral* guidelines; and to organize training for officers involved in marine litter management).

National level

National marine litter consultants made proposals for actions, projects and changes at the national level and they are all listed in the *Review Document.*

Recommendations

National consultants on marine litter made suggestions and drafted project proposals targeting activities to address and reduce the marine litter problem in their countries. In addition, participants of the Special Session on marine litter (Istanbul, 9-10 October 2006) proposed a list of high priority actions to be included in the Regional marine litter Action Plan. Reflecting all available provisions, the aim, objectives and high priority activities of the Action Plan are presented below in the section *Draft Strategic Action Plan for the Management and Abatement of Marine Litter in the Black Sea Region (BS-ML-SAP).*

Draft Strategic Action Plan for the Management and Abatement of Marine Litter in the Black Sea Region (BS ML SAP)

The *Draft Strategic Action Plan for Management and Abatement of the Marine Litter in the Black Sea Region (BS ML SAP)* was prepared and discussed at the Advisory Groups meetings, with comments received from Georgia, Romania, Russia and Turkey. A summary of the revised version is presented below.

It was considered that special activities should be applied to overcome the marine litter problem in the Black Sea region, and that those activities presented in this document (BS ML SAP) should be later incorporated into the framework of the revised *Strategic Action Plan for the Rehabilitation and Protection of the Black Sea* – BSSAP2009.

Aims and objectives

Reflecting the above provisions, the focus of the BS ML SAP is to consolidate, harmonize and implement necessary environmental policies, strategies and measures destined to develop sustainable integrated management of marine litter issues in the Black Sea region.

The objectives of the BS ML SAP are as follows:

Consolidation of environmental policy, legislation and administrative instruments

1. to improve the waste management policies in order to devote due regional/ intergovernmental and national/governmental attention and outline proper effort and resources for the abatement of marine litter pollution in the Black Sea in general and in every Black Sea coastal state, in particular;
2. to reinforce and harmonize existing legal and administrative instruments relevant to the implementation of waste management policies in order to ensure their efficacy under the application with respect to marine litter issues;

Organizational and institutional arrangements

3. to strengthen intergovernmental institutional arrangements consolidating Black Sea regional activities on marine litter and other types of marine pollution;
4. to improve national institutional arrangements regarding the addressing, preventing and combating the marine litter problem;
5. to identify financial sources and allocate essential funds for the implementation of marine litter projects;

Research, monitoring and assessment

6. to develop regional and national marine litter monitoring and assessment schemes on the basis of common research approach, methodology, evaluation criteria and reporting requirements;
7. to improve, develop and implement practical measures aimed to prevent and reduce marine litter pollution;

Practical activities aimed to prevent and reduce marine litter pollution

8. to gain and implement the best available technologies in order to collect, process, recycle and dispose marine litter;

Public awareness, education and information exchange

9. to raise public awareness and promote public education on marine litter issues;
10. to strengthen public, governmental, and private sector partnerships in combating marine litter pollution;
11. to improve professional skills and knowledge of responsible authorities involved in the management of marine litter issues; and
12. to stimulate information exchange on marine litter issues in order to share the best experiences and innovative technologies amongst the Black Sea countries.

General principles and tools

1. The BS ML SAP shall be implemented as an integrated mechanism for Black Sea cooperation in the field of management and abatement of marine litter pollution in order to achieve the BS ML SAP objectives and objectives set up in the Convention on the Protection of the Black Sea Against Pollution and its Protocols.
2. The Contracting Parties to aforementioned Convention shall incorporate the provisions of the BS ML SAP into their national strategies, plans and/or programmes for the protection and rehabilitation of the Black Sea.
3. The Contracting Parties shall endeavour to apply an ecosystem approach to any human activities that may contribute to marine litter pollution in the region and, thus, irreversible damage, compromise or affect otherwise the Black Sea marine and coastal environment.
4. The implementation of the BS ML SAP shall be closely coordinated with respective global and European legal instruments and initiatives covering a wide range of the environment-oriented fields, including management of wastes, water pollution, nature conservation, and relevant European criteria and standards.
5. The implementation of the BS ML SAP shall be based on fundamental environmental principles and tools including the precautionary, 'polluter pays', clean technology/clean production principles and tools of the integrated coastal zone management, combating the pollution at source, and shared responsibility.

Actions

There were 41 Actions proposed in the BS ML SAP, including the following:

Consolidation of environmental policy, legislation and administrative instruments

- to introduce specific issues, aimed to address, prevent, control and reduce marine litter pollution, into the Black Sea regional and national environmental policies concerned with the waste/solid waste management and the integrated coastal zone management;
- to introduce amendments related to marine litter into existing and draft protocols of the Convention on the Protection of the Black Sea Against Pollution;
- to promote implementation by all Black Sea states of the principles of the London Convention;
- to carry out the detailed comparative analysis of national policies relevant to marine litter problem and to conduct the verification of their correspondence with respective international and regional legal acts; to prepare appropriate recommendations on the harmonization and improvement of national legislation; and
- to bring into conformity national legislative acts and administrative policies of the Black Sea states with international and regional instruments concerned with marine litter problem and solid waste management.

Organizational and institutional arrangements

- to introduce marine litter issues as a matter of regular supervision and special discussions into the workplans and practice of operation of the Black Sea Commission, BSC Permanent Secretariat, and BSC Advisory Groups (AG);
- to inventory and evaluate operational abilities of governmental and non-governmental entities concerned about marine litter pollution and involved in appropriate activities;
- to ensure tight cooperation between key central and provincial/municipal authorities involved in marine litter issues; and
- the Contracting Parties shall provide for proper financing of the measures and actions aimed at the marine litter issues on the national level and ensure that the programmes and projects identified as Black Sea regional importance are properly incorporated in national budgets.

Research, monitoring and assessment

- to study spatial and temporal patterns of marine litter distribution, accumulation and shifting on the sea surface, within the water column, over the seabed and along the seashore with regard to hydrological, hydrochemical and hydrometeorological peculiarities*;*
- to carry out a comprehensive study and mapping of the main sources of marine litter pollution in the BS ML SAP area;
- to study and address on the regional and national levels an issue of ghost fishing caused by the fixed and floating nets, which were discarded, abandoned or lost, and by the uncontrolled fishing nets pertinent to illegal, unreported and unregulated fishery;
- to study adverse effects of marine litter on the environment, biodiversity, public health, economics and social life in the Black Sea countries and in the region as a whole;
- to develop and implement on a continuing basis the common methodologies, unified standards, guidelines and reporting format for the monitoring and assessment of floating, submerged and coastal litter, its sources and effects. The recommendations provided by international bodies should be taken into consideration as important mainframe documents;
- to incorporate the monitoring and assessment modules devoted to marine litter as obligatory components into the Black Sea Integrated Monitoring and Assessment Program (BSIMAP);
- to conduct further periodical assessments annually (national level) and biennially (regional level) analyzing the results of marine litter monitoring effort;
- to ensure that marine litter issues are included in the environmental impact assessment schemes and procedures carried out before approving every development project that may affect the marine and coastal environment; and
- to develop and maintain national and regional marine litter databases accumulating primary information obtained due to the monitoring of marine litter and its impacts.

Practical activities aimed to prevent and reduce marine litter pollution

- to improve or develop municipal and industrial infrastructures for solid waste management in the coastal zone in order to prevent and reduce marine litter pollution originated from local land-based sources;
- to develop and improve port reception facilities for garbage collection from vessels;
- to improve or develop permanent services for marine litter collecting and removal along the entire coastline of the BS ML SAP area including the populated and unpopulated sections of the shore;
- to promote activities aimed to develop and introduce on a larger scale the re-usable packaging, fast degrading wrapping materials and other practical tools which can be sufficient for the prevention and abatement of marine litter pollution;
- to elaborate and implement the unified [regional] system of technical norms for the prevention and reduction of marine litter pollution as well as for marine litter collecting and processing technologies and devices; and
- to elaborate and implement measures suitable to prevent litter carried by rivers from its reaching the sea.

Public awareness, education and information exchange

- to organize the Black Sea regional and national public education and awareness raising campaigns directed towards different target groups and aimed to create ‘responsible’ behaviour;
- to raise public participation in marine litter abatement activities by means of involving more people in cleanup campaigns on voluntary basis;
- to involve major stakeholders in anti-marine litter cooperation, including the shipping industry, tourism industry, manufacturers of plastics, fisheries, waste managers/services, municipalities, local communities and authorities, NGOs and general public;
- to prepare, adopt and implement a set of [regionally agreed] professional *sectoral* guidelines;
- to organize and conduct a training course on marine litter issues for officers occupied with municipal and port waste management, wild nature conservation and fish protection (on ghost fishing);
- to use the Biannual Scientific Conference of the Black Sea Commission as a platform for regular information exchange (including specific symposia and round tables) on the state of marine litter problem; and
- to prepare and publish a handbook or manual aimed to address marine litter problems in the Black Sea region and provide methodological framework for the implementation of this BS ML SAP.

Implementation framework

1. The Commission on the Protection of the Black Sea Against Pollution through its Permanent Secretariat shall coordinate regionally relevant activities as far as possible to ensure joint programmes and projects.
2. Before BS ML SAP coming into force the corresponding activities shall be conducted in line with provisions of the Strategic Action Plan for Rehabilitation and Protection of the Black Sea 1996, amended 2002.
3. Priority activities identified in the BS ML SAP will be included directly in the management targets of the revised SAP 2009.

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Marine litter in the Caspian region
Overview and recommendations for action

Introduction

The Caspian Sea is the largest inland water body in the world, occupying a deep depression on the boundary of Europe and Asia with a water level at present approximately 27 m below the level of the world's oceans. It is of importance to note that the water level rise in some places inundates waste dumping areas, residential areas and farms taking back into the sea a considerable amount of litter. The sea's surface is about 436,000 km², its volume is about 78,000 km³ and its coastal length is about 7,000 km. The maximum depth of the sea is 1025 m, and the average depth is 184 m. The geographical area where economic activities can have a noticeable impact on the environment of the Caspian region, i.e., the Caspian Economic Hinterland, is home to some 14.8 million people.

The sea is bordered by five countries (Azerbaijan, Islamic Republic of Iran, Kazakhstan, Russian Federation and Turkmenistan) that in 1998 established, in partnership with International Partners (EU, UNDP, UNEP, and WB), the Caspian Environment Program (CEP). The overall goal of the CEP is to promote the sustainable development and management of the Caspian environment in order to obtain the optimal long-term benefits for the human population of the region.

During the first phase of CEP, 1998-2002, the programme created a regional coordination mechanism to achieve sustainable development and management of the Caspian environment; completed a Transboundary Diagnostic Analysis (TDA) of priority environmental issues and formulated for regional and national endorsement, a Strategic Action Program (SAP) and a National Caspian Action Plan (NCAP) for each of the five countries. The countries demonstrated their commitment to protecting and restoring the Caspian environment by signing the *Framework Convention for the Protection of the Maritime Environment of the Caspian Sea* (Tehran Convention), on 4 November 2003 in Tehran.

The second phase of the CEP witnessed the continued transition to enhanced regional ownership of the programme with its international partners, including GEF and the EU, playing supportive roles. This phase was also characterized by the enhanced focus on the implementation of the SAP and of the NCAPs developed earlier and fully updated, by the full ratification of the Tehran Convention which entered into force on 12 August, 2006, and by the constructive regional dialogue on four associated protocols dealing with biodiversity protection, land-based sources of pollution, EIA in transboundary context and emergency response to oil spills. The First Conference of the Parties to the Convention (COPI) held in Baku in May 2007 was the major highlight of this phase as it approved the Convention Rules of Procedures, Financial Rules and the Work Plan.

Of the issues that have received considerable attention during the two phases of the CEP, marine pollution and unsustainable coastal development activities stand out. Both have been ranked as two major regional environmental areas of concern in the SAP and a fairly large number of remedial and preventive measures and policies have been designed and recommended to deal with these issues.

What seems to have not been fully addressed is, however, the interaction between the two issues in general and the associated problem of marine litter in particular. While marine litter has been recognized in the areas around major ports and in some densely populated areas of the Caspian coastline, as well as in connection with waste disposal from vessels, no systematic attempt has been made to conceptualize the issues and to develop a regional strategy to address it.

Towards this end, CEP in cooperation with UNEP has worked to develop a Regional Marine Litter Strategy since 2005. An international consultant was recruited to lead, supervise and integrate outputs from five national consultants, one in each of the Caspian littoral countries. The expected outputs were a Review document and a Strategy and Action Plan document. National consultants were tasked to collect data, information and analysis in their respective countries which would then be integrated by the Regional Consultant into the Regional Assessment. The preparation of the assessment was hampered by the lack of specific information on marine litter since the data, information and analytical inputs were inadequate and varied in scope and quality. An exception was the Islamic Republic of Iran, home to some 50 percent of the Caspian coastal inhabitants densely settled in the narrow ribbon of land between the Alborz mountain range and the Caspian Sea where marine litter is recognized as an issue.

The objective of this chapter is to present a summary of the document *Marine litter in the Caspian Region: Review and Framework Strategy (CEP, 2009)*.

A Caspian waterway. © Caspian Environment Programme

This apparent lack of regional interest in marine litter issues led to insufficient information and analysis that would have been required to produce the Review and Action Plan documents. Upon reviewing the limited inputs from the countries, a decision was made to make use of whatever data, information and analysis that had been contributed by the region in the form of a combined Situation Assessment and Framework Strategy document. It was further decided to review the first draft of the composite document as part of a public discussion through a workshop in Iran, which had appeared to attach a higher priority to the issue. The first draft would then be revised to incorporate the outcomes of the workshop and would be sent to the region for comments. This course of action was followed through a National Workshop in Bandar Anzali in Iran (26 February 2007) where the first draft was subjected to review by a group of experts including four renowned national experts as well as representatives of the municipalities, departments of environment, ports and shipping organizations, tourism organizations and NGOs from all the Caspian provinces. The workshop, in general, endorsed the strategic component of the draft document while making a number of pragmatic recommendations to be incorporated in the text.

Assessment of the status of marine litter

Marine litter is a new and emerging concern for all Caspian littoral states. Despite its importance, the data on the amount, levels or impacts of marine litter in the region is very sparse. However, the population distribution in the coastal zone and information on domestic waste, visual appearance, mass-media news and personal observations and experiences provide the possibility of a qualitative assessment of the existing situation.

The findings of the questionnaires filled in by national consultants revealed the most common sources of marine litter in the region as being:

- urban solid waste;
- coastal tourism;
- hazardous waste;
- fishing;
- shipping and rivers; and
- oil and gas exploitation.

The items listed above are not in the order of priority, nevertheless, it is reported that plastic material items (including PET bottles), glass bottles, paper and cardboard, tins and cans, textiles and wood are the most common items composing marine litter in the Caspian region. Inflowing rivers are cited as sources of marine litter. No reliable quantitative information was available on marine litter at the regional level although reports do indicate high accumulations in a number of ‘hot spots’. National reports further indicated that with the economic recovery in the region, marine litter is on the increase.

Most of the marine debris and litter appears to have been generated from land-based sources and is connected to specific activities in the region. Hazardous wastes, including hospital wastes such as syringes and urine/blood bags, as well as chemical hazardous materials and industrial sludge, are noteworthy examples of litter being connected to specific activities. While dumping from vessels does not appear to have been noted as having considerable contribution to the marine litter issue, it should be noted that with the increase in oil exploitation and transport across the sea one should expect an increase in marine litter originating from sea.

In addition to the land sources, one should note another factor that contributes to accumulation of marine litter namely, the Caspian Sea's water level fluctuations. Due to tidal changes waters inundate coastal houses and villas, farmlands and at times oil fields and dumping areas resulting in the washing off of marine litter into the sea including high amounts of abandoned construction materials along the shallow water or on beaches. Construction materials such as cement blocks, metal bars and scraps are reported as marine litter in the Iranian coastline.

Marine litter 'hot spots' in the Caspian region

Marine litter 'hot spots' in the Caspian region appear to reflect the population distribution and are reported as follows:

I.R. Iran: Marine litter levels and effects in the Iranian coastline are estimated to be higher in locations with more cities and residential areas. These places are usually situated in the narrower corridors of coastal areas between the mountain range and the sea. Primary hot spots for marine litter in Iran are recognized as the settlements chains from Ramsar to Chalus City, Nowshahr to Noor City, and Anzali Port, Mahmoodabad and Chamkhaleh area.

Moreover, the huge number of tourists travelling to the coastal zones especially in the summer season reaching up to five million on certain weekends bring considerable amounts of litter including food and beverage packaging wastes to this part of coastline.

Kazakhstan: High levels of marine litter and its effects on coastal areas are noted in the Bay Bautino, Port of Aktau, Ural River and the coastal zone area within the Aktau bounds as well as Atyrau, Cities of Aktau, Atyrau, and settlements of Ghambai, Koryk, Prorva, and Karaghanbas.

Azerbaijan and Turkmenistan did not report any 'hot spots' for marine litter. This is clearly an underestimation at least for the city of Baku which is experiencing an oil-based economic boom, rapid population increases and unplanned physical growth, all of which can contribute to an increase in marine litter.

Russia did not directly report any marine litter 'hot spots' although referred to 'rivers', presumably Volga and Terek, as major sources of marine litter.

Institutional arrangements

Governmental structures

In general, the governmental institutional structures addressing environmental issues in the Caspian littoral countries are based in the ministries and other high level national agencies under the supervision of high executive bodies such as presidential offices or cabinet ministers. The marine litter management issue is rather ignored as a specific and independent topic and the work related to marine litter issues is often carried out either as a part of other activities and tasks of a high ranked governmental body such as a ministry or is dealt with by local governments, organizations and agencies. None of the countries has a specialized organization focused specifically on the topic of marine litter in Caspian region.

Azerbaijan: The management of marine litter issues in Azerbaijan is dealt with by the Ministry of Transportation, the Ministry of Health and the Ministry of Ecology and Natural Resources. In addition, the State Oil Company of Azerbaijan is also working with issues related to marine litter.

I.R. Iran: Due to the unique physiographic condition of the Iranian coastal zone, i.e. the dense population distribution combined with tourism pressures, this part of the Caspian region suffers from both the high amount of waste generated at the beaches and those reaching the coastline through rivers and flooding. Based on the Environmental Protection and Preservation Law, the Department of Environment of Iran is responsible for, *inter alia*, monitoring and reporting of environmental situation in the terrestrial and marine environment, including the marine litter issue. The newly adopted Waste Management Law (2005)

considers the local governments' responsible for solid waste management of the cities, linking them indirectly to the marine litter-related issues of the region. Recently, three independent state-owned companies, one in each of the three Iranian Caspian provinces, have been established in cooperation with the municipalities named "Provincial Solid Waste Recycling Organizations" which are, *inter alia*, responsible for solid waste management of the region with particular focus on the waste recovery and disposal sites. Presently these organizations are strongly active in implementing environmentally sound management of all types of solid waste in the Iranian Caspian region.

Russia: The management of marine litter is addressed by the Federal Service in the Sphere of Nature Use; Ministry of Transport, Services/Committees for Environment protection in Astrakhan, Kalmykia and Dagestan; and municipal bodies of coastal settlements.

Kazakhstan: The Ministry of Environment, Ministry of Transportation & Communication, Ministry of Health and Ministry of Agriculture are responsible for marine litter problems and related issues.

Turkmenistan: The Balkan region municipality and Turkmenbashi City, municipalities of Hazar and Bekdash are involved in marine litter management issues in Turkmenistan.

Marine litter research and monitoring

As noted above, marine litter issues are dealt with by organizations tasked with the management of other issues and these organizations are partially involved in the marine litter-related work including research and monitoring activities. In Azerbaijan, a few institutions are involved in marine litter research and monitoring including the Ministry of Ecology and Natural Resources and the Ministry of Health. In Turkmenistan, Kaspekontrol is the only reported institution dealing with marine litter research and monitoring. In Iran, the Department of Environment through the Office for Marine Environment conducts research and study on marine issues including marine litter. No institutions are reported for Kazakhstan.

NGOs and marine litter activities

In general the national non-governmental institutions are weak in the region and international NGOs are not very welcomed. No regional NGO specifically responsible for the Caspian environment exists. While the situation varies from one country to another, the NGO community is not active. Having said that, the national and local NGOs in some of the countries, e.g. Iran and Azerbaijan have on occasion attempted coastal cleanup campaigns and can be relied upon for marine litter awareness campaigns, if supported.

Legal and regulatory settings

Legal Instruments

International agreements

A number of major global environmental conventions (MARPOL Convention with its Annex V; London Convention; Basel Convention; CBD Convention; Bern Convention; and Bonn Convention) have been adopted or acceded to by the Caspian littoral states and although no legally binding instrument is specifically focused on the marine litter issue, some of them partially address the issue.

National environmental legislations

Findings from the questionnaires indicated no separate legislation existed on marine litter at the national level. However, more general national regulations exist that are partially dealing with marine litter issues in each littoral state.

Azerbaijan: Marine litter management falls under the decrees of Industrial and Domestic Waste (1998), Environmental Safety (1999), Environmental Protection (1999) and Water Provision and Effluents (1999). These regulations establish requirements for the state to control the amount and/or type of waste/wastewater generated in the country before reaching the coastal and marine area of the Caspian. In April 2005, the Ministry Ordinance on Hygienic and Ecological Regulations for Sanitation and Deactivation of Domestic Waste was signed. Above all, there is the Environmental Protection Decree (1999), which partly deals with marine litter issues in the country.

I.R. Iran: The Environmental Protection and Enhancement Act (1974) is the main environmental law through which the Department of the Environment (DOE) has been appointed as the main authority responsible for the protection of the environment. According to this act, protection and enhancement of the environment, prevention and control of any form of pollution or degradation leading to the disturbance in the environmental balance, and conducting all matters related to wildlife and aquatic biota of the territorial waters by environmental violation is defined by law. In addition, the Law on the Prevention of Water Pollution Act (1994) tasks the DOE with the protection of the marine environment.

In terms of urban solid waste, municipalities are responsible for the waste collection and transfer, as specified in the Municipalities Act and in the Waste Management Act of 2004 which mostly deal with urban areas leaving waste collection in the non urban coastal areas in a legal vacuum. Other related legislations include the EIA Law and Regulations which are applicable to all infrastructural and industrial developments and 'indirectly' point out to the waste management through highlighting the need for and Environmental Management Plan for the country.

Another important legislation to be mentioned is the Coastal Recognized Properties Act (1975) in which the limit of the Caspian Sea Recognized Land/Properties is defined according to where the lands are located at 1.5 m above the water level of the Caspian in the year 1963. The limit of seashore lands (Harim) where no development is allowed are 60 m further to back land from the maximum inundated land boundary in 1963. Wherever the existing coastal throughway crosses the 60 m limit, then the limit of seashore lands (HARIM) will be the road itself. The importance of this legislation lies in the fact that the sea level rise has made its implementation a hugely costly if not impossible task. Lack of enforceability of the legislation has encouraged encroachment by developers on the coastline which in many places has resulted in total destruction of the coast.

Russia: Resolution of the Federal Government No 391 of 30 July 2004 dealing with scientific studies in the interior marine waters ..., Resolution 395 of 30 July 2004 dealing with provisions on Ministry of Transport …, Codex of Russian Federation on Administrative Violations; Rates for Dues from Vessels in Marine Trade Ports (1995); Codex of Trade Marine Navigation (2006); Resolution of the Federal government No 745 of 206 dealing with standards of marine and river ports …, Ministry of Transport Instructions to prevent pollution from trade ship (1994); Provisions on Reserve Areas in Northern Caspian (1975); Provisions on Wetlands Volga river Delta (1997); and provisions on Implementation of State Control Survey for Use and Protection of Water Objects (2007) are examples of national legislation related to marine litter issues in Russia.

Kazakhstan: The Internal Water Transport Act (2004), the Water Code (2003), the Land Code (2003), Of Land Act (2001) and Of Oil Act (1995) are the reported examples of national environmental legislations dealing directly or indirectly with marine litter management challenges. In addition the Government Decree Of Approval of Rules of Agreement, Location and Operation of Enterprises and other Buildings Influencing Water Condition as well as Condition of Production of Building and Other Works in Water bodies, Water-protective Areas signed recently (2003-2004) are reported as having implications for marine litter management.

Turkmenistan: The National Plan of Turkmenistan on Warning and Recovery of Oil Spills (2001), the Water Code of Turkmenistan, the Regulations on Development of Hydrocarbon Fields in a Golden Century Turkmenistan (1999) and the Turkmenistan Code on Administrative Violations are reported as national laws and regulations dealing with the marine litter issue.

Administrative Instruments

This section of the *Review Document* lists the existing administrative instruments in each of the littoral countries including a) central government instruments dealing with marine litter e.g. statements, resolutions, ministerial regulations, national standards, guidelines, etc., and b) subordinate instruments, e.g. province, district, municipal, harbour, etc. level, which cover the regulation of the marine litter problem.

Central and local government instruments documents dealing with marine litter are reflected in Tables 1 and 2 below. In Table 3 references to marine litter issues in other legislation are noted.

Table 1. Central governmental instruments

	Title of document	dd/mm/yy
AZ	Standards on environmental protection management MC 166 9347-08-04	2004
	Nature protection and nature conservation improvement's standards system MC 1669347-10-05	2005
	State statistical reports on wastes (form 2 TP)	
IR	National regulation on Waste Management Enforcement (Ministerial regulation)	27/07/2005
KZ	Rules of agreement, location and putting into operation of enterprises and other buildings influenced on water condition as well as productive condition of building and other work on water bodies and water protective areas	03/02/2004 No. 130
	Direction of observation of ecological safety standards during designing and carrying out of oil operations in water area and coastal zone of sea and inland water of RK	09/07/1999
	Sanitary-epidemic requirements for surface water preservation from pollution (RK Ministry of Health Centre)	28/06/2004 No. 506
	Rules of conditioning of magazine of operations with garbage (RK Ministry of Transport & Communication Order)	28/04/2003 No. 152-1
	Rules of surface water preservation of RK (RND, 1)	01/03/94
	Of rules validation of navigation of ship berthing in sea ports of RK (RK Ministry of Transport and Communication Order)	10/11/2005 No. 216-1
	Of decree validation of port captain (RK Ministry of Transport and Communication Order)	22/06/2005 No. 217-1
	Of rules validation of ship call at a port and port exit, ship sailing within bounds of water area of port and berthing as well using of technological connection of ferrymen (RK Ministry of Transport and Communication Order)	22.06.2005 No. 217-1
	Special ecological conditions for geophysical research realization in Kazakhstan part of Caspian region	02/01/1995
	Safety laws during realization of sea geophysical work	21/07/1995
TK	No information available on Turkmenistan	

Table 2. Local Instruments

	Title of document	dd/mm/yy
AZ	Guidance (command paper) for sea-crafts' captains on technical measures of the marine protection from pollutions. Baku, 2000	2000
IR	Establishment of Gilan Province Solid Waste Recycling Organization	2004
	Establishment of Mazandaran Province Solid Waste Recycling Organization	2004
	Establishment of Golestan Province Solid Waste Recycling Organization	2004
KZ	Ecological program of region Mangystau for 2005-2007	06/04/2005
	Ecological program of region Atyrau for 2005-2007	06/04/2005
TK	No information available on Turkmenistan	

Table 3. Reference to marine litter items in other national and legal and administrative instruments

Marine litter presence in instruments	AZ	IR	KZ	RU	TK
Public health	Y		Y		Y
Coastal and urban development	Y	Y	Y		
Marine and riverine traffic	Y	Y	Y	Y	Y
Fishery and aquaculture			Y		Y
Tourism and recreation	Y			Y	Y
Offshore gas and oil exploitation	Y	Y	Y	Y	Y
Agriculture and farming	Y				
Various branches of industry	Y	Y			
Protection of state boundaries	Y				
Military activities					

Marine litter mitigating activities in the Caspian region (1997-2006)

Azerbaijan: Azerbaijan has taken a number of steps in this regards although mostly in the broader context of pollution abatement and monitoring. In terms of legal and administrative instruments, the country has developed decrees on "Environmental Safety", "Hazardous Waste Strategy" and the "Ministry Ordinance on Hygienic and Ecological Regulations for Sanitation and Deactivation of Domestic Waste" in the last decade. The last two legislations apply rules and regulations to the country's waste policy to control and monitor different kind of solid waste. Improvement of services for garbage collection of vessels in the ports is another example of actions taken towards solving marine litter problems. Besides the above, monitoring of

the marine litter issue and its effects is organized and maintained by the Ministry of Ecology and Natural Resources. On a regular basis, the ministry is responsible for supervision and monitoring of the Caspian's coastal zone and marine environment.

Another successful initiative taken by the government is the "Beautiful City, Clean Village, Key-man" event. Every year, the Ministry of Ecology and Natural Resources organizes this campaign through which actions such as cleaning the cities, villages and coastal zones from litter are conducted by citizens. Observations have reported a year-by-year growth in public participation rate in this event. The action has automatically raised the community awareness of problems related to littering. Moreover, mass-media programmes especially on waste problems in the country, including the coastal areas, have significant impacts on raising the community awareness.

Azerbaijan has participated in two international and regional programmes of TACIS and GEF under the CEP both of which address pollution issues which have bearings on marine litter. In the TACIS project, implemented by the Ministry of Ecology & Natural Resources, the environmental problems of the coastal zone as well as the potential polluters have been studied and a number of corrective and remedial measures have been developed.

I.R. Iran: Iran appears to have given a fairly high priority to the issue of waste management including, although indirectly, marine litter management. Regarding legal and administrative instruments aimed at marine litter management in the region, the National Regulation on Waste Management Enforcement was approved in 2005 which indirectly covers marine litter-related issues. Moreover, there are several ongoing projects on composting of organic waste in the Iranian coastal cities: Rasht composting plant with a capacity of 500 tons/day is a remarkable example in this case. Investing USD three million for Solid Waste Management in the three Caspian provinces is another step taken by the local governments of the region in sponsorship with the Ministry of Interior. This project aims at speeding up the proper disposal of the generated solid waste in the region. Another important initiative is the Development of Integrated Coastal Zone Management for the Iranian Coastal Area Programme which has been implemented by the Ports and Shipping Organization of Iran with the sponsorship of the Management and Planning Organisation of Iran. The programme has initiated the provision of port facilities and services for garbage and litter coming from vessels and the improvement of the three major ports and one oil terminal of the region.

Like the other littoral countries, Iran has been a participant of the CEP under which it collaborated in implementing a pilot project aiming at improved urban solid waste management in the coastal city of Ramsar. Solid Waste Management in the Coastal City of Ramsar was a pilot project implemented by the Organisation for Cooperation of Municipalities of the Mazandaran Province in 2002-2004. This project was designed to reduce the solid waste volumes in the city of Ramsar through the separation at source of solid waste and its recycling. To this end, collection sites were selected and 30 containers were purchased. Several workshops for the local residents and authorities were held as part of its public awareness campaign and the objectives of the project were advertised and prizes were awarded to the most active neighborhoods. As the result of this project, 2,500 households were familiarized with the solid waste recycling procedures, and 6.1 tons of plastics, 10.4 tons of paper, 5 tons of metals and 5.5 tons of glass were collected in three months. Also, the project created job opportunities for 16 workers and reduced the urban waste by 4.4 percent. However, long term success of these types of projects depends on their continuity and exercising lessons learned a challenge which this particular project did not rise to.

Besides governmental efforts, local NGOs have organized a number of meetings, fora and workshops to draw attention to and address the marine litter related issues in the coastal areas. These activities have included marine litter clean up campaigns in specific coastal sites which appear to have generated local interest.

Kazakhstan: Pollution management has been a priority in Kazakhstan in recent years, although the initiatives and measures have not specifically targeted marine litter issues. In general, waste management issues appear to be attracting increased attention in Kazakhstan as pertinent policies are being reviewed and amended, warehouses and platforms for the reception of waste/litter generated from courts are being constructed and more stakeholders such as municipalities, local communities/authorities, the shipping industry and NGOs are getting involved in marine litter management partnerships. There seems to be a noticeable growth in the participation of local communities, local authorities, officials and NGOs in activities such as cleanup programmes for rivers and beaches located in the Caspian region.

The country has developed two ministerial initiatives namely the Plan of Measures towards Realization of Environment Protection Programme of RK for 2005-2007 and Plan of Measures towards Realization of Conception of Ecological Safety of RK for 2004-2015. Various ministries such as the Ministry of Environment, the Ministry of Health, the Ministry of Agriculture, and the Ministry of Foreign Affaires as well

as the departments of Energy and Mineral Resources, and Industry and Commerce have been involved in these plans.

Cleaning up a Caspian beach. © Caspian Environment Programme

The projects and initiatives that have been carried out or are ongoing and have a bearing on marine litter management include the Development and Inclusion of Normative Documents, Directed to Organisation of System of SG Registration and Control which is implemented by the Ministries of Environment, Health, Agriculture, Foreign Affairs and the Department of Energy and Mineral Resources; Inclusion of Environmental Monitoring in the North Caspian which aims at collecting information for the government of RK and is under execution of the Ministry of the Environment; Scientific Research on Changes in the Coastal Ecosystem of the West Kazakhstan, a project of the Ministry of the Environment that provides information for the government.

Kazakhstan has been actively participating in the CEP and its environmental monitoring activities. Under the CEP Kazakhstan has carried out two pilot projects that deal with litter and waste management, namely Clean Up of Ural River Project and production of Concrete Blocks from Abandoned Construction Materials. Both initiatives have been rated as highly successful.

Russia: Marine litter is mostly seen as an issue related to marine transport and port facilities, fisheries, recreation and tourism and oil and gas exploration activities. Legislation is being developed on port operations and the authorities are conscious of the likely impacts of expanding oil and gas activities and tourism on marine litter. A few CEP supported Small Grants have targeted marine litter reduction in coastal areas.

Turkmenistan: As with other littoral countries, marine litter is dealt with as part of waste management in general. At the national level, the Ministry of Nature Protection in collaboration with various other ministries and industries has developed the National Action Plan that partially deals with the marine litter problems in the region. The TK State Enterprise on Caspian Issues in cooperation with UNEP has initiated the project of “Development and Implementation of Regulations of Coastal Water Protection from Vessels’ Pollution” later passed as the Decree of the President of Turkmenistan. Under the CEP a pilot project is being implemented in Turkmenbashi Port that aims at collecting and disposing of litter in the city in an environmentally-friendly way. The project is near completion.

Local experts’ perception of marine litter in the Caspian region

Marine litter in the marine and coastal environment of Caspian region is reported to be perceived as a priority issue only in Azerbaijan and Iran. High population densities and tourism in these coastal zones which result in remarkable volumes of solid waste is the main reason for getting the States’ attention to this topic. By contrast, Kazakhstan and Turkmenistan are less concerned about the topic. Since no

methodological research or monitoring on marine litter problems has been implemented in these countries, the following assessment is based on personal observations and/or supplementary data and information available to the experts on marine litter-related issues such as tourism.

Azerbaijan: The levels of marine litter pollution in AZ side of the Caspian have been assessed as being low in the marine environment and 'unchanged' in the coastal area. No significant improvement has been reported in either the marine or coastal environments for the last ten years.

I.R. Iran: The marine litter levels in the Iranian coastal zone are reported to be 'unchanged' in the marine and high in the coastal environment. Available records and observations indicate an increase in the general long-term trend of marine litter pollution in both the marine environment and the coastal areas. The growth in solid waste generation, improper waste management and disposal in the last decade and, a large number of national tourists and visitors to the area are a heavy burden on local authorities.

Kazakhstan: Low levels of marine litter with no significant variation are reported for the marine environment in KZ. The level of debris is still moderate in the coastal environment; however, an increase in its general trend has been reported.

Russia: No specific information is available although it appears that Caspian marine litter is engaging the attention of the authorities. So far marine litter in the Baltic and Black Seas has had priority.

Turkmenistan: Marine litter levels are moderate in both marine and coastal environments of Turkmenistan, with no significant variation.

Conclusions

Several conclusions can be derived from the findings of the study including the national questionnaires. A list was made under the headings of "What We Know" and "What We Do Not Know" as follows:

What we know

1. Marine litter is an emerging but largely ignored issue in the Caspian region. Based on estimations and observations, marine litter levels are already problematic and even growing in some parts of the Caspian region. Nevertheless, no regional action has yet been taken towards solving this problem. National actions have also been not well targeted and appear to be insufficient. Main reasons are:

- insufficient targeted laws and regulations on marine litter prevention, control or mitigation at regional, national or local levels;
- absence of national organizations or institutions specifically tasked to deal with marine litter;
- lack of a Regional Coordinating Unit specifically tasked to manage marine litter issues in the Caspian region;
- insufficient number of professional marine litter experts and researchers in the region;
- lack of specific policies on marine litter prevention, control or mitigation at regional, national or local levels;
- lack of economic instruments to dissuade the polluters from polluting;
- insufficient enforcement capacity and inadequate compliance measures at regional, national and local levels; and
- lack of monitoring and assessment.

2. Marine litter is considered to be a "growing transboundary" concern or "weakly transboundary" problem. However, there is still a need for regional agreements and activities to prevent and control the problem, especially for items with long term persistence such as plastic materials.

3. It is estimated that most of the marine litter is coming from land-based activities and that most of the litter in the marine and coastal environment consist of plastic materials which persist and move in the water for a long time.

4. To overcome the marine litter problem, it is necessary for all key stakeholders to become involved and engaged. Main stakeholders in the Caspian region include the local citizens; central, national and local authorities; municipalities, tourism-related bodies; industry; fisheries; academia and research institutions; hospitals and medical centres; NGOs; and CBOs.

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5. Unsustainable tourism in the Caspian coastal area is a major cause of marine litter problem in this part of the region.

6. Marine litter management cannot be restricted to the coastal areas alone and should have a much wider geographical coverage and broader institutional cooperation. Furthermore, marine litter management demands the close cooperation/coordination of all the related local authorities and cannot be limited only to the certain coastal municipalities.

7. There is a fairly substantive body of legislation that deals with pollution and waste management in each of the countries, but there are no specific laws or regulations dealing with marine litter. Specific laws and regulations need to be developed for marine litter management. Furthermore, the existing legislation is not adequately complied with and enforced. Measures are needed to improve compliance and enforcement.

8. Inefficiency and inconsistency in waste management system and inappropriate disposal of waste results in high volumes of litter in the marine and coastal environment.

9. Although there is no report on the exact impacts of marine litter on human or animal health or indeed on the whole ecosystems, it is suggested that marine litter can affect the region in a number of ways:

a. Environmental impacts consist of a variety of threats to the biodiversity including entanglement, and poisoning of species by litter; ruining the pristine habitats and beaches; transportation of invasive species and impacting the benthic communities.

b. Socio-economic impacts result when marine litter contaminates beaches, harbors and marinas, and coastal areas in general. This could affect human health in many ways including direct contact with debris such as broken glass or hazardous waste, e.g. hospital wastes such as syringes. Agriculture and cattle grazing are also impacted by marine litter in coastal areas. Marine litter can also affect the fishery industry by damaging nets and fish stocks, fishing vessels and gear.

c. Other impacts include damage to recreational and leisure activities. Since tourism is a high source of income in the Caspian region, in particular in the Iranian coastal zone, marine litter can damage the aesthetic appeal of the marine/coastal environment causing “direct” and “hidden” cleanup costs for the authorities to sustain the aesthetic appeal of the region. Furthermore, marine litter damages navigation and coastal power station and desalination plants by fouling the screens with gross litter items.

What we do not know

1. Very little quantitative information is available on the volume, distribution, composition and other aspects of marine litter in the Caspian. Therefore, causes and effects are poorly defined and understood.

2. Due to lack of research on this topic, it is difficult to assess the economic damages associated with the marine litter impacts on the ecosystem, human health, recreation and leisure, agriculture and animal husbandry, fishery industry or military navigation.

3. We do not have enough monitoring data for source identification of the marine litter items accurately.

4. Long term effects of plastic materials, especially on biodiversity and human health, are not well known.

Proposals for action

To mitigate marine litter and its undesirable consequences, a number of local, national as well as regional strategies, policies and initiatives will need to be defined and implemented. These measures must commit authorities and encourage and engage people to prevent and eliminate the marine litter entering and impacting the coastal and marine environment of the Caspian. To do so, both government and peoples should be involved in order to develop marine litter mitigation programmes, promote public participation and raising awareness, and finally, try to change people's attitudes and behavior towards producing less litter and garbage in the Caspian region.

Goals

With an overarching aim of *Marine litter Mitigation through Source Management in the Caspian Sea*, the region should aim at reaching the following goals:

Goal 1: Reducing land-based waste and litter through applications at national and coastal levels of the Integrated Solid Waste Management (ISWM) strategy focusing on river- and coastal-litter management based on the Three R's Approach of "Reducing, Re-using and Recycling" wastes in the Caspian region.

Goal 2: Reducing sea- sourced litter through, *inter alia*, the development and use of adequate port reception facilities for garbage from ships.

Goal 3: Establishment of a sustainable indicator-based marine litter regional and national monitoring mechanism including regional monitoring of vessel and platforms.

Goal 4: Improved regional and national inter-sectoral coordination on marine litter related activities.

Goal 5: Influencing people's waste generation and disposal behaviors in the short to medium term and the waste generation and culture in the longer term.

Goal 6: Development of sustainable and environmentally-friendly tourism in the region particularly in southern part of the Caspian region.

Actions

To achieve the above goals, the following actions are suggested:

Legal, regulatory and institutional measures

Action 1: To develop a Regional Agreement and understanding on marine litter issue among the Caspian littoral states. To begin with, the Tehran Convention's associated Protocol for the Protection of the Caspian Sea against Pollution from Land-based Sources could be recommended to incorporate the relevant wording on regional marine litter issues.

Action 2: To develop a regional strategy as a general framework and guidance for the voluntary adherence of the littoral countries to be followed with country specific strategies and programmes that should take into account the specific capacities, needs and conditions of the countries.

Action 3: To improve the existing national laws and regulations on marine pollution to target and place more emphasis on marine litter management issues including revision of the solid waste management

policies at the national level to minimize the volumes of waste reaching the landfills and to ensure proper disposal of waste including adequate port reception facilities, and waste recycling and recovery to decrease the amount of waste as litter.

Action 4: To task the fledging Tehran Convention Secretariat and CEP to facilitate and encourage regional coordination on marine litter policies and activities as well with pursuing full implementation of pertinent international regulations.

Action 5: To establish at the national and coastal levels appropriate inter-agency mechanisms to coordinate and allow for exchange of information and best practices on marine litter management issues and activities. Establishment of a marine litter National Coordination Nuclei in countries where marine litter is reaching critical levels is recommended.

Action 6: To develop and implement national sustainable eco-based tourism programmes.

Action 7: To consider options to declare development-free coastal areas in specific areas.

Stakeholder involvement

Action 8: Encourage the businesses and industries producing materials that end up as litter, e.g. wrapping papers, beverage containers, food wrappers, cigarettes, etc. to play a critical role in proper waste management of marine debris.

Action 9: Establishment of Public-Private Partnerships to obtain optimum involvement of the government and businesses to address the marine litter problem collaboratively.

Action 10: Supporting involvement of NGOs and local communities in the design and implementation of waste reduction and collection activities.

Action 11: Design and implement with NGOs and CBO involvement local marine litter awareness educational activities including cleanup campaigns, such as the International Coastal Cleanup initiatives, or exhibitions in the littoral states where marine litter is perceived to be a major issue.

Action 12: Implementation of environmental training and education programmes for officials and designing and introducing an environmental education package to be used at schools.

Action 13: Design and production of a user-friendly CD-ROM multi-media information package about Caspian Sea marine litter problems and how to overcome these challenges in the local languages.

Compliance and enforcement measures, including awareness raising

Action 14: Introduction of economic and financial instruments such as pay for recycled waste, pay for returned marine litter plastic packaging, marine litter fines, and ‘polluter pays’ policies.

Action 15: Introduction of waste- and marine litter-conscious methods and practices into EIA procedures.

Action 16: Establishment of cost effective indicator-based waste and marine litter monitoring and a reporting system on marine litter at the country level.

Research and development

Action 17: Encourage academia and industry to direct research to marine pollution and debris.

Action 18: Produce baseline information on marine litter volume, distribution, composition, source identification, and trend analysis; study the impacts of marine litter, including plastic items and derelict and abandoned fishing gear, on the marine ecosystem, human health and on the economy of coastal areas and communities.

Action 19: Conduct research to determine whether economic incentives on cleaning litter and trash are effective in motivating behavioral changes

Services and facilities

Action 20: Waste disposal services and facilities should become fully available. In this case municipalities and local governments are responsible for the provision of adequate garbage bins on beaches and coastal cities cleanup and collection facilities, waste recovery facilities and recycling plants in the region.

Action 21: Conducting a Pilot Project at a local community such as a fishing village or a tourist centre is a good starting point for marine litter management in the Iranian and Azerbaijani coastal areas where marine litter is a major issue.

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Marine litter in the East Asian Seas region
Overview and Regional Action Plan

Introduction

The East Asian Seas region embraces the most populous region in the world. It is home to almost 1.8 billion people, 60 percent of whom are concentrated in coastal areas. The length of the coastline is more than 100,000 km.

The *Action Plan for the Protection and Development of the Marine and Coastal Areas of the East Asian Region* was approved in 1981 by five countries of the region, stimulated by concerns on the effects and sources of marine pollution. By 1994 the following ten countries were ready to address East Asia's marine environmental challenges: Australia, Cambodia, China, Indonesia, Malaysia, Philippines, Republic of Korea, Singapore, Thailand and Vietnam. Among the Regional Seas programmes, East Asia has steered a unique course. There is no regional convention. Instead, the programme promotes compliance with existing environmental treaties and is based on member country goodwill. The Action Plan is managed from Bangkok, Thailand by its coordinating body, COBSEA. The Regional Coordinating Unit (EAS/RCU) serves as Secretariat, and is responsible for coordinating the activities of governments, NGOs, UN and donor agencies, and individuals in caring for the region's marine environment. COBSEA commenced its marine litter initiative in April 2006, with financial support from the UNEP RSP. The initiative includes the following activities: national consultants were nominated by the COBSEA member countries, and a regional consultant was identified to prepare a regional review on marine litter; a standard national survey was prepared and distributed to the participating countries and on the basis of responses received the *Regional Review on Marine Litter in the East Asian Seas Region* was prepared. This document included information on collection and review of existing institutional arrangements; data and information on marine litter in the marine and coastal environment; legal and administrative instruments; relevant economic instruments; programmes and initiatives; identification of gaps and needs in coverage of marine litter management; proposals for changes and recommendations. Based on the *Regional Review* document a *Draft Framework Document* for a *Regional Plan of Action on Marine Litter in the Seas of East Asia* was prepared. Both *Regional Review* and *Draft Framework Document* were presented to the First COBSEA Marine Litter Workshop held in Jakarta, Indonesia 8-9 May 2007. Based on the information provided, the workshop participants developed a draft COBSEA Regional Action Plan on Marine Litter (RAP-MALI). The COBSEA RAP-MALI was adopted by the 19th Meeting of COBSEA, Siem Reap, Cambodia, 22-23 January 2008. In 2008 the COBSEA Secretariat published the document *Marine litter in the East Asian Seas Region* (UNEP, 2008) that contains as Part I "*A Regional Review on Marine Litter in the East Asian Seas Region"* and as Part II "*The Coordinating Body on the Seas of East Asia (COBSEA) Regional Action Plan on Marine Litter (RAP-MALI)".*

The objective of this chapter is to present a summary of the document *Marine litter in the East Asian Seas Region (UNEP, 2008)*, prepared by the COBSEA Secretariat that includes the *Regional review on marine litter in the East Asian Seas Region* and the *Regional Action Plan on Marine Litter (RAP-MALI)*.

Assessment of the status of marine litter

At the global level, scientific data and information on the problem of marine litter is geographically patchy. There are many studies, however, that show alarming quantities of debris accumulating in ocean convergence zones and washing ashore to impact coastal resources. Relatively good data is available from a few concentrated geographical areas where intensive studies have been conducted, such as near the Hawaiian Islands, the seas of Northeast Asia and the North Pacific generally. Some limited studies are available from other areas such as around Australia and in European seas, and many other regions have very little to absolutely no data on the marine litter issue (e.g., seas around Africa, South Asia and South America).

Perhaps the best data available is on marine litter that washes ashore. Globally, a large number of countries have coastal cleanup and monitoring programs. Some of these are nationally coordinated, government-led initiatives such as in Japan (Uchida, 2007) and Korea (Cho, 2007), and others are focused on specific areas and run by NGOs and/or community groups, such as the Carpentaria Ghost Net programme in northern Australia (www.ghostnets.com.au).

The most well-established programme covering the largest number of sites globally is the community-based and implemented International Coastal Cleanup (ICC) (www.oceanconservancy.org/ICC) coordinated by the US-based NGO, Ocean Conservancy. There are other international cleanups including Clean Up the World (CUW) (www.cleanuptheworld.org), which does not have a specific marine or coastal focus; the UN World Environment Day, which many countries celebrate through coastal cleanups; and PADI Project AWARE that participates in the ICC supporting underwater cleanups (www.projectaware.org).

All of these collect various types of data to varying degrees of rigor on litter, including coastal and marine. A major limitation in our knowledge and understanding of the global and regional marine litter situation is the lack of available systems to gather, store, manage, analyze and interpret the data from all of these programmes, to support policy-making and management planning.

Ocean circulation, movement and accumulation of marine litter

Brainard (2000) reports that much of the marine debris found accumulating on many coastlines originates from far-distant sources, often from across the ocean. In developing actions and measures to address marine litter, it is important for scientists, regulators and industry to have an understanding of ocean circulation patterns.

In recent years significant advances have been made in the mapping and modelling of complex ocean circulation patterns, at various scales and incorporating the different elements that drive these patterns. There are many examples where oceanographic tracking and modelling have been used in the assessment and management of marine litter. For example Kubota (1994) tracked virtual marine debris in the North Pacific using a simple numerical model over five years, which indicated the accumulation of debris from the whole North Pacific in the northern Hawaiian Islands. The results of this predictive modelling have been verified by real-life sightings in this area, including the current US-NOAA Marine Debris Program (Donohue, 2004).

Work by various parties has shown that marine litter tends to accumulate in ocean convergence zones, and will move away from ocean divergence zones. Mass concentrations of marine debris in high seas 'sink' areas, such as the equatorial convergence zone, are of particular concern. In some such areas, 'rafts' of assorted debris, including various plastics, ropes, fishing nets, cargo-associated wastes such as dunnage, pallets, wires and plastic covers; drums and shipping containers along with accumulated slicks of various oils, often extend for many kilometres (UNEP, 2008).

Very little detailed work was found on ocean circulation patterns within the East Asian Seas region, in contrast to the Northwest Pacific where Japan, Republic of Korea and Russia have high-resolution physical data. It is recommended that further work be undertaken in the East Asian Seas region in order to develop and run marine litter trajectory models for each sub-regional sea in the region.

Amounts

No data or references on the sources, causes, quantities and distribution of marine litter at the regional level in the East Asian Seas region have been identified. Relatively viable data is available for only two countries within the region – the Republic of Korea (a COBSEA member) and Japan (a non-COBSEA member). In Australia some data is available from various uncoordinated survey and monitoring efforts, undertaken at various geographical scales by different parties. The ICC collects potentially useful data, but this has not yet been organized into a central database, which would facilitate identification of hot spots, trends over time and other parameters that managers would find useful. In 2006 the ICC included eight COBSEA members Australia, Indonesia, Malaysia, Philippines, Singapore, Republic of Korea, Thailand and Vietnam. The People's Republic of China organized its first ICC in 2007. The COBSEA member country of Cambodia has not yet become involved in the ICC. Within the region the ICC was also active in 2006 in Hong Kong (China), Japan and Taiwan (COBSEA non-members).

The development and maintenance of a central, regional database in the East Asian Seas region to which national administrations report annual statistics on the sources, causes, quantities and distribution of marine litter in their respective jurisdictions could be a means to improve the current lack of available data and information on this issue. The database could present outputs in Geographic Information System (GIS) maps, thus providing a powerful monitoring tool for assessing the true regional extent of the problem, including regional hot spots, trends over time and the effectiveness of management and control responses.

National marine litter data

Overall, the current state of knowledge about the extent of the marine litter problem is very poor in the East Asian Seas region, and extensive work is required to address this significant information gap for marine litter management and abatement. Based on the national surveys on marine litter, the only COBSEA member country that has a formal nationally coordinated marine litter survey and monitoring programme is the Republic of Korea. In Australia a number of ad-hoc marine litter surveys have been undertaken at various sites by different parties. In most of the other countries, the ICC provides some limited data on the current situation at the participating sites where ICC activities are conducted each year. Other activities taking place in COBSEA countries involve CUW and PADI Project AWARE, which are more focused on cleanup efforts than data collection. Also, CUW is focused on general litter, not specifically coastal or marine. In Thailand some data is derived from targeted cleanups at high profile tourist areas and dive sites. In Jakarta Bay, Indonesia, island surveys repeated since the 1980s show significant increases in marine litter over time (Willoughby, 1986a, 1986b; Willoughby *et al*., 1997; and Uneputty and Evans 1997). A summary of existing knowledge and data on marine litter in each COBSEA member country, as reported in Section 2 of the national survey responses is presented in Table 1.

Greenfins cleanup, Koh Lanta, Thailand. © COBSEA

Table 1. Summary of existing knowledge and data on marine litter in each COBSEA member country, as reported in Section 2 of the national survey responses

	Australia	Cambodia	China	Indonesia	Malaysia	Philippines	R.O. Korea	Thailand	Vietnam
Existing surveys and monitoring	*Ad-hoc* in disparate locales at different scales by various parties using different methods – ICC, PADI Project AWARE, CUW, KAB etc.	None reported	No program to date and will join ICC in 2007	Repeat surveys in Jakarta Bay – significant 20 yr increases ICC	ICC	ICC	National Marine Debris Monitoring Program in place since 1999 ICC	Regular clean-ups at resort areas and dive sites ICC	ICC
Source differentiation	Surveys near cities indicate up to 80% from land-based sources and in remote areas most from sea-based sources	Not identified	Not identified	Not identified	Not identified	1997 JICA study indicates 15% of daily solid waste production in Manila disposed to water-bodies	Land-based sources appear to be the major contributor, although sea-based sources high relative to other countries	Not identified	Not identified
Accumulation zones	No national survey to date but ad-hoc studies indicate accumulations at urban centres and certain remote coasts	Not identified	Not identified	Not identified	Not identified	Not identified	Not identified	Not identified	Not identified
Ecological and environmental impacts	A number of studies confirm the range of impacts caused by marine litter, esp. on marine turtles, seabirds and similar wildlife	No specific data reported	No specific data reported	No specific data reported	No specific data reported	No specific data reported	Measured reductions in fisheries believed to be linked to ghost fishing by ALDFG	ALDFG identified as marine litter type causing worst impacts	No specific data reported
Socio-economic impacts	Australia supporting APEC study with Indonesia and Chile in 2007	No specific studies reported	No specific studies reported	Indonesia supporting APEC study with Australia and Chile in 2007	No specific studies reported	No specific studies reported.	No specific studies reported	No specific studies. High value tourism industry affected	No specific studies reported
Lost and Abandoned Fishing Gear	Major problem along northern coastline. Carpentaria Ghost Net Programme specifically targeting the problem	No specific work reported	No specific work reported	No specific work reported. Anecdotal reports of ALFG from Fisheries patrol vessels		No specific work reported	High priority issue with unique waste fishing gear 'buy-back' programme	No specific work reported	No specific work reported

Sources

In most countries of the East Asian Seas region, information on sources of marine litter has not been identified. In Australia, surveys near cities indicate up to 80 percent of marine litter originating from land-based sources, with sea-based sources in the lead in more remote areas. Land-based sources appear to be the primary contributor in the Republic of Korea, with sea-based sources higher in comparison to other countries. In the Philippines (Manila), a 1997 JICA study reported that 15 percent of the daily solid waste was disposed into local water bodies.

Impacts

Across the region records indicate that the primary ecological and environmental impacts of marine litter target wildlife, especially marine turtles, seabirds and similar wildlife. In the Republic of Korea, reductions in fisheries are believed to be linked to 'ghost fishing' by abandoned, lost or otherwise discarded fishing gear (ALDFG). Thailand has identified ALDFG as the form of marine litter that causes the most serious impacts.

The socio-economic impacts of marine litter are currently being reviewed through an APEC study involving Indonesia and Chile, with collaboration from Australia. In Thailand, it is recognised that marine litter affects tourism – a high valued industry for the entire region.

Abandoned, lost or otherwise discarded fishing gear

As a component of the broader marine litter problem, abandoned, lost or otherwise discarded fishing gear is likely to be a major concern in East Asia, due to the large size of the fishing industry and the difficulties in effectively regulating the industry, as well as a high level of illegal, unregulated and unreported (IUU) fishing in the region.

The impacts of ALDFG are similar to those of marine litter in general and include:

- navigational hazards and threats to human life and property when vessels entangle ALDFG;
- 'ghost-fishing' when ALDFG continues to function as designed, catching target commercial species without economic benefit but with economic (and ecological) loss;
- entanglement of non-target species, including sea-turtles, marine mammals and seabirds, many of which may be of conservation concern and/or legally protected species;
- accumulation of communities of fouling organisms on ALDFG that then act as an agent for the introduction of foreign species to new areas;
- beaching of ALDFG which can cause amenity impacts, preventing or hampering use of beaches and foreshores for tourism, recreation and other uses; and
- economic impacts – including from the four other impact types listed above, and from the response to these impacts – which can be costly (e.g. emergency response to entangled vessels, ALDFG recovery and clean-up campaigns, scientific research and monitoring).

Existing programmes and initiatives

Regional

There are currently no regional legal instruments such as multi-lateral treaties addressing marine litter or even marine environmental management generally for the East Asian Seas region. In fact the region is one of the few Regional Seas in the world where coastal states have not concluded a formal Regional Seas treaty, convention or other legal instruments.

Apart from the UNEP Regional Seas Programme for the East Asian Seas region (COBSEA), there are several regional and sub-regional technical cooperation programmes and other initiatives that address various aspects of coastal and marine environmental management and protection in the region, and some of the major initiatives are summarized below. Collaboration between these programmes would enhance the effectiveness in addressing the marine litter problem in the East Asian Seas region and should be sought to the greatest extent possible.

Asia Pacific Economic Cooperation (APEC)

APEC, comprising all of the Pacific-Rim economies, through its Marine Resources Conservation Working Group (MRCWG), funded a project entitled *Understanding the economic benefits and costs of controlling marine debris in the APEC region, which was completed in mid-2008.* This APEC initiative was co-sponsored by Australia, Chile, Indonesia and UNEP.

Association of Southeast Asian Nations (ASEAN)

The Association of Southeast Asian Nations (ASEAN) (www.aseansec.org) has a Working Group on Coastal and Marine Environment (AWGCME), which although not currently active on marine litter issues, could provide a very useful vehicle for the promotion and implementation of regional marine litter prevention and control efforts.

Partnerships for Environmental Management of the Seas of East Asia (PEMSEA)

The GEF/UNDP/IMO *Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas* began in January 1994 and ended December 1998. In 2000 a second phase to the programme was funded by GEF, and renamed PEMSEA. The PEMSEA programme expanded the number of demonstration sites and broadened its focus to cover a wider range of integrated coastal zone management issues.

Adjacent regions

Immediately to the north of the COBSEA region is the Regional Sea known as the Northwest Pacific, which is covered by NOWPAP. The NOWPAP member countries are China, Japan, the Russian Federation and the Republic of Korea, two of which are also members of COBSEA – China and the Republic of Korea. NOWPAP has a highly developed programme on marine litter. In particular, Japan and Republic of Korea are among the most advanced countries in the world in addressing marine litter, and have a lot to offer the other East Asian countries. In addition to economic, political and technical linkages, the COBSEA and NOWPAP regions are linked oceanographically, and both regions undoubtedly receive marine litter from sources in the adjacent region, including by ocean currents and from vessels from countries in the adjacent region.

National

The COBSEA member country with the most advanced programme to address marine litter is the Republic of Korea, which has the *National Integrated Management Strategy for Marine Litter* (NIMSML) in place since 1999, funded and managed by the Ministry of Maritime Affairs and Fisheries (MOMAF). This programme is fully comprehensive including, *inter alia* clear designation of a lead agency (MOMAF), clear structures and procedures for the involvement of all other relevant government agencies, local governments, NGOs, research institutions, the private sector and the community, a variety of funding mechanisms, a national awareness campaign, nationally coordinated marine litter survey and monitoring programme, linked to physical clean-ups; integration with the broader national solid waste management effort, a concerted technological research and development programme, and a major effort to address the problem of ALDFG, including an innovative scheme where fishermen are paid to return waste fishing gear to port.

Overall, in all COBSEA countries governmental responsibilities for marine litter issues tend to be shared by different government agencies, with environment ministries generally taking the lead for land-based sources and maritime administrations taking responsibility for sea-based sources. Local governments tend to be responsible for general waste management matters in all countries. Of all the countries only Indonesia has a national task force to coordinate marine litter issues among the various government agencies – the *National Action on Coastal and Marine Cleanup* (Gerakan Bersih Pantai Laut).

A review of the status of COBSEA countries regarding their national legislation (and MARPOL Annex V status), NGO involvement, economic instruments and incentives related to marine litter, and integrated waste management systems was compiled through national surveys. All COBSEA Member States have government agencies that carry responsibility for various marine affairs and environmental protection, but none have an agency that is specifically assigned to manage marine litter. Australia and Korea have marine litter-related

policies and the other Member States have general environmental and waste management regulations that can be used to potentially address marine litter problems. Australia, Cambodia, China, Malaysia, Philippines and Korea are signatory to MARPOL Annex V. Most of the COBSEA Member States have some regulations for port waste reception facilities, but all report a need for improvement in their operations. Korea has the only formal, nationally coordinated monitoring programme for marine litter. As solid waste management issues are closely aligned with marine litter, the implementation of Integrated Waste Management (IWM) systems in the East Asia Seas region is a significant component in how the region will be able to address marine litter. Australia, Indonesia, Philippines and Korea have implemented IWM programmes. Most of the COBSEA Member States have various *ad hoc* programmes that involve NGOs such as Ocean Conservancy's ICC, Clean Up the World and PADI Project AWARE in volunteer-driven cleanups and other marine litter-related public education projects.

International Coastal Cleanup. Thailand. © COBSEA

Identified barriers, gaps and needs

Among a majority of the COBSEA countries, the primary need for addressing marine litter focuses on a lack of data, poor awareness by the public and policy makers, geographic challenges, inadequate policies and enforcement, and funding deficiencies. Agreement between the member countries is highlighted by the recognized need to promote and implement better coordination between federal, state and local levels; the adoption of programmes and incentives for integration waste management; programmes for education and technical training; and the development of marine litter trajectory models in the region. The major regional and national barriers, gaps and needs related to marine litter for the East Asian Seas region are reviewed in Table 2.

Table 2. National-level barriers, gaps and needs in relation to marine litter in the COBSEA member countries, as reported in the national survey responses

Country	Barriers	Gaps	Needs
Australia	Lack of coordination between Federal, State and local levels (being addressed through development of national marine debris threat abatement plan) Lack of data on the extent and nature of the problem (national database being developed) Cost of using port waste reception facilities based on fee for service approach Vast coastline with many remote areas making it difficult to undertake survey, monitoring, clean-up and enforcement activities	No structured, nationally coordinated, strategic approach to marine litter (being addressed through development of national marine debris threat abatement plan) Efforts to implement GPA NPA appear to be largely superficial Lack of enforcement of relevant laws and regulations (due in part to large coastline and many remote areas) No marine litter trajectory models	Greater coordination between Federal, State and local levels National coordinated marine litter survey and monitoring programme (development of national guidelines underway) Adopt 'no special fee' approach to port waste reception facilities Develop marine litter trajectory models (under development)
Cambodia	Very low level of awareness, inc. at decision-maker level (low political will) Lack of data on the extent and nature of the problem Competing socio-economic development priorities Cost of using port waste reception facilities based on fee for service approach	No designated Lead Agency Lack of broader national and local integrated waste management system Lack of relevant laws and regulations Lack of technical capacity No marine litter trajectory models No national funding for marine litter	Designate Lead Agency Concerted awareness campaign at all levels Develop broader national and local integrated waste management system National coordinated marine litter survey and monitoring programme Adopt 'no special fee' approach to port waste reception facilities Technical training Develop marine litter trajectory models Join ICC
China	Very low level of awareness, inc. at decision-maker level (low political will) Lack of data on the extent and nature of the problem Competing socio-economic development priorities Cost of using port waste reception facilities based on fee for service approach	Lack of enforcement of relevant laws and regulations No marine litter trajectory models	Concerted awareness campaign at all levels National coordinated marine litter survey and monitoring programme Adopt 'no special fee' approach to port waste reception facilities Technical training Develop marine litter trajectory models Join ICC (accomplished Sep 2007)
Indonesia	Very low level of awareness, inc. at decision-maker level (low political will) Lack of data on the extent and nature of the problem Competing socio-economic development priorities Extremely vast and complex geography, including tens of thousand of islands Lack of coordination between National, Provisional and local levels Cost of using port waste reception facilities based on fee for service approach	Confusion of roles and responsibilities between Govt agencies Inefficiencies of broader national and local integrated waste management system Not a party to MARPOL Lack of enforcement of relevant laws and regulations No marine litter trajectory models No national funding for marine litter	Designate clear Lead Agency Accede to MARPOL Concerted awareness campaign at all levels Improve efficiencies of broader national and local integrated waste management system National coordinated marine litter survey and monitoring programme Adopt 'no special fee' approach to port waste reception facilities Technical training & develop marine litter trajectory models

Country	Barriers	Gaps	Needs
Malaysia	Low to medium level of awareness, inc. at decision-maker level, (but low political will) Lack of data on the extent and nature of the problem Cost of using port waste reception facilities based on fee for service approach	Lack of enforcement of relevant laws and regs. No marine litter trajectory models No national funding for marine litter	National coordinated marine litter survey and monitoring programme Adopt 'no special fee' approach to port waste reception facilities Develop marine litter trajectory models
Philippines	No data on level of awareness Lack of data on the extent and nature of the problem Vast and complex geography, including many islands	Confusion of roles and responsibilities between Govt agencies Inefficiencies of broader national and local integrated waste management system Lack of enforcement of relevant laws & regs. No marine litter trajectory models No national funding for marine litter	National situation assessment Clearer designation of Govt roles and responsibilities Concerted awareness campaign at all levels National coordinated marine litter survey and monitoring programme Establish physical infrastructure for waste management
Thailand	Low level of awareness, inc. at decision-maker level (low political will) Lack of data on the extent and nature of the problem Competing socio-economic development priorities Cost of using port waste reception facilities based on fee for service approach	Inefficiencies of broader national and local integrated waste management system Not a party to MARPOL Lack of enforcement of relevant laws & regs No marine litter trajectory models No national funding for marine litter	Accede to MARPOL Concerted awareness campaign at all levels Improve efficiencies of broader national and local integrated waste management system National coordinated marine litter survey and monitoring programme Adopt 'no special fee' approach to port waste reception facilities Technical training Develop marine litter trajectory models
R.O. Korea	No major barriers – marine litter is well established as a high priority issue in R.O Korea	No major gaps Spread of national marine litter monitoring sites could be more representative	Ongoing commitment to funding if the existing national programme is to continue
Vietnam	Very low level of awareness, inc. at decision-maker level (low political will) Lack of data on the extent and nature of the problem Competing socio-economic development priorities Cost of using port waste reception facilities based on fee for service approach	Lack of broader national and local integrated waste management system Not a party to Annex V of MARPOL Lack of relevant laws and regulations Lack of technical capacity No marine litter trajectory models No national funding for marine litter	Accede to Annex V of MARPOL Concerted awareness campaign at all levels Develop broader national and local integrated waste management system National coordinated marine litter survey and monitoring programme Adopt 'no special fee' approach to port waste reception facilities Technical training Develop marine litter trajectory models

Conclusions and recommendations

Marine litter, also known as marine debris and marine garbage, from both land and sea-based sources, is one of the major threats to the world's oceans. However, very little is known about the extent and nature of the problem in the East Asian Seas region, including source differentiation, zones of accumulation and degree of ecological, environmental and socio-economic impacts.

The problem of marine litter is likely to be particularly severe in the East Asian Seas region, due in part to the massive industrial and urban development underway in the coastal zones of the region, combined with an exponential and sustained growth in shipping activity serving their rapidly expanding economies, the current lack of effective marine litter prevention and control measures in many COBSEA member countries, and, in many cases, cultural and awareness barriers that impede political will to address the problem.

As a component of the broader marine litter problem, ALDFG is likely to be major concern in the East Asian Seas region, due to extremely large size of the fishing industry and lack of effective regulation of the industry in the region, including an extremely high level of illegal, unregulated and unreported (IUU) fishing in the region.

All countries in the region face significant barriers to the effective prevention and control of marine litter. In order to effectively address and manage this pollution problem in the region, the COBSEA member countries have developed and adopted a regional action plan on marine litter, which recognizes the transboundary nature of the problem and the need for regional cooperation and coordination.

COBSEA Regional Action Plan on Marine Litter (COBSEA RAP-MALI)[1]

The purpose of the COBSEA RAP-MALI is to improve the quality of marine and coastal environments of the East Asian Seas by addressing the issue of marine litter through regional cooperation and partnerships.

The objectives of the COBSEA RAP-MALI are to:

- prevent and reduce litter in marine and coastal environments of the East Asian Seas;
- mitigate the environmental and socio-economic impacts of litter in marine and coastal environments of the East Asian Seas;
- raise awareness about marine litter and its impacts, among all relevant stakeholders in the East Asian Seas region, including but not limited to government decision makers, the private sector such as fisheries, shipping, ports and the plastics and packaging industries, and the general public; and
- monitor and assess the types, sources, distribution, quantities and trends of litter in marine and coastal environments of the East Asian Seas, in order to provide science-based information for policy making and management planning.

The institutional arrangements for the coordination and management of the implementation of the COBSEA RAP-MALI will include the establishment of a regional working group of marine litter consisting of national focal points and experts, to provide advice to the COBSEA Inter-Governmental Meeting (IGM) and guide the implementation of the COBSEA RAP-MALI. The group will discuss and advise COBSEA on its modality of work.

Within the framework of COBSEA, cooperation with other global and regional organizations and programmes including civil society, the private sector such as fisheries, shipping, ports, the plastics and packaging industries and other relevant stakeholders will be coordinated.

Actions and activities

ACTION 1. Preventing and reducing marine litter from land-based sources

In working to prevent and reduce marine litter from land-based sources, COBSEA will seek to work closely with the UNEP *Global Programme of Action for the Protection of the Marine Environment from Land-based Activities* (GPA) including joint funding and/or implementation of projects where appropriate.

[1] The COBSEA RAP-MALI was adopted by the 19th Meeting of COBSEA, Siem Reap, Cambodia, 22-23 January 2008.

Activity 1.1. Legal and economic instruments
Encourage and assist countries to develop and adopt legal and economic instruments to assist the management and prevention of marine litter from land-based sources.

Activity 1.2. GPA National Plans of Action (NPAs)
Encourage and assist countries to develop and to achieve greater on-ground implementation of GPA NPAs.

Activity 1.3. Integrated waste management
Encourage and assist countries to promote integrated waste management (IWM) systems for major municipal areas and coastal towns and villages, including the waste management principles of reduce, re-use and recycle.

Activity 1.4. Urban catchments
Encourage and assist municipal councils in each country to implement litter prevention and interception systems in urban catchments, by sharing information on the use of engineering and non-engineering approaches, including but not limited to litter booms, physical traps/interceptors, Stormwater Quality Improvement Devices (SQIDs) and similar measures.

Activity 1.5. Training & capacity building
Seek to provide technical training and capacity building to staff from national and municipal governments on the prevention and reduction of marine litter from land-based sources, through regional workshops and training courses.

Activity 1.6. Award-based incentives
Encourage and assist countries to develop and implement award-based incentive schemes for coastal villages, towns and cities that have IWM systems, using models such as the Australian 'Tidy Towns' programme.

ACTION 2. Preventing and reducing marine litter from sea-based sources

In working to prevent and reduce marine litter from sea-based sources, COBSEA will seek to work closely with the International Maritime Organization (IMO) and both the Transport and Marine Resources Conservation Working Groups of Asia Pacific Economic Cooperation (APEC), as well as the international and regional shipping and ports industries, as represented by bodies such as the International Association of Ports and Harbours (IAPH), the International Association of Tanker Owners (INTERANKO) and the International Chamber of Shipping (ICS); including joint funding and/or implementation of projects where appropriate.

Activity 2.1. Legal and economic instruments
Encourage and assist countries to develop and adopt legal and economic instruments to assist the management and prevention of marine litter from sea-based sources.

Activity 2.2. MARPOL Annex V
Encourage and assist countries in the region that are not party to MARPOL Annex V to become party, and assist countries with on-ground implementation of Annex V.

Activity 2.3. Port waste reception review
Consider undertaking a regional review of the adequacy of port waste reception facilities and publish a Regional Directory of such, similar to that published jointly by Australia and New Zealand.

Activity 2.4. Port waste reception fees
Seek to encourage countries in the region to adopt a coordinated regional approach to port waste reception facilities, based on a 'general fee' cost recovery basis.*

Activity 2.5. Training and capacity building
Seek to provide technical training and capacity building to staff from national governments, port authorities and the shipping industry on the prevention and reduction of marine litter from sea-based sources, through regional workshops and training courses.

ACTION 3. Preventing and reducing ALDFG

In working to prevent and reduce ALDFG, COBSEA will seek to work closely with the Food and Agriculture Organization (FAO) of the United Nations, the Asia-Pacific Fisheries Commission (APFIC), the Marine Stewardship Council (MSC) and both the Fisheries and Marine Resources Conservation Working Groups of APEC, as well as the fishing industry itself, including joint funding and/or implementation of projects where appropriate.

Activity 3.1. FAO Code of Practice
Encourage and assist the regional fishing industry to better implement / comply with the FAO Code of Practice for Responsible Fisheries as it relates to ALDFG.

Activity 3.2. Gear marking
Encourage and assist countries to develop national legislation that requires all fishing gear to be identified/marked.

***NOTE Port reception fees**

In the Regional Review of Marine Litter in the East Asian Seas region most COBSEA members reported that where there were port waste reception facilities provided, it is on a fee-for-service (user pays) basis. Such an approach can be a barrier to the use of such facilities – as vessel operators may not wish to pay such fees, and instead may opt to dispose of their garbage at sea – at no cost (assuming they are not caught and fined).

An alternative model that has been shown to be effective in some instances is a "General Fee" approach. This requires that all vessels using a port pay a standard environmental fee, which is used to fund the provision and operation of waste reception facilities, regardless of whether or not the vessels use the reception facilities. The result is that vessels are more likely to use the facilities – as they are paying for them anyway and make no cost savings by dumping at sea.

Activity 3.3. Gear registers
Encourage and assist countries to establish national registers of fishing gear types (especially net types) used by their domestic fishing fleets.

Activity 3.4. Waste gear buy-back
Encourage and assist countries to establish waste fishing gear buy-back schemes such as that implemented successfully in Republic of Korea.

ACTION 4. Mitigating the impacts of marine litter

In working to mitigate the impacts of marine litter, COBSEA will seek to work closely with the International Coastal Cleanup (ICC), PADI Project Aware, Clean-Up-The-World (CUW) and similar programmes, as well as the plastics and packaging industries which may be interested in supporting cleanup activities, including joint funding and/or implementation of projects where appropriate.

Activity 4.1. International cleanup campaigns
Encourage and assist all COBSEA member countries to join the ICC, PADI Project Aware, CUW, Green Fins and similar campaigns and programmes and to spread these activities to additional sites in each country.

Activity 4.2. Targeted cleanup campaigns
Encourage and assist entities with particular interest in or responsibility for certain coastal areas, such as tourist resorts and port authorities, to undertake regular cleanups of their areas.

ACTION 5. Raising awareness of marine litter

In working to raise awareness about marine litter in East Asia, COBSEA will seek to work closely with the ICC, PADI Project Aware, CUW, Green Fins and similar programmes that have major awareness as well as clean-up objectives. COBSEA will also seek to work with the plastics and packaging industries, which may be interested to support awareness activities, including joint funding and/or implementation of projects where appropriate.

Activity 5.1. Regional communication strategy
Seek to develop and implement a regional communication strategy on marine litter to promote awareness of the issue among all relevant audiences (government, industry, community), with consideration being given to the use of mass media (TV, radio and newspaper) as the most effective communication method.

Activity 5.2. Targeted awareness campaigns
Seek to develop and undertake awareness campaigns targeting high priority marine litter sources (e.g. fishing, shipping, municipal councils, port authorities).

ACTION 6. Monitoring and assessing marine litter

Monitoring and assessment programs are required so as to determine the true regional extent of the problem, including identification of high priority sources and regional hot spots that require targeted management action, as well as trends over time and the effectiveness or otherwise of management and control responses.

In working to develop and implement marine litter monitoring and assessment programmes in East Asia, COBSEA will work closely with UNEP and the Intergovernmental Oceanographic Commission (IOC), which are jointly developing UNEP/IOC guidelines on survey and monitoring of marine litter. COBSEA will also work with the Ocean Conservancy and the ICC, which generates some limited monitoring data from its annual clean-up activities, as well as marine and coastal scientific institutions which may be interested to support marine litter monitoring and assessment activities, including joint funding and/or implementation of projects where appropriate.

Activity 6.1. Data from the International Coastal Cleanup
Seek to develop procedures in collaboration with the ICC to improve the reporting of data to national governments and COBSEA that is collected from annual ICC events in the region.

Activity 6.2. National surveys and monitoring
Encourage and assist each COBSEA member to develop and implement formal, systematic, nationally coordinated marine litter survey and monitoring programmes, using standardized methods being developed by UNEP and IOC (standardization is vital for data quality control and inter-comparability). Consider encouraging COBSEA members to annually report the results of any such programmes to EAS/RCU for inclusion in a possible Regional Marine Litter Information System, as proposed under activity 6.3, and for consideration by COBSEA IGMs.

Activity 6.3. Regional Marine Litter Information System
Consider the merits of establishing a central regional information system on marine litter at EAS/RCU and the role that the East Asian Seas Knowledgebase and other existing databases, such as the marine litter database managed by the NOWPAP Data and Information Network Regional Activity Centre (DINRAC), could play.

If developed, such an information system could be used for the storage, management, analysis and interpretation of the results of the national marine litter survey and monitoring programmes, as well as data returns for the ICC events in the region and any other relevant sources of marine litter information in the region.

Such an information system could present outputs graphically on map-based Geographic Information System (GIS) – providing visual representation of the geographic spread of this problem. This would provide a powerful monitoring tool for assessing the true regional extent of the problem, including regional hot spots, as well as trends over time and the effectiveness or otherwise of management and control responses.

Activity 6.4. Trajectory modelling
Consider to undertake marine litter trajectory modelling in the COBSEA region, to identify sources and accumulation zones for marine litter and enable better targeted management actions.

Funding and sustainability

The funding and sustainability arrangements for the implementation of the COBSEA RAP-MALI are as follows:

- The budget for implementation of the RAP MALI shall be allocated from the COBSEA Trust Fund and financial and in-kind support shall be sought from other sources such as:
  - – COBSEA members,
  - – Other bilateral donors,
  - – Multi-lateral donors,
  - – Relevant private sector industries, and
  - – NGOs.

- The implementation of the COBSEA RAP-MALI at the national level will be carried out by individual member countries.
- With a view towards longer-term sustainability, COBSEA and its members will endeavour to include user-pays, polluter-pays and other economic instruments in all marine litter activities, as and where appropriate and possible.

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Marine litter in Eastern Africa (WIO region)
Overview and recommendations for action

Introduction

Eastern Africa, also known as the Western Indian Ocean (WIO) region, forms part of the greater Indian Ocean, which is the third-largest of the world's five oceans.

Marine litter and solid waste is becoming a significant contributor to marine pollution in WIO. In recognition of the problems caused by marine litter, UNEP Regional Seas Programme commissioned in 2005 an assessment study that led to a report entitled "*A Regional Overview and Assessment of Marine Litter Related Activities in the West Indian Ocean Region" (Regional Overview).* The regional assessment was coordinated by the Western Indian Ocean Marine Science Association (WIOMSA) in collaboration with the UNEP-WIO-LaB Project Management Unit based at the Nairobi Convention Secretariat. The countries that participated in the study were Comoros, Kenya, Madagascar, Mauritius, Mozambique, Seychelles, South Africa and Tanzania.

The population of the WIO Region countries is approximately 154 million of which 54 million reside in the coastal regions. The coastal length of participating countries is approximately 13,000 km.

The main objective of the *Regional Overview* was to collect data and information in order to establish current status of the marine litter problem in the WIO and particularly how it is being dealt with by the participating countries in the WIO region, and to make practical recommendations for improvements. This study was the first regional assessment on marine litter and as such it provides an integrated synthesis of information and data presented in national reports on marine litter from eight of the countries that are signatories to the Nairobi Convention. The report was also supplemented by information from published and unpublished sources.

The objective of this chapter is to present a summary of the document *Marine Litter in the Eastern Africa Region: An Overview Assessment (UNEP and WIOMSA, 2008)*.

Assessment of the status of marine litter

Amounts

There is a lack of published, quantified information about marine litter in all Western Indian Ocean countries, excluding South Africa. None of the participating countries has information about the magnitude of the litter problem in the sea. Accordingly it is not possible to provide accurate information about the true magnitude of the problem in any of the countries or the region as a whole. An overview of the information available in the countries of the region is presented below in Table 1.

Information and data from marine-based sources

Information and data from marine-based sources is effectively non-existent because there have been no comprehensive assessment studies done locally or internationally on what persistent solids, particularly plastics, vessels dispose of at sea. All participating countries are aware that shipping and especially fishing are significant contributors of unknown volumes to the marine litter load, but that they seem to contribute less than land-based sources to the quantities of litter washed ashore. Exceptions to this are remote islands and remote coastlines such as in northern Kenya and Mozambique where litter from fishing and shipping appears to dominate beach litter.

Table 1. Information on the availability of data in the countries of the region

Comoros	Six general reports on pollution supplemented by the author's personal observations on land and while diving. The magnitude of impacts of litter on the sea bed is largely unknown, and most impacts on economic resources have not been quantified.
Kenya	Annual reports of the International Coastal Cleanup 2002-2005, popular press articles; State of the Environment Reports; personal observation and key informant interviews.
Madagascar	Government reports on waste management in coastal areas, key informant interviews. The country report states that surveys are scarce and statistics unreliable.
Mauritius	Government statistics on general waste, and interviews.
Mozambique	Two quantitative surveys on marine litter in the south of the country, literature review, field visits, anecdotal information from tour operators via key informant interviews and a questionnaire.
Seychelles	Qualitative information based on interviews, and experience in the waste sector and cleaning programmes.
South Africa	Quantitative surveys published in scientific journals, some unpublished data, and key informant interviews.
Tanzania	Reports on general solid waste management and key informant interviews.

Information and data from land-based sources

Information and data from land-based sources varies considerably from country to country:

At one extreme: South Africa has been publishing the results of research into marine litter for over two decades. There is therefore information on the abundance, distribution and trends of different types of litter around the coast. The sources of the litter are inferred rather than demonstrated, but it is obvious that most of it originates from littering and inappropriate waste disposal on land. By developing national standards, South Africa is relatively better of and currently manages to contain the quantity of litter entering the sea to reasonably low levels. Seychelles has a good waste management system in place and it contributes almost nothing to the marine litter load in the WIO Region. Mauritius falls into a similar category of wealth and governance and the ability to contain wastes. Mozambique on the other hand, despite poverty currently contributes very little to the marine litter load. This is because it has a very poor transport infrastructure and the vast majority (about 70 percent) of the population live in abject poverty. Additionally, informal 'recycling' of anything salvageable occurs. These factors have kept marine litter under control thus far in most places, but this situation may change quickly in Mozambique.

Fishing wastes, old port of Mahé, Seychelles.

At the other extreme: In Tanzania, Madagascar, Kenya and Comoros, there is relatively little information about the quantities, types and characteristics of marine litter that contributes to the marine litter load in the WIO. There is however more information on the massive quantities of litter from urban areas that eventually finds their way to the sea. In certain circumstances, particularly in Comoros and Madagascar, a solid waste is disposed of into the ocean. The main reason that solid wastes find there way into the sea is that none of these countries have adequate (solid or liquid) waste management systems in place.

Aspects in common: All countries report that most land-based sources are from urban centres, particularly industrial or commercial areas and informal settlements (where they exist), and that surface water runoff is the main distributor through discharge of rivers, streams, and stormwater drains. It should be noted that because of the inadequacy of data for the WIO region as a whole, the relative contribution to the global marine litter problem of the quantity and types of litter originating in the region cannot currently be assessed.

Quantification of abundance and of the resulting impacts is scarce, although in all countries socio-economic and biophysical harm occurs, none of them has information indicating where litter is or could be distributed at sea within their Exclusive Economic Zones. Information collected is presented in Table 2.

Table 2. Information supplied by the national consultants

Comoros	Most litter is concentrated near urban areas. Litter collects on beaches and coral reefs. Impacts are reported to be evident on coral reefs and associated ecosystems (sea grass, mangroves, and beaches) and with sea turtles and fish. Dumped medical wastes could also be hazardous.
Kenya	Marine litter is concentrated around urban areas. Impacts on human health, tourism and marine mammals are the main concerns. Oceanic litter occurs has been reported in the northern-most coastal areas of Kenya.
Madagascar	Marine litter is found around urban areas. Other areas have not been investigated. The emphasis is placed on negative impacts on human health, particularly, and on aesthetics and tourism.
Mauritius	Most litter is found in the port area and near river mouths. Litter blocks drainage systems and causes back-flooding. Divers report that lost anchors and fishing materials dumped at sea have damaged corals at certain sites. Plastics and other litter are abundant at known sites on the sea bed. Aesthetically these are an acute environmental eyesore to the public and tourists, and also a potential threat to public health. Solid waste in the port has been reported to damage propellers.
Mozambique	Litter is found mainly on popular beaches, in major towns, at harbours and opposite markets; concerns expressed are about human health, aesthetics and tourism impacts. Areas exposed to oceanic influences (not protected by reefs) receive litter from vessels on the high seas, and from uncontrolled illegal fishing by foreigners.
Seychelles	There are reported to be well defined zones where litter collects, particularly in and around the capital city and sea port, and immediately to the north due to currents - for 6 months of the year. When currents change direction with the monsoon, the destination of the flotsam is unknown. Very little impact is reported to occur because litter levels are kept very low on the islands.
South Africa	Litter is ubiquitous around the South African coast and in waters throughout the Exclusive Economic Zone. However, densities vary greatly, decreasing with distance offshore and with distance long shore from urban centres. Accordingly the highest concentrations are near urban centres, except that fishery wastes are only weakly correlated. Levels of ingestion by marine organisms and, perhaps to a lesser extent entanglement, are on a par with the highest recorded elsewhere in the world, with several threatened species affected. Levels of ingestion in some species of birds are among the highest recorded for any birds, and thus cause for concern. Quantities of litter are negatively correlated with the popularity of beaches used for recreation - litter discourages tourism.
Tanzania	Litter is highly abundant near coastal cities and in fishing areas. Impacts are reported to be that marine organisms including coral are smothered and that litter may jeopardise future tourism and fisheries developments.

Sources

The major land-based sources of marine litter are found to be: (a) waste from legal and illegal dumpsites located on the coast or on the rivers; (b) rivers and floodwaters; (c) industrial outfalls; (d) discharge from stormwater drains, untreated municipal sewerage; and (e) littering of beaches and coastal picnic areas.

The major sea-based sources of marine litter are from shipping (merchant, public transport, pleasure, naval, and research) and fishing (vessels, angling and fish farming) activities. To a lesser extent offshore mining and extraction (vessels and oil and gas platforms) and authorized dumping at sea also contribute to marine litter. These latter activities occur in known locations and presently appear to be relatively well regulated.

International Coastal Cleanup in Mombassa, Kenya.

Dispersion of marine litter

Some pertinent points about the dispersal of litter by the currents in the West Indian Ocean region are the following:

- Very broadly, the dominant flow pattern of ocean currents in the south of the West Indian Ocean region is counter-clockwise, whereas the currents in the northern areas flow clockwise and counter-clockwise depending on the monsoon seasons. In the northern areas of the Western Indian Ocean the monsoon reverses the currents because of the wind cycles. These latter winds and currents would significantly affect predictions of marine litter distribution in the Seychelles, Kenya and northern Tanzania.
- Seychelles reports litter accumulation on the east coast of Mahé during the southeast monsoon, whereas during the northwest monsoon the litter is presumably distributed to sea.
- The currents throughout the Indian Ocean are complex. Some change direction with the seasons and many consist of eddies, which are variable and not fully understood. This means that no one can be 100 percent certain where the litter that is dumped into the Indian Ocean will eventually be deposited, but some trends in deposition of marine debris have been established.
- Some evidence of the large-scale ocean circulation pattern in this area has been obtained from the drift of scientific instruments and small polythene drift cards. Items deployed on the east coast of South Africa have been recovered 30 months later on the south coast of Mozambique, presumably having been carried counter-clockwise around the southern Indian Ocean Gyre.
- Items deployed off the west Australian coast have been retrieved on the South African east coast (Gründlingh, 1989).
- Most land-based and some marine-based litter that enters the ocean ends up back on beaches. This is because the predominantly onshore winds and wave capture zones make beaches a “net capture area” of particulates from the sea.

- Most of the currents in the Indian Ocean are fed by other currents so marine litter 'dumped' offshore could end up being transferred from one current to another.
- During the northeast monsoon season the Somali Current is relatively close to the coast and its speed is 0.7-1.0 m/s. This makes it possible that marine litter dumped off-shore in the north of the Western Indian Ocean region can be deposited directly on the northern Kenyan coast during this season.
- It is also possible that litter can be transported to and deposited on the Indian and Australian coasts throughout the year as the currents are situated very close to the coast in these areas.
- It can be inferred from Gründlingh (1989) that if a gyre touches the coast it is possible litter will be deposited along the shore. Deposition will depend on the velocities of the current. Higher current velocities are less likely to deposit litter than lower velocities.
- The oceanic gyre (Agulhas Current, Mozambique current) of the south Indian Ocean generally touches Madagascar, the southern Mozambique and northern KwaZulu-Natal coasts, which is where objects floating in the southern ocean areas could be deposited. Most deposits are reported from northern KwaZulu-Natal southwards to the coast of Port Elizabeth. Other litter reaches the Australian coast.
- If marine litter enters the sub tropical gyre and sinks due to marine organisms growing on it, it should sink near the centre of the gyre where velocities are very low.
- Other weather patterns affecting the distribution of marine litter include:
  - annual cyclones that cause shipwrecks and wreak havoc on informal constructions and open-pit dump sites on the coast in Madagascar and
  - severe floods in Kenya, Tanzania and Mozambique, which break river banks and carry everything 'moveable' from land areas into the sea.

Social, economic and environmental impacts of marine litter

Social, economic and environmental impacts of marine litter within the region are largely inferred and have not been adequately assessed or quantified, other than in some South African research.

Further, the reports from Comoros, Kenya, Madagascar and Tanzania have indicated that medical and sewage wastes can impact human health. This urgent matter appears to be being addressed by the governments in partnership with aid agencies, but not adequately. Medical wastes would obviously be a high priority source of marine litter to eliminate.

Legislation, policies and institutional arrangements

Adequacy of institutional arrangements, policy and law

Most of the countries in the WIO Region do not consider marine litter to be a separate category of pollution. In most countries, it is dealt with as part of the solid waste stream, which is considered appropriate. In some countries, some relevant policies and laws are in place, and institutional mechanisms do exist. However, many WIO countries are incapable of dealing with comprehensive waste management – which contributes to the marine litter problem. This is largely because of a lack of funding, and therefore an inadequate technical capacity for compliance and enforcement.

It is critically important for national governments to implement legislation that compels producers of plastics (and other synthetics, and tins and glass) to provide effective mechanisms for the recovery of used products.

Seychelles, Mauritius and South Africa
Seychelles has a centralized and successful waste management regime that operates at the national level. Along with Seychelles, Mauritius and South Africa have largely adequate institutional arrangements, technical means and services provided. Despite this South Africa is reported to face severe problems with marine litter because retail products are heavily packaged, and because a large proportion of the population has limited access to formal waste disposal options. Currently, however, both countries are deemed to have the most effective levels of governance in the WIO (along with Réunion) and so should in theory be able to contain and reduce their contributions to marine litter more effectively than the other countries.

Comoros, Kenya, Madagascar, Mozambique and Tanzania
Other than having some policy and law in place at national and local levels, all other participating countries, namely Comoros, Kenya, Madagascar, Mozambique and Tanzania, are currently deemed to have wholly inadequate levels of the basic institutional arrangements and technical means and services provided. This means that their contributions to the marine litter load are relatively uncontrollable at present, other than in isolated pockets. The development and operation of basic solid waste management facilities throughout urban areas should be a high priority.

However, these countries face enormous development challenges and the methods of dealing with priorities for action differ between each country, and even between districts or regions within a country. Each country and district may require a unique combination of topics to be dealt with. This implies that different approaches would be necessary to solve the marine litter problem in each country.

Programmes and initiatives

There are numerous successful projects, programmes and initiatives that are being undertaken by non-governmental organizations, businesses and local communities to educate the public and reduce marine litter in their countries. These are either managed or funded to different degrees by business, government and foreign aid – or are the initiatives of local communities themselves. Some key points about these initiatives in the WIO region include the following:

- Most country reports emphasise the importance of small -scale, locally driven initiatives focussing on recycling solid wastes for reuse. Such projects can help create jobs and promote businesses – and reduce the levels of marine litter.
- The most successful small-scale litter abatement programmes in most places in the WIO are those that allow people to earn a living through involvement in the programme. This type of initiative needs promotion.

Madagascar: subsistence fishing with nylon nets.

These initiatives do play an important part in the education that is required at all levels of society to reduce littering and increase recycling and put pressure on governments to take appropriate action:

- It is considered important to enhance existing capabilities and interests in waste disposal and ocean-related activities, and collaborate with existing ventures where possible, in order to avoid costly duplication.
- Many activities associated with reducing marine litter loads need to be coordinated, and many need financial support to continue.
- As fishing is a major economic activity in the WIO, methods need to be developed by the international community to ensure flag states are held to count for their contribution to the marine litter problem.
- International intervention is also required to help address the contribution to marine litter from illegal fishing vessels operating in the WIO. Garbage management is obviously a very low priority in this industry. The extent of illegal fishing, by long-line vessels, is not clear but is evidently a serious problem. Mozambique, for example, reports that increasingly significant quantities of litter (including numerous flares used for illegal night fishing) from these vessels are washing up on their beaches. Initiatives to deal with lost or abandoned fishing gear and related marine litter from fishing are considered to be particularly important. Some considerations are:

- that marine litter abatement requirements should be tied in with contractual agreements for foreign fishing activities in the WIO. The highest standards of environmental pollution control, as applied in the developed country's seas, should also be adhered to in the WIO;
- although law enforcement could be applied to industrial fisheries that are compelled to use port facilities, and are thus more readily checked, it would be difficult to control garbage and fishing gear disposal among the artisanal fisheries which are spread along extensive coastlines and are largely unregulated. Van der Elst et al. (2005) estimated that almost three million people are directly dependent on artisanal fishing for their livelihood along the shores of East Africa and Madagascar. Most of the WIO regions' fisheries go unreported in global statistics, largely due to their unregulated and informal nature; and
- stakeholders who would need to be contacted to help design and agree to marine litter prevention strategies for fishing include different government ministries, cooperatives or trade unions and regional and international development banks. The latter organizations are likely to be involved in programmes to aid and support fishermen as part of poverty relief already.

Finally, it is recognised that there should be cooperation between all the various foreign funded and domestic projects (and programmes and initiatives) that are being undertaken on land and at sea and which can influence solid waste management.

Regional partners and strategies

Currently there are no regional strategies dealing specifically with solid waste and marine litter management. One of the major challenges of implementing any strategy at a regional level is to have in place a regional framework law and to strengthen regional administrations. In the WIO region one of the most appropriate mechanisms for implementing marine litter and solid waste management regional strategies would be the Nairobi Convention, to which all countries in the WIO are signatories.

With strengthening, such an administrative body could *advice and coordinate governments in the region to develop standards for waste management*, *inter alia*. Nairobi Convention provides an overarching regional framework than Indian Ocean Commission and in this regard, is more appropriate for *advising and coordinating governments in the WIO region to develop standards for waste management. This is in fact already inferred to in the SAP for addressing land-based activities that is being developed by the UNEP-WIO-LaB Project under the Nairobi Convention.* IOC can be a partner in such a process.

In addition, the Land-based Sources and Activities (LBSA) Protocol, additional to the Nairobi Convention, can form the basis for national action on land-based sources of marine litter in the WIO Region.

One of the more important structures that needs to be consulted and possibly to be worked through or integrated with are the New Partnership for Africa's Development's Sub-Regional Environment Action Plans (SREAPs) and particularly, but not exclusively, the Coastal and Marine Programme (COSMAR). The larger NEPAD Environment Action Plan (NEAP) outlines priority actions that African countries need to implement to maintain the integrity of the environment and ensure the sustainable use of their natural resources through partnerships with the international community. The marine litter abatement programme(s) could focus on the NEAP thematic areas of marine and coastal resources' and crosscutting issues. It is important that activities affecting solid waste/marine litter management are explicitly addressed within each priority area of the above mentioned Coastal and Marine Programme.

Other structures, programmes, and organizations operating at a regional level, which would need to be consulted and where possible integrated, include GEF, UNDP, WB, EC, FAO, WTO, SADC, WWF, IUCN, JSDF, USAID, France, Germany, Ireland, Norway, Finland and Sweden.

Gaps and needs

In this section information is presented in Table 3 from the national consultants' reports on deficiencies in solid waste management systems related to marine litter and recommended priorities for action. In addition all countries reported the need for increased funding and for improved enforcement of existing laws (excluding Seychelles).

Table 3. Reported areas for priority action to address marine litter problem

Country	Stakeholder consultation	Policy, laws & regulations	Infrastructure required	Skills training	Economic aspects	Baseline & ongoing monitoring	Education guidelines, Codes of Practice	Other integrated planning aspects
Comoros 	NGOs, CBOs and government need to participate in designing solutions.	Enforce EIA law and define pollution standards.	Subcontract specialized and well equipped international agencies to assist in waste management.	Capacity building in local government, and specialized waste management agencies.	Identify and establish sustainable participatory funding mechanisms.	Establish a marine laboratory and marine pollution monitoring activities encompassing marine litter.	Establish a national "Clean up the sea" day.	Formulate a national action plan for marine litter management.
Kenya 	Consultation with and involvement of stakeholders is considered to be important.	Policy and laws to include marine litter management are required.	Place bins on beaches, and create additional official disposal sites.	Promote sanitary dumping practices.	Introduce deposit and refund system.	Carry out surveys at key sites to establish the origins of litter in order to target reduction. Long term monitoring programmes need to be put in place.	Work out how best to educate culturally diverse public about littering and waste handling.	Promote and encourage recycling for poverty relief.
Madagascar 	Hold strategic meetings with key stakeholders to design solutions.	Draw up priority legal documents for preventing marine and coastal pollution.	Create the transfer and disposal infrastructure for all 12 coastal regions.	Train managers and technical personnel.	Develop incentives and cost recovery mechanisms.	Draw up a national inventory of targets for preventing marine litter.	Educate stakeholders. Come up with incentives for volunteer groups.	Design an integrated management plan. Issue directives on collecting, sorting, processing and disposal of marine litter.
Mauritius 	Involve all stakeholders and establish co-ordination mechanisms.	Develop specific marine litter regulations.	Beach facilities are required, including grids in rivers and canals.		Develop incentives and cost recovery mechanisms.	Need monitoring, reporting, and communication	Develop codes of ethics and best practice. Raise public awareness.	Address waste minimization. Need a review of the waste management situation.
Mozambique 	Involve local stakeholders to develop site specific strategies.	Penalties for littering are required in existing laws. National and local laws need updating. Join MARPOL.	Establish trash bins and local clean-ups at litter 'hot spots'.			Find all sources, types, quantities and seasonal variations and focus on management.	Need guidelines and codes of practice for shipping and fishing and motivation for volunteers.	Promote recycling to stimulate local economies. Need a review of the situation involving all sectors.
Seychelles 	Develop an action plan to keep litter under control.	Set regulation for deposit-refund systems.	Need maintenance of litter barriers on rivers.	Need to build human capacity (trained personnel).	Introduce a deposit and refund system for recycling all types of bottles.	Need detailed analysis of sources of marine litter and marine dispersion.		Carry out a review to evaluate environmental and economic impacts, and eliminate grey areas in institutional mandates.
South Africa 		Legislate to promote recycling and reuse through appropriate financial mechanisms.	Need waste reception and disposal facilities in fishing harbours. Install litter traps and grids on storm water drains.	Training programmes to build capacity in waste management at local and national government levels.	Institute a reward system for fishing vessels for returning wastes and gear to shore.	Set up an effective monitoring programme to assess the efficacy of mitigation measures.	Educate recreational fishers and small boat users, and the public, about the marine litter problem and disposal costs.	Raise the profile of marine litter as a priority issue at national government level.

Country	Stakeholder consultation	Policy, laws & regulations	Infrastructure required	Skills training	Economic aspects	Baseline & ongoing monitoring	Education guidelines, Codes of Practice	Other integrated planning aspects
Tanzania	Need cross sectoral strategizing to collaborate and build on what is available.	Need an integrated waste management policy.	Need sanitary landfills and all other infrastructure. Relocate dumpsites away from the coast and rivers.	Further training is required.	Develop economic incentives for waste minimization and recycling.	Research to quantify marine litter abundance and impacts. Establish a marine litter monitoring programme.	Raise public awareness of marine litter. Standards and guidelines for waste management need to be established.	Develop integrated waste management plans.

Conclusions and recommendations

Key findings of the assessment

On the basis of the assessment on marine litter problems in the WIO Region, the following key conclusions are made:

- With regard to the existence of data and information on the quantities, types, trends, sources and sinks of marine litter, there is very little information in the WIO Region, except in South Africa (where there has been a comprehensive research and monitoring programmes on marine litter). Also, the economic impact of marine litter has not been quantified.

- Marine litter is not dealt with in policies or laws as a separate category of waste, it is considered to be part of the general waste stream in most countries of the WIO region.

- Most countries in the WIO region do have specific laws and policies that govern solid waste and marine litter management, and where relevant legislation exists, they are not effectively implemented.

- The most significant source of marine litter in the WIO Region is solid waste that is brought to the sea via surface water runoff from urban areas. The degree of successful management of the solid waste and litter varies greatly between countries in the WIO Region.

- The major constraints to effective solid waste management (including marine litter) in the WIO region countries includes inadequate awareness on the environmental and socio-economic impacts of marine as well as lack of adequate funds in institutions that are charged with the responsibility of solid waste management.

- With regard to the volume of marine litter disposed of from vessels involved in various maritime activities (e.g. fishing, shipping, etc), there is very little data and information in most of the countries in the WIO Region.

- Although the WIO region is heavily trafficked by commercial shipping and fishing vessels, most of the countries do not have the capacity to effectively police their territorial waters or Exclusive Economic Zones (EEZs). Also, none of the countries are able to effectively monitor garbage disposal and gear loss by foreign fishing and shipping activities in their territorial waters or EEZ.

- As compared to the land-based sources, the marine-based sources of marine litter are less significant in the WIO Region, although there is lack of comprehensive data to confirm this.

- The extent to which solid waste generated on land is prevented from reaching the sea varies greatly among countries, and regions within countries. Mauritius, Seychelles and South Africa presently have the moderate capacity to manage waste fairly adequately, and they contribute relatively little to marine littering. On the other hand, Comoros, Kenya, Madagascar, Mozambique and Tanzania have limited capacities and waste management is therefore constrained.

- Although the volume of marine litter produced by the countries in the WIO is insignificant compared to the volumes generated in industrialized countries, the situation in the WIO Region still requires urgent remedy.

Synthesis of key points from each country

Information sources about marine litter. There is a dearth of published information about marine litter in all WIO countries, excluding South Africa. Most of the countries do not have information about the magnitude of the litter problem in the sea. Accordingly it is not possible to provide accurate information about the true magnitude of the problem in any of the countries.

Key areas where marine litter is found and key impacts. The geographic distribution of litter in the WIO Region is not adequately known, although there is some information in some of the countries. None of the countries have information on where marine litter is distributed within their Exclusive Economic Zones. Quantification of abundance and impacts of marine litter is also scarce, although it is appreciated in most countries that socio-economic and biophysical harm has been done.

The proportion of plastic/synthetic litter. Plastic materials are the most persistent and damaging of litter items and make up a significant proportion of the marine litter found in the WIO Region. Data on the volumes of marine litter is not accurate and cannot be compared between countries.

Trends in abundance and efficiency of monitoring. There is no comprehensive marine litter monitoring programmes in the WIO Region countries. This is despite the fact that most countries in the WIO Region report that littering is showing an increasing trend. All countries except Seychelles and Mauritius report increased uncollected levels of garbage from fast expanding informal settlements in coastal towns. However, in most countries information on the quantities of garbage dumped from ships, or on the quantities of fishing gear lost at sea is not available.

Where the litter comes from – major sources. As sources of marine litter are generally inferred rather than definitively demonstrated, the consultants have reached sound conclusions about the major problems. The major source of marine litter in the WIO region is land-based activities in urban areas. Sea-based sources contribute less as compared to the land-based sources. There is however a need for comprehensive data to confirm this observation.

Adequacy and sources of funding to control litter. Most countries in the WIO Region have limited financial resources and as such the environment sector receives less attention in budgetary allocations. The inadequacy of funding has constrained waste management in most of the countries.

Adequacy of waste management infrastructures and use. Because of inadequate funding in most WIO countries, the basic infrastructure for effective waste management either does not exist or is becoming overloaded, inefficient or unsustainable. In all countries this is a concern because of increasing waste loads without an associated increase in revenues for waste management.

Political will and capacity to implement good practices. Political will to address marine litter related problems is limited in most in the WIO Region. This reflected partly in the lack of specific policies, legislation and institutional frameworks for addressing marine litter problem. Capacity is largely tied to 'political will' which reflects the perceived level of importance of litter management to the country. The potential for substantial foreign earnings from tourism can be one of the drivers of a successful litter abatement programme.

Adequacy of domestic policy, law and standards. Most of the policies and laws are focussed on the management and or regulation of general waste t and these are either adequate or partially adequate in most of the WIO countries. However, such laws are not fully applied and enforcement is the problem. In addition, marine litter is not recognised as a distinct type of pollution in any of the WIO countries' policies and laws. In this regard, there are no specific policies or laws that are focussed on marine litter.

Commitment to international policy, law and agreements. The MARPOL Convention of the IMO is the primary convention addressing prevention of pollution of the marine environment by ships from operational or accidental causes. Of particular relevance is MARPOL Annex V on prevention of pollution by garbage from ships, which entered into force in 1988. Also, the London Convention and Protocol govern dumping at sea. The UNEP Global Programme of Action for the protection of the coastal and marine environment from land-based activities and sources (GPA) is a source of conceptual and practical guidance for governments to draw on while planning and undertaking activities to prevent damage to the coastal and marine environment. In order to rid the seas of ship-generated garbage, litter and debris, as part of the overarching goal of preventing litter from all sources from entering the marine environment, there is a need for all countries in the WIO region and all flag States in the world to ratify and adhere to existing international instruments, particularly MARPOL Annex V and the London Convention.

Nairobi Convention is another regional agreement that is essential for the protection, management and development of the coastal and marine environment. All countries in the WIO Region (Eastern Africa) are signatories to the Nairobi Convention. The Convention has relevant provisions that are essential in the management of marine litter problem in the WIO Region. Article 6 on POLLUTION CAUSED BY DUMPING states that …'the Contracting Parties shall take all appropriate measures to prevent, reduce and combat pollution of the Convention area caused by dumping of wastes and other matter at sea from ships, aircraft, or manmade structures at sea, taking into account applicable international rules and standards and recommended practices and procedures'.

Article 7 on POLLUTION FROM LAND-BASED SOURCES states that …'the Contracting Parties shall endeavour to take all appropriate measures to prevent, reduce and combat pollution of the Convention area from land-based activities and sources caused by coastal disposal or by discharges emanating from rivers, estuaries, coastal establishments, outfall structures, or any other sources within their territories. In taking measures contracting parties may take into account applicable international rules and standards and recommended practices'.

Recommendations for action

Several recommendations were put forward in the regional synthesis report on the regional assessment of marine litter related activities in the Western Indian Ocean Region. The report provides a broad overview of the marine litter problems in the WIO region. Despite lack of comprehensive data and information on the volume and distribution of marine litter in the WIO Region, it makes the following recommendations in general terms:

- Marine litter arising from sources on land should be tackled separately from litter arising at sea because different laws and approaches would apply in many instances. There is obviously potential for overlap in the economic incentives required to reduce the production of persistent wastes and improve solid waste management.

- Key stakeholders should be involved in developing action plans in each WIO country, particularly those with a vested interest in relevant waste generating, management and disposal activities and in developing and marketing alternative (bio-degradable) products. This would include government, port authorities, ship operators and agents, industry, private sector, fishing associations and unions, non-governmental and community organizations and others who may also be key players and who would want the opportunity of expressing their views and stating their interests before any plans for action are finalized. It is essential that efforts are not duplicated or resources wasted, and this can only be achieved when all stakeholders consult with each other and agree to collaborate.

- The marine litter abatement or solid waste management programmes are seen to be driven by the citizens of the region and particularly the participating nation. Ultimately solutions will have to come from the people themselves in each country.

- All countries in the WIO region and all flag States in the world should be encouraged to ratify and adhere to existing international instruments, particularly MARPOL Annex V and the London Convention. Ports also need to provide adequate waste reception facilities, which in turn require adequate treatment, recycling and disposal services.

- It is suggested that audits be done by flag States on fishing (and shipping generally), i.e. a comparison between relevant items purchased by vessels *versus* quantities lost or incinerated or dumped at sea or returned to port for disposal. *Ships Garbage Record Books* required by MARPOL should be linked with orders of goods, and amended to help track quantities of synthetic fishing gear and other plastic items and packaging.

- Because of the nature of the ocean currents and the possibility that marine litter can be distributed widely in the WIO Region, marine litter should be considered as a significant problem during the preparation of the Transboundary Diagnostic Analysis for the WIO focussed on land-based activities.

- Regarding suggested strategies and approaches for funding high cost initiatives (such as port reception facilities, landfills, fisheries, etc.), including approaches to international financing institutions, this aspect needs to be addressed by the relevant ministries within each participating country, including the ministries of finance, and should be linked with the use of various economic instruments. The Regional Seas report on financing for the environmental conservation of the Red Sea and Gulf of Aden (UNEP, 2006) can be referred to as an example. In addition, UNEP has recently commissioned a study

on *Guidelines and Case Studies – Using Market-based Economic Instruments to address the Problems of Marine Litter,* which should be useful to WIO countries.

- The appropriate regional mechanism for implementing recommendations about land-based sources of marine litter is considered to be the Nairobi Convention. The Convention offers an appropriate regional platform and or framework for countries to formulate comprehensive action plans for addressing marine litter problem. The convention also has relevant provisions that are relevant to marine litter management. For land-based sources of marine litter it would be important for 'solid waste management' to be listed as an activity requiring attention within an Annex to the new draft Protocol on land –based sources and activities (LBSA Protocol, additional to Nairobi Convention). Any marine litter management programme should not be separated from solid waste management – including where this ties in with municipal wastewater management.

- Once solid waste management is listed under the LBSA Protocol, approaches and action points addressing national legal and administrative instruments and strategies, and cooperation with civil society, etc., should be dealt with under the provisions of the Nairobi Convention.

- The national priorities for waste management should be considered in the context of the other priorities for national development – which may or may not necessitate new or amended domestic laws or regulations, but rather institutional capacity enhancement and methods of better implementation. It is essential for countries to find ways to raise and spend adequate funding on developing (a) technically adequate disposal sites; (b) garbage collection facilities including port reception facilities; and (c) employing skilled and motivated waste managers.

- Activities could focus on providing insights into reasons for preventing marine litter and, amongst other things, discussing methods of doing so in ways which reduce costs to the fiscus, maximise benefits to the poor, and put the onus of cost of disposal onto producers of plastics, particularly. Amongst others, solid waste management and marine litter abatement strategies should be brought into focus in all foreign-funded programmes that governments are allowing in their countries, to assist with development.

- With regard to the development and implementation of regional and national monitoring programmes, countries operating under the umbrella of the Nairobi Convention should strive to come up with comprehensive monitoring programmes that will be implemented throughout the region using a standardized approaches and methods.

- For the development of professional sectoral and 'responsible citizenship' guidelines for different target audiences for the wise management of marine litter and solid waste and to help with capacity building and awareness rising, it is recommended that WIO countries operating under the umbrella of Nairobi Convention should consider to adopt and domesticate guidelines on solid waste and marine litter management that already exist.

- Finally, the Nairobi Convention should have a "Regional Programme on Marine Litter in the WIO region". This programme would need to be endorsed by the Conference of Parties to the Nairobi Convention. The priority would be to mainstream solid waste management "concerns into the development agenda of countries through targeted actions that address not only environmental concerns, but also institutional, regulatory, policy and capacity aspects".

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Marine litter in the Mediterranean
Status and assessment

Introduction

Marine litter has been an issue of concern in the Mediterranean since the 1970s. Within the framework of the *Convention for the Protection of the Mediterranean Sea against Pollution* (the Barcelona Convention), Mediterranean countries adopted the *Protocol for the Protection of the Mediterranean Sea against Pollution from Land-based Sources* and in Annex I of this Protocol, litter is defined as one of the categories of substances: "*Litter as any persistent manufactured or processed solid material which is discarded, disposed of, or abandoned in the marine and coastal environment."*

Numerous activities on marine litter have been organized by Mediterranean Action Plan (MAP), including:

- UNEP/MAP, jointly with IOC and FAO, convened in 1987 an *ad hoc* meeting on persistent materials. The meeting recommended that a pilot survey be initiated in selected Mediterranean areas. The pilot survey was organized in 1988 by UNEP/MAP, in cooperation with IOC and FAO, with five participating countries: Cyprus, Israel, Italy, Spain and Turkey. Results were reviewed at the IOC/FAO/UNEP Review Meeting on the Persistent Synthetic Materials Pilot Survey held in 1989. This pilot survey is considered as a landmark activity for the assessment of coastal and marine litter in the Mediterranean.
- A *Comprehensive Bibliography on Marine Litter* containing 440 references and an *Assessment of the State of Pollution of the Mediterranean Sea by Persistent Synthetic Materials, which can Float, Sink or Remain in Suspension* were published by UNEP/MAP in 1991 (MAP/UNEP, 1991 and UNEP/IOC/FAO, 1991).
- The 11th Meeting of the Contracting Parties to the Convention for the Protection of the Mediterranean Sea against Pollution and its Protocols, 1999, asked the Secretariat to begin action on coastal and marine litter and to prepare a relevant assessment. It also decided to include a budget line for the assessment of pollution of the Mediterranean Sea by litter.
- A Consultation Meeting on Marine and Coastal Wastes in the Mediterranean held in 1999 outlined a project on Marine and Coastal Litter Management. A general questionnaire about litter management in coastal zones of the Mediterranean was sent to Mediterranean countries and the responses analysed.
- In 2003, UNEP/MAP, in cooperation with WHO, prepared *Guidelines for Management of Coastal Litter for the Mediterranean Region (MAP/UNEP/MED POL, 2004)*.
- MEDPOL implemented in 2004-2005, with the cooperation of RAMOGE and UNADEP, a pilot project in the municipality of Tripoli, Lebanon in which direct technical and legal assistance was provided along with a public awareness campaign (MAP/UNEP, 2004).
- In 2006, the Mediterranean Action Plan of UNEP with the support of the Regional Seas Programme of UNEP developed a medium-term public awareness and education campaign on the management of marine litter in the Mediterranean. UNEP/MAP opted to work with partner non-governmental organizations (NGOs) of the region, namely the Mediterranean Information Office for Environment, Culture and Sustainable Development (MIO-ECSDE), the Hellenic Marine Environment Protection Association (HELMEPA) and Clean Up Greece - Environmental Organisation, in the context of a project entitled “Keep the Mediterranean Litter-free Campaign” (Clean Up Greece/HELMEPA/MIO-ECSDE, 2007).

A large number of international organizations and NGOs have conducted surveys and beach cleanup campaigns yielding data and information on marine and coastal litter pollution of the Mediterranean Sea. These efforts, which continue to the present, are considered a reliable source of data and information for this region.

The main objective of this assessment was to understand the current status of the marine litter problem and how it is being dealt with by the Mediterranean countries, and to make practical recommendations in view of the Regional Strategy for the Sustainable Management of Marine Litter in the Mediterranean being prepared by MED POL within the Global Marine Litter Initiative of UNEP (GPA and the Regional Seas Programme).

The objective of this chapter is to present a summary of the document *Marine litter in the Mediterranean Region (UNEP MAP/MED POL 2009)*.

Divers participating in Clean Up Greece.
© Clean Up Greece

The assessment relied on (1) information collected from the completed questionnaires of 14 Mediterranean countries; (2) analysis of beach cleanup data, mainly from the period 2002-2006; (3) the monitoring and recording of litter floating on the sea surface for the duration of the study by HELMEPA member companies with ships travelling in or transiting the Mediterranean; (4) existing literature and initiatives; and (5) direct contacts with local authorities, NGOs and associations, as well as scientists and individuals who could provide reliable data on marine litter (recorded or unrecorded). Replies to the questionnaire were received from Bosnia and Herzegovina, Croatia, Cyprus, Egypt, France, Greece, Israel, Italy, Lebanon, Malta, Monaco, Morocco, Tunisia and Turkey. The final draft of the assessment document was prepared by the following NGOs: the Mediterranean Information Office for Environment, Culture and Sustainable Development (MIO-ECSDE) (www.mio-ecsde.org), the Hellenic Marine Environment Protection Association (HELMEPA) (www.helmepa.gr), and Clean up Greece Environmental Organization (www.cleanupgreece.org.gr), and was reviewed by international experts and staff of the Mediterranean Action Plan Coordinating Unit.

Assessment of the scale of the problem

Amounts of marine litter in the Mediterranean

General

The issue of marine litter and related information on the types and amounts in the Mediterranean is rather complicated as it is addressed principally by sub-regional and local authorities in most countries on the one hand, and by competent NGOs on the other. A relatively systematic and reliable source for amounts and types of litter were the existing NGO initiatives in the region. NGO efforts are the most significant in terms of surveying and cleaning beaches and the sea and providing information on the volume and types of litter existing in the Mediterranean. The most significant of these at regional level include the following:

- The Italian environmental organization, Legambiente, coordinates beach cleanups in the Mediterranean every spring and summer.
- MIO-ECSDE organizes marine litter-related events, including cleanups, in the framework of its annual Mediterranean Action Day (since 1998) with an average participation of member NGOs from 12 Mediterranean countries.
- The Australian organization Clean up the World organizes cleanups in September with around 115 countries worldwide, many of which are in the Mediterranean.
- The International Coastal Cleanup (ICC) campaign is coordinated globally by the Washington-based NGO, Ocean Conservancy, in cooperation with NGOs in over 100 countries and is the oldest and largest one-day cleanup event in the world.

Furthermore, initiatives of varying importance are taken up by NGOs, local authorities and other partners at national and local level in almost all Mediterranean countries.

The aforementioned initiatives succeed in gathering tens of thousands of volunteers in the Mediterranean countries with the purpose not only to clean the coasts, rivers and lakes in their local communities but also to raise awareness amongst students, citizens and various stakeholders about the serious implications of marine litter and to inspire people to make a difference and improve their daily environmental conduct.

For the purpose of this assessment the figures resulting from the various cleanups were compared and it was deduced that a common synthesis is not possible due to the fact that each initiative is conducted with different data cards, standards and measures (litter types are classified differently if at all; in some cases litter is measured by counts of items while in others by weight, etc.), while certain crucial information is completely lacking (length of coast cleaned, type of coast, proximity of coast to sources of litter, etc.).

Regional surveys

ICC campaign in the Mediterranean

One of the key aspects of the ICC campaign is the recording of collected litter items on specialised data cards. Recorded data is analysed to produce conclusions with regards to the sources and types of marine litter. These findings are then used to educate local/regional/national authorities, industry stakeholders and the wider public in order to improve solid waste management systems and environmental conduct.

Being the national coordinator of the ICC campaign in Greece since 1991 and in order to compare marine litter data over the last five-year period, the Hellenic Marine Environment Protection Association (HELMEPA) processed the figures from the Mediterranean countries that participated in the ICC between 2002 and 2006. The main findings from the analysis of this data are presented below. There was an overall decrease in the number of items and weight of marine litter collected in Mediterranean countries from 2002 to 2006 (Figures 1 and 2). In general terms, this follows the decreasing trend in public participation and can be largely attributed to the latter.

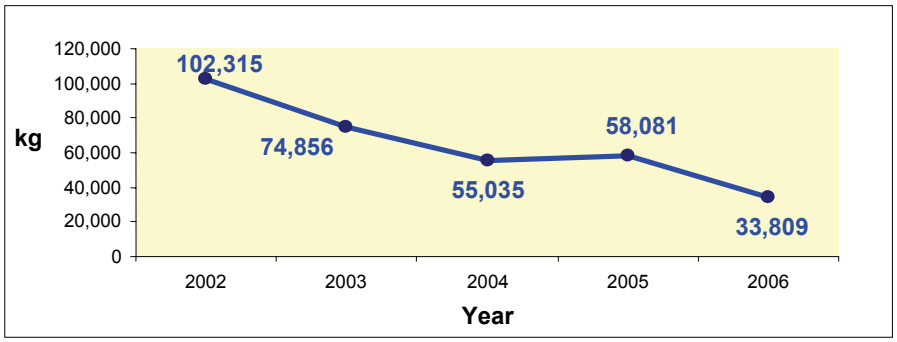

Figure 1. Weight of collected marine litter during the ICC (2002-2006)

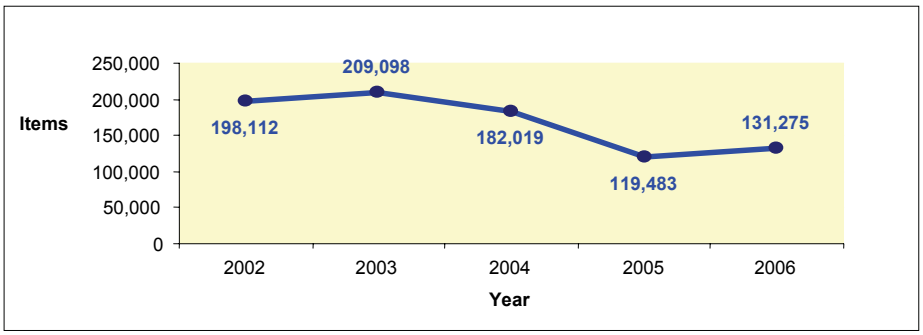

Figure 2. Collected marine litter items during the ICC (2002-2006)

Public participation in the ICC campaign in the Mediterranean countries has been decreasing steadily from 2002 to 2007 (Figure 3). Thus, from 15,648 volunteers participating in ICC 2002, participation declined to 7,305 volunteers in ICC 2006, which corresponds to a decrease of over 50 percent.

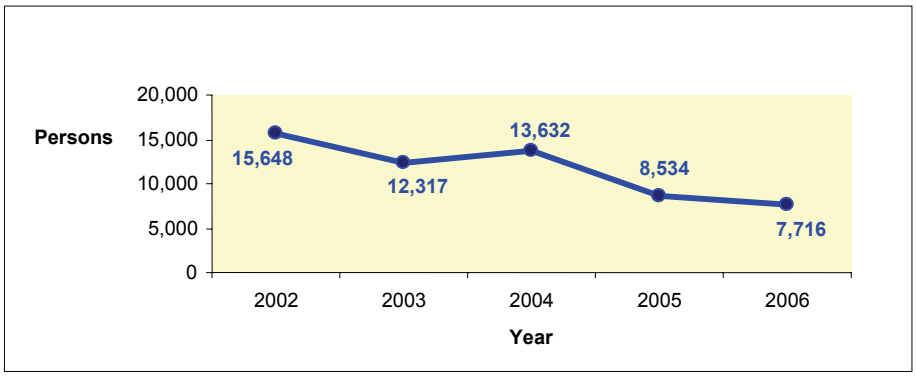

Figure 3. Public participation in Mediterranean ICC campaigns (2002-2006)

A slight increase in public participation in 2004 could be attributed to the greater number of countries (14) participating compared to the previous year (13). Overall, the downward trend in public participation is closely matched by the decreasing number of Mediterranean countries participating in this global event: from 15 countries in 2002 down to eight in 2007.

There was an interesting observation when examining the average number of litter items and weight per volunteer from 2002 to 2006; whereas the number of litter items per volunteer increased in the long run, the weight of collected litter per volunteer had a decreasing trend, with the exception of an increase between 2004 and 2005. This finding indicates that we may be facing a proliferation of lighter marine litter items in the Mediterranean, including plastics, aluminum and smoking-related litter, as opposed to heavier items from dumping activities such as household appliances, construction materials, tires, etc. Indeed, if we examine the average weight of litter items in the same period there is a steadily decreasing trend, with the exception between 2004 and 2005.

Types of marine litter in the Mediterranean

The 'Top 12' marine litter items collected from Mediterranean beaches and the seabed during ICC campaigns from 2002 to 2006, which accounts for over 89 percent of total marine litter, are presented in Table 1.

Table 1. 'Top 12' marine litter items in Mediterranean ICC campaigns (2002-2006)

Item	Counts	Percent
Cigarettes/cigarette filters	222,563	27
Cigar tips	86,146	10
Plastic bottles (2 L or less)	81,238	9.8
Plastic bags	70,912	8.5
Aluminum beverage cans	63,282	7.6
Caps/lids	60,920	7.3
Beverages bottles (glass)	48,085	5.8
Cups/plates/forks/knives/spoons	32,037	3.8
Tobacco packaging/wrappers	23,648	2.8
Food wrappers/containers	21,029	2.5
Straws/stirrers	17,184	2.1
Pull tabs	15,488l	1.9

Of the 'top 12' litter items in the Mediterranean ICC, 55 percent originate from shoreline and recreational activities. These include mainly plastics (bottles, bags, caps/lids, etc.), aluminium (cans, pull tabs) and glass (bottles). These litter items are highly persistent and do not degrade quickly in the environment, which allows them to persist over time and to travel vast distances with sea currents and winds, impacting the remotest parts of the Mediterranean.

The remaining 45 percent of the marine litter 'top 12' from 2002 to 2006 originates from smokers and includes waste items such as cigarette filters and cigar tips, tobacco packaging and wrappers. This percentage for the Mediterranean region is considerably higher than the global average for the same period (32 percent) and is certainly an area that has to be addressed by policy makers and targeted by public awareness campaigns.

By far the most common marine litter items in the Mediterranean are cigarette filters (closely followed by cigar tips), which constitute a real scourge for the region and can be found even in the most remote coastal areas. Thus, 57,810 volunteers collected 222,563 cigarette filters between 2002 and 2006 in the Mediterranean ICC, which corresponds to almost four cigarette filters per volunteer, while the global average in 2006 was only 0.2 cigarette filters per volunteer.

Recording of litter floating on the surface of the Mediterranean Sea

In the framework of this assessment exercise HELMEPA invited its member managing companies with ships traveling in or transiting the Mediterranean Sea to implement a programme for the monitoring and recording of litter floating on the sea surface. During the period of February to April 2008, 14 reports were received from HELMEPA member vessels containing information on litter observations from various sea areas in the Mediterranean, from the Straits of Gibraltar to South of Cyprus and from the Adriatic Sea to the Suez Canal. In total, observations of 1,051.8 nautical miles (nm) of Mediterranean Sea resulted in the recording of 500.8 kg of marine litter.

The main findings from the analysis of the recorded data were:

- Observations of floating marine litter were carried out over a distance of 1,051.8 nm (1,947 km) corresponding to an area of observation of approximately 172.8 km^2. The width of observation depended on the weather conditions, the sea state, the position of the officer in the navigational bridge who monitored the sea, the use of binoculars, the freeboard and volume of marine litter, etc., and generally fluctuated between 22 and 150 meters. Observations were carried out mainly in the eastern Mediterranean (Aegean Sea, Libyan Sea and Eastern Mediterranean Levantine Sea), in the Alboran Sea between Spain and Morocco and in the Adriatic Sea.
- The total number of marine litter items recorded was 366, corresponding to a concentration of one item per three nm or 2.1 items per km^2. The concentration of marine litter ranged from 0.08 to 71 items/nm. Relatively higher concentrations of marine litter were observed along routes close to coastal areas, while there were cases where lengthy observations (more than 120 nm) revealed no presence of marine litter.
- Plastics accounted for about 83 percent of marine litter items, while all other major categories (textiles, paper, metal and wood) accounted for 17 percent.
- To provide a more quantitative view of the data collected during the survey, each type of litter included in the Observation Log was given an approximate weight on the basis of conservative assumptions.
- The average quantity of marine litter was estimated to be 230.8 kg/km^2 ranging from 0.002 to 2,627 kg/km^2. Relatively heavy items such as steel drums, wooden pallets and crates observed on the sea surface were responsible for the greater quantity of marine litter in certain routes. In terms of the length of observation, the average quantity was 0.47 kg/nm.
- The survey verified the overwhelming presence of plastics in the Mediterranean Sea both in terms of number of items observed and mass estimation. Accurate conclusions about the geographic origin of plastics as well as the other types of marine litter cannot be reached since most of them can be easily carried by wind and currents and can circulate in the open sea.

Due to the uniqueness on a global scale of the availability of such data and the potential impact it may have on decision and policy making regarding solid waste management practices, HELMEPA will continue to record and analyse data on litter at sea provided by member vessels with the view to present it at international fora in which the Association participates.

Sources of marine litter in the Mediterranean

Sources of marine litter are traditionally classified into land-based or ocean-based, depending on where it enters the water. Other factors such as ocean current patterns, climate and tides, and proximity to urban centres, waste disposal sites, industrial and recreational areas, shipping lanes, and commercial fishing grounds influence the type and amount of marine litter found in open ocean areas or collected along beaches and ocean including underwater areas.

Figure 4 presents the sources of marine litter in the Mediterranean from 2002 to 2006 in accordance with data from the ICC provided by Ocean Conservancy and analysed by HELMEPA.

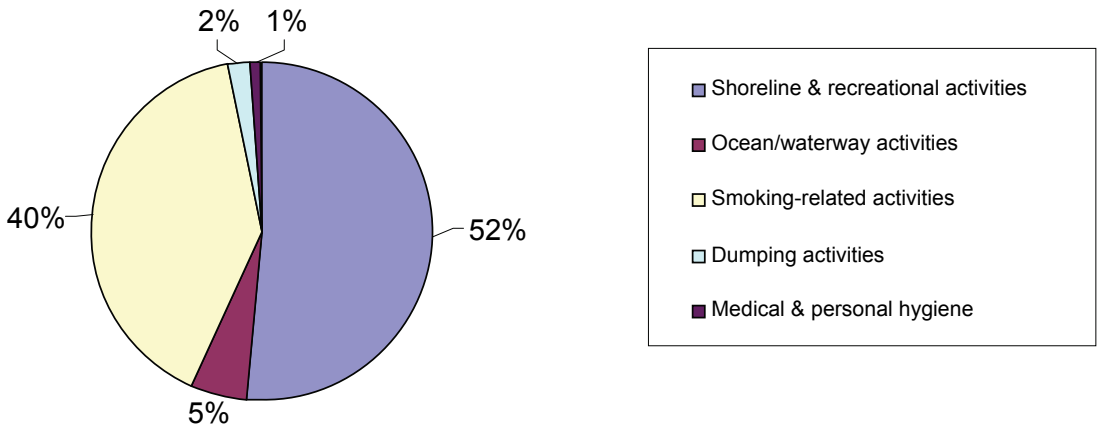

Figure 4. Sources of marine litter from Mediterranean ICC campaigns (2002 - 2006) (Source: Ocean Conservancy, ICC Annual Reports, 2002-2006).

According to the analysis of ICC data collected between 2002 and 2006, 52 percent of marine litter in the Mediterranean originates from shoreline and recreational activities. In general terms, this figure is in line with the global average.

Marine litter from smoking-related activities accounts for 40 percent of total marine litter in the same period. Although the number of litter items from smokers dropped significantly between 2004 and 2005, since 2005 it is on the rise again. The figure for the Mediterranean from 2002-2006 is considerably higher than the global average and constitutes a serious problem that has to be given priority in a Regional Strategy to address the issue of marine litter.

Another worrisome observation is that marine litter from shoreline and recreational activities and from smoking-related activities continues to increase from 2002 to 2003 and 2005 to 2006 despite the considerable decrease in the numbers of volunteers participating in the ICC campaigns in Mediterranean countries during in the same timeframe.

Sea and waterway activities account for five percent of marine litter in the Mediterranean and have remained steadily low throughout the period under review. This could largely be due to the fact that all vessels above 400 tons or carrying more than 15 persons are obliged to implement garbage management plans in accordance with international maritime law. It is also true that the situation concerning the availability of reception facilities in the major Mediterranean ports has also improved in recent years.

Prohibitions regarding the disposal of solid wastes are particularly strict in 'Special Areas' for the purposes of Annex V of the MARPOL 73/78 Convention. The Marine Environment Protection Committee (MEPC) of the International Maritime Organization (IMO) at its 57th Session (April 2008) decided that the status of 'Special Area' of MARPOL Annex V for the Mediterranean will take effect on 1 May 2009. Consequently, for all ships, beginning 1 May 2009, disposal into the Mediterranean Sea of the following is prohibited: all plastics, including but not limited to synthetic ropes, synthetic fishing nets and plastic garbage bags; and all other garbage, including paper products, rags, glass, metal, bottles, crockery, dunnage, lining and packing materials. The adoption of the resolution follows the notification at the same MEPC session by Albania,

Algeria, Croatia, Cyprus, Egypt, France, Greece, Israel, Italy, Lebanon, Malta, Monaco, Montenegro, Morocco, Slovenia, Spain, Syria, Tunisia and Turkey, representing States bordering the Mediterranean Sea 'Special Area', that adequate reception facilities for garbage are provided in all the relevant ports within the region.

However, problems still exist in relation to the operation and use of port reception facilities. Seafarers and shipping companies still complain that although crews on board merchant vessels may implement waste management plans including the separation of solid wastes in accordance with international legislative requirements, the efficiency of the shore-side management of these separated waste streams often remains in question. Ships should not be deterred from discharging waste to port reception facilities due to high costs, complicated procedures, unnecessary paperwork, excessive sanitary regulations or customs regulations. Furthermore, coastal municipalities must make sure that the wastes left in reception facilities are properly handled on land, in a manner that is optimal in terms of caring for the environment and human health.

It is essential that governments, local/port authorities, the maritime industry and other stakeholders enhance their cooperation in order to address all remaining problems regarding the availability of port reception facilities, and the collection, treatment and disposal of waste. This need is more urgent in the case of smaller fishing harbours and marinas where even greater problems exist.

Marine litter from **'**shoreline and recreational activities' has at its root cause the fact that the situation of solid waste management in most Mediterranean countries is still very poor. Funding, awareness and participation of individuals in good waste management practices are insufficient in this region. Current legal and illegal waste handling practices contribute to the presence of marine litter. The inadvertent release of litter from coastal landfills and garbage from water transports; recreational beach and roadside litter and the illegal dumping of domestic and industrial garbage into coastal and marine waters are practices contributing to the marine litter problem. A regional common framework, in tune with on-going global efforts, is necessary to create the conditions for curbing the problem of marine litter in terms of proper solid waste management practices and education and public awareness.

The overall goal in the Mediterranean should be to meet the main objectives of the GPA on marine litter, *to establish controlled and environmentally-sound facilities for receiving, collecting, handling and disposing of litter from coastal area communities and to reduce significantly, the amount of litter reaching the marine and coastal environment by the prevention or reduction of the generation of solid waste and improvements in its management, including the collection and recycling of litter.* Reduction of waste at the source, reuse, recycling (including composting), energy recovery and proper land filling should be the ways to achieve the goal of reducing the total quantity of waste that each Mediterranean country generates – the quantity reaching landfills, in particular – and to increase waste recovery and recycling. Indeed all the Mediterranean countries that replied to the questionnaires have responded that most of the above are priorities in the waste management schemes under development.

Marine litter from **'**shoreline and recreational activities' is also highly connected to tourism. The Mediterranean Sea is one of the biggest tourist regions in the world. Many of the tourist destinations are concentrated along the coast, with a heavy dependence on the marine environment. The most popular season is summer. Tourist revenues are of significant socio-economic importance for the coastal regions. Various businesses and industries are connected to tourism (hotels, restaurants, camping, agriculture, processing industry, shipping companies, etc.) and therefore a big challenge for municipalities handling this amount of solid waste.

During the summer season the inhabitants of seaside towns sometimes are twice as much as in wintertime. In some tourist areas, more than 75 percent of the annual waste production is generated during the summer season.

Research funded by the Balearic Government in 2005 focused on the origin and abundance of beach debris in the Balearic Islands, a main destination area for tourists. This fundamental study shows similarities to other tourism areas and is therefore very helpful regarding the sources of littering, which is highly connected to tourism. Litter found in the summertime is twice as much as in winter (Martinez-Ribes et al., 2007).

Israel achieved good results with their pollution abatement, Clean Coast Index, involving municipalities and NGOs in beach cleanups (Ministry of Environmental Protection, 2008). Although there is no data about the types and quantities of litter pollution in the coastal areas, the published index shows a 30 percent reduction of littered beaches. Raising public awareness with leaflets and competitions in tourism and public areas supported the strategy and ongoing efforts will be continued on a yearly basis to tackle the litter problem on the shorelines of Israel.

Tourism needs a clean environment and efficient handling of solid waste is a key issue in the planning of tourism zones. With globalization shifting power away from governments and into the hands of the private sector, despite the benefits from this trend, there are bound to be negative effects on the environment. According to the FEMIP study (FEMIP, 2007) governments may be in a weak position, with local travel and tourism becoming reliant on international tour operators and developers. The tourism sector-focused government regulation and intervention will be required, and governments have to understand the importance of travel and tourism within the economic, social and environmental sectors. Large tourism companies, such as Touristik Union International (TUI) with collaborative partners throughout the Mediterranean, started several years ago the collection of data sheets from their cooperating partners regarding waste production and management, due to the pressure for safer and more environmentally friendly tourism. Tourist information about environmental efforts is available in most of the hotels and "Green Teams" are recruited from the staff to support the environmental policy of the tourism companies. The tourism company Thomson in cooperation with TUI started to reward environmentally friendly hotels in 2006 with the 'Green Medal.' The first winner in the Mediterranean was a hotel in Cyprus.

Regarding beaches, there is a big gap between holiday resorts and public beaches. Hotel beaches are usually cleaned by hotel personnel on a daily basis during the summer and ashtrays are available on site. Most public sand beaches in tourism areas are jammed with cigarettes butts, as stated in the research of the Balearic Islands and confirmed by the beach cleanups of Mediterranean NGOs. Dustbins are usually overloaded and not covered, which is a problem for wind distribution of light items. Nevertheless, public users seem to be more careless in non-surveyed areas.

Environmental effects and socio-economic loss of marine litter in the Mediterranean

Impacts on wildlife and humans

Besides being an eyesore, marine litter also poses hazards and dangers for wildlife and people. Unfortunately, every year ICC volunteers find a variety of marine wildlife species entangled in or injured by marine litter items. There is a general lack of available data on marine wildlife affected by marine litter in the Mediterranean.

When settled on the seafloor, marine debris alters the habitat, either by furnishing a hard substrate where none was available before, or by overlaying the sediment, inhibiting gas exchange and interfering with life on the seabed. Floating debris may serve as rafts aiding the dispersal of epibionts – a potential vector for alien organisms. During its pelagic phase, floating debris provides a new, anthropogenic substrate for settlement of encrusting biota and other epibionts . Drifting debris, driven by winds and currents, provides opportunities for long-range transport of fouling assemblages, increasing their abundance and distribution with the proliferation of maritime flotsam (Galil, 2006).

A study of the loggerhead sea turtle*, Caretta caretta*, indicates a high frequency of occurrence of debris in their stomachs in the Mediterranean. The loggerhead, widely considered one of the emblematic animals of the Mediterranean, is classified as 'vulnerable' by the International Union for the Conservation of Nature (IUCN), and so attracts many conservation efforts. The impacts of maritime litter at the surface and seabed of the Mediterranean on the 'nonemblematic' biota are poorly documented beyond anecdotal finds of fish and larger invertebrates 'necklaced' with debris (Galil, 2006).

Marine litter may also endanger human health and safety. Sharp objects, such as broken glass and rusty metal, may cause serious injuries when people step on them on the beach or seabed. Contaminated medical and sewage wastes may pose a public health hazard through disease transmission. Abandoned fishing nets and lines may entangle scuba divers.

Secondary pollution from marine litter

In 2005, a methodology was developed by the Laboratory of Environmental Chemistry, University of Athens (Chalkiadaki, 2005), for determining secondary pollution caused by the leaching of pollutants from litter found on beaches, through laboratory simulation of natural processes. The pollutants found in the leachates were primarily heavy metals. The purpose of the study was to estimate the contribution of marine litter in the pollution of the sea by metals and to understand if litter, beyond its unfavorable effects as

debris, acts as secondary sources of heavy metals, particularly over the long periods of time that it takes to decompose, whether on the beaches or in the sea. The results of the study showed that marine litter indeed acts as a secondary source of trace metals, with cigarette butts (in increasing levels Cd<Pb<Cu<Zn) contributing considerably less than plastic bags. What is noteworthy is that trace metal concentrations are higher in rainwater than in seawater and increase the longer the litter item is exposed to rain or sea water.

Socio-economic impacts

Abandoned, lost or discarded fishing gear can have financial implications for the fishing industry, which will have to replace it. In addition, 'ghost fishing' as the result of lost and abandoned nets also kills thousands of fish and other wildlife. Marine litter may cause costly or irreparable damage to boats. Fishing nets can wrap around propellers, plastic sheeting can clog cooling water intakes and lost nets or lines can physically entangle vessels. In the Mediterranean, but also worldwide, there is little or no reliable data on what the exact costs are on vessel repairs, 'ghost' fishing, etc., as well as the costs that burden local authorities and other bodies for monitoring and cleanups. Furthermore, the loss of tourism and related revenues due to marine litter both on the beaches and in the sea, although recognized and considered, has not been quantified. Further research is needed for determination in quantifiable terms of the social and economic impacts of marine litter on the environment and the economies of coastal communities in the Mediterranean.

Marine Litter Monitoring (MLM) programmes in the Mediterranean

Various studies have dealt with the problem of debris in the marine environment. Most of the data concerns floating debris or litter along the coast, particularly on beaches where it is abundant. Although the debris is quite variable in type, plastic materials account for the major part because of their poor degradability. The typology of items found in the literature relates the quantity of marine litter to the inadequate handling of solid wastes, which can remain in the environment for long periods and be transported over long distances by winds, rivers and ocean currents. Municipalities in gulf or harbour areas have more problems with floating debris than with airborne or abandoned litter from tourist beaches.

Comprehensive surveys of marine litter on beaches have been made in many areas, often over a number of years, by various NGOs in the Mediterranean region. Valuable information about the quantity and composition of beach litter has been available in most of the Mediterranean countries.

There is a lack of official statistics from most of the Mediterranean countries. This is not due to lack of awareness of the issues surrounding marine litter or lack of data from various regions. Instead, the problem is the lack of standardization and compatibility between methods used and results obtained in these projects, which makes it difficult to compare data from different regions or make an overall assessment for the entire Mediterranean region. Nevertheless these MLM programmes provide examples of methods which could be used to address the problem of marine litter in the Mediterranean.

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

The University of Patras recently 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 composed of plastic (56 percent). The most burdened area was that of the Gulf of Patras (a major urban centre as well as fishing hub and commercial port) with a recorded number of items ranging between 188 and 437 per km^2.

The Gulf of Thessalonica and Piraeus/Greece

The programme for collection and estimation of floating litter in the Gulf of Thessalonica started in 2007 by the company "North Aegean Slops" (a Clean Up Greece member) on behalf of the Ministry of Macedonia and Thrace. The collection of marine litter was conducted using a special, technically equipped boat and an additional rubber boat for otherwise unreachable coastal areas. Total amount of solid waste collected from 1 June 2007 to 22 January 2008 was 395.5 per m^3. The collection and estimation is continuing on a monthly basis (Ministry of Macedonia and Trace, 2008).

The 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). The daily collection of floating debris from the port sea area (including the passenger and container ports) 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, the volume of marine litter is significantly higher, reaching an average of 2.96 m³ per day. 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. Although quantitative information with respect to 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' programme)

The 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' programme, applying the 'Environmental Problem Solving' concept. Based on a quantifiable Clean Coast Index (CCI), the results showed a significant improvement in coastal cleanliness. While at the starting date, June 2005, only 27 percent of the beaches were defined as 'clean' or 'very clean.' In December 2006, 80 percent of the coastal length was 'clean' and above (Figure 5) ((Alkalay et al., 2007). 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.

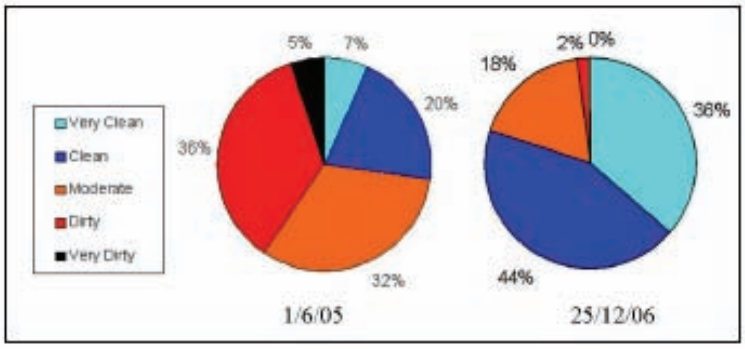

Figure 5. Clean Coast Index (CCI) at the beginning of the programme and at the end of 2006
Source: Ministry of Environmental Protection, 2008)

Balearic Islands/Spain

The abundance, nature and possible sources of litter on 32 beaches on the Balearic Islands were investigated in 2005. The mean summer abundance in the Balearics reached approximately 36 items per m, with a corresponding weight of 32 ± 25 g/m, which is comparable to the results of other studies in the Mediterranean. Cigarette butts were the most abundant item, accounting for up to 46 percent of the objects observed in the high tourist season. In contrast, plastics related to personal hygiene/medical items were predominant in wintertime (67 percent) and natural wood was the most important debris by weight (75 percent). 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* sea-grass 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 analysed 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.

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. Of the removed material, 46 percent is deposited behind dunes, 34 percent in unauthorized locations and only 20 percent in authorized locations. No separation of common litter and *P. oceanica* has been made.

Coasts of El-Mina and Tripoli/Lebanon

This project was 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 into six categories: (1) cloth; (2) fishing material; (3) glass; (4) metal; (5) paper; and (6) plastic, its volume estimated, data entered and processed in a GIS, percentages calculated and maps identifying the location of marine litter generated. All six categories were present in the waters of El-Mina and 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 intense human activity, 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 both human activity 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. 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 differences in the percentage of wastes collected during the five month period.

Ligurian Sea/Italy

The visual sightings of large floating debris were taken in the Ligurian Sea. Data were collected during three oceanographic cruises in the summer of 1997 and 2000. Results for 1997 suggest a debris density of the order of 15-25 objects km^2, while in 2000 a lower density of the order of 3-1.5 objects km^2 was found (Aliani et al., 2003).

Deep sea floor off the French Mediterranean coast

The distribution and abundance of large marine debris items were investigated on the continental slope and bathyal plain of the northwestern Mediterranean Sea during three oceanographic cruises undertaken in June 1994, July 1995 and April 1996 (Galgiani 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 zero to 78 pieces of debris/ha. In most stations sampled, plastic bags accounted for a very high percentage (more than 70 percent) 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.

Analysis of country questionnaires

In the framework of this assessment a questionnaire was prepared and sent by MED POL to all of the Contracting Parties. The questionnaire was a follow-up to what was sent in 2000 and the analysis of which resulted in the document *Litter Management in Coastal Zones of the Mediterranean Basin - Analysis of the Questionnaire and Proposals for Guidelines* (2001), which focused on the institutional and operational mechanisms that govern the management and monitoring of marine and coastal areas in the majority of the Mediterranean countries (MAP/UNEP, 2001).

Fourteen countries replied to the questionnaire including Bosnia and Herzegovina, Croatia, Cyprus, Egypt, France, Greece, Israel, Italy, Lebanon, Malta, Monaco, Morocco, Tunisia and Turkey. Although replies were not as complete as anticipated, they proved very helpful in confirming that the common problems, trends, obstacles and inadequacies and therefore needs are more or less the same as in 2000.

The majority of the Mediterranean countries integrate coastal litter management into their national policies, with few opting for more specific management of marine litter based on specific litter management policies.

Beaches and ports are still the focus of the policies and strategies. Litter management in relation to merchant ships, pleasure craft and marinas is integrated into most countries' policies and practices mainly due to relevant international conventions. With the coming into effect in 2009 of the Mediterranean Sea as a *Special Area* under Annex V of the MARPOL Convention this will be even further strengthened. The majority of the countries continue, after eight years, to neglect litter management of the seabed.

The Ministry of the Environment remains the 'actor' most involved in litter management but there seems to be a noted increase in the sharing of this responsibility with other Ministries as well. Municipalities and port authorities have followed suit, as was expected. The identification of the lack of coordination between these stakeholders, as well as those of a lesser role, as a main obstacle, was a clear deduction from the latest set of replies.

Control and enforcement remains the main role of the environmental authorities in litter management in practically all the countries that replied to the questionnaire, with their follow-up and juridical role coming in second and third respectively. The operational role lies mainly with the municipalities, which are responsible for litter management.

A major shortcoming identified in 2001 was the lack of mechanisms for collecting information and monitoring trends in the areas of concern. It seems that Croatia is one of the few exceptions that have since 2000 adopted special institutional and legal indicators. In terms of technical indicators, the amount of waste collected remains the most commonly adopted indicator for the reasons described in the 2001 analysis.

Cost effective abatement programmes with a high level of public awareness and participation were rated as the two priorities for on-the-ground action. Fund allocations and sectoral professional awareness closely followed suit, confirming the validity of a number of proposals of the 2001 Guidelines relating to prioritization of the mobilization of resources and training and capacity-building activities.

Gaps, needs and proposals

The main reasons that the problem of marine litter has not been successfully addressed in the Mediterranean can be summarized as follows:

- The lack of international legal instruments (except for IMO/MARPOL Annex V which deals only with garbage from ships) or Global Programmes – makes it difficult to tackle the problem.
- The main legal and institutional frameworks affecting the Mediterranean are: (1) Local Agendas 21; (2) national legislation on waste management and environmental protection; (3) the Barcelona Convention and its Protocols; (4) the Mediterranean Strategy for Sustainable Development (MSSD); (5) MEDPOL of UNEP; (6) the EU Environmental Strategy for the Mediterranean and Horizon 2020; (7) the EU Marine Strategy Directive; (8) the EU Thematic strategy on the Prevention and Recycling of Waste; (9) the IMO MARPOL 73/78 Convention – Annex V; (10) the GPA and the Regional Seas Programme of UNEP; and (11) the Basel Convention.
- There is non-existent, insufficient or ineffective coordination among the various institutions and authorities – both national and regional – involved in environmental management and more specifically in waste management. It is thus necessary to ensure the involvement and cooperation of administrative stakeholders at different levels and regional/national scales and obtain the vertical integration and cooperation among the various sectoral branches of the administration (fisheries, tourism, environment, industry, port activities, etc.).
- In several Mediterranean countries there is no adequate regulatory framework to organize the management of coastal wastes. Most commonly there is a lack of (1) liability for bad practices of waste handlers (producers, transporters, or those that are entrusted with disposal); (2) classification of waste by nature and origin; (3) regular and specific monitoring of the waste from production to disposal; (4) effective penalties for offenders; and (5) application and enforcement of existing laws and regulations.
- Major problems are encountered in the application of economic instruments (mainly fines and taxes), e.g., inadequate and ineffectual administrative organization, non-payment of taxes, the human factor, very low fines and the inadequate follow-up.
- There is a lack of the technical tools, means and expertise, at regional and national levels, needed to focus and prioritize actions for better management of coastal waste.
- There is very little and inconsistent information on quantities, flows, and handlers of marine litter. Available data and information are often useless for planning and investment purposes. Urgent actions are required to improve the present situation.
- There is a need for further information on the impacts of marine litter on humans and the ecosystem.

- There is a need for communication, transparency and coordinated action with the various economic sectors that are part of the marine litter problem in the Mediterranean (e.g. tourism and public - private partnerships) in terms of the need to protect and preserve the marine environment from macro-waste.

Cigarette butts are an abundant litter item on Mediterranean beaches. © Clean Up Greece

Awareness campaigns and educational programmes have been isolated and short-term efforts and have addressed in a non-integrated way focusing on the problem of marine litter in the Mediterranean. A recent exception to this was the 'Keep the Mediterranean Litter-free' campaign which was jointly launched in 2006 by MIO-ECSDE, HELMEPA and Clean Up Greece with the support of UNEP/MAP but with very few resources to give it the appropriate momentum.

Perhaps most importantly, there has not yet been a concerted regional response to the problem of marine litter in the Mediterranean through a harmonized regional coastal waste management scheme, taking into account national specificities, needs, opportunities and priorities.

The above should be integrated within the development of national and local strategies for the integrated management of solid waste, including what eventually becomes marine litter, according to regional guidelines (Action Plan or Framework Strategy) for the proper management of coastal and marine litter. A prerequisite for this would be the review and enhancement of related national legal, technical and financial instruments; the development of strategies and approaches for better implementation and enforcement of MARPOL Annex V and for funding high cost initiatives (such as port reception facilities, landfills, fisheries, etc.); the allocation of legal responsibilities and financial resources to local authorities for regular and mandatory beach and river cleanup operations, etc.

Summary of findings

The main findings of the assessment can be summarized as follows:

- Although useful data on marine litter exists in the region (types, quantities, etc.), it is inconsistent and geographically restricted mainly to parts of the North Mediterranean. Standardized research data for statistical purposes concerning the problem of litter in the Mediterranean is a necessity. Furthermore, information sharing between and among NGOs, IGOs, research institutes, relevant authorities, etc., in the Mediterranean regarding litter data needs to be improved.
- Previous deductions that most of the Mediterranean marine litter is from land-based sources, rather than ships, were confirmed.
- Marine litter on beaches in the Mediterranean originates from shoreline and recreational activities and is composed mainly of plastics (bottles, bags, caps/lids etc.), aluminium (cans, pull tabs) and glass (bottles) at 52 percent. In general terms, this figure is in line with the global average in the same period (2002-2006). Marine litter from smoking-related activities accounts for 40 percent, considerably higher than the global average.
- In terms of marine litter items floating in the sea, plastics account for about 83 percent, while all other major categories (textiles, paper, metal and wood) account for 17 percent.

- Most of the countries that provided input to this assessment are undergoing a series of policy reforms relating to marine litter, covering the whole range from waste prevention practices all the way to environmentally-sound disposal practices of waste, with a view to involving a wide range of stakeholders. Administrative coordination, budget allocation, technical capacity and weak enforcement remain the primary obstacles. On the up-side, there is a clear indication that private sector involvement is increasing. No country has any kind of cross-border collaboration scheme on the issue of marine litter management.
- With the signing of the Integrated Coastal Zone Management (ICZM) Protocol in January 2008 by Algeria, Croatia, France, Greece, Israel, Italy, Malta, Monaco, Montenegro, Morocco, Slovenia, Spain, Syria and Tunisia and the coming into effect in 2009 of the Mediterranean Sea as a 'Special Area' (under Annex V of the MARPOL 73/78 Convention), marine litter management will be further strengthened.
- The economic impact of marine litter has not been addressed in the region, while region-specific impacts on nature and humans need to be further identified and explored.

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Marine litter in the Northeast Atlantic region
Assessment and priorities for response

Introduction

The Northeast Atlantic Sea area covered by the 1972 Oslo Convention and the 1974 Paris Convention was consolidated in the 1992 OSPAR Convention and defined as extending westwards to the east coast of Greenland, eastwards to the continental North Sea coast, south to the Straits of Gibraltar and northwards to the North Pole.

The Convention for the Protection of the Marine Environment of the Northeast Atlantic (the "OSPAR Convention") was opened for signature in September 1992 and came into force in March 1998. The Convention has been signed and ratified by all of the Contracting Parties to the original Oslo or Paris Conventions (Belgium, Denmark, the European Community, Finland, France, Germany, Iceland, Ireland, the Netherlands, Norway, Portugal, Spain, Sweden and the United Kingdom of Great Britain and Northern Ireland) and by Luxembourg and Switzerland.

The OSPAR Convention replaces the Oslo and Paris Conventions, but decisions, recommendations and all other agreements adopted under those Conventions will continue to be applicable, unaltered in their legal nature, unless they are terminated by new measures adopted under the 1992 OSPAR Convention. The Convention establishes the OSPAR Commission, as successor to the Oslo and Paris Commissions, to administer the Convention and to develop policy and international agreements in this field.

The United Nations Environment Programme (UNEP) and the OSPAR Commission signed a Memorandum of Understanding in October 2007 through which UNEP supported OSPAR to assess the scale of the problem and the main sources of marine litter in the Northeast Atlantic and to propose response actions. This was done through the development of the document *Assessment of the Marine Litter problem in the Northeast Atlantic region and priorities for response.*

The purpose of this report was to assess the amounts, types and sources of marine litter as well as investigating their environmental and socio-economic impacts and to draw together information on legislation, programmes and measures and organizations involved with marine litter issues. To facilitate this, National Contacts representing each Contracting Party were asked to complete a questionnaire on marine litter after consulting with competent organizations within their country. Unfortunately no response was received from Denmark or Portugal. This report will contribute to the background report for the marine litter section of the OSPAR Quality Status Report, which will be produced in 2010.

There is one clear picture that emerges from the data that has been collected in this assessment of marine litter in the OSPAR maritime area and that is, despite year to year variability, the overall amount of marine litter is consistently high and is not decreasing, despite recent efforts. The results for the OSPAR Pilot Project on Marine Beach Litter Monitoring showed that from 2001 to 2006 there was no statistically significant increase or decrease of the amount of marine beach litter in the Northeast Atlantic. However, the spatial distribution of marine beach litter was significantly different throughout the area.

Despite the consistent picture of large amounts of marine litter, there are still gaps in the data characterizing the status of marine litter in this region. Most of the available information comes from beach monitoring of litter, but outside the OSPAR monitoring programme almost all the monitoring is undertaken by local authorities or NGOs with very little harmonisation between countries. The data is also not collected centrally within Contracting Parties and in relation to floating litter at sea and on the seabed there are relatively few studies being conducted. Therefore, analyzing the problem in the Wider Atlantic is extremely difficult.

The objective of this chapter is to present a summary of the document *Marine Litter in the North-East Atlantic Region: Assessment and priorities for response (OSPAR, 2009)*.

Littered shore in the Shetland Isles. © OSPAR

Amounts found on coastlines

In the 2007 OSPAR Commission pilot study, *Monitoring of marine litter on beaches in the OSPAR Region,* on average 542 items of marine litter of varying sizes were found per 100 m survey on the reference beaches. Surveys were also made on one km stretches for larger items (>50 cm in any direction), but included some items smaller than this. On the one km stretches on reference beaches, an average of 67 marine litter items were recorded (OSPAR Commission, 2007a).

The total number of marine litter items found per stretch of beach varied considerably among beaches and surveys in different regions (Figure 1). On average, significantly more items were found on beaches in the northern regions (northern North Sea and the Celtic Seas) than on the beaches on the Iberian coast and in the Southern North Sea. The highest levels recorded during the OSPAR Pilot Project were in the Greater North Sea Region with 600-1400 items per 100 m of beach surveyed in the Northern North Sea and 200-600 items per 100 m in the Southern North Sea. In the Celtic Seas, levels were also high with 600-800 items per 100 m; however in this case levels were higher in the south, as shown by the MCS Beachwatch Survey 2007, where 3,230 items per km were monitored in the southwest of England compared to 1,057 items per km in Northern Ireland. Marine litter levels on the Bay of Biscay and Iberian Coast were much lower with only 100-300 items per 100 m. In France, anecdotal evidence from local authorities suggests that on average around 30 tonnes of marine litter are collected per km per year (OSPAR Commission, 2007a).

The Wider Atlantic and Arctic Waters are likely to have the lowest levels. However, due to lack of quantitative data for these areas, it was not possible to carry out an assessment. There were no statistically significant trends of either a decrease or increase in the average number of marine litter items found. However, the average number of items of marine litter found per 100 m stretch was already high, so this lack of an observable trend should not be interpreted as a positive sign.

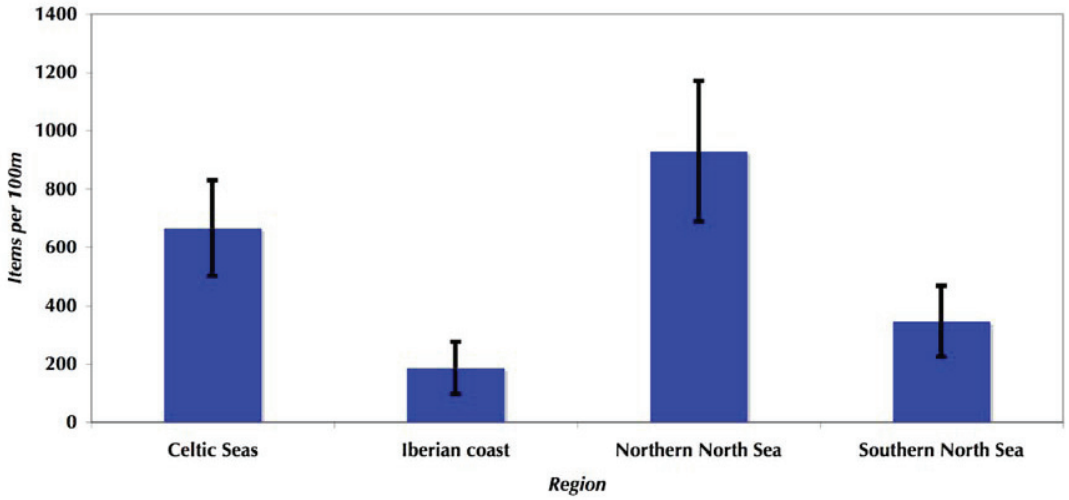


Figure 1. Average number of marine litter items per 100 m on the reference beaches
Source: OSPAR Commission 2007a.

Small plastic/polystyrene pieces were the most common and abundant type of marine litter items, followed by rope/cord/net pieces, for all reference beaches (Figure 2) (OSPAR Commission 2007a).

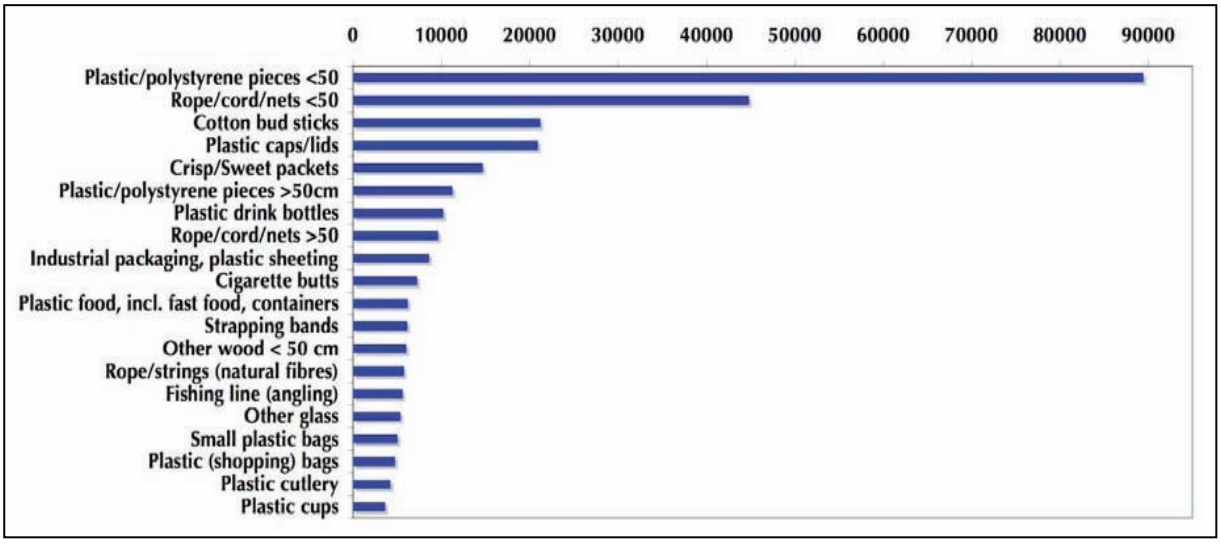


Figure 2. Most common (total numbers) items on reference beaches
Source: OSPAR Commission 2007a.

Changes in the composition of marine litter items on the reference beaches during the six-year period of the OSPAR marine litter monitoring project, in eleven categories used in the beach survey protocol are presented in Figure 3.

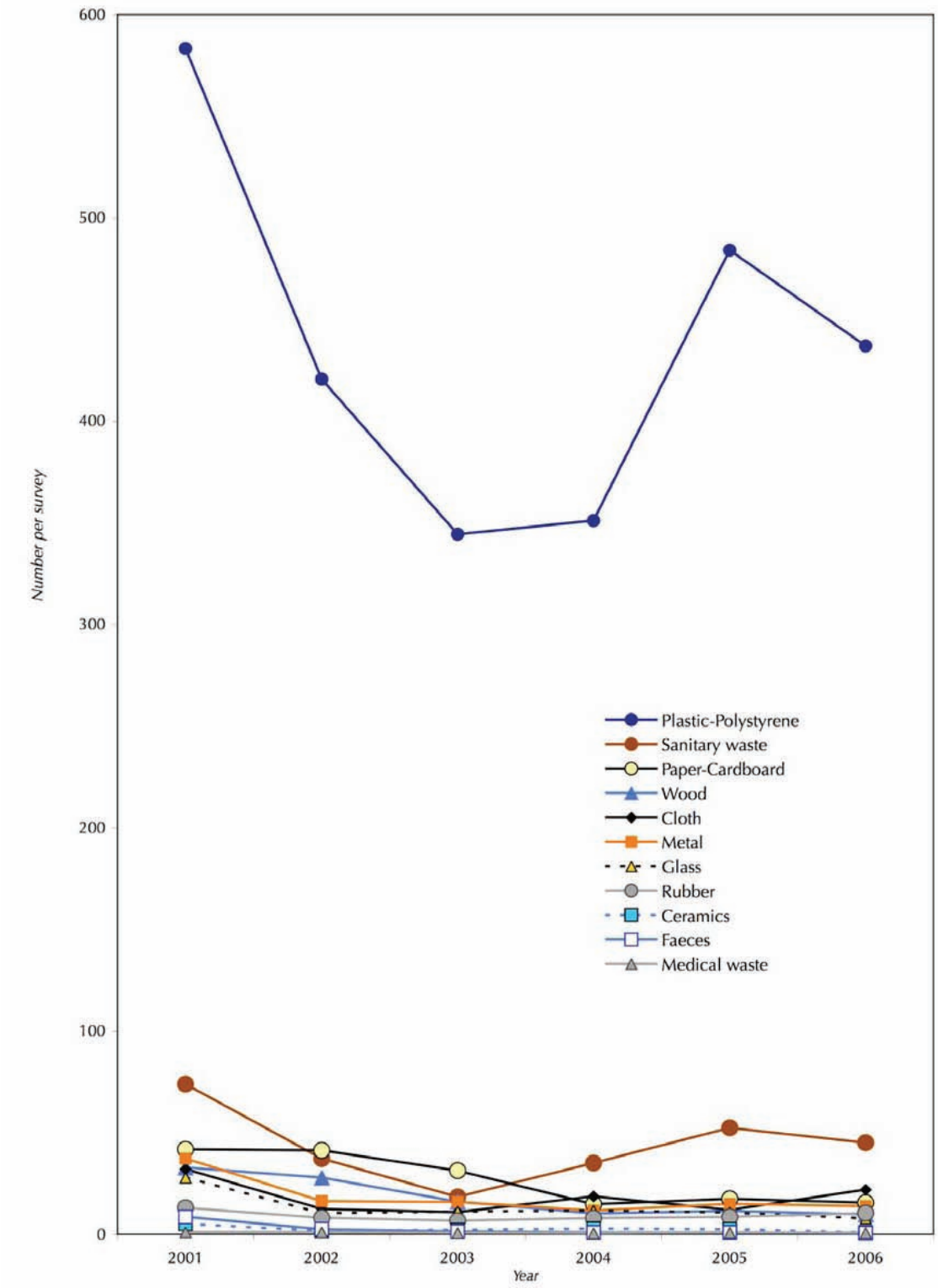


Figure 3. Average number of items in different categories
(Source: OSPAR Commission, 2007a).

Amounts found at sea

A study by Galgani et al. (2000) investigated the distribution and abundance of large items of marine litter on continental shelves and slopes along European Seas, including the Baltic Sea, the North Sea, the Celtic Sea, the Bay of Biscay and different areas in the north western basin of the Mediterranean Sea and the Adriatic Sea. On the basis of 27 oceanographic cruises undertaken between November 1992 and August 1998, different types of litter 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 in concentration, which ranged from 0 to 101,000 pieces of litter per km^2. In most of the stations sampled, plastic (mainly bags and bottles) accounted for a very high percentage (more than 70%) of total number of litter items and accumulation of specific litter, such as fishing gear, was also common. In some areas, only small amounts of litter were collected on the continental shelf, mostly in canyons descending from the continental slope and in the bathyal plain where high amounts of litter were found down to more than 500 m. Dives using the manned submersibles, *Cyana* and *Nautile,* between 50 and 2700 m allowed accumulation areas to be detected on the sea floor. Analysis of these results revealed the influence of geomorphologic factors, local anthropogenic activities and river inputs. Temporal trends indicated seasonal variations in the northern part of the Bay of Biscay. Accumulation areas were detected 200 km west of Denmark, in the southern part of the Celtic Sea and along the southeast coast of France.

A study of microscopic plastic found at sea, undertaken by Thompson, *et al.* (2004) in the UK (OSPAR Regions I, II and III) showed that microscopic plastic fragments and fibres are also widespread in the oceans and have accumulated in the pelagic zone and sedimentary habitats. The fragments appear to have resulted from degradation of larger items. Marine organisms have also been shown to ingest plastic materials of this size, but the environmental consequences of this contamination are still unknown. To assess the extent of contamination, an additional 17 beaches were examined. Similar fibres were found, demonstrating that microscopic plastics are common in sedimentary habitats. To assess long-term trends in abundance, plankton samples collected regularly were examined since the 1960s along routes between Aberdeen and the Shetlands (315 km) and from Sule Skerry to Iceland (850 km). Undetermined particles, some being identified as plastic, were found archived among the plankton in samples back to the 1960s, but with a significant increase in abundance over time. Similar types of polymers were found in the water column as in sediments, suggesting that polymer density was not a major factor influencing distribution.

Amounts of marine litter at sea have also remained consistent, but show varied spatial distribution with litter on the seabed varying significantly from 0 to 101,000 pieces of litter per km^2 due to topological and tidal differences. The Greater North Sea background study into the Ecological Quality Objective (EcoQO) on plastic particles in fulmars stomachs showed that there was a reduction in the amount of litter at sea during the late 1990s, with the average amount of plastic per bird falling from 0.5g to 0.3g, however, this has now levelled off and there has been no reduction in recent years. In the Bay of Biscay strong seasonal variation was noted with seven times more litter found on the seabed in winter compared to summer.

Fulmars feeding at sea taken from Fulmar Litter EcoQO Monitoring in the North Sea - results to 2006. © OSPAR

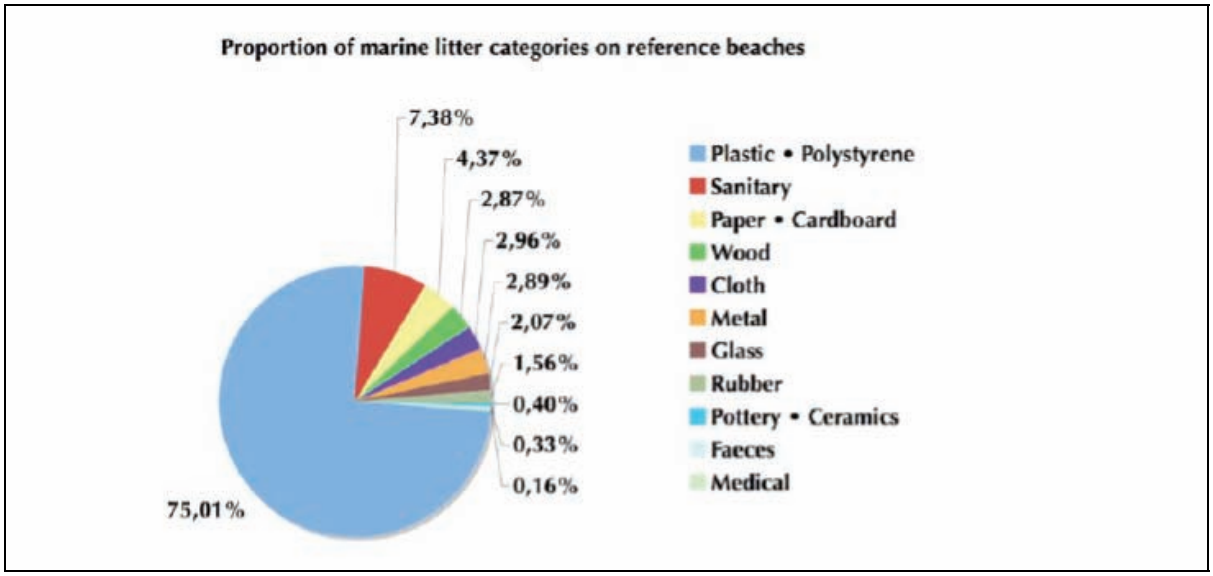
As a part of the “Save the North Sea Project” and in other “Fishing for Litter” projects, the monitoring of seabed marine litter showed the proportion of plastic varied from 55 percent in the Celtic Seas to 38 percent in the Greater North Sea. However other items such as metal (23 and 13 percent), rubber (25 and 9 percent) and wood (10 and 11 percent) respectively, made up a greater proportion of the total number of items compared to marine litter monitored on beaches. This is as expected as many types of plastic float and therefore are concentrated on the surface of the sea and at the coastline whereas heavier items sink to the seabed (Save the North Sea, 2004).

Types of marine litter in the North-East Atlantic

Types at coastline

Marine litter can be accidentally lost material (fishing gear, cargo), deliberately left by people on beaches and shores or thrown overboard from ships. Globally reported marine litter consists of many items, for example: plastic products (coffee cups, takeaway food containers, packing material), fishing gear, rubber, glass, wood, metals, sanitary and sewage-related litter, clothing, paper and cardboard (OSPAR Commission, 2004). Of all marine litter items found in all 100 m surveys on the regular reference beaches in the OSPAR Maritime Area, an average of 75 percent was made of non-degradable plastic and/or polystyrene (Fig. 4). Plastic and polystyrene was the most common type of marine litter found also in the 1 km surveys on the reference beaches, accounting on average for almost 66 percent of the total (OSPAR Commission, 2007a).

Figure 4. Proportion of different categories of marine litter found on reference beaches during the project period 2001–2006



Source: OSPAR Commission, 2007a.

Sources of marine litter in the Northeast Atlantic region

Marine litter enters the region from both land-based sources and sea-based sources. It can be brought indirectly to the sea or coastal areas by rivers, drains, sewage and storm water outflows or winds. Land-based sources include tourism or recreational visitors to the coast, fly tipping, local businesses and unprotected waste disposal sites. Recognized sea-based sources for marine litter are shipping (commercial, recreational and other), the fishing industry and offshore oil/gas installations.

Identifying sources of marine litter is difficult as many types of items can come from multiple sources. This is demonstrated in the Beachwatch survey, in the UK, where the largest category is non-sourced items at 42 percent of the total, with recreation beach users at 35 percent and fishing at 14 percent. The OSPAR Pilot Project on Marine Beach Litter Monitoring identified several indicator items specific to different sources in attempt to analyse trends. However, analysis of the data for the whole of the OSPAR region

showed a consistent picture with no trends in shore-based sources such as tourism or sanitary wastes. There was also no trend for the sea-based sources of galley waste and shipping, although fishing sources did show an increase from 2001 to 2006.

Land-based sources

Land-based sources and recreational users of the coast have been found to contribute the largest percentage to beach litter in several surveys (MCS Beachwatch, 2007). The OSPAR Pilot Project identified indicator items to analyse trends in different sources of marine litter (Table 1).

Table 1. Source-specific indicator items selected for the purpose of the analysis of beach data in the pilot project (OSPAR Commission, 2007a).

Source	Indicators
Fisheries, including aquaculture	Jerry cans, fish boxes, fishing line, fishing weights, rubber gloves, floats/buoys, ropes/cords/nets <50 cm, and >50 cm respectively, tangled nets/cords, crab/lobster pots, octopus pots, oyster nets and mussel bags, oyster trays, plastic sheeting from mussel culture ("Tahitians")
Galley waste from shipping, fisheries and offshore activities (*non*-operational waste)	Cartons/tetrapaks, cleaner bottles, spray cans, metal food cans, plastic gloves, plastic crates
Sanitary and sewage-related waste	Condoms, cotton bud sticks, sanitary towels/panty liners/backing strips, tampons/tampon applicators
Shipping, including offshore activities (*operational waste*)	Strapping bands, industrial packaging, hard hats, wooden pallets, oil drums (new and old), light bulbs/tubes, injection gun containers
Tourism and Recreational activities	4-6-pack yokes, plastic shopping bags, plastic bottles/containers for drinks, metal bottles/containers for drinks, plastic food containers, glass bottles, crisp/sweets packets and lolly sticks

During the period 2001-2006 although levels of indicators of sanitary waste or tourism fluctuated, no statistically significant trends were demonstrated. However, the initial levels of the items were already high, 50 items from sanitary waste and about 60 items from tourism, per 100 m surveyed so the lack of any trend pattern should not be interpreted as a positive indicator.

Sea-based sources

Ocean-based sources of litter include commercial shipping, fishing vessels, passenger cruise liners, military fleets, research vessels, passenger ferries, tugboats and barges, offshore oil and gas platforms, offshore industry service vessels and recreational boats. Items ranging from large oil drums and storage pallets to everyday domestic waste from galleys continue to be discharged at sea, despite international legislation such as Annex V of the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) (MCS Beachwatch, 2007). One particular area of concern was the increase in lost containers from shipping, especially in the wake of the MSC Napoli grounding in January 2007 in Lyme Bay, UK.

The OSPAR Pilot Project 100 m beach survey data, during the project period of 2001 to 2006, indicated that the number of fishing indicator items (including aquaculture indicator items) found in the surveys increased during the project period. The increase was statistically significant on the reference beaches. It should be noted that no statistical analysis was conducted for other ocean-based sources including galley waste or shipping wastes.

Environmental effects, economic losses and other negative effects caused by marine litter

The presence of marine litter on beaches and in the water has a wide range of impacts on a number of interests. Damage to wildlife, marine ecosystems, the aesthetic quality of beaches, recreational and fishing interests and risks to health and property are all part of the price that is paid for the irresponsible and accidental disposal of litter (Hall, 2000).

Ecological/environmental effects

Marine litter can have a severe impact on marine life and incidents involving litter are very common in the North Sea. It affects wildlife such as seals, whales and sea turtles as well as seabirds either through entanglement by ropes and fishing gear or by ingestion of different kinds of marine litter.

Anecdotal evidence shows that a wide range of organisms are affected by either entanglement in or ingestion of marine litter including birds, seals, sea turtles, porpoises and whales. In addition to the direct impacts, there is evidence that invasive species have also been carried into the region by marine litter, as in the case of the exotic barnacle species *Elminius modestus,* which has been found on plastic on the shoreline of the Shetland Islands.

The only quantitative data on the environmental impact of marine litter is from the background study into the EcoQO on plastic particles in the stomachs of fulmars. Averaged for the whole North Sea, 94 percent of birds investigated contained plastic; on average 34 pieces and 0.30 gram mass and 55 percent of all birds exceeded the level of 0.1 gram of plastic in the stomach much higher than the preliminary EcoQO target of 10 percent.

Abandoned, lost or otherwise discarded fishing gear (ALDFG)

Lost or abandoned fishing gear is a significant and very persistent form of marine litter. It poses a threat to the marine environment, as well as human life and activities. The Regional Seas Programme of UNEP recognises the immediate and direct interconnection between marine litter and lost/abandoned fishing gear and related debris. Lost/abandoned fishing gear has increasingly becoming a world-wide problem. By putting prominent emphasis on the effort to address the issue of lost or abandoned fishing gear within the wider context of marine litter, UNEP's Regional Seas Programme can act as a platform for developing common regional objectives, promoting synergies and coordinating regional implementation (UNEP Regional Seas Programme, 2005).

Even when the lost nets sink from the weight of their 'catch', the persistent nature of the synthetic materials from which they are made means that they can continue to damage the seabed and affect commercially important shellfish species for many years. An estimated USD 250 million (about €161 million or £127 million) in marketable lobster is lost every year due to 'ghost' fishing (http://marine-litter.gpa.unep.org/facts/facts.htm).

According to the Norwegian Fisheries Directorate, efforts to collect and take up lost fishing nets have been made regularly since 1983. On average, about 500 nets are found and removed every year (with a peak in 1992, when some 1,200 nets were removed). However, it is assumed that considerably larger amounts of fishing nets are lost and not reported. Since 1989, it has been stipulated in Norwegian legislation that when nets are lost during fishing for cod, haddock and saith, this should be reported to the Norwegian Coastguard (OSPAR Commission, 2007b).

The Marine Institute and BIM (Irish Sea Fisheries Board), together with Seafish and CEFAS from the UK have recently began an EU-funded project (DEEPCLEAN) focusing on assessing the extent and effect of lost, discarded and abandoned gillnets on the shelf edge and deepwater fisheries off the coast of Ireland and the UK. The DEEPCLEAN surveys planned for 2008 will be the largest coordinated retrieval exercise conducted in the Northeast Atlantic (a total of 80 days) and will cover a wide area off the coast of Ireland and the UK.

Socio-economic effects

Marine litter can cause serious socio-economic losses to various sectors and authorities. In 2000, KIMO International presented the results of a two-year project to investigate the economic and social impacts of marine litter on coastal communities (Hall, 2000). The report demonstrates the significant costs to coastal communities not previously acknowledged and demonstrated not only that polluters of the oceans are not being apprehended, but that they are not being made to pay for their actions either.

Marine litter may have impacts on human health and local economics including the loss of tourism and recreational potential, repeated cleanup costs, fouling of marine equipment and fishing gear, direct competition with fisheries (ghost fishing) and reduced value of catches (MCS Beachwatch, 2007).

The primary cost to local authorities throughout the study area was for beach cleaning. The UK Tourist Boards responding to this survey reported that each year more than 34 million people visited the coast and spend an estimated £1.4 billion (about €1.8 billion) visiting coastal attractions. In comparison with these high numbers, the number of complaints about the state of the beach received by tourist boards remains low, with less than 200 being reported annually. These complaints are generally about dog fouling, sewage or broken glass. Tourist Boards also stated that they received a few reports of actual injuries occurring on the beach due to marine debris. In the Den Haag municipality, expenses for annual beach cleaning are €626,709 (about £493,804).

The fishing industry has long been considered a major contributor to marine pollution but little work has been done on the effects of marine debris and other pollution on the industry. Shetland fishermen were questioned about the effects of marine debris on their fishing activities. They responded that 92 percent of them had recurring problems with accumulated debris in nets, 69 percent had had their catch contaminated by debris and that 92 percent had snagged their nets on debris on the seabed. Many also experienced fouled propellers and blocked intake pipes. On average one to two hours per week is spent clearing debris from nets. The debris could cause a restricted catch and many boats avoided particular fishing areas altogether due to the high concentrations of debris. The catch itself, as well as nets and other equipment, could be contaminated by oil containers, paint tins, oil filters and other chemical wastes. This may cost up to £2,000 (about €2,500) in lost revenue each time. Large items such as wires and old nets may be collected off the seabed and may damage the nets. A fouled propeller could cost up to £300 (about €380) for the hire of a diver to disentangle it. A substantial amount of fishing time could also be lost.

It is estimated that each boat could lose between £6,000 (about €7,600) and £30,000 (about €38,000) per year due to the effects and presence of marine debris. If 50 percent of the Shetland fishing fleet was affected in the same way, the cost to the local industry could be between £492,000 (about €624,000) and £2,460,000 (about €3,120,000). The cost of marine debris to the fishing community of the Bohus region of Sweden was estimated at over £620,000 (about €786,296) each year. According to reports from fishermen in both Shetland and Esbjerg, small inshore boats appear to be more susceptible to marine debris than large pelagic boats. This is because the larger offshore boats are fishing mid-water and are therefore less likely to collect debris on or near the seabed. Smaller boats may also notice the presence of marine debris more than larger boats as they have less crew and a lower profit margin, so any time or money lost would affect them more.

Harbour authorities throughout the UK reported over 180 incidences of propeller fouling during 1998. The cost of hiring a diver was between £100-£400 (about €127- €507). In some cases, the vessel was required to be lifted out by crane to remove the fouled material. Fouled anchors were also known to have delayed vessels and in some cases, caused safety concerns during bad weather. Some harbour authorities also undertook additional dredging or removal of items from the seabed. A survey of 42 harbour authorities reported that up to £26,100 (about €33,000) is spent per year in some ports, often to clear fouled propellers and remove debris from the water discarded fish boxes were a problem in many harbours.

In 1998, the Royal National Lifeboat Institution (RNLI) attended over 200 incidents to vessels with fouled propellers. The rescues were divided equally between fishing vessels and pleasure craft. As noticed by the marina managers, the RNLI data confirmed that there are more incidences of recreational boats becoming fouled in the summer months. It is estimated that the cost to the RNLI to undertake these rescues is on average £900,000 (about €1,141,402) each year.

In many exposed coastal areas, and in particular island areas, marine debris may be blown from the shore onto neighbouring farmland. For example, in Shetland, 96 percent of responding crofters had experienced problems with debris blowing onto their land. They may spend up to three hours per month removing debris from their fields. Debris may also collect on fences causing damage to them and in drainage ditches. Up to five animals per croft may become entangled in marine debris each year. It is estimated that marine debris may cost affected crofters £400 (about €507) each year in Shetland.

Power stations reported having to clean their water intake screens more often due to accumulations of marine debris. The amount of debris removed from the screens varies between 100-10,000 tonnes depending on location each year. This may cost the company up to £50,000 (about €63,465) to remove the debris with additional costs for pump maintenance.

Existing legal regimes related to marine litter in the Northeast Atlantic

There are numerous legal instruments at the international, regional and country level in the OSPAR region that are being implemented by OSPAR countries. Among the international instruments are: (a) United Nations Convention on the Law of the Sea (UNCLOS); (b) International Convention for the Prevention of Pollution from Ships, 1973 (MARPOL 73/78) Annex V; (c) London Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972 (LC); (d) Agenda 21 and the Johannesburg Plan of Implementation; (e) Convention on Biological Diversity, with the Jakarta Mandate; (f) EU Directive on port reception facilities for ship-generated waste and cargo residues (EC2000/59); (g) The Waste Framework Directive 75/442/EEC; (h) EU Marine Strategy Framework Directive; (i) EC Urban Waste Water Treatment Directive (97/27/EEC); (j) EU Environmental Liability Directive (2004/35/EC); and (k) EU Directive on Packaging and Packaging waste (Directive 2004/12/EC).

Programmes and measures in the Northeast Atlantic

The OSPAR Pilot Project on Monitoring Marine Beach Litter (2000-2006), and the designation of the North Sea as a 'Special Area' for the purpose of Annex V to MARPOL 73/78, are two examples of practical actions taken to deal with marine litter in the OSPAR Maritime Area. Some countries have also taken some initial steps to address the marine litter issue through different programmes and initiatives improving their waste management practices, supporting beach cleanup activities, 'Fishing for Litter' (OSPAR Commission, 2007b) projects, national litter campaigns, Adopt-a-Beach schemes, as well as through the initiation of information, education and public awareness programmes.

The OSPAR Pilot Project on Monitoring Marine Beach Litter (2000–2006) has been the first region-wide attempt in Europe to develop a method for monitoring marine litter on beaches and to assess presence of marine litter on the beaches in the OSPAR region, using this standardized method. A total of 614 regular beach surveys were conducted at 51 reference beaches in eight countries during the pilot project period, 2001–2006. In addition, 10 surveys were made during 2006 on four beaches in France (not classified as regular reference beaches). The results presented in this report are mainly based on the statistical analyses of data from the 609 surveys made on regular reference beaches.

As part of the "Save the North Sea" campaign an initiative called 'Fishing for Litter' involved fishermen from Sweden, Denmark, Holland and the UK, who were asked to return all litter caught in their nets to shore. In return for bringing litter back to shore the project paid the waste costs. The project was launched in June 2003 and by December 2004 the scheme had collected 500 tonnes of litter from 60 boats. Since then, additional projects have been initiated in the Netherlands, Scotland and England. The projects demonstrate that fishermen are willing to take part in returning litter to shore, if provided with an incentive and educational resources (Save the North Sea, 2004).

Despite these examples progress has still been slow on developing and implementing the wide range of programmes and measures that are required to reduce the input of marine litter from its many sources or to introduce mechanisms for the remediation of existing litter. Marine litter therefore remains one of the major unresolved outstanding pollution issues throughout the Northeast Atlantic region.

Port reception facilities (PRFs)

IMO has recognised that adequate provision of reception facilities is crucial for effective MARPOL implementation, and the Marine Environment Protection Committee (MEPC) has strongly encouraged Member States, particularly those Parties to the MARPOL Convention as port States, to fulfil their treaty obligations on providing adequate reception facilities.

The 'no-special-fee' system is one of the prerequisites for a substantial decrease in the number of operational and illegal discharges and thus for the prevention of pollution from ships to the marine environment.

Port authorities are responsible for providing reception facilities for wastes covered by Annex I (oily wastes from machinery spaces of ships), Annex IV (sewage) and Annex V (garbage) of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78) (http://www.imo.org/Conventions/contents.asp?doc_id=678&topic_id=258).

OSPAR Contracting Parties that are members of the EU must also adhere to the EU Directive on port reception facilities for ship-generated waste and cargo residues (EC2000/59).

Ports are required to cover the costs of the post waste reception facilities including costs of treatment and disposal. How the port recovers its costs was left open, so this varies from port to port with some charging on a ship-by-ship basis and others incorporating charges in harbour or port dues. However the charge is calculated, the port must make clear the amount of the charge, and the way in which it has been calculated.

Existing monitoring programmes related to marine litter in the Northeast Atlantic

Comprehensive surveys of marine litter on specific beaches have been made in many areas, often over a number of years, by various organizations and groups in the Northeast Atlantic Maritime Area. Valuable information about the quantity and composition of marine litter found on beaches has therefore been available for decades.

The challenges in dealing with this problem have not been due to lack of awareness of the issues surrounding marine litter or lack of data from various regions. Instead, the problem has been the lack of standardization and compatibility between assessment methods used and results obtained in these projects. This has made it difficult to compare data from different regions and to make an overall assessment of the marine litter pollution situation for the entire OSPAR Maritime Area.

Despite the difficulties in comparison, there are many longstanding monitoring programmes such as Beachwatch and Adopt-a-Beach organized by the Marine Conservation Society in the UK. Also programmes such as CoastWatch that conduct a beach marine litter monitoring effort or the Jellyfish campaign that also manages the clearing of marine litter on the sea surface along the Spanish coast. All these programmes can help to provide some insight into the marine litter situation in the OSPAR Maritime Area.

The monitoring method developed during the pilot project proved functional for the purpose of providing data on marine litter on beaches. It provides a feasible approach and could be used as a cost effective means to monitor marine litter on beaches – quantities, composition and trends – in the OSPAR Maritime Area. However, a monitoring programme for marine litter is yet to be made mandatory within OSPAR and is currently proceeding on a voluntary basis only.

There are also many other monitoring schemes operating nationally within individual Contracting Parties.

Scientific studies and research in marine litter

Various scientific analysis and studies have been undertaken in different areas, researching various items such as small plastic fragments found in seabirds' stomachs (e.g. fulmars) or the ingestion and accumulation of microscopic plastic by marine organisms.

Studies into the impact on microscopic plastic particles on the marine environment are at the forefront of recent research into marine litter. Global plastic production is now estimated at 225 million tons per year (Plastic-Europe, 2006). Plastic debris is accumulating in terrestrial and aquatic habitats worldwide and it is progressively fragmenting into small pieces and as it does so the potential for ingestion by animals increases. The biological consequences of macroscopic plastic (≥ 5mm) debris on wildlife have been better documented than those of microscopic plastics and include suffocation, entanglement and starvation. By contrast, the impacts of microscopic (<1mm) plastic debris are still poorly understood. Plastics can be mistaken as food by numerous animals, including birds, fish, turtles, marine mammals, and marine vertebrates. Given the high capacity of the plastics to absorb phenanthrene, plastics may be an important vehicle for transporting contaminants to organisms.

Another example of unique research is the monitoring programme using litter abundance in stomachs of a seabird, the Northern Fulmar, which is being developed by OSPAR as an Ecological Quality Objective (EcoQO). As fulmars are purely oceanic foragers, they regularly ingest litter, and accumulate wear-resistant items such as plastic products in their stomach. Stomach contents thus provide an integrated picture of litter abundance at the sea surface. The current situation fits in with the pattern of reduced plastic loads in Fulmar stomachs after peak levels in the 1990s, with mass of plastic returning to levels similar to those in the early 1980s. Mean values over the most recent five years are that 95 percent of birds had plastic in the stomach, with an average number of 31 pieces and average mass of 0.3 grams plastic. Thus, the year 2006 was very 'average' for the situation over the past five years, which implies that there is no clear evidence of improvement within this period (Franeker and SNS Fulmar Study Group, 2006).

There are few studies into the socio-economic impacts of marine litter. A study for KIMO International in 2000 under the name *Economic and Social Impacts of Marine Debris and Oil in the Coastal Communities*, illustrated the wide-ranging impacts (Hall, 2000).

Gaps, needs, priorities and recommendations

There is one clear picture that emerges from the data that has been collected in this assessment of marine litter in the OSPAR Maritime Area and that is that the amount of marine litter remains high and is not decreasing. This is despite areas such as the North Sea being 'Special Areas' under MARPOL Annex V and the introduction of EU legislation such as the Directive on port reception facilities for ship-generated waste and cargo residues (EC2000/59). The impact on biodiversity is clear and with studies showing that 96 percent of North Sea Fulmars have at least one piece of plastic in their stomachs illustrating the prevalence of marine litter in the marine environment. In addition, the cost of marine litter to marine users and coastal communities continues to rise.

However despite the overall picture being clear there are still gaps in the knowledge on marine litter for the OSPAR region.

Gaps and needs

Most of the information comes from beach monitoring of litter and although OSPAR has developed a harmonized monitoring programme for marine litter, it is voluntary and not being implemented by all Contracting Parties (CPs). Outside the OSPAR monitoring programme, almost all the monitoring is undertaken by local authorities or NGOs with very little harmonization between countries. The available data is also not collected centrally within CPs making it very difficult for them to gain an objective view of the marine litter situation or its impacts. For the propose of this review much of the monitoring information provided was not spatially complete or repeated over a sufficient timescale to allow a complete analysis of the situation. In relation to litter at sea and on the seabed, there are relatively few studies making analysis of the problem in the Wider Atlantic extremely difficult.

In assessing the impacts of marine litter on biodiversity the development of an Ecological Quality Objective on plastic particles in Fulmars stomachs is a welcome step but this is currently only implemented within the North Sea region and would need to be rolled out across the whole OSPAR Maritime Area to give a full picture. Applicability in other Regions is still under debate. The impact of microscopic plastic particles in the marine environment is another area that requires further research. Work by Dr. Richard Thomson and his research team have shown that these particles are removed from the water column by detritivours such as barnacles and lug worms, yet their impact on these animals and the rest of the food chain has still to be determined.

At a national level, one of the main gaps is the lack of a coordinated approach to marine litter. In almost all of the countries in the OSPAR Maritime Area marine litter is not the sole responsibility of a single agency but is divided between a range of national and local government agencies and voluntary organizations making collecting the most basic information a difficult and time consuming task. As a result many CPs found it difficult to contribute fully to this assessment with no information being received from Portugal and Denmark.

Awareness of the issues is another area where there are significant gaps both in terms of the general public and specific source industries. For example two of the main sources of marine litter are the shipping and fishing industries but there are no compulsory courses on marine environmental awareness in either of these sectors, although the Dutch Government has been working with the ProSea Foundation to incorporate amendments into the STCW Convention at the IMO. If crew members are more aware of the impacts of marine litter, they are more likely to adhere to existing regulations. However it is not just awareness of the impacts but of the legislation and regulations themselves that are lacking. For example, an investigation by the Netherlands showed that many agents and skippers were not aware of the fee system in Dutch ports highlighting the lack of efficient communication between users of the sea and regulators.

Outside the public awareness campaigns conducted by NGOs and initiatives such as the ProSea marine awareness courses and 'Fishing for Litter,' there is still a lack of practical programmes and measures at a national level to tackle marine litter. To date most programmes have involved monitoring of litter or legislation rather than practical action. In order to tackle the problem of marine litter, a much broader suite of economic and practical incentives is needed.

The diffuse nature of marine litter pollution also makes prosecution of those who break existing legislation extremely difficult. There is rarely any evidence as to the source of the litter and this lack of proof means that almost no convictions are ever achieved, severely reducing the effectiveness of legislation. There needs to be a more effective communication between prosecutors in CPs and more effective implementation of the EU Port Waste Reception Directive, which is currently under review.

Despite recent initiatives at the EU Level, such as the Marine Strategy Framework Directive which includes marine litter, there is a lack of political commitment (political will) and resources from CPs. For example the Intersessional Correspondence Group on Marine Litter (ICG Marine Litter), which coordinates marine litter

issues and monitoring within OSPAR, does not have representation from all CPs. Marine litter monitoring itself is only a voluntary programme, hence it is not funded by many CPs unlike chemical or heavy metal monitoring which are compulsory and resourced appropriately.

Priorities and recommendations

In deciding upon priorities and recommendations, it is important to note that with a diffuse and widespread problem like marine litter, action at all levels is required to have any impact on the problem.

The first priority is to consider the continuation and expansion of the monitoring programme for marine beach litter by making it mandatory within the OSPAR Maritime Area. This would ensure that it would be possible to assess the marine litter situation uniformly in all CPs allowing the impact of any programmes and measures to be assessed. However, as this only addresses litter that washes ashore a different approach would be needed to assess litter at sea. ICG Marine Litter is currently working towards developing a monitoring protocol to be used by fisheries research vessels to monitor litter on the seabed during scientific trawls. If this were implemented in all CPs, it would allow assessment of litter at sea especially in areas such as the Wider Atlantic that are not currently covered.

In relation to the collection of information on marine litter, a more coordinated approach at the national level would also be useful. Each CP should be encouraged to establish a lead agency that is responsible for marine litter with a duty to collect data centrally, assess impacts and assist in the development of programmes and measures in cooperation with local authorities and NGOs. Currently the responsibility tends to be spread over too many agencies, resulting in a lack of cohesion in approaching marine litter problems. A more coordinated approach would assist in gaining political support for marine litter initiatives, as it would be easier to demonstrate the problems in a national perspective.

A new threat from marine litter is that of microscopic plastic particles in the marine environment. Studies by Thomson *et al.* (2004) and KIMO Sweden have shown that these particles, in the µm to mm size range, are numerous and widespread with concentrations up to 150-2400 per m^3 in the water column. A monitoring programme is needed to assess the situation across the OSPAR Maritime Area along with further research into the impact of these particles on marine organisms. Initial studies have shown that small detritivours and bivalves will remove these particles from the water column, but their impact on organisms through both physical damage and concentration and transport of hazardous substances is unknown.

Education on the impacts of marine litter, both ecological and financial, is another priority area. Despite numerous public awareness campaigns, there is insufficient targeted awareness and training in marine environmental awareness for professional mariners. The ProSea Education Foundation has been leading the way in this field with the development of courses for the merchant navy and fishermen. There is an argument for these types of courses to be mandatory, as part of the IMO STCW Convention and form a part of any mariner's basic training along with issues such as safety and navigation. The level of awareness of facilities, regulations and fee's structures in relation to the disposal of wastes from ships is also low in some areas and is not helped by the range of different charging structures for wastes under the EU Directive on Port Waste Reception Facilities. The introduction of a harmonized indirect (or even 'no special') fee system in all ports for both merchant and fishing vessels would eliminate this confusion.

The introduction of more programmes and measures is essential to tackle and diffuse source of pollution such as marine litter. An example of a programme that could be easily implemented in the whole OSPAR Maritime Area is "Fishing for Litter." This project not only works to change attitudes to marine litter within the fishing industry, but also proactively removes marine litter from the environment. This could be implemented in all CPs with a fishing fleet and could form a subject for further discussion between OSPAR and the Northeast Atlantic Fisheries Commission. There are also many more generic programmes that are operating in CPs that could be considered for implementation across the OSPAR Maritime Area. For example, in Germany plastic bottles all have a deposit giving them a value after they have been used encouraging recycling. This measure could also be expanded to cover larger plastic containers that are used commercially. In Ireland the introduction of a tax on plastic bags has reduced the number of bags entering the environment.

Current international legislation is very clear regarding plastic materials: the IMO MARPOL Convention Annex V bans all dumping of plastics at sea. However, as there is very little enforcement there is little deterrent to breaking the legislation. The EU Port Waste Reception Directive also requires vessels to carry a waste log to ensure that no waste has been dumped during a voyage but again more stringent enforcement and greater cooperation between ports and regulators is required for this to be effective. A possible solution to increasing the effectiveness of enforcement on marine litter in general would be to ask networks such as the North Sea Network of Investigators and Prosecutors, which currently try to harmonize evidence gathering and increase prosecutions for oil pollution, to address marine litter.

The level of fines also needs to be reviewed to make them a sufficient deterrent. For example in the US the cruise ship Regal Princess was fined $500,000 (about €336,600 or £268,719) in 1993 for dumping 20 bags of garbage in to the sea. Fines of this level would act as a genuine deterrent to dumping of marine litter.

Finally in order to start reducing the levels of marine litter Contracting Parties (CPs) should give marine litter a higher profile within their own national priorities in order to release the funding required to address this problem. This is especially important with the adoption of the EU Marine Strategy Framework Directive, which includes Marine Litter in Annex III under pressures and impacts. This will require CPs to develop programmes and measures at a regional level to ensure that waters reach good environmental status in relation to marine litter.

Proposals for action

It is recommended that OSPAR consider the following actions to address marine litter within the OSPAR area:

- Include Marine Beach Litter Monitoring in an expanded CEMP (Coordinated Environmental Monitoring Programme) as a mandatory element.
- Investigate using fisheries research vessels to undertake seabed monitoring of marine litter during scientific trawls.
- Encourage all CPs to participate actively in OSPAR's work on marine litter.
- Develop a recommendation that all CPs identify a lead agency to collect and assess marine litter data nationally and report back to OSPAR.
- Investigate a possible monitoring programme and further research on microscopic plastic particles.
- Collective action to encourage other competent authorities to take necessary action where appropriate. For example, CPs should support the Netherlands efforts at the IMO to have marine environmental awareness training included in the STCW Convention.
- Encourage CPs to introduce a harmonized indirect (or 'no special') fee system for port reception facilities.
- Develop a recommendation to implement "Fishing for Litter" in all CPs with a fishing fleet.
- Ask the North Sea Network of Investigators and Prosecutors to investigate cooperation on marine litter pollution enforcement.

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Marine litter in the Northwest Pacific (NOWPAP) region Overview and Action Plan

Introduction

The Northwest Pacific is among the most highly populated areas of the world, resulting in enormous pressures and demands on the environment. Many of its 1.6 billion people are concentrated along the region's 86,812 km of coastline, and are particularly dependent on the sea for their food and livelihoods.

At the First Intergovernmental Meeting (Seoul, Korea, 14 September 1994) the *Action Plan for the Protection, Management and Development of the Marine and Coastal Environment of the Northwest Pacific (NOWPAP)* was adopted and is currently supported by four countries (People's Republic of China, Japan, Republic of Korea and Russian Federation), with the hope of full participation of all five countries of the region (including the Democratic People's Republic of Korea). In order to support the implementation of activities, a network of four Regional Activity Centres was established with two Regional Coordinating Unit Offices in Toyama, Japan and Busan, Korea.

The NOWPAP *Marine Litter Activity* (MALITA) has been initiated since its approval by the Tenth NOWPAP Intergovernmental Meeting in November 2005, as part of the UNEP *Global Initiative on Marine Litter,* with the overall goal of developing a *NOWPAP Regional Action Plan on Marine Litter* (RAP MALI). Since then, several MALITA components have been successfully implemented:

1. Marine litter-related data and information available in the region were collected and analyzed. On the basis of collected data and information, a NOWPAP marine litter database (http://dinrac.nowpap.org) was established (DINRAC, 2007a).

2. A regional overview of legal and administrative aspects and institutional arrangements and programmes related to marine litter of the Member States was prepared (DINRAC, 2007b).

3. Monitoring guidelines for marine litter (found on beaches and shorelines as well as on the seabed) and sectoral guidelines focusing on fishing, shipping and tourism were developed (CEARAC, 2007a, b and MERRAC, 2007a, b, c, d, e, f).

4. Meetings and workshops on marine litter as well as the International Costal Cleanup (ICC) campaigns were organized.

5. Several reports, guidelines, brochures, leaflets and posters were published in English for different sectors and different target audiences. Some of these were translated into national languages of the NOWPAP Member States to facilitate and promote their practical use.

6. Cooperation with UNEP Regional Seas Programme and other regional organizations and projects – such as the Coordinating Body on the Seas of East Asia (COBSEA) and the Yellow Sea Large Marine Ecosystem (YSLME) project – was strengthened.

Finally, a draft NOWPAP RAP MALI has been developed and further discussed and finalized at the NOWPAP RAP MALI meeting (Toyama, Japan, November 2007) and by March 2008 it was approved by all NOWPAP Member States that strongly support its implementation. RAP MALI is integrated into the NOWPAP Programme of Work (together with the existing work on harmful algal blooms, oil spills, integrated coastal area and river basin management, etc.).

The objective of this chapter is to present a summary of the document *Marine Litter in the Northwest Pacific Region (NOWPAP, 2008)* that includes the *Regional Overview of Marine Litter in the NOWPAP Region* and the *NOWPAP Regional Action Plan on Marine Litter*.

Overview

While implementing the two-year project of MALITA, NOWPAP has prepared this regional overview on marine litter based on data and information available in the region. The objective of this overview was to assess the current situation of marine litter in the region in order to assist the NOWPAP Member States in the development and formulation of the necessary measures for sustainable management of marine litter.

Assessment of the status of marine litter

Data to assess the regional situation of marine litter are very unevenly distributed geographically in the Northwest Pacific region. In addition to data on marine litter provided in this overview, other national information is available through the NOWPAP marine litter database (http://dinrac.nowpap.org) (DINRAC. 2007a). At present, the best data available for the NOWPAP region can be obtained from the research results of the Northwest Pacific Region Environmental Cooperation Centre (NPEC, 2003, 2004, 2005, 2006). NPEC has initiated a research on washed-up driftage on the coasts on the Northwest Pacific region since 1996 and has gradually extended its survey area to the neighbouring countries such as Republic of Korea, People's Republic of China and Russian Federation (Table 1). The research was carried out once a year using relatively standardized methods.

Table 1. The number of survey locations in each of the NOWPAP Member States (NPEC, 2002-2005)

Year	Number of survey locations				
	Japan	Korea	Russia	China	Total
2002	26	9	5	0	40
2003	26	5	5	12	48
2004	26	6	5	14	51
2005	44	6	6	14	70

Source: NPEC

Amounts of marine litter

Japan

In the NPEC research, marine litter was classified into eight categories: plastics, rubber, polystyrene, paper, cloth, glass and ceramic, metals, and others. According to the results of the four years of research (2002-2005) (NPEC, 2003, 2004, 2005, and 2006), plastic litter was most prevalent along the coastal areas of Japan, accounting for 76.2 percent of the total in terms of number of pieces collected, and 51.3 percent of the total weight. The second most prevalent item was polystyrene (by number) and glass and ceramic (by weight).

On average, approximately 570 pieces (3,864g) of marine litter were found per 100 m^2 from 2002 to 2005. The annual average number of items collected per 100 m^2 varied from 360 in 2002 to 707 in 2003. The annual average weight of marine litter collected per 100 m^2 was between 532 g in 2005 and 4,482 g in 2004. However, these values do not represent the actual inter-annual variation in the quantities of marine litter because they could vary depending on the intensity of each survey In the NPEC research, the survey locations can be grouped into five areas. In one of the areas the average number of pieces of marine litter observed per 100 m^2 from 2002 to 2005 was 1,366, which was up to seven times higher than that in the remaining four areas. However, the annual average values in each grouped area do not directly represent actual inter-annual variation in the amount of marine litter, as previously described.

Republic of Korea

According to the results of the four years of NPEC research, the most prevalent litter material along the coastal areas of Korea was plastic, accounting for 53.6 percent of the total number of items collected and 33.7 percent by total weight (NPEC, 2003, 2004, 2005, and 2006). The next most prevalent material was metal (21.5 percent by number), and glass and ceramic (14.4 percent by weight). Approximately 30 pieces of marine litter were, on average, observed at every 100 m^2 of the NPEC survey areas along the costal zone of Korea from 2002 to 2005. The annual average number of items of marine litter collected per 100 m^2 varied between 20 in 2005 and 53 in 2004. The annual average weight of marine litter collected per 100 m^2 was from 20 g in 2005 to 269 g in 2003. However, these average values do not represent the actual annual

fluctuation in quantities of marine litter as previously described. The Ministry of Maritime Affairs and Fisheries (MOMAF) in Korea has implemented national marine litter monitoring surveys since 2000. This overview used the data obtained from the recent two years' survey only (DINRAC, 2007a) (http://dinrac.nowpap.org/MALITA_Whatis.htm). Polystyrene was the most prevalent material in terms of total number of items collected, with plastic litter most prevalent by weight. A significant proportion of wood was also found in both the total number and weight collected. In the MOMAF surveys, the high percentage of polystyrene possibly indicates the presence of intensive fisheries-related activities.

Russian Federation

In the Russian Far East, there were no national data available for this overview. However, the NPEC surveys provide limited data on marine litter in the three coastal provinces of the Russian Far East between 2002 and 2005 (NPEC, 2003, 2004, 2005, and 2006). Plastic litter was most prevalent in terms of total number of items collected, with glass and ceramic litter the most prevalent by weight. According to the NPEC surveys, approximately 70 pieces (822 g) of marine litter were found on average for every 100 m^2 of the coastal areas of the Russian Far East from 2002 to 2005. The average number of marine litter items collected annually per 100 m^2 ranged from 53 in 2003 to 98 in 2005. The annual average weight of marine litter collected per 100 m^2 was between 97.4 g in 2005 and 1,515.1g in 2002. These variations do not represent the actual increase or decrease in the quantities of marine litter in the given survey locations as previously explained. According to the NPEC data, the proportion of glass and ceramic litter is higher in the Russian Far East than in Japan and Korea.

People's Republic of China

Since very little is known about marine litter in China, no national data were available for this overview. The NPEC surveys cover the eastern coastal areas of China (NPEC, 2004, 2005, and 2006). Glass and ceramic litter were the most prevalent in the total number of items collected, with polystyrene in the total weigh collected. A significant proportion of plastic litter was also found in both the total number of items and weight collected. These findings are somewhat similar to that in the Russian Far East but different from that in Japan and Korea. In the NPEC surveys, every 100 m^2 of the observed areas along the Chinese coast were polluted with 120 pieces of marine litter on average from 2003 to 2005. The annual average number of marine litter items collected per 100 m^2 of the survey areas was between 64 in 2003 and 166 in 2005. The annual average weight of litter collected per 100 m^2 varied from 128 g in 2002 to 1,982 g in 2005. However, these average values do not reflect the actual annual variations in the amounts of marine litter as previously explained.

Sources of marine litter

Among the NOWPAP Member States, Japan and Korea have participated in the International Coastal Cleanup (ICC) campaign, coordinated globally by the US-based NGO, Ocean Conservancy, since 1990 and 2001, respectively. China joined the ICC campaign in 2006. This overview is based on ICC data from 2004 to 2006 (OC, 2005, 2006 and 2007). According to the ICC reports of Japan and Korea, almost 50% of marine litter collected originated from shoreline and recreational activities, and included food wrappers and containers, beverage bottles and cans, and straws. In Japan, smoking-related marine litter came in second accounting for over 31 percent. In Korea, second place went to ocean and waterway-source marine litter at 29 percent, most of which came from fishing-related activities (e.g., bait containers, floats, traps, fishing line, lures and nets, light sticks and bulbs, rope, etc.). Dumping activities were responsible for a little less than five percent. While litter related to medical and personal hygiene made up little more than 0.1 percent of the total marine litter on average, it accounted for some of the more disturbing litter items such as syringes and tampons.

In 2007, China organized an ICC campaign in Rizhao as part of the NOWPAP MALITA implementation. Russia also conducted a pilot ICC campaign in 2007 and is expected to organize a full scale ICC campaign in 2008. The ICC data to be produced by China and Russia will contribute to a better understanding of the sources of marine litter in the region.

Legislation, policies and institutional arrangements

Legislation and policies

According to the regional overview on legal instruments, institutional arrangements and programmes related to marine litter, based on the four national summaries prepared as a part of NOWPAP MALITA, each of the NOWPAP Member States has marine litter-related national laws and regulations (Table 2) (DINRAC, 2007b). The NOWPAP Member States comply with marine litter-related international

conventions and agreements such as the MARPOL, London, and Basel Conventions and the Global Programme of Acton (GPA) for the Protection of the Marine Environment from Land-based Activities. Marine litter is, in most cases, not specifically mentioned in national legal instruments of the NOWPAP Member States. The litter problem is more likely connected to other marine and coastal environmental protection and health issues. Marine litter should be further addressed by the existing national legislation with measures to prevent, reduce and control the discharge of land-based and ship-generated wastes, and to reduce the loss of fishing gear from fishing vessels.

Institutional arrangements

According to the regional overview of legal instruments, institutional arrangements and programmes related to marine litter, which were based on the four national summaries, governmental responsibilities for marine litter issues are shared by different authorities such as ministries, provincial and municipal governments and agencies (DINRAC, 2007b). In general, environmental ministries take the lead for the overall supervision of land-based marine litter and maritime ministries/administrations take responsibility for sea-based marine litter. Local governments are in charge of the general management of waste generated within their coastal area. Therefore, at the national level, a mechanism to strengthen cooperation between different national institutional bodies is needed for better management of marine litter. Currently, no comprehensive national action plans on marine litter have been developed in the NOWPAP Member States.

Table 2. Marine litter-related national laws and regulations in the NOWPAP region

	National laws and regulations
China	**Environmental Protection Law (EPL)** sets the overall supervision and management of the environmental protection throughout the country. **Marine Environment Protection Law (MEPL)** aims to supervise the nationwide marine environment protection, conserve marine resources, prevent pollution, safeguard human health and promote economic and social development. **Law on Control of Ocean Waste Dumping** regulates waste dumping at sea. **Regulations on Prevention of Pollution Damage to Marine Environment by Land-based Pollutants** prohibits the piling up, discarding of or disposal of solid waste along seashores and beaches without authorized permission. **Regulations on the Control of Environmental Pollution by Ship-based Wastes** describes the treatment of garbage from ships. **Regulations on Strengthening Management of Plastic Package Wastes along Main Roads, in River Basins and at Tourist Attractions** prohibits littering plastic waste or other solid waste into rivers, lakes and their banks and to use non-degradable tableware on passenger ships and cruise lines. **Regulations on Prevention of Pollution Damage to Marine Environment by Coastal Construction Projects** concerns the protection of marine environment from the costal development and construction.
Japan	**Basic Environment Law** sets forth basic principles for environmental policy. **Waste Management and Public Cleansing Law** regulates industrial waste disposal, including waste dumping at sea, and concerns the maintenance of ports and harbours. **Cabinet Order of Waste Management and Public Cleansing Law** sets the standards for the collection, transport and disposal of municipal solid waste, including industrial waste and ocean dumping of solid waste. **Law Related to Prevention of Marine Pollution and Maritime Disasters** regulates the discharge of waste generated from ships and its management onboard. **Seacoast Law** aims to protect the seacoast area from damages caused by a variety of oceanographic phenomena (e.g., tsunami, storm surges and high waves) and promote coastal zone conservation and its proper use. **Port and Harbour Law** describes the maintenance and management of port areas and facilities. **Establishment Law of the Ministry of Land, Infrastructure and Transport** concerns the matters of the prevention of the marine environment pollution.

Korea	**Environmental Policy Basic Law** provides the overall supervision of management of the environmental protection. **Maritime Pollution Prevention Law** aims to prevent the marine and coastal environment from hazardous pollutants (mainly from ships) such as oil, sewage and garbage. **Ocean and Fisheries Development Basic Law** sets forth basic principles for the development of ocean-related industries, including fisheries. **Port Management Law** prohibits the discharge of waste in the port area for safe navigation and describes the development, maintenance and management of ports and their facilities. **Coast Management Law** aims towards the sustainable use of the coastal environment, including beaches and public swimming areas, and regulates coastal construction. **Waste Management Law** concerns the collection and treatment of industrial waste and household waste.
Russia	**Environment Protection Law** sets basic policies for the environmental protection and ecological safety. **Water Code** deals with the water protection from pollution and abuse. **Production and Consumption Wastes Law** focuses on the waste management from production and consumption. **Inland Sea Waters, Territorial Sea and Contiguous Zone Law** describes surveillance in case of incidents **EEZ (Exclusive Economic Zone) Law** contains the protection and conservation of special areas to prevent marine pollution from ships **Regulations on Waste Disposal and Other Kinds of Abuse** defines environmental pollution and related adverse effects where procedures of waste disposal are included **Fishing Fleet Instructions on Preventing Pollution from Ships** focus on preventing marine pollution from fishing vessels **Pollution Harbour Waters Cleanup Operation Rules** deal with cleaning polluted water in the port areas, including oil spill incidents **Compulsory Regulations on Sea Ports** address the management of garbage from ships

Programmes and initiatives

Marine litter-related programmes and initiatives have been drawn from several outcomes obtained through the NOWPAP MALITA implementation. In Japan and Korea, relevant national activities to deal with the marine litter problem already exist, in addition to national legal instruments and administrative institutions as described. Such national programmes and initiatives are expected to be further developed and specified taking into account the growing magnitude of the litter problem. In particular, two projects implemented in Korea, 'Waste Fishing Gear Buy Back Project' and 'Cost-Sharing Programme', could be replicable, good practices not only in the NOWPAP region but beyond the region. In the case of China, no directly relevant information is available for this overview, but such activities seem to be covered under other marine and coastal environmental protection, pollution prevention and health issues (except for ship-generated marine litter and waste dumping at sea that are relevant to Annex V of the MARPOL Convention and the London Convention, respectively). In Russia, marine litter-related national initiatives are more likely to focus on the port areas that are mainly organized by local administration authorities governing the coastal zone. Furthermore, there are very positive signs that the Chinese and Russian governments have started paying more attention to the marine litter problem, in particular since the implementation of the NOWPAP MALITA project.

Outreach

The marine litter problem cannot be resolved solely by means of legislation, law enforcement and technical solutions. Therefore, it has to be addressed by efforts to change attitudes, behaviours, management approaches, education and involvement of all sectors and interests, including the public at large. At the regional level, NOWPAP has established a mechanism to communicate between the NOWPAP Member States which contributes to information sharing and awareness building.

Since the initiation of the NOWPAP MALITA project, six NOWPAP marine litter workshops have been held to share and exchange marine litter-related information (e.g., national policies, monitoring programmes, scientific research and technologies and public awareness, etc.) between the Member States and interested parties beyond the region such as UNEP, IMO and other Regional Seas conventions and action plans. National experts in this field, governmental representatives and NGOs actively participated in these workshops.

NOWPAP International Coastal Cleanup (ICC) Campaigns

The workplan of NOWPAP MALITA included the organization of the International Coastal Cleanup (ICC) campaigns. During 2006 and 2007, four NOWPAP ICC campaigns have been organized with the financial support from the Member States, in combination with other side events such as exhibitions, workshops and NGO meetings. In addition to Japan and Korea that have participated in the ICC campaign since 1990 and 2001, respectively, China has joined the ICC campaign since 2006 and organized the NOWPAP ICC campaign in Rizhao in 2007 showing strong ownership as a Member State of NOWPAP. It is one of achievements of the NOWPAP MALITA project. Russia also conducted a successful pilot ICC campaign in Vladivostok in October 2007. The ICC campaigns provide a very good opportunity to raise the public awareness and to collect data of marine litter sources, in particular for those countries which have not yet had systematic national marine litter surveys.

For the purpose of public awareness raising on marine litter and its adverse effects on the marine and coastal environment, NOWPAP developed several sectoral guidelines (for fishing; for shipping, including passenger ships and cruise lines; and for tourism) (CEARAC, 2007b; MERRAC, 2007b, c, d, e, f), booklets, brochures and leaflets, in collaboration with the nominated Marine Litter National Focal Points of the Member States and the four Regional Activity Centres. Some of them were translated into national languages of the NOWPAP Member States.

Coastal cleanup groups from Vladivostok, Russia, Yamagata, Japan and Busan, Korea. © NOWPAP

Strengths, gaps, needs and proposal for action

Marine litter issues have been of increasing concern in the Northwest Pacific region, in particular since the initiation of the NOWPAP MALITA project. During the project period, the NOWPAP Member States have demonstrated a remarkably strong willingness to implement the MALITA project with the full extent of ownership and cooperation between the Member States. A regional overview on legal instruments, institutional arrangements and programmes related to marine litter was developed on the basis of national summaries prepared by the Marine Litter National Focal Points. The overview to assess the overall status of the marine litter problem in the NOWPAP region was drawn from available national information and outcomes achieved during the MALITA implementation. This overview revealed some barriers and gaps between the NOWPAP Member States, mainly due to different levels of national economy; different priorities set by each member state among a variety of marine and coastal environmental issues; the different extent of the coverage of marine litter issues in national legal instruments and administrative institutions; insufficient enforcement of national and international laws and regulations; and lack of public awareness. In most cases, marine litter is not clearly specified in national legal instruments which are related to other marine and coastal environmental protection and health issues. Government responsibilities for marine litter issues are mostly shared between several different authorities (e.g., ministries, provincial and municipal governments and agencies). In general, authorities taking the lead for marine and coastal environment issues, including marine litter, are different from those taking responsibility for the whole national environmental issues. The involvement of several ministries, on the other hand, can positively lead to more comprehensive awareness on the marine litter problem as long as they cooperate with each other.

Barriers and gaps found in this overview could be mostly overcome through a change in the acknowledgement of marine litter as one of the marine pollution issues since the legal framework to protect and conserve the marine and coastal environment from pollution has already been in place in the NOWPAP Member States. However, it is recommended that the NOWPAP Member States develop, and implement, comprehensive national action plans including measures to prevent, reduce and control the litter from its generation to treatment and proper final disposal. Marine litter should be integrated into the national solid waste management plans; with application of the ‘3R’ principles (Reduce, Reuse and Recycle). Public involvement and the results of scientific research are expected to eventually influence the national policy makers. Regarding best management practices, including preventive and control measures

and environmentally-sound technologies to deal with marine litter, continuous exchange marine litter related information within and beyond the NOWPAP region will also greatly contribute to changing people's attitudes and behaviours and increase the public awareness on this matter as a whole.

Taking into account the severity of the marine litter problem in the Northwest Pacific region and the growing concern at the global level, NOWPAP implemented the MALITA project in November 2005 and completed it in 2007. A Regional Action Plan on Marine Litter (RAP MALI) is being implemented as successor of MALITA. RAP MALI suggests a series of detailed actions to be taken by the Member States as well as at the regional level: on prevention of marine litter input, on monitoring of marine litter and on removal of existing marine litter in the marine and coastal environment. Such actions will be applicable to national legal instruments, administrative arrangements, research activities and technology development (e.g., measures to decrease or eliminate the discharge of ship-generated litter; to stop the discharge of solid waste from land-based sources; to protect rivers from pollution; and to reduce the loss of fishing gear from fishing vessels).

The NOWPAP RAP MALI serves as a roadmap to improve the overall regional status of marine litter pollution with active participation of (and cooperation among) the Member States. This overview will be updated in the near future to illustrate the overall status of the marine litter problem in the Northwest Pacific.

NOWPAP Regional Action Plan on Marine Litter (RAP MALI)

Marine litter is a part of the broader problem of solid waste management which is closely linked to the protection and conservation of the marine and coastal environment and sustainable development of the Northwest Pacific region. As a result of the MALITA implementation, NOWPAP RCU developed the draft *Regional Action Plan on Marine Litter* (RAP MALI), in collaboration with the Member States and the four RACs and in consultation with UNEP. During the implementation of RAP MALI, some activities carried out through the MALITA project will be continued.

The success of NOWPAP RAP MALI will be significantly dependant upon support from and active participation of the Member States as well as cooperation among the four RACs. However, the already well-established NOWPAP mechanism to deal with marine litter issues will be continuously used to implement NOWPAP RAP MALI and any follow-up marine litter-related activities. In this regard, NOWPAP RAP MALI is a result of joint efforts at the national and regional level to cope with the marine litter problem as a whole that will, eventually, contribute to better protection and conservation of the marine and costal environment and sustainable development of the Northwest Pacific region. A draft of the NOWPAP RAP MALI was discussed in detail at a special NOWPAP RAP MALI meeting in November 2007 and was approved by all NOWPAP Member States by March 2008. The Regional Strategy on Marine Litter is integrated into the Regional Programme of Work for the 2008-2009 biennium and is being implemented.

Objectives

The NOWPAP RAP MALI has three major objectives: (1) To prevent the marine litter input to the marine and coastal environment; (2) To monitor the quantities and distribution of marine litter and (3) To remove existing marine litter. These three objectives represent the three components of RAP MALI. The components, activities and actions of RAP MALI at the national and regional level are presented below.

Implementation of RAP MALI

NOWPAP RAP MALI has been implemented in close coordination with UNEP and other UN agencies, including FAO, IOC of UNESCO and IMO. For example, when UNEP/IOC guidelines for marine litter monitoring are developed, the NOWPAP Member States might consider using those guidelines. Regular assessments are expected in the future as part of the RAP MALI implementation.

One of critical factors for success of NOWPAP RAP MALI is the integration of national and regional actions. NOWPAP institutional infrastructure (Intergovernmental Meeting, Regional Activity Centres, Regional Coordinating Unit, and National Marine Litter Focal Points) has proven itself to be operational and reliable during the MALITA implementation and will be used for implementing RAP MALI. The NOWPAP Regional Coordination Unit (RCU) will be responsible for the overall management of the RAP MALI implementation using the mechanism for dealing with marine litter issues established during the MALITA implementation. The representatives of the Member States (Marine Litter Focal Points) and the four RACs lead some segments of RAP MALI using their expertise and experience accumulated during the MALITA implementation.

COMPONENT 1. Prevention of the marine litter input to the marine and coastal environment

The NOWPAP Member States are party to the existing global marine-litter related agreements: MARPOL 73/78 Convention; London Convention; the Basel Convention; and the Convention on Biological Diversity. Other international instruments and programmes, such as Agenda 21; the Johannesburg Plan of Implementation of the World Summit on Sustainable Development; FAO Code of Conduct for Responsible Fisheries; and GPA and Regional Seas Programme of UNEP also apply to the NOWPAP Member States.

At the national level, the NOWPAP Member States have already taken some preventive actions to reduce the generation of marine litter such as the improvement of their waste management practices, supporting beach cleanup activities as well as information, education and public awareness programmes. Unfortunately, these on-going efforts are not enough to cope with the marine litter problem as a whole.

Therefore, the NOWPAP Member States, recognizing the need for joint efforts to deal with marine litter issues, agreed to take following actions:

Action 1.1. Legal instruments and administrative arrangements

Marine litter prevention should be addressed by both legislative and control measures. At the national level, relevant legal and administrative instruments in conformity with marine litter-related international conventions and agreements are needed as a fundamental base to deal with the marine litter problem. According to a NOWPAP regional overview on legal instruments, institutional arrangements and programmes related to marine litter, the NOWPAP Member States already have the existing legal framework to deal with the marine litter issues in compliance with marine litter-related international conventions and agreements.

The NOWPAP Member States are encouraged to undertake the following activities:

- reinforce the implementation and enforcement of the existing national legal instruments, in compliance with marine litter-related international conventions and agreements, with clear responsibility of the specific governing authority;
- integrate marine litter into national legislation on solid waste management with application of the 3R principles (reduce, reuse and recycle);
- develop the national plans on the Integrated Coastal Area and River Basin Management (ICARM) where marine litter issues should be included;
- improve national institutional arrangements to prevent and reduce the amount of marine litter effectively with clearly defined responsibility of the governing authority based on best management practices to deal with marine litter from its generation to disposal;
- promote cooperation among relevant national and local authorities which are involved in the marine litter issues in order to establish appropriate cooperation mechanism;
- develop comprehensive national action plans on marine litter. Such national plans should include measures to prevent and reduce the generation of marine litter, in particular targeting at changes in consumption patterns (e.g., avoiding the use of excessive packaging and plastic shopping bags, promoting the use of biodegradable plastics, etc.) with the application of the 3R principles (reduce, reuse and recycle);
- improve waste management practices, including garbage collection and recycling;
- apply market-based economic instruments to deal with marine litter; and
- provide capacity building support to staff from national/provincial/municipal governments, port authorities and other related fields on the prevention and control of marine litter from both land-based and sea-based sources where regional workshops and training courses might be helpful.

Action 1.2. Wise management of marine litter

Preventive measures to reduce the amount of marine litter should be part of solid waste management at the national level.

Marine litter management from land-based sources

A significant amount of marine litter originates from land-based sources. The NOWPAP Member States are encouraged to undertake the following activities, as appropriate:

- develop and implement the GPA National Plans of Actions, including land-based sources of marine litter;
- take appropriate measures to reduce the generation of solid waste on land that can become marine litter;
- establish and ensure the proper operations of solid waste management facilities on shore (waste reception and disposal from all sources, including shipping, fisheries and harbour wastes);
- enhance and promote land-based waste management, including the proper management by municipalities of landfills (including relocation, if needed), sewage treatment facilities (including building new ones), and the proper care of solid household waste (including collection and recycling);
- apply market-based economic instruments (such as plastic bag taxes; deposits for drink containers; award-based incentives for coastal villages and municipalities with integrated waste management systems; fines for illegal disposal of litter). Revenues from tourism taxes, car park fees, waterfront business charges, charging schemes for waste service and other sources can be used to cover the cost of collection and environmentally-sound disposal of garbage;
- apply sectoral guidelines (already developed during the MALITA implementation and to be further developed during the RAP MALI implementation), in particular taking into account best management practices on marine litter in the tourism sector. Plastic manufactures, in addition to tourism authorities, should be also involved; and
- increase local planning and management capacity to avoid location of waste dumpsites near coastlines or waterways as well as to avoid litter escape to the marine and coastal environment that will also be considered as part of the development and implementation of the Integrated Coastal Area and River Basin Management (ICARM), as described in Action 1.1.

In addition, NOWPAP RCU, in collaboration with the four Regional Activity Centres and the Member States, and in consultation with UNEP, will undertake the following activities:

- follow up on activities related to the prevention and reduction of marine litter from land-based sources agreed upon within the framework of RAP MALI;
- provide relevant guidance and introduce good practices applied (or being developed) within and outside the NOWPAP region (including those from UNEP RSP and GPA);
- facilitate the application of sectoral guidelines on the prevention and reduction of marine litter from land-based sources (already developed during the MALITA implementation and to be further developed during the MALITA implementation); and
- provide technical training and capacity building to staff from national and municipal governments on the prevention and reduction of marine litter from land-based sources through regional workshops and training courses (depending on funds available; if appropriate, together with UNEP RSP and GPA).

Marine litter management from sea-based sources

The NOWPAP Member States are encouraged to undertake the following activities, as appropriate:

- provide assistance in implementing of the requirements of Annex V of the MARPOL Convention to provide and improve reception facilities for all types of ship-generated waste in their ports, harbours, terminals and marinas;
- prepare administrative regulations and disseminate related information on waste management, including regulations on waste handling in ports and marinas, taking into account best waste management practices related to marine litter;
- make sure that the waste delivered to reception facilities is properly handled and processed on land, in a manner of caring for the environment and human health;
- apply market-based economic instruments such as incentives to fishermen for removal of marine litter and port reception fees (general fee approach, but no special fee for waste). Revenues from fines for illegal disposal of litter and other sources can be used to cover the cost of collection and environmentally-sound disposal of garbage;
- apply sectoral guidelines (already developed during the MALITA implementation and to be further developed during the RAP MALI implementation), in particular taking into account best management practices on marine litter in shipping and fisheries sectors. Plastic manufactures and tourism authorities, in addition to ship owners and operators, should be also involved;
- develop and apply operational fishing methods that minimize the loss of fishing gear and the ghost fishing effects of lost or abandoned fishing gear, according to the FAO technical guidelines for the implementation of the Code of Conduct for Responsible Fisheries; and

- develop and use marked fishing gear to identify its owner or user that will contribute to reducing fisheries-related marine litter, as has been demonstrated by the Republic of Korea since 2006.

In addition, NOWPAP RCU will undertake the following activities:

- follow up activities related to the prevention and reduction of marine litter from sea-based sources agreed upon within the framework of RAP MALI;
- provide relevant guidance and introduce good practices applied (or being developed) in and outside the NOWPAP region (including those by UNEP, IMO and FAO);
- assess the effectiveness of the MARPOL Convention Annex V and the status of national reception facilities on a regular basis;
- facilitate the application of sectoral guidelines on the prevention and reduction of marine litter from sea-based sources (already developed during the MALITA implementation and to be further developed during the MALITA implementation); and
- provide technical training and capacity building to staff from national and municipal governments on the prevention and reduction of marine litter from sea-based sources through regional workshops and training courses (depending on funds available; if appropriate, together with UNEP RSP, IMO and FAO).

Action 1.3. Information, education, outreach and public awareness

The NOWPAP Member States are encouraged to undertake the following activities:

- develop and implement education and training programmes for different target groups, such as ship owners and operators, crews, port users, fishermen, users of pleasure crafts and the general public, in order to better understand which sectors and groups are responsible for contributing to the generation of marine litter, why the problem with its significant implications for the marine and coastal environment still exists and what they can do to prevent and reduce the generation of marine litter;
- apply sectoral guidelines, (already developed during the MALITA implementation and to be further developed during the RAP MALI implementation), taking into account well-known best management practices on marine litter, for the purpose of education and training programmes;
- formulate and implement public awareness campaigns for the general public, industry (including tourism, shipping, fisheries, etc.), municipal authorities, local communities, ship officers and crews of recreational, commercial and fishing vessels, various groups within the tourism sector, and media to reduce the generation of waste and environmentally sound disposal and reuse;
- organize and coordinate comprehensive voluntary beach cleanups as a tool in educating and involving local communities, stakeholders and media to increase knowledge and awareness of the problem caused by marine litter, in combination with public awareness campaigns by means of distribution of printed materials (e.g., brochures, leaflets, flyers, etc.), environmental exhibitions and school children poster contests; and
- organize and support the annual International Coastal Cleanup (ICC) campaigns to promote public awareness and to educate the public, including school children, on marine litter issues as well as to encourage positive behaviour changes that will help to reduce the generation of litter.

In addition, NOWPAP RCU will undertake the following activities:

- organize the annual NOWPAP ICC campaigns, in combination with other side events such as workshops, NGOs meetings and exhibitions. If appropriate, participate in similar cleanup activities at the national and local level. These activities will eventually contribute to increasing the public awareness of the problems associated with marine litter;
- develop public awareness materials (e.g., booklets, leaflets, flyers, etc.) and facilitate the application of technical sectoral guidelines (already developed during the MALITA implementation and to be further developed during the RAP MALI) for different target groups, such as ship owners and operators, crews, port users, fishermen, users of pleasure crafts and the general public, through regional workshops and training programmes;
- promote and facilitate public awareness raising on marine litter issues through providing guidance and introducing good practices and programmes, including education and training programmes and relevant reference materials, applied (or being developed) in and outside the NOWPAP region (including those by UNEP and other UN agencies); and

- provide NOWPAP information about marine litter issues to the GPA Clearing-house node (Global Marine Litter Information Gateway) and UNEP RSP website for further dissemination.

Action 1.4. Cooperation with civil society

The NOWPAP Member States are encouraged to undertake the following activities:

- approach civil society (private sector, environmental NGOs and scientific community) to develop partnerships and voluntary agreements to reduce the generation of marine litter;
- involve private sector, NGOs and scientific community in the policy-making process and the policy implementation, if appropriate;
- jointly organize workshops and campaigns on marine litter issues to promote public awareness and educate the general public, including school children and youth, and to change behaviours and attitudes positively to produce less marine litter; and
- cooperate with municipal and local authorities of the respective member state in need of assistance, through financial, scientific and technical support to increase public awareness and organize awareness and education campaigns (see also Action 1.3).

In addition, NOWPAP RCU will undertake the following activities:

- approach private sector, NGOs and scientific community in order to exchange a wide range of information on marine litter issues, including materials for public awareness and technical sectoral guidelines (already developed and to be further developed by NOWPAP RACs and the Member States), as well as to establish partnerships; and
- involve representatives of civil society in the NOWPAP annual ICC campaigns and related side events (such as workshops, NGO meetings, exhibitions, etc.) and, if appropriate, to jointly organize the ICC campaigns and similar cleanup events with technical support and assistance from NOWPAP.

Action 1.5. Research activities

In order to prevent the marine litter input to the marine and coastal environment, the development and application of new and existing technologies are needed. The NOWPAP Member States are encouraged to undertake the following activities:

- develop technologies to prevent the marine litter input from land-based sources (e.g., floating booms and barriers);
- support research on environmentally-sound technologies and production methods (e.g., biodegradable materials or materials which decompose under the influence of UV light, marked fishing gear to identify its owner) and promote the use of such research outcomes;
- develop and carryout research on the impact of marine litter on the marine and coastal environment and economy (including economic costs and impact on human health and safety); and
- develop and support research on the effectiveness of market based instruments related to marine litter.

In addition, NOWPAP RCU will undertake the following activities:

- promote the exchange of information on technologies to prevent the marine litter input into the seas and oceans; and
- exchange the research outcomes among the Member States.

COMPONENT 2. Monitoring of marine litter quantities and distribution

All NOWPAP Member States recognized a need for the regional monitoring programme to address the marine litter problem effectively and agreed upon the NOWPAP monitoring guidelines developed as part of the MALITA implementation in 2006-2007. The NOWPAP Member States are encouraged to undertake the following activities:

Action 2.1. Marine litter monitoring using NOWPAP guidelines

A regional NOWPAP marine litter monitoring programme will be implemented by integrating already existing (and being developed) monitoring activities. The NOWPAP Member States are encouraged to develop national marine litter monitoring programmes that will be integrated into the regional NOWPAP

marine litter monitoring programmes. Two NOWPAP marine litter monitoring guidelines can be used: one for marine litter found on the beaches and shorelines and the other for the seabed.

Action 2.2. Maintenance of marine litter database

Database containing data on marine litter distribution on the coasts of all four NOWPAP Member States for 2000-2006 has been established by NOWPAP DINRAC in 2006 (http://dinrac.nowpap.org) (DINRAC, 2007a) and updated in 2007. New marine litter monitoring data generated within RAP MALI will be added to the NOWPAP marine litter database together with other relevant information and the results of regular assessments.

Action 2.3. Compilation of data from national monitoring programmes

National Marine Litter Focal Points (or Coordinators) nominated by the NOWPAP Member States will be responsible for collecting data from national monitoring activities. Such activities include, but are not limited to, research, cleanup and monitoring efforts of (in alphabetical order): Japan Environmental Action Network (JEAN), Korea Marine Pollution Response Corporation (KMPRC), Korea Marine Rescue Centre (KMRC), Northwest Pacific Region Environmental Cooperation Centre (NPEC) of Japan, etc.

NOWPAP CEARAC will be responsible for compiling and harmonizing data of marine litter monitoring on the beaches based on the national input provided by designated National Marine Litter Focal Points of the NOWPAP Member States, analysing these data and submitting the results to DINRAC using the unified formats with illustrative materials (e.g., maps, photos and diagrams).

NOWPAP MERRAC will be responsible for compiling and harmonizing data from marine litter monitoring on seabed based on the national input provided by designated National Marine Litter Focal Points of the NOWPAP Member States, analysing these data and submitting the results to DINRAC using the unified formats with illustrative materials (e.g., maps, photos and diagrams).

Action 2.4 Regular assessments of current situation and trends in marine litter quantities and distribution

Short overviews of the current situation with marine litter in the Northwest Pacific region were prepared by NOWPAP RCU during the MALITA implementation in 2006-2007, based on national monitoring results and data from International Coastal Cleanup events, and were posted on the NOWPAP website (http://www.nowpap.org). The last assessment was published in October 2007.

Regular assessments of the marine litter quantities and distribution will be prepared by NOWPAP RCU (in close collaboration with RACs and Marine Litter National Focal Points) during the RAP MALI implementation and posted on the NOWPAP website. Data from national monitoring activities, ICC and other sources will be used for such assessments.

Action 2.5. Collection of marine litter-related research outcomes

A variety of information on impacts of marine litter on the marine and coastal environment, associated economic losses, collection and treatment technologies and other marine litter-related issues will be obtained through the collection and review of published data (articles, reports, etc.) and interpretation of the survey results. These data will be included in the NOWPAP marine litter database updated on the regular basis and available through the DINRAC website (DINRAC, 2007a).

COMPONENT 3. Removing existing marine litter and its disposal

There are two approaches to deal with the marine litter problem, one is to prevent and reduce marine litter input to the marine and coastal environment and the other is to remove accumulated litter that is already discarded, disposed of and abandoned in the environment. This section is focusing on actions and activities required to remove existing marine litter and to treat it in environmental-friendly manner after collection. Therefore, the NOWPAP Member States should continue removing marine litter originated from domestic sources and from abroad, in combination with its proper disposal and treatment. The following actions are proposed:

Action 3.1. Beach cleanups

In the NOWPAP region, a variety of cleanup operations have been already undertaken by national and local authorities, volunteers and NGOs.

The NOWPAP Member States are encouraged to undertake the following activities, as appropriate:

- continue their efforts in organizing the annual ICC campaigns and promote public participation in ICC as widely as possible. At the same time, national coordination on ICC should be improved and the role of NGOs and civil society should be enhanced;
- submit the annual national ICC data to DINRAC directly or through the NOWPAP National Marine Litter Focal Points in order to help assess the regional extent of the marine litter problem;
- use the ICC campaign as an opportunity to collect marine litter data, in particular for those NOWPAP Member States which have not yet conducted systematic national marine litter surveys or monitoring;
- strengthen the existing regional network on ICC through the platform of NOWPAP to build partnerships between governments, NGOs, and enterprises for sustainable ICC activities; and
- use the annual ICC campaigns to promote public awareness and educate the public (including school children and youth) on marine litter issues as well as to encourage positive behaviour changes.

In addition, NOWPAP RCU will undertake the following activities:

- organize the annual NOWPAP ICC campaigns, in combination with other side events, such as workshops, NGOs meetings and exhibitions, in order to increase the public awareness of the problems associated with marine litter (see also Action 1.3); and
- participate in, if appropriate, similar cleanup activities at the national and local level not only the public awareness but also local capacity in dealing with the marine litter problems (if necessary, RCU will provide technical assistance).

Action 3.2. Removal of existing marine litter

In order to keep the marine and costal environment clean from litter, practical efforts are needed, such as regular litter removal operations, in addition to preventive measures.

Regular removal operations of marine litter

The NOWPAP Member States are encouraged to undertake the following activities, as appropriate:

- designate a responsible authority or contract a private entity or interested NGOs in order to undertake regular removal operations as part of their routine garbage collection and disposal (if appropriate, using modern technologies for marine litter collection);
- facilitate and support public participation, including school children and youth, in regular removal operations in order to promote public awareness, educate them and to encourage positive behaviour changes that will reduce the generation of litter (see also part 1); and
- establish partnerships with civil society and private sector (industry), related to marine litter issues, though joint organizing regular removal operations (see also part 1).

Marine litter collection in fishing sector

The NOWPAP Member States are encouraged to undertake the following activities:

- develop and apply measures to remove and collect fisheries-related marine litter efficiently;
- develop and use marked fishing gear to identify its owner or user that will contribute to preventing fisheries-related marine litter being abandoned (as it has been carried out by the Republic of Korea since 2006);
- develop and implement national projects or programmes on fisheries-related marine litter, taking into account good practices; and
- facilitate and promote fishermen participation in the marine litter collection (if appropriate, with financial and other incentives).

Action 3.3. Research activities related to marine litter

The development of new technologies is of great use for proper treatment and disposal of marine litter and further development of technologies is needed. The NOWPAP Member States are encouraged to undertake the following activities:

- support research and development (R & D) activities related to waste treatment equipment and facilities for proper treatment of marine litter;
- promote R & D on environmentally-sound technologies and production methods such as recycling of polyethylene and polypropylene waste plastic, recycling of expanded polystyrene (EPS) waste, producing fuel from refuse paper and plastic, recovery of raw materials, etc.;
- develop and support recycling technologies such as the use of certain natural resources from collected marine litter; and
- promote cooperation among the Member States, through scientific and technical support, in developing environmentally sound waste disposal methods and alternatives to disposal.

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Marine litter in the Red Sea and Gulf of Aden (PERSGA region) Overview and Regional Action Plan

Introduction

The Red Sea is an inlet of the Indian Ocean between Africa and Asia. It is the world's most northern tropical sea. Occupying a part of the Great Rift Valley, the Red Sea has a surface area of about 450,000 km² , a volume of about 230,000 km³, and a maximum depth of approximately 2,500 m. The sea is the habitat of over 1,000 invertebrate species and 200 soft and hard corals. The Red Sea is one of the most saline water bodies in the world, owing to the effects of evaporation, wind stress and its particular water circulation pattern. Salinity ranges between 3.6 and 3.8 percent.

The *Regional Convention for the Conservation of the Red Sea and Gulf of Aden Environment* (Jeddah Convention) provides an important basis for environmental cooperation in the region as its provisions are complemented by those of MARPOL and the Basel Conventions. The Jeddah Convention was adopted in 1982 by a Regional Intergovernmental Conference supported by UNEP, along with a supplemental *Protocol Concerning Regional Cooperation in Combating Pollution by Oil and Other Harmful Substances in Cases of Emergency*. The Conference produced a Programme for the Environment of the Red Sea and Gulf of Aden (PERSGA), adopted an Action Plan for the Conservation of the Marine Environment and Coastal Areas in the Red Sea and Gulf of Aden, and established a Secretariat for the execution of the Programme in Jeddah. Member countries of PERSGA include Djibouti, Egypt, Jordan, Saudi Arabia, Somalia, Sudan and Yemen.

PERSGA has undertaken a number of initiatives in formulating the preparatory and fundraising phase of the regional Programme of Action for the Protection of the Red Sea and Gulf of Aden Marine Environment from Land-Based Activity. These initiatives were developed with close cooperation and financial support from the UNEP/GPA Coordination Office and the UNEP Regional Seas Programme. Two integrated and key documents were produced: the first, Part I, presented a 'roadmap' of the preparatory and fundraising phase, while Part II outlined a proposed project on the management of marine litter in the PERSGA region. The *Regional Action Plan (RAP) for Sustainable Management of marine litter in the PERSGA Region* (PERSGA/UNEP, 2007) has been prepared by the PERSGA Secretariat within this framework with the support of UNEP.

The RAP document contains a set of priority actions for combating the marine litter problem and achieving sustainable management of marine litter in the Red Sea and Gulf of Aden region. The PERSGA region is identified as a 'Special Area' of the Annex V of the MARPOL Convention. The RAP is, therefore, consistent with global, regional and national initiatives. It was developed to meet the needs for proper management of coastal and marine litter in the region.

The RAP strategies, objectives and actions are based on assessment of coastal and marine litter in the PERSGA region. The assessment was derived from: (a) information gathered through a standard questionnaire distributed to the member countries of PERSGA; (b) data available from previous regional and national surveys; and (c) relevant reports and documents.

The RAP will be coordinated at the regional level through PERSGA, in liaison with other national and international agencies. In each member country, implementation will occur through integrated networks of national and local working groups, government departments, NGOs and other stakeholders. Owing to the existing clear discrepancies in institutional capacities and manifestations of the marine litter problem among the countries, it is recommended that a National Action Plan (NAP) be developed for each member country in accordance with this RAP.

The objective of this chapter to present a summary of the document *Marine Litter in the PERSGA Region and Gulf of Aden (PERSGA/UNEP, 2008)* that includes the status of marine litter in the PERSGA Region and the Regional Action Plan for combating marine litter problem and achieving its sustainable management within the Red Sea and the Gulf of Aden.

Assessment of the status of marine litter

Amounts

A review of available data on the various types of marine litter found worldwide indicates that most originate from human activities, whether consumption (food wrappers, beverage containers, cigarettes, etc.), transportation by sea (boats and ships) and harvesting from the sea (fishing line/nets and gear).

According to reports, several types of marine litter have been found in the coastal and marine environment of the PERSGA region, including plastics (fragments, sheets, bags, containers); polystyrene (cups, packaging, buoys); rubber (gloves, boots, tires); wood (construction timbers, pallets, fragments of both); metals (beverage cans, oil drums, aerosol containers, scrap); sanitary or sewage related litter; paper and cardboard; cloth (clothing, furnishings, shoes); glass (bottles, light bulbs); pottery/ceramic; munitions (phosphorus flares); fishing nets; and abandoned/lost fishing gear.

Estimates of the total and relative amounts of marine litter by category are tentatively available for some member countries of PERSGA, mainly from the results of the questionnaire and some previous reports. Of about 1.2 tons of marine litter collected in Jordan during 2003-2005, plastics and rubber together represented 59 percent, metals 18 percent, glass 15 percent, and the rest (fishing equipment, paper and others) 8 percent. In Yemen, qualitative estimates of the quantities of marine litter suggest that plastics and metals are also dominant. Noticeably, plastic bags account for most of the accumulated litter in Al Salif city on the Red Sea coast of Yemen.

In the Hadramout Inshore (Gulf of Aden), over 25 types of litter, including rubbish and discarded fishing gear, were reported along one kilometre (MWE/EPA, 2003). In Djibouti, litter and wastes – mostly plastics, glass bottles and discarded fishing nets – occur throughout the Iles des Sept Freres and Ras Siayyan, especially in areas frequented by people. Distribution of coastal and marine litter in some marine protected areas (MPAs) in the region was reported by PERSGA prior to the declaration of such areas in Djibouti and Mukawwar Island and Dungonab Bay MPA in Sudan.

Impacts

Fishing gear and 'ghost' fishing. One source of marine litter that requires special attention is abandoned, lost or otherwise discarded fishing gear (ALDFG), composed of both whole and large sections of nets, in addition to discarded fishing lines and plastic parts associated with traps and nets. Whether intentionally discarded or unintentionally lost during storms or fishing operations, ALFDG poses serious threats around the world, entrapping marine life ('ghost' fishing), destroying coral reefs and other habitats, and even posing a danger to humans. Currently, almost all of the fishing nets used outside of subsistence fisheries are made of synthetic fibres that are highly resistant to degradation. Though there is increasing recognition of the problem of 'ghost' fishing, few studies have been conducted since 1994 (Laist and Liffmann, 2000). Limited evidence from studies conducted in areas of the Atlantic suggests that ALDFG may be responsible for significant losses of some commercially valuable fish and crab species (Laist, 1997). Ghost nets are perpetual 'killing machines' that never stop fishing (Esteban, 2002). Worldwide, this phenomenon is having an impact on the sustainability of already stressed fisheries.

In the PERSGA region, the extent and impacts of ghost fishing are largely unknown. UNEP's Asian Tsunami Force estimated that on Gulf of Aden coast in Yemen 500 fishing nets, 1,500 octopus traps and 8,000 lobster traps were lost to the sea as a result of the December 2004 Tsunami. Fishers on the Island of Socotra also lost approximately 174 fishing nets and 37 hook lines (UNEP, 2006).

Breakdown of plastic products and their toxicity. Plastic litter breaks down in the environment releasing chemicals (plasticizers and other polymer constituents) and particulates into the sea. Some of these substances may be persistent, and others are known to exert adverse biological effects at very low concentrations.

The little data available on coastal and marine litter in the PERSGA region suggest that plastic products are the most encountered litter types in the coastal and marine environment. The threat from the released persistent and toxic chemicals arises from the semi-closed nature; limited water circulation and exchange of the Red Sea, which bring about accumulation of such substances in the marine environment.

Community beach cleanup in Yemen © PERSGA

Human health and safety. Items such as broken glass, medical waste, rope, and fishing line pose immediate risks to human health and safety. Medical and personal hygiene-related litter often enters the waste stream through direct sewage outflows or inadequate sewage treatment systems. These items can indicate the presence of invisible pathogenic pollutants such as streptococci, faecal coliforms, and other bacterial contamination. Consumption or contact with water polluted with these pathogens could result in infectious hepatitis, diarrhea, bacillary dysentery, skin rashes, and potentially typhoid and cholera.

The most pressing issue in the member countries of PERSGA is the poor management of wastewater. In some countries, coastal and marine litter could pose risks to human health. Dumping household/sanitary solid wastes on the shore and the discharge of untreated sewage represent a problem in several localities in the regions (e.g. Djibouti, northern coast of Somalia). During periods of heavy rain, leaching of substances from dumps near the shore also pose a potential hazard. However, impacts of coastal and marine litter on human health are still unknown in the region.

Wildlife entanglement and ingestion. Many forms of marine litter – including ALDFG – can pose serious threats to wildlife. Litter that entangles a living creature can hamper its mobility, prevent it from eating, or suffocate it. Monofilament line, fishing nets and ropes, six-pack rings, and packing strapping bands are some of the more harmful culprits related to entanglements. Birds, for example, often become entangled in trash they have selected for nesting. According to the U.S. Marine Mammal Commission, 136 marine species have been reported in entanglement incidents, including six species of sea turtles, 111 out of the world's 312 species of seabirds, and 32 species of marine mammals (Marine Mammal Commission, 1996).

Litter that has wrapped around limbs and fins can cause circulation loss and amputation, especially as the animal grows. Heavy, large plastic sheets and other large litter smother or trap benthic-dwelling animals and drown those that must rise to the surface to breathe. Ingested, litter can lead to strangulation or digestive problems. Sea turtles confuse floating trash and food bags with jellyfish, one of their favourite treats. Seabirds, too, are vulnerable to the unintentional ingestion of litter because of their indiscriminate eating habits. Many animals cannot regurgitate an item once it has been swallowed, and it often becomes lodged in their throats and digestive tracts. Litter that will not pass out of the stomach can also give a false sense of cessation, causing some animals to stop eating and slowly starve to death.

The Red Sea and Gulf of Aden contains globally important feeding and nesting grounds for green (*Chelonia mydas*), hawksbill (*Eretmochelys imbricata*) and loggerhead (*Caretta caretta*) sea turtles. Two other sea turtle species, leatherback (*Dermochelys coriacea*) and olive ridley (*Lepidochelys olivacea*) are infrequently seen but no nestings have been recorded. Accumulated litter such as logs, discarded nets, solid wastes and plastics has been reported as an important factor that can deter nesting females (PERSGA/GEF, 2004a). There are 31 Important Bird Areas (IBA), 17 true seabird species, including three endemic ones, and 14 other water bird species recorded from the RSGA. Despite a comprehensive survey

effort by PERSGA in the past few years, there are shortages of data on the impacts of marine litter on sea turtles and seabirds.

Of the 15 species of marine mammals known to occur in the Red Sea and Gulf of Aden, two are 'threatened' (endangered or vulnerable), five are dependent upon conservation actions to prevent their listing as threatened, five are insufficiently known to assign a conservation status, and three are secure. Dugongs are listed as vulnerable by IUCN and are protected in the region. The number of dugongs to be found off Jizan and Farasan Islands (Saudi Arabia) and in Mukawwar Island and Dungonab Bay MPA (Sudan) has declined, probably due to losses from accidental drowning in fixed fishing nets (PERSGA, 2006). Though enough information is not available, it is quite reasonable to assume that entanglement in discarded nets may have contributed to decline of the dugong population in the region. The impacts of marine litter (through entanglement or ingestion) on the threatened species in the region are largely unknown. However, one of the main issues for marine mammals in the region is accidental drowning (Preen, 2004, PERSGA, 2006) suggesting possibly impacts from 'ghost' fishing.

Habitat destruction and alien species introduction. Litter causes physical damage such as covering coral reefs and smothering sea grass beds. ALDFG in the form of nylon ropes, nets, and fishing line once entangled in coral reefs and other benthic communities can cause significant damage, with effects that can last for many years. Ropes and nets, twisting and moving by currents and tides, abrade, scour, break and destroy living corals when entangled in the benthic habitat. Ensnared litter may also cause increased siltation and turbidity blocking essential sunlight or smothering sea grasses. Additionally, marine litter floating for great distances may be a transportation vector for invasive species since it eventually becomes a home to entire communities of encrusting and attached organisms. Drifting litter can become a living raft carrying potentially harmful, non-native species of animals and plants to the far corners of the ocean.

In the PERSGA region, solid wastes (e.g., plastic bags and bottles and metal cans) are often dumped directly into mangrove stands or dumped nearby and transported in by wind and water, becoming trapped among trees and aerial roots, or even blocking mangrove tidal channels (PERSGA/GEF, 2004b). This problem is especially encountered in several mangrove stands in Egypt and Yemen (PERSGA/GEF, 2004b and PERSGA, 2006). Similar impacts have been reported on coral reefs near diving centres and major fish landing and human settlement sites. In Somalia, solid waste pollution is a major problem (PERSGA, 2006). Near human settlements, solid waste is dumped on the shore and in the sea. Such activities are likely to be locally detrimental to near-shore habitats and their associated species.

Vessel damage. ALDFG in the form of nets and ropes, invisibly floating just below the water's surface, can cause significant risks to vessel operations. Nets, ropes and other discarded gear can entangle vessel propellers and rudders resulting in costly repairs, significant loss of operational time and threats to boater and crew safety. One of the most common causes of burned-out water pumps in recreational boats is the result of plastic bags clogging water intakes. A burned-out water pump in a recreational boat results in costly engine repairs and disablement of the vessel if the problem occurs at sea.

In many fishing areas of the PERSGA, the lack of fisheries services, in terms of repairs to fishing gear and maintenance workshops for outboard engines, has been indicated as a limiting factor for any increase in fishing effort. Much of the equipment runs down due to lack of repair and maintenance (PERSGA, 2002). The true scope and frequency of damaging encounters between litter and fishing/recreational vessels is difficult to estimate, as most incidents go unreported.

Sources

In the PERSGA region, several sources of marine litter pollution were listed by respondents of the questionnaire. These include sewage treatment works, combined sewer overflows, fishing industry, aquaculture, municipal wastes, shipping, urban runoff, industrial discharge, oil refineries, oil rigs, fly tipping and recreational and leisure activities. In Jordan, the major source for marine litter is recreational and leisure usage contributing to 67 percent of the total quantity of marine litter discharge over three years (2003-2007), while shipping and port activities contribute to 30 percent and the fishing industry to only three percent. In Yemen, qualitative estimates indicated fishing industry, urban runoff, shipping, oil rigs, agricultural and municipal wastes as major sources for marine litter.

Available reports (PERSGA/GEF, 2001 and PERSGA, 2006) provide some additional information on major sources of marine litter in the other member countries. In Djibouti, solid wastes are dumped on the shore. The household waste dumping sites in Douda and Djibouti towns represent the major sources of coastal marine litter that reaches the sea via runoff. A similar situation is found on the northern coast of Somalia, especially in the towns of Bosaso, Berbera and Saylac. In Egypt, the major marine litter discharges were reported to consist of garbage from urban and recreational areas. In Sudan, solid wastes are dumped on

the shore near human habitations, especially in Port-Sudan, forming large garbage dumps from which marine litter washes to the sea through runoff or winds.

In general, the accumulation of litter on beaches in the region is associated with human habitation. In Yemen, most coastal areas and beaches are covered with litter, owing to the absence of effective collection services. In Jeddah, Saudi Arabia, for instance, most beach sites are private and litter is often observed floating inshore in the vicinity of coastal resorts. Some garbage reaches the shore from nearby watershed areas in the PESRGA region. Unfortunately, some municipalities and local inhabitants dump their wastes in the basins of 'wadis', which they consider as landfill areas.

Economics

Marine litter is not only unattractive and potentially dangerous; increased beach maintenance costs can also deplete a coastal community's finances. The presence of litter along shorelines can lead to serious economic impacts for regions that are dependent on tourism (Buxton, 1990). Such concerns can also lead to higher maintenance costs for resorts, parks and communities. Litter makes shorelines unattractive and hazardous and can inhibit tourism. The indirect costs, though, are perhaps even greater. Unsightly litter discourages people from partaking in coastal activities such as recreational fishing, boating, swimming, or beach-going, and can even repel tourists from visiting coastal areas altogether.

Owing to growing tourism, the degradation of marine habitats and loss of their aesthetic values has been highlighted among the most serious impacts of marine litter in the member countries of PERSGA (PERSGA/GEF 2001 and 2006). The attractive seascape, coastal and marine life and favourable climate have encouraged the rapid development of the tourist industry along the coasts of the Red Sea and Gulf of Aden. Coastal tourism has been actively developed in some countries, namely Egypt and Jordan, while other countries, such as Yemen and Sudan, are striving to promote the tourist industry (PERSGA/GEF, 2001). Tourism is the third most important source of revenue in Egypt, while 22.2 percent of the country's total hotel capacity is located along the Red Sea coast in 2000 (PERSGA/GEF, 2001). Jordan has a growing tourism industry centred on Aqaba. In 2001, 66 percent of tourists entering Jordan visited Aqaba (PERSGA/GEF, 2001 and 2003a). Given the economic importance of coastal tourism in the northern parts of the Red Sea, and the potential of the tourist industry in its central and southern parts, marine litter might be considered as a serious problem with possible significant impacts on national economies in the region.

Legislation, policies and institutional arrangements

Legislation and policies

There seems to be ample national legislation related to coastal and marine environments in the member countries of PERSGA (PERSGA/GEF, 2001 and 2003b). However, the implementation of such regulations is greatly inadequate mainly due to a lack of awareness, capacity and coordination between different authorities, in addition to a lack of sufficient updating of the laws.

National laws and regulations

A brief overview of the national laws and regulations pertaining to the marine environments in the member countries of PERSGA (PERSGA/GEF, 2001, 2003a and 2003b) provides the following information:

Djibouti. There are 31 national laws, regulations, orders and decrees addressing protection of coastal and marine environments in Djibouti, including provisions on marine pollution, protection of endangered species, designation of protected areas, and ratification of regional and international conventions and agreements.

Egypt. There are 14 national laws, regulations, orders and decrees pertaining to coastal and marine environments in Egypt. These focus on the prevention of pollution, the cleanup of ports/territorial waters, fisheries regulation, maritime transport, trade, navigation safety, protected areas and coastal zone management. Another set of institutional decrees ratify the country as signatory of some 22 regional and international conventions addressing the subject. Although several authorities are involved in implementing marine and coastal environmental legislation, the Egyptian Environmental Affair Agency (EEAA), and the National Committee for Integrated Coastal Zone Management (NCICZM) are the principal players. The main objectives of the NCICZM (established in 1994) are to evaluate major projects, approve rehabilitation programmes, ensure the presence of contingency arrangements, coordinate coastal activities and specify the mandates of the different authorities involved, and ensure balance between development projects and

the carrying capacity of the ecosystems in the coastal zone. Twenty-one sites have been designated as protected areas, with those located on the Red Sea comprising most of the Egyptian Red Sea coast.

Jordan. There are several national laws and regulations related to coastal and marine environment. Jordan is party to eight international conventions relevant to the protection of the Gulf of Aqaba. The Aqaba Special Economic Zone Authority (ASEZA), formerly known as ARA is the principal national authority responsible for development and management of the coastal zone.

Saudi Arabia. Twelve royal and ministerial decrees related to marine and coastal area environments have been developed. They include regulations regarding seaports and lighthouses, fisheries and living aquatic resources, pollution prevention, sewage treatment, environmental management, coastal construction and landfills, the regulatory authority of the Presidency for Meteorology and Environment (PME) and the foundation and authority of the National Commission for Wildlife Conservation and Development (NCWCD). Although several authorities are involved in guarding and implementing marine and coastal environmental legislation, PME and NCWCD are the most concerned. Saudi Arabia is also a signatory to four bilateral or regional, and 12 international agreements and conventions.

Somalia. Somalia had, prior to the collapse of their central government in 1990, around 10 national decrees and laws regulating ports administration, fisheries, shipping and maritime transport. The country was also a signatory to eight regional and international agreements and conventions. As the central government has been absent since 1990 and the new entities are not recognized by the international community, this legislation is no longer in effect.

Sudan. There are 27 federal and state laws and regulations related to the protection of coastal and marine environments in Sudan. The country has also signed 43 regional and international agreements and conventions on the subject. According to the Federal Constitution, environmental policy and protection is a shared responsibility between the Federal Council for Environment and Natural Resources and the relevant councils in the different states.

Yemen. There are 14 principal laws and decrees related to coastal and marine environments. These address environmental protection from pollution and regulate fisheries, urban planning, land tenure, construction activities, urban planning, marine affairs, shipping, ports and harbours, tourism, free zones, mining, protected areas and involve local authorities. Yemen is signatory to 11 international agreements and conventions on the subject. According to Environmental Protection Law, the Environment Protection Council (EPC) is the official government agency responsible for developing the general national policy for the environment and coordination with concerned bodies, which should adhere to, and are obliged to implement decisions, resolutions and recommendations of the EPC.

Regional LBA Protocol

An important step was taken towards a coordinated regional approach with the signing by member countries of PERSGA in 2005 of the *"Protocol Concerning the Protection of Marine Environment from Land-Based Activities"*, which represents an addition to the Jeddah Convention. This Protocol in the Article 7 entitled "Management of Solid Waste" states:

"The Contracting Parties commit themselves as follows:

> *1. Taking all appropriate action to ensure elimination, to the greatest extent possible, of the solid wastes and litter reaching the marine and coastal environment by prevention or reduction of solid waste generation and by introduction of enhancements to waste treatment, including methods of collection and recycling and final disposal thereof.*
>
> *2. Cooperating with each other, and with international organizations, on exchange of information relevant to the practices and experiences relating to solid waste management, recycling, reuse, and cleaner production processes."*

Programmes and initiatives

In the PERSGA region, municipalities are the principal authorities responsible for collection of garbage. However, it is obvious from the data provided in the questionnaire and previous survey reports that the quantities of garbage discharged in coastal rural and urban areas are far beyond the capacities of collection and management. In many coastal areas solid waste management is either inadequate or lacking (PERSGA/GEF, 2001). Upgrading solid waste and wastewater management efforts have previously been

identified by the member countries of PERSGA as important priorities for controlling land-based pollution (PERSGA/GEF 2001).

A monitoring programme for coastal and marine litter exists in Jordan. In contrast, the other countries lack such a programme.

There are several management responses and initiatives, carried out by PERSGA, that principally, or in part, take the problem of marine litter into account. These include development of Coastal Zone Plans, Regional Action Plans for key habitats and species, Master Plans for Marine Protected Areas, hydrographic surveys and navigation aids to reduce risks of pollution, *etc*. The progress made in these fields is outlined in the State of Marine Environment Report (PERSGA, 2006).

Outreach

One of the major constraints regarding marine pollution in the PERSGA region is a lack of public awareness and the limited understanding of the environmental impacts of solid wastes, besides the ineffective management practices (PERSGA, 2006). Conversely, threats have arisen rapidly in recent decades in conjunction with increasing urbanization and coastal development. Recognizing this, however, several initiatives have been undertaken at both regional and national levels. At the regional level some capacity building has been developed (via training workshops) in the following subjects: management of solid wastes in industrial areas; coastal zone management; environmental impacts of development projects; improvement of wastewater management; and environmental inspection.

PERSGA's environmental awareness programme concentrated on conservation including the production of Environmental Education Learning Supplement, and implementation of community participation projects including cleanup campaigns. Five pubic information centres and 150 school nature clubs have been established within the region. These activities, carried out within the Strategic Action Programme (1998-2003), have raised awareness of PERSGA and its concerns at the national, regional and international levels. Currently, national awareness projects are executed by PERSGA within its On-ground Activities Programme in Jordan and Djibouti. National efforts addressing the marine litter problem are largely confined to the joint work with PERSGA in the above described activities. Some added efforts, including some cleanup campaigns, are noticeable in Egypt, Jordan, Saudi Arabia and Yemen.

In Egypt, occasional beach cleanup activities are undertaken. NGOs, mainly the Hurghada Environment Protection Association (HEPCA), private sectors (e.g. The Coca-Cola Company and PADI Intl. Ltd.) and volunteer citizens participate in such activities. In Jordan, daily beach cleanup activities and monthly cleanup dive campaigns are undertaken in the Aqaba Marine Park, in addition to participation in the annual International Coastal Cleanup campaigns, coordinated globally by the U.S. NGO, Ocean Conservancy. The Saudi Environmental Awareness Programme (SEAP) is responsible for conducting activities to raise awareness of the marine environment. In 2004 there were underwater cleanup campaigns. For example, in Jeddah, Saudi Arabia, a large official inshore underwater cleanup campaign was launched jointly with a private sector and diving centres, including Desert Dive Centre. Some NGOs, such as Reef Chief, conduct awareness activities in the coastal areas of Saudi Arabia. Other CBOs, such as Friends of Environment, undertake such activities in Yemen. As a pioneer step in the PERSGA region, Yemen has developed a National Programme of Action for the Protection of Marine Environment from Land-Based Activities (NPA) in 2003 as a pilot project with financial support from the UNEP/GPA Coordination office. Litter was addressed as a high priority problem in the NPA. Beach Cleanup Campaigns were launched during the NPA development in the Gulf of Aden. School students, along with a CBO and national broadcast, took part in such campaigns.

Recently, PERSGA established an important event during development of this RAP. It dedicated its 2006 annual campaign day (26 September) to marine litter through designing a poster and launching beach cleanup campaigns.

Regional Action Plan

The strategic approach, objectives and actions for this Regional Action Plan (RAP) for Sustainable Management of Marine Litter in the PERSGA Region were identified on the basis of assessment of the status and management of coastal and marine litter in the region. The RAP is consistent with the global, regional and national initiatives; it was developed to meet the needs for proper management of coastal and marine litter in the region.

To assist the implementation of the RAP, the framework for action is constructed of the following three key components: (a) public awareness and education, (b) legal and institutional framework and (c) research and monitoring.

For each component, an overview of the component theme is given, and the objectives and priority actions identified. Setting priority actions was based on status and impacts of marine litter and response to the problem in the region.

The RAP will be coordinated at the regional level through PERSGA, in liaison with other national and international agencies. In each member country of PERSGA, implementation will occur through integrated networks of national and local working groups, government departments, NGOs and other stakeholders. As there are clear discrepancies in institutional capacities and the manifestation of marine litter problems among the countries, it is recommended to develop National Action Plans (NAP) for each member country in accordance with this RAP. The NAP for each respective country will specifically assist in: (a) the designation of the level of urgency for each specific priority action according to the country needs; (b) indicating realistic budgets, which will depend on the amount and range of activities to be undertaken to achieve any specific priority action in the respective country; (c) developing a phased approach to implementation, subject to the budget and available national capacity; (d) indicating time-frames and performance indicators of results, outcomes and impacts of the plan at the national level; (e) integration of the NAP in the national strategies for coastal and marine environment in the light of their strong interconnectedness to each others; and (f) designation of the national stakeholders involved and their roles.

Public awareness and education

Awareness and education are essential tools contributing to environmental protection. Raising public awareness to encourage people to choose better options is an important part of the response of governments to this issue. Reducing marine litter will require preventing litter from reaching the coastal and marine environment in the first place by pursuing long-term public awareness and education programmes. While education and cleanup initiatives have made a substantial contribution to improving the ocean environment, the occurrence of litter, trash and garbage that continue to accumulate on beaches and in the oceans indicate that many people and communities have not yet changed their behaviour. This situation is especially encountered in the PERSGA region. Participation of all sectors of society is an essential requirement for the development of sustainable policies in the region. It requires the development of education projects, transparent and participatory decision-making procedures and open rules on access to administrative and judicial procedures.

Historically, PERSGA had a public awareness component within the eight, objective-based components of the Strategic Action Programme (SAP), carried out between 1999 and 2003. Some awareness materials, including brochures ‘A Letter to the Beach Visitor’ and ‘Clean-up Dive Instructions’ were produced. Many local school environmental clubs, established through SAP, took part in cleanup campaigns launched jointly with NGOs and other stakeholders. The Awareness Programme has continued, but with fewer activities. Therefore, there is a need for enhancement of such a programme, which is a basis to undertake awareness and education programme addressing problems of coastal and marine litter.

Objectives

This RAP component has the following three objectives aiming at reducing and/or avoiding litter accumulation on beaches and in the sea with involvement of wide stakeholders, including rural coastal communities, in the PERSGA region:

- rising of public awareness of the impacts of marine litter on coastal and marine environment;
- cleanup of the coastal and marine environment; and
- education of stakeholders on marine litter issues.

Actions

Under each objective a set of 16 priority actions were to be undertaken in order to achieve the objective, listed among them:

- production and distribution of appropriate awareness materials (in Arabic and English/French);
- organization of local awareness workshops and seminars;
- participation of local media and press in awareness activities;
- development of regional cleanup programme and strategies and organisation of yearly regional cleanup campaigns, in cooperation with the ICC;
- development of regional sustainable education programme for protection of the marine environment from litter;
- education and training of ship owners, ship operators, crews, cruise line passengers; port users, fishermen, recreational boat users; school teachers; local administrators on protection of the coastal and marine environment from litter, as well on the MARPOL Convention and its Annex V; and
- work with the international travel industry on education of consumers about the importance of the MARPOL Convention, its Annex V and other international programmes and activities for the management of marine litter.

Legal and institutional framework

Effective legislation and control and adequate institutional capacities are considered essential components for proper management of marine litter. There is a need of development and enforcement of legislation for protection of the coastal and marine environment from litter in the PERSGA region. Strengthening capacity of governmental institutions is a necessary action for this purpose. The member countries of PERSGA should have specific legislations and institutional frameworks to deal with litter and problems associated with litter accumulation. In general, on the legal level, it is recommended that regulations be developed and implemented to: (a) give a sense of responsibility to those who produce and manage the waste and maintain public places; (b) allow for classification of waste by nature and origin and encourage the use of biodegradable packaging materials; (c) require regular and specific follow-up of wastes from production to disposal; (d) require introduction of national and regional solid waste management plans; (e) establish enforcement procedures on the management of the coastal zone; and (f) impose severe penalties on offenders through the application of the ‘polluter pays’ principle.

The PERSGA LBA Protocol in Article 7 emphasizes actions to be taken for the disposal of wastes or marine litter. On the institutional level, it is recommended that financial and fiscal incentives relating to investment or exploitation be adopted to encourage the privatization of waste collection, transport and treatment. PERSGA, as an intergovernmental organization, can play a role for development of legislation on marine litter within the legal framework of the Jeddah Convention 1992 and the LBA Protocol. It can support the member countries for development of the national legislation and institutional framework to manage the marine litter at the national level.

Objectives

This RAP component has the following seven objectives aiming at prohibiting dumping of litter in the coastal and marine litter environment and strengthening government capacity to manage the marine litter:

1. regulation of litter pollution and impacts on the coastal environment;
2. regulation of marine litter pollution and effects on the marine environment;
3. coordination of activities in the framework of the PERSGA Initiative on marine litter;
4. information sharing and exchange of experiences on marine litter;
5. capacity building for marine litter management;
6. building of Public-Private Partnerships (PPP); and
7. development of National Action Plans on Marine Litter.

Actions

Under these objectives a total of 37 priority actions are to be undertaken. These include:

- adoption of regional regulatory systems for managing coastal and marine litter in the region;
- management policies for local municipality services;
- encouragement of the amendment of existing national policy and by-laws concerning littering in the urban and rural coastal areas;

- cooperation with UNEP/GPA and UNEP/RS for development of appropriate legislation for protection of the marine environment from coastal litter and its land-based sources;
- coordination with the UNEP/GPA, UNEP/RS, and ICC of activities on marine litter in the region;
- encouragement of countries to ratify the MARPOL Convention and enforce Annex V of the MARPOL Convention;
- promotion of the introduction and enforcement of ship waste and port waste management plans;
- appointment of a nation-wide agency to manage and control marine litter;
- implementation of a regional coordinated and continuous region-wide cleanup campaign programme;
- enhancement of the PERSGA database with information and data on marine litter activities for each country member and setting up of a regional clearing-house mechanism/node within the PERSGA web site;
- promotion of regional and international sharing and expansion of waste minimization and recycling strategies within the cruise line industry;
- promotion of development of a regional training programme for protection of the coastal and marine environment from litter;
- building of a partnership with private sectors for a regional programme on the marine litter in the PERSGA region; and
- development of regional guidelines for development of a National Action Plan on Marine Litter (NAP marine litter).

Research and monitoring

There is a need for research and monitoring to clearly understand the status of the coastal and marine litter in the PERSGA region. Surveys for litter on beach and in the sea are important activities that should be carried out in the region. Beach-focused surveys and sea-focused surveys can provide important information on the types, sources and impacts of litter in the region.

By selecting particular pilot sites and then monitoring certain types of typical marine-sourced litter, it is possible to approximate and evaluate the extent of sources.

Objectives of monitoring are: (a) to provide information on the types, quantities and distribution of marine debris; (b) to provide an insight into problems and threats associated with an area; (c) to identify source of coastal and marine litter; (d) to explore public health issues relating to marine debris; and (e) to increase public awareness of the condition of the coastline.

Consequently, research and studies are necessary to be undertaken in the region. These include, but not limited to the following research: (a) assessment of effects of litter on the coastal and marine ecosystem; (b) identification of litter priority sources; (c) capacity of pertinent institutes dealing with litter; (d) valuation of legal and institutional frameworks; (e) effects of coastal litter on human health; (f) socio-economic impact caused by coastal and marine litter; and (g) investigation of reducing and protective measures of marine litter impacts.

Litter might significantly affect the communities and individuals depending on coastal marine areas for their livelihood. It can damage vessels, burden coastal communities with exorbitant cleanup costs, and turn away tourists leaving local merchants at a loss. Further, once a tourist area is perceived to be polluted it is very difficult to dispel that image. Therefore, pilot economic assessments should be conducted to evaluate the impact of marine litter in coastal areas of PERSGA. These studies should, in addition to the above tasks, take into consideration the loss of wildlife and aesthetic impact as economic factors. Pertinent social and economic studies would be useful for policy makers, waste management planners, tourism and industry planners, and others who are formulating coastal and waste management policies in the PERSGA region. Undertaking these studies should be one of high priority actions needed for the region.

Objectives

This RAP component has the following six objectives aiming at understanding the status of the coastal and marine litter in the PERSGA region in terms of impacts and management:

1. assessment of priority sources and types of marine litter in the region;
2. understanding the impacts of litter on the coastal and marine environments;
3. investigation of effects of coastal and marine litter on human health;
4. assessment of socio-economic impacts of marine litter in the region;
5. monitoring of the litter accumulation in the marine environment of the region; and
6. investigation of mitigating and protective measures for reducing dumping of litter in the coastal and marine environment.

International Coastal Cleanup on a Djibouti beach. © PERSGA

Actions

Under each objective a set of priority actions, totalling 29 actions, to be undertaken in order to achieve the objectives were listed, including:

- development of a regional and national monitoring programmes to investigate the types, sources and extent of marine litter accumulation on beaches and in the sea;
- conducting studies of trash and garbage in urban run-off and litter "hot-spots" through the region in order to characterize the most significant products contributing to the problem;
- investigation of the extent and impacts of fishing gear (ghost fishing) on the marine environment at each country member;
- establishment of a Regional Coastal and Marine Litter Survey Group with national team members from each country;
- conducting a regional study on impact of accumulation of litter on shoreline profile, intertidal zone area, shallow seagrass; mangroves; and coral reef communities;
- conducting a regional study on human health affected by litter accumulated on beaches and in the sea in the region;
- compilation of existing studies that relate to the social and economic effects of coastal and marine litter;
- conducting a social and economic study on effects of coastal and marine litter for a country member/ a coastal area where consideration should be given to: cost of vessel repair; towing charges; ghost fishing; cost to private owners, cities and regional authorities of cleaning beaches; loss of tourism and related revenues; cost and benefit analyses of implementing recycling programmes; and loss of aesthetic values and use of beach sites;
- assessment of capabilities of municipal services and port facilities for garbage and litter collection at each country member; and
- analysis of cost-benefit of litter recycling in one or two country members.

Integration and fund raising

Activities of this RAP should be integrated with programmes and projects of PERSGA. They should also be included in the existing national environmental programmes to enhance such activities at the national level. Actions at the national level would rely mainly on national and local funding. However, it should be emphasized that the protection of the marine environment from litter cannot be achieved through government actions alone or by depending entirely on public funds.

For effective implementation of this RAP there is a need for international cooperation. It is required mobilizing financial resources from relevant international agencies. There is a need to enhance cooperation with UNEP/GPA and UNEP/RSP to ensure support schemes within their framework.

In general, the financial resources should include:

- central government budgets of the member countries;
- international donor agencies, e.g., GEF, UNEP, UNDP, WB, ISESCO, and NGOs;
- private sector, e.g., The Coca-Cola Company;
- sales of recyclable litter products;
- sales of TV documentaries, books, images, CDs, *etc.;*
- donations and grants; and
- fines from illegal activities and compensation for discharges of solid wastes.

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Marine litter in the South Asian Seas region
Overview, strategy and Action Plan

Introduction

The South Asian Seas (SAS) region includes the seas bordering Bangladesh, India, Maldives, Pakistan, and Sri Lanka and comprises the northern part of the Indian Ocean, along with parts of the Bay of Bengal and the Arabian Sea. The total population of the region is approximately 1,424 million (UNEP, 2002) and the length of the coastline is about 10,610 km.

The South Asian Seas Action Plan (SASAP) was adopted in March 1995, with the overall objective to address critical problems through the protection and management of the marine environment and related coastal ecosystems of the region in an environmentally sound and sustainable manner. The South Asia Cooperative Environment Programme (SACEP), established in 1982, is acting as the Action Plan secretariat.

Within the context of UNEP's support to SACEP, and bearing in mind that marine litter is a priority activity for both the SAS and UNEP's Regional Seas Programme, UNEP and SACEP signed a MOU for the development of Regional Activity on Marine Litter in the South Asian Seas. The objective of this activity was to assist in the environmental protection and sustainable management and development of the South Asian Seas region through the development of a regional activity on marine litter. Under the terms of the MOU, SACEP, in consultation with the UNEP Regional Seas Coordinating Office (RSCO), prepared the following two documents: *Review of marine litter in the SAS Region* and *Framework for Marine Litter Management in the South Asian Seas Region.*

The project became operational in June 2006, with the appointment of the Regional Consultant, preparation of a national questionnaire that was transmitted to the National Focal Points and nomination of the National Consultants for assisting SACEP in preparing the country reports on marine litter. The Regional Consultant prepared the review document on *Marine Litter in the SAS Region* based on the national reports of Pakistan, India and Sri Lanka and the secondary data/information available from the country reports of the region on the Bay of Bengal Large Marine Ecosystem (BOBLME) programme and National Environment Status Reports. He also prepared the framework document on *Marine Litter Management in the SAS Regio*n based on the national reports of Pakistan, India and Sri Lanka.

The Regional Workshop to consider the draft review and the framework documents on the marine litter activity in the SAS region was conducted in Colombo, Sri Lanka, 20-21 August 2007, at which the Regional Consultant, the three National Consultants, the National Focal Points, experts from the member countries and representatives from UNEP participated and discussed the reports and gave useful suggestions for finalizing the documents. It was decided that a task force comprising a minimum of two to three experts from each Member State would be set up by SACEP to review and finalize the strategy and action plans that will be proposed by each Member State of the SAS region. This task force will meet at a suitable time and place during 2008 to firm up the future strategy and action plan for marine litter management in the region.

The objective of this chapter is to present a summary of the document *Marine Litter in the South Asian Seas Region (SACEP/UNEP, 2007)* that includes *Review of Marine Litter in the SAS Region* and *Framework for Marine Litter Management in the SAS Region*.

Review of solid wastes and marine litter in the SAS region

Marine and other aquatic litter (or debris) is the one of the world's most pervasive pollution problems impacting the shorelines, coastal waters, estuaries, and oceans, affecting the health of the seas and waterways. The nature and intensity of development activities, human population size, income level, state and type of industry and agriculture are among the factors contributing to the unique pollution problems in each country of the South Asian Seas region. The priority issues for the SAS region recently identified by UNEP/GPA (2005) include: sewage, litter – solid waste (industrial and municipal), agricultural chemicals, oil hydrocarbons, sediment, and physical alteration and destruction of habitats.

Assessment of the status of marine litter

Regional solid waste issues

In the SAS region numerous cities and industries with inadequate waste management are situated along major rivers such as the Ganges, Narmada, and Indus. The quantity of solid waste generated by the coastal populations of the region is 11,650 tonnes per day, which is an average of 0.5 kg per person per day (UNEP/GPA, 2005). The waste is primarily composed of paper, plastics, and biodegradable matter. Solid waste generally arises from domestic and industrial sources. Domestic waste also includes hospital and medical wastes, which can find their way into the coastal waters during the rainy season via the rivers, streams and mangrove swamps that are used as local dumping sites.

In Bangladesh, India, Pakistan and Sri Lanka, only a fraction of the solid waste generated is collected. The rest is dumped into open areas, many of which are waterside and adjacent to coastal habitats. The disposal of solid waste by ships in near-shore areas is regulated by Annex V of the MARPOL 73/78 Convention. Compliance with this convention requires countries to provide port reception facilities for ship-generated wastes, which may not be available in all port areas in all SAS countries.

The increasing amounts of solid waste in the coastal zone are detrimental to the economies of many countries, especially those dependent on coastal fisheries (India and Sri Lanka, in particular) and on tourism (particularly, Maldives). Scientists have documented an increasing number of injuries and death among marine mammals, fish, sea turtles and birds due to entanglement in solid waste. Furthermore, animals can mistake plastic litter or other marine litter items and pelagic tar and accidentally ingest them, eventually killing them.

Ship-breaking

Ship-breaking yards are operational in India, Bangladesh and Pakistan and are a source of marine litter and other pollutants in this region. It has turned into an industry in which thousands of workers are employed earning government revenues of Tk 2.5 billion (SHED, 2002). In India ship-breaking operations are carried out over a distance of about 10 km on the beaches of Alang in Gujarat – one of the largest and busiest ship-breaking yards in the world. In Bangladesh, where ship-breaking started on an industrial scale in recent years, nearly 50 ship-breaking units operate on the seashore from Khulna to Fauzderhat in Chittagong and near Mongla port in Khulna. In Pakistan the ship-breaking industries at Gadani are the major sources of pollution to the adjoining coastal areas.

Ship-breaking at Alang, Gujarat, India. © SACEP

Natural disasters – tsunami and floods

The 26 December 2004 tsunami, which seriously affected Sri Lanka, India, and the Maldives, demonstrated that in addition to land-based sources of pollution induced by human activity, natural events can also result in substantial contributions of pollutants in the form of sediment and litter (UNEP, 2005). Coastal areas were inundated with huge deposits of various forms of solid waste. In Sri Lanka, it was estimated that about 900,000 tonnes of debris was generated in the 2004 tsunami. Many government and non-governmental organizations have jointly cleared the debris accumulated due to the damages caused to coastal installations. There is no report available on either the quantum of debris left behind along the coast by tsunami or the impact of the debris on the marine ecosystem.

Status of solid waste and marine debris at the national level

India

The status of marine debris in India varies from place to place. The Indian coastline has 13 major ports and 181 minor to intermediate ports, of which 139 are operational and are under the jurisdiction of the respective State governments. These areas are sources of marine debris due to quantities of solid wastes handled in these ports. India's major shipyards are located in Kolkata, Visakhapatnam, Kochi, Goa, and Mumbai, with the world's largest ship-breaking yard located in Gujarat. These activities generate peeled-off paint chips, iron scrap and other types of non-degradable solid waste, which can enter the marine environment as marine debris. Tourism activities have also been associated with marine debris production in key areas of the Indian coast.

Maldives

Solid waste generation has increased measurably throughout the Maldives. Traditionally much of the solid waste was disposed either on designated beach areas or into the uninhabited parts of the island for natural composting. With the increase in development and the amount of goods imported into the country, the quantity and nature of solid waste generated has changed dramatically. In the absence of an appropriate disposal system, particularly for small islands, the increase in non-degradables such as various forms of plastic, cans and bottles, and in particular an increase in hazardous wastes such as dry cell batteries or hospital wastes, are threatening the aesthetics and health of people on many islands.

Discarded cans and plastic bottles near a Maldives beach area. © SACEP

Pakistan

A survey in the late 1990s revealed that each person in Karachi generates about half a kilogram of solid waste per day. The Karachi Municipal Corporation claims that it collects and disposes about 50 percent of the 7,500 tonnes of solid waste generated per day. However, it is reported that in reality a much smaller percentage is actually disposed with the garbage being dumped into nearby riverbeds, which is eventually carried into the coastal areas as debris.

Privatization of solid waste management was initiated by the Ministry of Environment, Urban Affairs, Forestry and Wildlife. The Ministry is also responsible for the proposals in connection with the recycling of paper in government offices. About 60 percent of Pakistan's industries are located in Karachi. The rest of the coastal areas do not have any major industry except fisheries, small power plants, a sugar mill and ship-breaking industry. The Balochistan coast has small towns with a population of about one million. Due to lack of industry and population, the coastal waters of Balochistan are relatively free from pollution except in a few areas.

The ship-breaking industry at Gadani has been a prominent source of pollution because of the booming business of ship-breaking along the coast of Gadani. This industry has been the biggest source of heavy metal pollution in the area. In addition, waste oils, bilge oils, scrap steel and other scrap metals and scrap

wooden products are also discharged directly into the intertidal zone on the beach at sea-front and become marine debris.

Sri Lanka

Coastal waters in Sri Lanka are severely polluted due to a number of threats, including the dumping of solid wastes in coastal areas. At the turn of the last century, 51 percent of the population of Colombo City lived in 1,500 shanty settlements comprising around 66,000 households. These settlements are underserved with respect to sanitation, safe water and proper waste disposal facilities. About 70 percent of the tourist hotels are located within the coastal region, which has led to water quality degradation and aesthetic pollution of the beaches and near shore waters. Some development activities in the coastal zone, including inadequately planned tourism, have resulted in adverse impacts. Examples are the pollution of beaches and coastal waters due to the release of sewage, solid waste and wastewater.

Harbour pollution in Sri Lanka. © SACEP

Status of marine debris

For the entire SAS region, marine litter data and other information of some utility are available only from India and Sri Lanka, with information from Bangladesh, Pakistan, and the Maldives either unavailable or inadequate. There are also no accepted or standard methodologies being followed in the region for collecting, analysing and interpreting marine litter data. There is also a lack of information related to the open-ocean floating and submerged marine litter/debris, as no systematic monitoring/sighting of such debris has so far been undertaken in this part of the South Asian Seas.

As observed by Tudor *et al*. (2003) and Tudor and Williams (2004), the methodologies adopted in the SAS region, particularly in India, tabulate the material composition of the litter without addressing the origin of the litter. The data available from India are from the periodic beach cleanups/coastal surveys conducted by local communities, non governmental organizations (NGOs), conservation groups, students and the public. Such data are of limited value in evaluating impacts and formulating management plans. Beach surveys allow large amounts of data to be collected at low cost (Rees and Pond, 1995). The use of volunteers in surveys is commonplace, and provides impartial data with no statistical difference between that gathered by experience and inexperienced surveyors (Tudor and Williams, 2001).

Types and sources of marine litter in the SAS countries

Major sources of marine litter (land and sea) have been derived from the national reports on marine litter for India, Pakistan and Sri Lanka and from the published reports on liquid and solid wastes polluting the coastal and marine areas in Bangladesh and Maldives. This assessment includes a wide array of materials and products associated with everyday life in the region. The following table describes the types of debris that have been found in the coastal areas of the SAS region:

Table 1. Types of marine and coastal litter recorded in the SAS region

Site No.	Types of marine/coastal litter	Bangladesh	India	Maldives	Pakistan	Sri Lanka
1	Plastics (fragments, sheets, bags, containers)	✓	✓	✓	✓	✓
2	Polystyrene (cups, packaging, buoys), foam, PVC, etc.	✓	✓	✓	✓	✓
3	Rubber (gloves, boots, tires)		✓			✓
4	Wood (construction timbers, pallets, plywood, fragments of both)	✓	✓		✓	✓
5	Metals (drink cans, oil drums, aerosol containers, scrap)	✓	✓	✓	✓	✓
6	Sanitary or sewage related debris (tampons, diapers, condoms, faeces)	✓	✓	✓	✓	✓
7	Paper and cardboard		✓		✓	✓
8	Cloth (clothing, furnishings, shoes)		✓			✓
9	Glass (bottles, light bulbs), glass wool	✓	✓	✓	✓	✓
10	Pottery/ceramic					✓
11	Monofilament fishing line		✓			✓
12	Floats, marking buoys and abandoned cut pieces of used nets		✓			
13	Plastic beach chairs*		✓			
14	Computer monitors and refrigerators*		✓			
15	Waxed milk carton/Tetra Packs		✓			✓
16	Fruit peels		✓			✓
17	Cigarettes, cigarette filters, lighters, cigar tips, and other tobacco related packaging and wrappers		✓			✓
18	Used batteries		✓	✓		✓
19	Building materials, etc.		✓	✓		✓
20	Tar/grease balls, oil film, black tar, etc.	✓				
21	PCBs	✓				
22	Others	✓	✓	✓	✓	✓

** reported in the Andaman and Nicobar Islands after 2004 December tsunami*

Legislation, policies and institutional arrangements

No exclusive legal or institutional mechanism, policy or framework specifically for marine litter management currently exists within the Member States of the South Asian Seas region. However, each country in the region has implemented an umbrella environmental protection law that allows for the establishment of an institution to control and regulate environmental pollution and other problems.

Bangladesh

The first major law that has been promulgated for the specific purpose of conservation of nature and protection of environment is the Environmental Conservation Act (ECA) of 1995, which was followed by the Environmental Conservation Rules (ECR) of 1997. Virtually there is no marine litter policy in the country. However, to tackle the environmental pressures created by solid waste disposal, ship-breaking and lube oil discharge at sea, the Bangladesh Government uses the provisions of the Environmental Conservation Act and Regulations.

India

The International Convention for the Prevention of Pollution from Ships, 1973 (ICPPS) was ratified by India in 1986. ICPPS covers pollution by oil, chemicals, harmful substances in packaged form, sewage, and garbage. The disposal of ship-based wastes is regulated by the Merchant Shipping Act, 1958 and by the adoption of MARPOL 73/78. The Recycled Plastics Manufacture and Usage Rules, 1999 and Municipal Solid Wastes (Management and Handling) Rules, 2000 are a couple of the rules framed under India's Environmental Protection Act, 1986, with an aim to providing environmental protection and are relevant to the coastal environment and marine litter.

In order to strengthen international, including regional cooperation and coordination, India is a member of various international/regional programmes and some of them are relevant to marine debris including the UNEP Regional Seas Programme and South Asia Cooperative Environment Programme, United Nations Convention on the Law of the Sea (UNCLOS), International Convention for the Prevention of Pollution from Ships (MARPOL 73/78), Basel Convention on Transboundary Movement of Hazardous Substances (1992) and several others.

Maldives

The Environmental Protection and Preservation Act of Maldives (Act 4/93) was enacted by the People's Majlis in 1993. The Act 4/93 contains provisions that provide environmental advice regarding environmental policy formulation, biodiversity conservation, environmental impact assessment, and waste disposal, including hazardous wastes. The Second National Environment Action Plan (NEAP) of Maldives was adopted in 1999 and also identifies the management of solid wastes as a key issue to be addressed. Maldives is party to the Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal. Maldives is also a member of the MARPOL 73/78 Convention of the International Maritime Organization and has adopted Annexes I, II and V.

Pakistan

Presently, there is no legislation specifically covering litter in marine and coastal regions in the country of Pakistan. However, Pakistan is a signatory to a number of conventions, protocols and international treaties on environment and related issues, which includes MARPOL 73/78, the Convention on Biological Diversity, Convention on Trade of Endangered Species, Kyoto Protocol and several others.

Sri Lanka

The Coastal Zone Management Plan (CZMP) for Sri Lanka was published in 1990 in accordance with the provisions of the Act and revised in 1997. The second revision was completed in 2004. Although the initial CZMP document was only dealing with coastal zone management aspects, subsequent revisions recognised the importance of pollution control and included a special chapter on Coastal Pollution Control. The CZMP of 1997 as a management objective proposed that the types and volume of solid wastes be reduced in the coastal environment; develop solid waste management plans for coastal urban and tourist centres and fishing harbours; discourage local authorities of solid waste disposal in the coastal zone; and collaborate in public education and awareness programmes for solid waste management.

Other relevant International conventions adopted in Sri Lanka include: MARPOL 73/78; London Convention 1972; UNEP Regional Seas Programme; UNEP GPA; and Basel Convention.

Institutional arrangements

National government ministries, departments, organizations, NGOs and civic groups

Bangladesh

Marine litter has not been identified as a separate entity for exclusive monitoring and management in the National Plan of Action for Environmental Protection. The Department of Environment is directly responsible for coastal and marine pollution control. However, the Ministry of Environment & Forests, Department of Environment, Department of Environmental Pollution Control, Ministry of Law, Ministry of Fisheries and Livestock, Ministry of Local Government; Ministry of Health, Ministry of Agriculture, Ministry of Water Resources are all collectively responsible for prevention and control of environmental pollution and could be engaged in working on marine litter issues relevant to their core programming. The Dhaka City Corporation (DCD) is responsible for solid waste management (collection, transportation, disposal and treatment) in the metropolitan area (Kazi, 1998). In addition to DCC, some NGOs also have come forward in solid waste management.

India

The following Indian Government Ministries, Departments and Organizations have the mandate for addressing the marine pollution and protection of coastal environment related issues in general, but not specific to marine debris: Ministry of Environment and Forests, Ministry of Agriculture, Ministry of Earth Sciences (erstwhile DOD), Ministry of Science and Technology, Ministry of Surface Transport including Directorate of Shipping, Ports and Harbours, Ministry of Urban development, Ministry of Tourism, The Indian Coast Guard, The Indian Navy, Central Pollution Control Board, Coastal State Governments Department of Town Planning, Department of Fisheries, Department of Environment & Forests, State Maritime Board, State Pollution Control Board, Coastal District Administration and Municipalities/Panchayats of coastal cities/towns.

The following are the NGOs and other groups that are involved in India with the collection and management of marine litter: EXNORA (Chennai), Indian Maritime Foundation (Pune), Green Peace (India), Toxilink, Kadal Ammai Padukappu Sangam (Chennai), the Indian Council for Plastic Environment (ICP), and WWF (India).

Maldives

The Ministry of Environment, Energy and Water (MEEW) is the nodal agency for prevention and control of environmental pollution in the Maldives and is mandated with waste management issues in the country. The fisheries sector in the Maldives is mandated with the Ministry of Fisheries, Agriculture and Marine resources. The Ministry has under it the Marine Research Centre, with a mandate to conduct fisheries-related research and development.

Pakistan

The Ministry of Environment, Local Government and Rural Development is responsible for overall policy, planning, coordination and implementation/execution of various activities in this sector. Protection of high seas, territorial waters and port-related matters are vested with the respective port authorities for administration and management. A Marine Pollution Control Board has been established to handle matters, which are related to marine life and environment and resources at risk; to provide advisory services to relevant organizations; and to review monthly progress in combating and controlling marine pollution (UN, 2002).

The responsibility for management of marine litter presently is not vested with government or any other organization. However, the issue of marine litter management involves a number of organizations including municipal authorities and others dealing with distribution of water and treatment of wastewater. Enforcement agencies/organizations include the Ministry of Environment, Ministry of Ports and Shipping, and Maritime Security Agency. A close coordination among concerned ministries and organizations is required to address the issue of marine litter management in Pakistan.

Sri Lanka

Waste management is the primary responsibility of municipal councils, urban councils and other local authorities. Maintenance of clean beaches also falls within the purview of these local authorities. At present, however, the removal of marine litter-floating or deposited on the seabed is not dealt with by any of these authorities. The two significant state institutions in Sri Lanka that are charged with the responsibilities of management and pollution abatement in the coastal zone and marine sector are the Coast Conservation Department (CCD) and Marine Pollution Prevention Authority (MPPA).

Programmes and initiatives for the management of marine litter

Currently, the SAS region does not have any specific national or regional projects that deal exclusively with the issue of marine litter. Marine litter activities in some of the countries of the SAS region are limited to periodic community beach cleanup exercises which are locally coordinated by the central and state government ministries/departments, Coast Guard, non-governmental organizations, schools, private sector organizations, community groups, pollution control boards, and coastal zone agencies. Regular beach cleanups are reported to be carried out in Bangladesh, India, Pakistan and Sri Lanka. There were no reports of community beach cleanup activities in the Maldives.

A marine litter programme has been introduced into India and other countries of the SAS region called the International Coastal Cleanup (ICC), which is coordinated globally by Ocean Conservancy, a U.S. NGO. The ICC has been conducted since 2002 in limited coastal areas of India, organized by the Indian Navy, Indian Coast Guard, National Institute of Ocean Technology at Andaman, and NGOs like the Indian Maritime Foundation with the participation of school children, industries and citizens.

Strengths, weaknesses, gaps and needs

All the Member States of the region have their own legal and institutional mechanisms to address marine environmental issues. They have also signed and ratified major international conventions on the utilization and management of the marine environment and resources. While the instruments provide a foundation for general pollution management, the same legislation is a weakness related to marine litter management in the region. What is lacking is the acknowledgement and integration of marine litter issues as a component of marine environmental regulations and policies. Currently, the responsibility for managing marine litter issues does not fall to any specific institution or framework within the entire region.

In addition to an inadequate institutional framework to address marine litter issues there are other deficiencies that have been identified including: a lack of effective mechanisms to control land-based sources of debris; no regional or national-level collaborative activities in any of the countries of this region on this issue; a lack of public awareness on the sources and impacts of marine litter; inadequate funding resources; no standard methodology for monitoring has been developed or adopted; no information/data available on the open ocean floating and submerged marine litter/debris, as no systematic monitoring/sighting of such debris has so far been undertaken in this part of the South Asian Seas; and most importantly, none of the National Environment Action Plans of the countries in the SAS region include programming that could support a marine litter monitoring, management and prevention effort.

Comments from India, the Maldives and Sri Lanka related to the needs for developing and implementing a marine litter programme in their countries should include:

- Pursuing a long-term public education and awareness campaign for behavioural change that includes the tourism industry, packaging companies, local government officials, recreational boaters, fishers (traditional and commercial) and other stakeholders;
- Expansion of proper solid waste disposal practices, including adequate receptacles and removal efforts, active management of debris entering and exiting the sewer systems;
- Setting up of small-scale plastic recycling plants in the affected coastal areas;
- Bio-waste management practices implemented as part of an integrated waste management system;
- Implementation and enforcement of local anti-littering regulations;
- A revision of appropriate regulations where the marine litter issue would be included (e.g., MPA, CZMP, etc.); and
- Development of state – private partnership programmes and to involve other stakeholders such as non-governmental organizations, community based organizations and fishing societies.

Conclusion

The problem of marine litter is continually getting worse and poses an increasing threat to the marine and coastal biodiversity in the productive coastal areas of the South Asian Seas region. In so far as the SAS region is concerned, no concerted efforts have been made to conduct a realistic assessment of the status of coastal marine litter or the implementation of remedial measures to manage and contain the incidence of marine litter in the coastal areas and on the high seas. Virtually no qualified information is available from the region on marine litter (its source/origin, the factors influencing the distribution and dispersal of the litter), or its negative impacts. Even though there are a number of legal and institutional mechanisms and framework existing in the countries of the SAS region, none of them is effectively addressing the marine litter issue. Therefore, the need of the hour is to develop and implement a comprehensive marine litter assessment and management programme engaging the entire SAS region.

Framework for marine litter management in the SAS region

Marine litter management is not a priority issue in any of the countries in the South Asian Seas region. Currently, the SAS region does not have any specific national or regional projects that deal exclusively with the issue of marine litter. There are no exclusive legal mechanisms or institutional frameworks and policies for marine litter management in this region, even though umbrella legislation for marine pollution control and prevention has been adopted in all Member States of the region. None of the National Environment Action Plans of the countries in the SAS region includes any programme component that addresses marine litter monitoring, management and prevention.

Organized marine litter activities in India, Pakistan and Sri Lanka are fairly limited to periodic beach and community cleanup exercises. Data available from the countries of the SAS region, indicate that the major sources of marine pollution, including debris, in the SAS region are domestic/industrial wastes, ports and harbours including fishing harbours and landing centres, ship-breaking yards, fish/food processing industries, tourist resorts/beaches, solid waste dumping, urban runoff, oil rigs, coastal aquaculture, fishing industry including fishing gear, shipping including garbage from ships, recreational and leisure use, marine mining and construction activities.

No detailed or systematic assessment on the damages to the ecosystems, tourism or public health and safety, economic loss due to the marine litter problem, social, physical, biological and economic ramifications of marine debris including that of lost and abandoned fishing gear on marine organisms has been conducted in any of the countries of the SAS region. There are also no reliable data available on the costs of beach cleanup exercises in the SAS region. This situation, therefore, warrants the development and implementation of a comprehensive programme, both at the regional and national levels to effectively address marine litter and related issues in this region.

The following goals have been identified for the SAS region related to implementation of their Regional Action Plan and marine litter mitigation through source management:

- reducing land-based waste and litter through application at national and regional levels, the Integrated Solid Waste Management (ISWM) focusing on river litter and coastal litter management based on the Three ‘Rs’ Approach of Reducing, Re-using and Recycling waste in the SAS region;
- reducing sea-based litter through, *inter alia*, the development and use of adequate port reception facilities for garbage from ships;
- establishment of a sustainable indicator-based marine litter monitoring mechanism both at regional and national level, including regional monitoring of vessels and platforms;
- improved regional and national inter-sectoral coordination of marine litter-related activities;
- influencing people’s waste generation and disposal behaviour in the short- to medium-term and waste generation and culture in the long term; and
- development of sustainable and environmentally friendly tourism, fisheries and coastal activities in the region.

Suggested approaches and strategic framework for marine litter management in the SAS region

Objectives

- To undertake a detailed survey of marine litter, to establish the source, quantum of production, patterns of distribution and accumulation, and impacts of marine litter in the SAS region;
- To recognise the problem of marine litter as a priority issue in the region;
- to prevent the discharge of persistent litter from the land and the sea faring vessels reaching the coastal and marine areas;
- To create/improve garbage collection systems in coastal cities/towns and to ensure proper disposal of non-degradable/persistent materials;
- To minimize the disposal of fishing gear in coasts and at sea; and
- To create capacity and awareness among all stakeholders on marine litter issues.

Littering is a cultural problem and must be treated as such by educational, legislative and law enforcement initiatives.

The overview of the proposed *SAS Framework for Marine Litter Management* includes:

- methodologies that could be adopted in the region for assessing the quantities, composition, distribution and trends of marine litter;
- thematic areas and activities that would be considered for implementation in the SAS region include: monitoring/data collection and research; education and outreach; stakeholder participation; economic impact analysis; policy, institutional and legal frameworks; and financing mechanisms;
- a National Marine Litter Monitoring Programme developed and incorporating the strategies for creation of a regional, web-based database on marine litter, stakeholder/community participation, assessment of the economic impacts of marine litter, impacts of marine litter on wildlife and ecosystems, and improvement of the common knowledge base;
- education and outreach, incorporating voluntary beach cleanups, introduction of educational programmes and development and dissemination of outreach materials;
- solid waste management strategies incorporating strategies for developing specialized marine litter waste management systems and improving and expanding waste management strategies for recycling, reuse and waste diversion;
- institutional frameworks and stakeholder involvement;
- legislation, policies and enforcement; and
- source reduction of marine litter from merchant ships, offshore platforms, pleasure crafts; fishing vessels; households; beach-goers, campers; economic aspects; information system on coastal waste; and development of quantitative and qualitative indicators for marine solid wastes.

Action Plan for Marine Litter Management in the SAS region

Monitoring/data collection and research

A *National Marine Litter Monitoring Programme,* to support an expanded understanding of the marine litter problem in each of the five countries of the SAS region, needs to be developed for implementation in the region. Monitoring can be used to address various issues relating to marine litter – e.g., sources, types, abundance, and impact of debris on coastal and marine environments; ecological, biological, social, and economic implications and whether current interventions, practices or policies are effective. The following activities are suggested:

- consolidating the existing data (where and if available) on debris types, amount, sources and where necessary conducting more comprehensive assessments to determine the scope of the problem; and
- undertaking research and development activities for developing alternative technologies for use in assessing the source and types of floating and seabed debris, their distribution and dispersal, including fishing gear and equipment.

Education and outreach

Information, education and outreach activities have generally been viewed as essential and integral components of strategies to prevent, reduce and eliminate marine litter. The ultimate goals of the programmes are, generally, to bring about a change in attitudes and behaviours of the polluters (target groups). The following are suggested activities:

- implementing comprehensive education and awareness programmes;
- developing and implementing community-based public education campaigns for marine litter prevention;
- developing and implementing specialized marine litter prevention outreach programmes for key user-groups and stakeholders;
- developing a regional campaign for the International Coastal Cleanup (ICC);
- incorporating cultural issues, in outreach programming;
- incorporating marine litter issues into other community and environmental events;
- exploring opportunities for integrating issues on marine litter into formal education curricula and materials; and
- collating best management practices, case studies and lessons learnt on marine litter management at the community and national levels and communicate these with UNEP-SACEP/SAS RSP for compilation and dissemination.

Stakeholder participation

Collaborations between NGOs and government agencies where authority is defined and authorized between these groups could strengthen management and control efforts. Some of the major actions required in this regard include:

- developing and implementing a model of a management plan for marine litter;
- establishing a SAS Marine Litter Regional Working Group and national monitoring committees to coordinate and advise on appropriate actions for marine litter management;
- provide training for enforcement officers and sensitization for different stakeholders on marine litter issues;
- promotion of national and regional mechanisms to enable involvement of all stakeholders in land-based and vessel-based waste management including clearing-houses for sharing of lessons learnt and information dissemination; and
- adopting a regional approach involving IMO, FAO and UNEP and relevant regional and national agencies.

Economic impact analysis

Economic information that tracks the costs associated with solid waste management activities, special cleanups and maintenance of beach areas, and costs associated with loss of recreational usage of coastal areas and lost commercial fishing nets and gear, damage to the vessels, the habitat destruction and its restoration would be useful to government agencies dealing with solid waste, fisheries and marine litter issues. Research on the economic impacts of marine litter can assist in justifying the need for adequate resources to support management and educational efforts based on tourism and coastal management concerns. An assessment of the economic impacts of marine litter, covering the above aspects, therefore, needs to be made by involving the government and non-governmental agencies including the private sector, in the five countries of the SAS region. The following activities are proposed:

- undertaking economic and environmental analyses to quantify the costs of lost fishing and shipping time due to immobilization, fouled gear; damaged vessels, and habitat loss or damage; and
- quantifying the value of fish or seafood lost to derelict gear.

Policy, institutional and legal frameworks

There are no agencies or departments in any of the SAS Member States that are assigned the specific responsibility of management of the marine litter issue. This has led to ineffectiveness in overall management of marine litter-related issues across the region. There are a host of national regulations and policies that are country-specific addressing liquid/solid waste management and other pollution concerns. However, specific marine litter legislation does not exist in any of the SAS regional countries. The policy and regulatory framework for marine litter management in the SAS region needs to be enforced by strengthening the legal enforcement mechanisms. Therefore, clear lines of responsibility and authority need to be identified in order to be more effective in marine litter management. The following are suggested actions to be taken:

- evaluate the existing legislation, regulations and enforcement practices that deal with marine pollution and strengthen them or enact new legislation/regulation (a Marine Litter Act) exclusively for marine litter management in each of the five countries of the SAS region;
- establish and/or enhance government sponsored 'litter patrols' in coordination/collaboration with municipal and other national authorities and establish the infrastructure for compliance; and
- expand ratification and promote effective implementation of MARPOL Annex V by the SAS regional countries.

Financing mechanisms

All the countries of the SAS region are developing countries, where resources are scarce and there is little or no advanced technology available for marine litter management and abatement. Implementation of the Regional Programme for the Integrated Management of Marine Litter in the SAS would require funds from multiple sources. Actions at national level would rely primarily on local funding. Investments to broaden the scope of garbage collection and its disposal in sanitary landfills and managed dumps should come from commercial/development banks in each country or in the region. Likewise, the necessary investments to make Annex V of MARPOL 73/78 operational (e.g., garbage reception facilities in ports) could come from port operators and from already established funding mechanisms in each country. Funds for research would require support from national research funds. Actions for public awareness and communication would require multiple sources of support, including sponsorships (e.g., port authorities, government institutions, NGOs and companies linked to the issue).

The SACEP/SAS Regional Seas Programme through negotiations with various donors would arrange technical and financial support for implementing the various programmes identified for marine litter management in the region. The national governments in the SAS region would also need to incorporate marine litter management programmes into their plan/development schemes for which funds could be provided in their country budget. The following actions are suggested:

- promotion of partnerships to ensure sustainability of activities by NGOs and community organizations; and
- promoting the development of economic incentives for proper disposal of the coastal and marine litter.

Integrated Marine Debris Management Programme

An *Integrated Marine Debris Management (IMDM) Programme* is being proposed for development and implementation in the SAS countries based on inputs from similar initiatives from Korea, Japan, China and Russia and the globally known IMDM model. The objectives of this proposed effort are to:

- conduct marine debris surveys in near shore and deep sea areas;
- support technology development;
- develop management tools;
- build capacity/skill and knowledge;
- initiate regional and national level awareness campaigns;
- restructure administrative/institutional and legal mechanisms; and
- prevent and control marine debris through long-term monitoring.

National programme work plans for an *Integrated Marine Litter Management Programme* have been drafted by India and Sri Lanka and are presented below:

India

The Indian national programme model will involve all the relevant agencies in central and state government levels, industry, NGOs and private partners and could also involve other neighbouring countries. Marine debris management is a multidisciplinary process that unites levels of government and the community, science and management, sectoral and public interests in preparing and implementing a programme for the protection and the sustainable development of coastal resources and environment. The overall goals of this work plan are:

- to improve the quality of life of the communities that depend on coastal resources;
- to provide for needed development (particularly coastal dependent development);
- to maintain the biological diversity and productivity of coastal ecosystems in order to achieve and maintain desired functional and/or quality levels of coastal systems; and
- to reduce the costs associated with coastal hazards to acceptable levels.

India's IMDM Project components/activities

- Survey – assessment of the quantity of marine debris in beach, near shore and deep sea. A marine debris survey should be conducted at selected sites.
- Research and development component – technology development for safe and environmentally friendly disposal method of marine debris, including medical waste disposal.
- Conservation policy – development of policies and legislation to support education, minimizing and mitigation of marine debris, with a mechanism for timely response for recovery, maximization of recycling with environmentally friendly treatment.
- Field surveys – carried out in a phased manner with initial emphasis on tourism related sites where majority of marine debris is generated and finding way into the sea. There is a great demand for a practical strategy to control the input from marine vessels and land-based activities in order to assess their potential impact on the marine environment and fishery resources, and to remove the accumulated litter on the seabed.
- Ports – collection of data from ports and harbours. This is important information that would provide the basic statistical data for making a budget and policy formation.

India's IMDM project estimated costs: USD 33.65 million

- Formation of working groups and Project Directorate (USD 0.05 M).
- Field surveys (USD 23.6 M).
- Technology for treatment and recycling (USD 3.0 M).
- Prevention of marine debris (USD 7.0 M).

Sri Lanka

Inadequate information is available on the amount and type of marine litter in the waters of Sri Lanka. The actual scale of the problem has not been investigated in a comprehensive and systematic manner.

Although a comprehensive control mechanism is absent for marine litter issue in the country, the issue is recognised as a concern within relevant state agencies. It has not received priority in any of the environmental action plans in the recent past as issues involved in marine litter issues are not brought out properly mainly due to lack of comprehensive data on the issue.

Legal authority to combat marine litter problem needs to be strengthened for effective management of the issue. In this regard legal enactments and other available regulatory and management mechanisms should be revised to include relevant requirements to address the issue in future.

Further regional and international cooperation should be obtained to tackle the issues in the country, and research and surveys should be conducted to assess the extent of the problem. The following steps are proposed:

- inclusion of marine litter issues during revision of respective enactments, e.g. the MPA Act;
- incorporation of coastal and beach litter management issues in future coastal zone management plans;
- development of a strong cooperative mechanism between major stakeholders to combat marine litter issue through establishment of a Steering Committee;
- creation of partnership programmes between government and the private sector, and involvement of other stakeholders such as NGOs, community-based organizations, fishing societies, etc.;
- use of customized approaches to various marine litter issues according to the nature of the problem and the relevant stakeholders. For example, the litter problem in fishery harbours would be tackled through active participation of the Ceylon Fishery Harbour Corporation (CHFC) and the litter problem in tourist areas would be tackled through the Ceylon Tourist Board and other concerned parties (hotels, etc.);
- combating beach litter through regular programmes involving local authorities and communities; and
- organizing public awareness programmes. Presently island-wide coverage is not received by any of the beach cleanup programmes.

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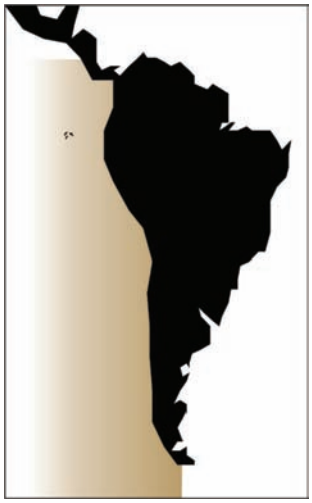
Marine litter in the Southeast Pacific region
Overview and proposed Action Plan

Introduction



The Southeast Pacific region spans the entire length of the Pacific coast of South America from Panamá to Cape Horn, encompassing tropical, sub-tropical, temperate and sub-Antarctic systems, with coastlines of Panamá, Colombia, Ecuador, Perú and Chile. The region has an area of 3,542,674 km², with over 11,500 km of coast, and about 15.6 million inhabitants.

In order to protect the rich marine and coastal environment of the region, the Southeast Pacific Action Plan was adopted in 1981 together with the *Convention for the Protection of the Marine Environment and Coastal Zones of the Southeast Pacific* (Lima Convention, adopted in 1981, entered into force in 1986) and its associated protocols: (a) Agreement on Regional Cooperation in Combating Pollution in the Southeast Pacific by Hydrocarbons and other Harmful Substances in cases of Emergency; (b) Protocol for the Protection of the Southeast Pacific Against Pollution from Land-Based Sources; (c) Protocol for the Conservation and Management of Protected Marine and Coastal Protected Areas of the Southeast Pacific; and (d) Protocol for the Protection of the Southeast Pacific from Radioactive Pollution. The Action Plan is implemented within the framework of inter-agency cooperation between the Permanent Commission for the Southeast Pacific (CPPS), national institutions, UNEP and some agencies, programmes and Convention Secretariats. The region signed an agreement with the South Pacific Environment Programme (SPREP) to cooperate in the protection of a more extensive area of the Pacific.

In December 2006 the CPPS and UNEP signed a Memorandum of Understanding to develop activities related with the management of the marine litter in the countries of the region. In the framework of these activities a regional consultant was engaged; national focal points for marine litter were nominated; national consultants were selected to prepare national reports; national questionnaires were developed; national reports were submitted; a Draft Review Document on Marine Litter was prepared by the regional consultant; the *Draft Review Document* and *Draft Regional Action Plan for Management of Marine Litter* were presented and agreed upon at the *Workshop on Sustainable Management of Marine Litter in the Southeast Pacific* (Sept. 2006); the *Regional Review Document and Draft Regional Action Plan* were submitted to UNEP; and the final output of the project, the document *Regional Programme for the Integrated Management of the Marine Litter in the Southeast Pacific* was submitted to UNEP and approved in November 2007 during the XIV Conference of Parties. This document was published as *Marine litter in the Southeast Pacific Region: a review of the problem (CPPS, 2007).*

A summary of the aforementioned document is presented in this chapter. The first part describes the available information on marine litter in the southeast Pacific Ocean. The area includes the coastal zones of five countries: Chile, Colombia, Ecuador, Panamá and Perú. Detailed information at the country level may be found in the national reports (www.cpps-int.org/spanish/planaccion/contaminacionmarinapa.htm#6) for Perú (Alfaro, 2006), for Ecuador (Coello and Macías, 2006), for Colombia (Escobar, 2006), for Panamá (González, 2006) and for Chile (Rovira, 2006).

The objective of this chapter was to present a summary of the document *Marine litter in the Southeast Pacific Region: a review of the problem (CPPS, 2007)* that includes the *Overview of the regional problems of marine litter* and the *Regional Programme for the Integrated Management of Marine Litter*.

Waste dump in Chile. © UNEP

Assessment of the status of marine litter

The Protocol for the Protection of the Southeast Pacific from Land-Based Sources of Pollution includes among the substances taken into consideration "*synthetic persistent materials that can float, remain in suspension or sink, which may become obstacles to any legitimate use of the sea*". This definition coincides with the definition presented in the Global Plan of Action.

Amounts and sources

Litter found in the coastal areas of the Southeast Pacific originates from both land and marine sources. Land sources would be the main contributors in generating marine litter (Table 1), although there is not enough information to properly estimate the contribution made by marine sources.

Table 1. Sources of litter collected during the ICC in the countries of the Southeast Pacific in September 2005

Activities that generate marine litter	Panamá*	Colombia**	Ecuador	Perú	Chile
	Percentage of related sources of litter				
Activities on the shore and recreational activities	78.3	91.7	35.1	79.5	85.7
Activities in oceans and other water bodies	18.0	4.9	7.2	8.6	3.2
Activities related to smoking	4.1	1.8	56.1	5.0	9.8
Biomedical and hygienic waste	1.7	0.3	0.6	4.1	0.3
Inadequate disposal of solid wastes	2.9	1.2	1.0	2.8	1.0

Main source of waste Secondary source of waste

Source: Ocean Conservancy, from annual ICC data.
** Countries are listed in geographic order of north to south*
*** Data reference for San Andrés (Colombian island)*

The International Coastal Cleanup (ICC), a global initiative of the US-based organization, Ocean Conservancy, has provided data on the magnitude of marine litter in the region (Table 2). A rough estimate can be made by multiplying the amount of litter (kg/km) by the length of coastline lengths of each of the five countries. Thus, it is estimated that at the time of the 2005 ICC, there were 30,333 tonnes of litter along the coasts of the Southeast Pacific region. Although this figure may be exaggerated, since it is based on cleanup activities in highly populated areas extrapolated to encompass the entire coastline of member countries, it does provide an idea of the potential magnitude of the problem posed by thousands of tonnes of persistent wastes. Alfaro (2006) reports an increase from 0.35 kg/m on the beach in 2002 to 0.94 kg/m in 2005. There is no similar data for the other countries; however, this could be an indicator that the amount of marine litter is increasing.

Table 2. Estimates of marine litter items collected on beaches of the region during the ICC in September 2005 (ND = no data available)

Country*	Coastal extension (km)	Length of cleaned beach(km)	Number of marine litter items collected		Weight of items collected (kg)	
			Total	Number/km	Total	kg/km
Panamá	1,700	91.7	96,498	1,051.9	68,520.8	747.0
Colombia[a]	1,300	37.0	18,355	495.9	2,497.1	67.5
Ecuador	4,359[b]	72.4	346,949	4,790.8	32,427.9	447.8
Perú	3,080	20.9	91,963	4,395.6	110,433.9	5,278.5
Chile	83,850[c]	ND	158,834	ND	ND	ND

Countries are listed in geographic order of north to south
Sources:
Coastal extension: Alfaro (2006), Coello and Macías (2006), Escobar (2006), González (2006), and Rovira (2006).
Litter collected from the beach: Ocean Conservancy
[a] *Data reference for San Andrés, Colombia (Caribbean island).* [b] *2,959 km on the continental coast and 1,400 km on the Galapagos Archipelago coast.* [c] *Including island coastlines.*

Land-based sources

The region has limitations on the capacity for the collection and disposal of litter, particularly in rural areas where garbage is commonly disposed of by throwing waste into waterways and unused plots of land. Primarily open dumps (with no sanitary treatment) are used or sites with a minimal degree of management (also known as '*vertederos*') where a portion of the litter can return into the environment and eventually reach the sea through runoff, wind, and activities by informal recyclers (also known as '*pepenadotes', 'minadores'* or '*chamberos')* of plastics, paper and glass. Animals scavenging to find food in dumps and trash receptacles can also introduce marine litter into the environment. The use of managed, sanitary landfills is limited.

There are a few analyses on the status of litter management in the countries of the region (e.g. ANAM, 2004; CONAM, 2004; CONAM and OPS, 2002; OPS, 2001; OPS, 2002; and OPS, 2005). PNUMA (1999) deals briefly with the subject of litter as a land-based source of pollution, and Escobar (2000) presents litter production estimates from the coastal area of the region for the 1990s. At that time, it was estimated that litter production was approximately 5.2 million tonnes/year (Table 3), of which nearly 1.7 million tonnes/year were not collected. Consequently, a significant portion of these wastes have the potential of becoming marine litter.

Table 3. Litter production estimate in the coastal region at the beginning of the 1990s

Country*	Litter production on the coast (tonnes/year)	Uncollected litter (tonnes/year)
Panamá	298,706	119,482[a]
Colombia	116,800[b]	40,880[b]
Ecuador	2,673,752[c]	828,863[d]
Perú	1,695,425[e]	729,032[f]
Chile	438,000[g]	ND[h]

Estimates from Escobar's data (2000).
** Countries are listed in geographic order of north to south*
[a] Panama City's production 298,706 t year-1 of which 60% are disposed off in sanitary landfills.
[b] Buenaventura's production (250 t day^{-1}) and Tumaco (70 t day^{-1}). 72% of litter from Buenaventura was collected and 40% from Tumaco. [c] Estimate for 20 coastal centres, including Guayaquil.
[d] 69% of litter was collected. [e] Production of ca. 4,645 t day^{-1} on the coast. [f] It indicates that 2,648.4 t day^{-1} (57%) are treated. [g] Estimated production on the coast of 1,200 t day^{-1}. [h] Does not include estimates for Chile.
ND = No data available.

Currently, it is estimated that 15.6 million people comprise the population that directly influences litter production in the coastal zone and generates *ca.* 4.54 million tonnes of litter per year (Figure 1).

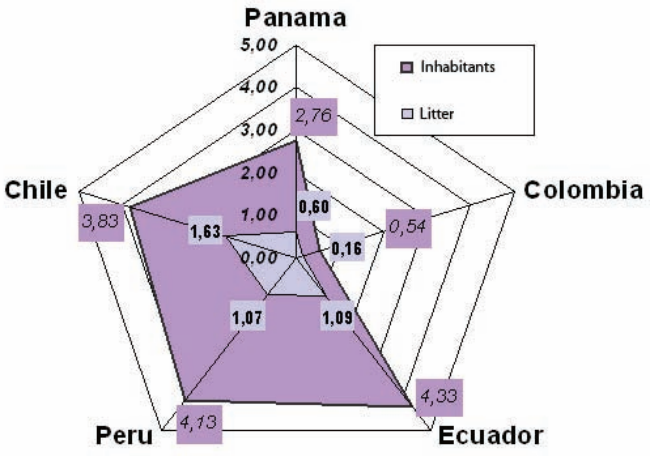


Figure 1. Population (millions of inhabitants) and total production of litter (millions of tonnes/year) in the coastal area of the Southeast Pacific.
Sources: Alfaro (2006), Coello and Macías (2006), Escobar (2006), González (2006), and Rovira (2006).

Most of the wastes are in the form of perishable, organic wastes (Table 4); however, a portion of the persistent materials (i.e., plastics, glass and metal) can reach the sea and become marine litter (Table 5).

Table 4. Per capita generation and composition of solid wastes in the countries of the region

Country	Per capita generation of solid wastes [+] (kg inhab^{-1} day^{-1})		Composition of municipal solid wastes (%)						
	Domestic[e]	Municipal[f]	Cardboard and paper	Metal	Glass	Textiles	Plastics	Perishable organics	Others and inert
Panamá [a]	0.60	0.81	25	4	6	ND	17	46	2
Colombia [b]	0.69	0.69	8.91	1.05	3.25	1.33	5.7	77.45	4.1
Ecuador	0.69	N/D	9.60	0.70	3.70	0.00	4.50	71.40	0.00
Perú [c]	0.53	0.71	7.50	2.30	3.40	1.50	4.30	54.50	25.90
Chile [d]	0.69	0.93	ND	ND	ND	ND	ND	55	ND

Source: OPS unless otherwise stated (2005).
Countries are listed in geographic order of north to south.
[+] Country average. [a] Residue composition data from ANAM (2004). [b] Residue composition data are average figures that correspond to San Andrés (Colombian Caribbean island) (Escobar, 2006) [c] CONAM (2004) presents the following litter composition paper 6.49; cardboard 0.97; plastics 4.3; glass 3.39; ferruginous metals 2.2; non-ferruginous metals 0.16; textiles and rags 1.56; leathers and rubbers 0.3; woods 0.93; others 25.2; and organics 54.5. [d] Litter composition in coastal municipalities includes 55% organic wastes, 17% paper and cardboard, 8% textiles and others, 10% plastics, glass and metals (Rovira, 2006). [e] OPS (2005) defines them as solid wastes generated by population's households. [f] OPS (2005) defines them as solid or semisolid wastes originating from urban activities in general. These can be residential or domestic, commercial, institutional, from small industry or from sweeping and cleaning of streets, markets, public areas and others. ND = No data available.

Table 5. Estimate of litter from land-based sources that has the potential of becoming marine litter (persistent materials)

Country*	Coastal population	Garbage per capita production (kg person^{-1} day^{-1})	Garbage collection coverage	Persistent fraction of garbage[+] (%)	Uncollected persistent garbage * (t year^{-1})	Marine litter potential (t year^{-1})
Panamá	2,767,896[a]	0.59[b]	Urban 75% Rural 40-50%	27[c]	55,650[d]	5,565 – 16,695
Colombia	543,000[e]	0.8[f]	Buenaventura 72% and Tumaco 40%[g]	10.35[h]	8,061[i]	806 – 2,418
Ecuador	4,336,812[j]	0.69	58.5%[k]	8.9[l]	24,823[l]	2,482 – 7,447
Perú	4,133,853[m]	0.711	75[n]	10.35[o]	27,759	2,776 – 8,328
Chile [p]	3,839,195[q]	1.16	96% – 98%	10	6,747.8[r]	675 – 2,021[r]

Countries are listed in geographic order of north to south.
[+] Glass, plastic and metal. [*] Corresponds to the uncollected fraction of persistent materials (i.e., glass, plastics and metal). [a] Population projection for July 1st 2006 in the provinces of Chiriquí, Veraguas, Herrera, Los Santos, Cocle, Panamá, and Darien. Source: Departamento de Análisis de Situación y Tendencias de la Salud, Sección de Registros Médicos y Estadísticas de Salud, Ministerio de Salud. 62.2% of the population is urban and 37.8% is rural (ANAM, 2004). [b] De la Cruz (2004), ANAM (2004). [c] ANAM (2004), see Table 5. [d] González (2006). [e] Population in 2001 of the four departments with maritime fronts to the Pacific Ocean. The Colombian Pacific coast has 16 coastal municipalities. [f] Escobar (2006). [g] Escobar (2006). The remaining settlements on the Colombian coastline do not have garbage collection service. [h] Glass 3.25%, plastic 5.70%, metals 1.05%, and rubber 0.35%. Average figures that correspond to the Colombian Pacific (Escobar, 2006); see also Table 5. [i] Corresponds to 10.35% of uncollected garbage estimate, carried out by Escobar (2006). [j] Population in 2001 (Population and Housing Census) of the 36 municipalities with coastlines. [k] Average value. The range in municipalities is 10.5% - 93.5% (see Table 4 in Coello and Macías, 2006). [l] Coello and Macías (2006). [m] 2005 Census. Population of the 120 district municipalities and 32 provincial municipalities with a coastal front. [n] CONAM (2004). [o] CONAM (2004) presents the following composition of persistent materials in garbage: plastics 4.3; glass 3.39; ferruginous metals 2.2; non-ferruginous metals 0.16; and leather and rubber 0.3. Total = 10.35%. [p] Chile has a database with direct information on the quantity of garbage deposited in sanitary landfills and managed dumps (Rovira, 2006). In 2005 1,619,490 t were deposited. [q] 102 municipalities with access to the sea. [r] Rovira (2006).

Marine-based sources

In the five countries, wastes from marine-based sources have been reported (Table 6). However, there is very little quantitative information regarding the origin and volume of these wastes. It is assumed that the main sources are the result of discarded or lost fishing gear (e.g., nets, floaters/buoys, pieces of rope) and operational wastes thrown overboard from ships.

Table 6. The ten most commonly found items collected during the 2005 International Coastal Cleanup in the region

Panamá		Colombia*		Ecuador		Perú		Chile	
Percentage of related sources of litter									
Beverage plastic bottles	11.8	Beverage plastic bottles	20.6	Cigarettes / filters	55.5	Beverage plastic bottles	41.4	Bottle caps and other containers	38.7
Bags	10.6	Beverage glass bottles	16.6	Bottle caps and other containers	8.4	Bags	10.3	Beverage plastic bottles	30.9
Clothes	10.2	Bottle caps and other containers	12.8	Bottle caps and other containers	6.4	Bottle caps and other containers	7.1	Cigarettes / filters	8.4
Cups, plates and utensils	8.6	Bags	12.2	Bags	4.8	Cups, plates and utensils	4.1	Food wrappings	4.4
Beverage glass bottles	7.4	Plastic joints	8.4	Food wrappings	3.9	Clothes	3.0	Bags	4.1
Beverage cans	6.5	Clothes	4.7	Rope	2.9	Toys	2.6	Plastic joints	2.8
Bottle caps and other containers	6.4	Cups, plates and utensils	4.2	Cups, plates and utensils	2.9	Cigarettes / filters	2.5	Beverage glass bottles	1.4
Food wrappings	6.2	Food wrappings	3.7	Beverage glass bottles	2.3	Plastic straws and swizzle sticks for drinks	2.5	Chlorine bottles and other cleaning articles	1.1
Plastic joints	4.1	Beverage cans	3.1	Plastic joints	1.7	Diapers	2.3	Cigarette packs and wrappings	0.9
Oil bottles	2.9	Plastic straws and swizzle sticks for drinks	2.7	Plastic straws and swizzle sticks for drinks	1.6	Beverage cans	2.2	Building materials	0.9
Total	**74.7**	**Total**	**89.0**	**Total**	**89.2**	**Total**	**78.0**	**Total**	**93.6**

** Data reference for San Andrés, Colombia (Caribbean island)*

Source: Ocean Conservancy

Escobar (2006) estimated that each year 5,376 units of nylon net enter the Colombian Pacific as floating litter, the majority of which is probably confined near the shore (2-3 miles). Fish wastes accounted for a small percentage of the total debris items found on the Coastal Cleanup day 2005 (Table 7). Fishing boats also discharge persistent litter like bottles, cans, food wrappings and motor oil containers. Escobar (2006) estimated that the Colombian fishing fleet generates approximately 273 tonnes/year of marine litter. There were no similar estimates for the other countries of the region.

Table 7. Percentage of fishing-related wastes found on beaches on 2005 ICC in the region

Country	Fishing line	Fishing nets	Rope	Floaters (buoys)
Panamá	0.18	1.25	1.26	1.39
Colombia[a]	0.12	0.01	0.20	0.01
Ecuador	0.34	0.40	2.87	0.83
Perú	0.28	0.52	0.89	0.44
Chile	0.05	0.06	0.42	0.12

[a] *Data reference for San Andrés, Colombia (Caribbean Island)*
Source: Ocean Conservancy

The Southeast Pacific has important ports and intense maritime traffic. Nevertheless, there is no estimate of the garbage discarded into the ocean by merchant ships. Despite national and international legislation currently in force such as Annex V of MARPOL, illegal discharge of garbage and plastics at sea continues. In Chile, Thiel *et al.* (2003) reported that the main concentrations of floating marine litter were found (of which 86.9 percent were plastics) in coastal areas near the main ports. The principle component of this garbage were plastic bags (47.6 percent of wastes recorded). Due to the fact that the bags sink relatively fast, it is believed that the main origin of this litter is the discharge from merchant ships. It must be pointed out that the concentrations of floating litter found in Chile (1 to 36 items per km²) are not significantly different from those found in the rest of the world. Rovira (2006) indicates that an important source of litter could be the tourist cruises that operate in Chile.

Not all the garbage transported by water courses reaches the ocean. Some garbage sinks and is deposited on river bottoms; however, the action of certain events (e.g., intense precipitation and swells) can eventually remove and re-suspend garbage from the bottom so that it can reach the surface. Another part of the garbage will reach estuaries where it can become trapped in temporary deposits. Escobar (2006) reports that some of the wastes accumulate among mangrove roots and around pilings and other structures (e.g., docks). Coello and Macías (2006) also observed this phenomenon and additionally reported that through wind and tidal action, floating litter accumulates in the narrowest channels of estuaries.

The coastal area is where the problem of persistent wastes is more conspicuous. Besides the wastes from land, there is direct disposal of garbage in estuaries, beaches and neighbouring plots (part of this garbage reaches the coast through runoff), as well as wastes from the sea. In estuaries and mangroves, floating litter is most visible, with an unknown amount deposited at the bottom to eventually be re-suspended. Part of the garbage generated on the coast can be trapped in landfills. Escobar (2006) reported that in Tumaco and Buenaventura much of the garbage is used in landfills to regain land from the sea. This practice also occurs on the coast of Ecuador. In Guayaquil, it was until recently a very common practice to use of construction material wastes to fill in estuaries. Today, debris is mainly used in marginal neighbourhoods to convert areas invaded by stilt construction into land that can be legalized. The process for cleaning beaches and estuaries may remove the wastes, but the final impact depends on the place where these materials are deposited. Wastes going into dumps located in the coastal zone have a very high probability of becoming marine litter – again.

Litter from land-based sources reaching the ocean may, due to winds and currents, float and keep drifting (floating or pelagic litter) or eventually sink to become demersal litter. Part of the floating garbage coming from land-based sources can return to the coast and be re-deposited on the beach. Another portion can end up in the open ocean; it is reported that floating litter can cross the Pacific. Thiel *et al*. (2003) found that floating litter forms patches mainly in coastal waters, but they also found patches in open, oceanic waters. In the North Pacific a great accumulation of floating litter has been identified in the calm waters that form from the general pattern of oceanic circulation – a pelagic deposit (Moore, 2003). It is estimated that this accumulation of floating litter represents around three million tonnes of waste. Nothing like this has been reported in the South Pacific where the pattern of oceanic circulation is similar; it is not improbable that a similar situation may exist. Little is known of the garbage once it sinks to the bottom.

The data from the 2005 ICC supplied by Ocean Conservancy only reports data from underwater cleanups that were conducted in Ecuador. Other underwater cleanups may have been conducted, but were not reported. The underwater data for the cleanup activity in Ecuador revealed that the litter was primarily ocean-based (Figure 2).

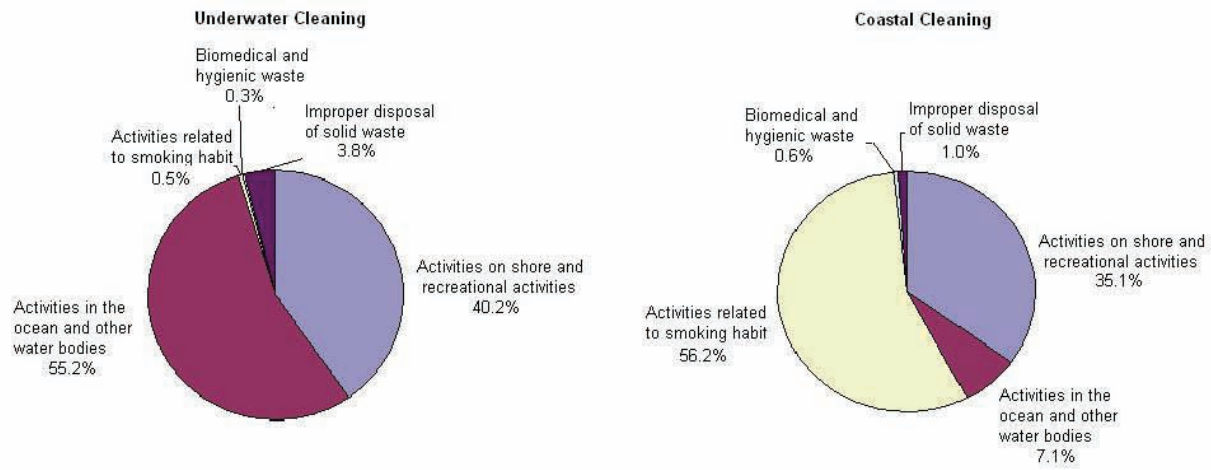


Figure 2. Comparison of litter composition found during the 2005 International Coastal Cleanup day (beach cleanups and underwater cleanups in Ecuador).

Winds and currents can take floating litter towards the coast or drifting out to the open ocean. Ships' wastes are discharged in facilities available at port for those purposes. Nevertheless, if these wastes are left in dumps near the coastline, there is a probability that they will become marine litter again.

Solid wastes found on beaches represent only a small fraction of the problem of marine litter. There are undetermined quantities of floating litter in temporary deposits (e.g., mangroves, estuary inlets '*cogollos*') in the ocean. A large quantity of persistent waste in dumps and rainfall (storm) drains has the potential of becoming marine litter. The magnitude of litter deposited at the bottom of rivers, estuaries and oceans is unknown. Cleaning of coastal zones and reception of ship's garbage at ports could be 'solutions' of no value, if final disposal is inadequate.

Monitoring

Most information available on marine litter comes from the activities carried out during the International Coastal Cleanup. In Panamá, Ecuador and Perú these efforts have been developed over many years and are now institutionalized. In Panamá, the National Association for the Conservation of Nature (ANCON) has maintained this Programme since 1991 on the beaches of the Pacific and in two provinces with beaches on the Caribbean coast. In Ecuador, the Coastal Resources Management Programme (PMCR) has been the national coordinator for the ICC since 1994. In the Galápagos, this event is organized by the *Albatros* Foundation. In Perú, this activity has taken place since 1999 coordinated by the non-governmental organization VIDA and the Peruvian Navy through the General Direction of Port Authorities and Coast Guards (DICAPI). In Colombia, the ICC is primarily conducted on the island of San Andrés in the Caribbean and is coordinated by the Corporation of Sustainable Development-CORALINA, with support of governmental institutions and sponsorships from the private sector.

This activity is relatively new in Chile. The Pontific Catholic University of Chile, that manages a marine coastal protected area in the Central Zone called Las Cruces, organized the ICC on 1October 2005, on the beaches of the central coast between Tunquen and Rocas de Santo Domingo in the Valparaíso region (Rovira, 2006). Ocean Conservancy has information on some specific actions carried out in the past, but the data have not been centralized.

There is also specific information generated by several country initiatives. For example, the Project – "Tumatai: Tumaco we want you clean" of Colombia, and the programme for beach management of the Council of Guayas Province (which began in 2005 and reports weekly on the weight of litter collected on five beaches) and the recovery plan for Estero Salado in Guayaquil City, in Ecuador.

Nevertheless, municipal statistics on garbage collection and disposal are not always reliable, especially in areas where open dumps are used. For the current work it was not possible to obtain statistics on litter from ships left in port facilities, but it is possible that this information exists in large ports as those of Panamá.

Legislation, policies and institutional arrangements

Legislation and policies

In all five countries, municipalities are responsible for operating garbage collection and disposal services, directly or through companies contracted for that purpose. In all cases, solid waste management also involves environmental and health authorities. Legislation related to garbage/litter management is diverse. In Panamá, a preliminary legislative project related to management and solid waste disposal is being formulated. In Colombia and Ecuador garbage management has been incorporated into laws related to environmental management. Perú has a specific law on the subject (i.e., General Law on Solid Waste). In Chile the legal framework is based on the Constitutional Organic Law for Municipalities and the Sanitary Code.

Institutional arrangements

All the countries in the Southeast Pacific region have recycling companies and public initiatives or non-governmental organizations (NGOs) that work with waste management. Panamá exports wastes for recycling; ANAM (2004) reported that between 1996 and 2001 approximately 7.7 million kg of plastic wastes were exported. In Colombia, it is estimated that recycling activities account for 12 percent of total wastes generated in the country (Escobar, 2006). Furthermore, there is a law that established a "Recycling Day". In Ecuador, there are several recycling companies (the main one on the coast is REIPA) but its main focus is on paper and cardboard (OPS, 2002). In Perú, 14.7 percent of municipal solid wastes are recycled (CONAM and OPS, 2002). In Chile, around 20 percent of PET plastic is recovered from Santiago, which is not located in a coastal area and contains 40 percent of the population. However, initiatives centered in coastal areas are primarily of a small scale and do not greatly diminish the persistent material loads that become into marine litter. Alfaro (2006) highlighted that the increase in the price of PET materials for recycling stimulated Perúvian recyclers to search for such wastes and resulted in a reduction of this type of product on appearing on beaches. None of these bottles were found during the 2005 ICC in Carpayo or Callao.

Programmes and initiatives

The coastline is of great value to the five countries, especially for tourism and recreational use. Consequently several initiatives have been established to clean beach-front areas. In Colombia, cleanup campaigns have been developed for the tourist beaches of Tumaco and Buenaventura. Escobar (2006) highlights the experience of the project "Tumatai: Tumaco we want you clean". Since its beginning in the early 1990s, the Coastal Resources Management Programme (PMCR) has supported the planning of tourist seasons on the main beaches in Ecuador, including strategies to keep them clean. Additionally, a process of certification with an eco-label 'Blue Flag' is underway in five beaches in the Guayas province, which includes regular cleaning of the beaches. Likewise, a system for cleaning several stretches of the Estero Salado (estuarine zone) which surround Guayaquil is underway (Coello and Macías, 2006). In Perú, several municipalities have established processes for periodically cleaning beaches (e.g., Callao since 1999) (Alfaro, 2006). In southern Chile, in the regions Aysén and Los Lagos, salmon farms have conducted cleanup campaigns on the beaches during the last ten years. Chile's tourist beaches (considered as such according to the number of visitors) are cleaned periodically by the respective municipalities (in many of them, this means every day during the summer). Nevertheless, a high proportion of them are cleaned insufficiently due to financial limitations of municipalities (Rovira, 2006).

Economics of marine litter

Municipalities need to address the cost of cleaning the coastline by collecting wastes that are not totally generated by their resident populations or by tourists and visitors. Alfaro (2006) presented the case of the municipality of Ventanillas in Perú that would have to invest around USD 400 thousand per year in order to clean its coastline, while its annual budget for all public cleaning is USD 200 thousand. Alfaro (*op cit.*) also estimated that it would require approximately USD 2.5 million to cover labour costs for cleaning the Peruvian coast, in addition to the requirements of machinery and materials. Marine litter puts pressure on the capacity for waste cleaning and management of coastal municipalities. Alfaro (2006) cites the

experience of Playa de Carpayo, only 500 m in length, where the litter brought in by the sea is of such magnitude that it nullifies all cleanup efforts.

It must be pointed out that many coastal municipalities have severe technical and financial limitations to tackle this problem. Alfaro (2006) pointed out that the costs involved in beach cleaning are high and may become unaffordable to some coastal municipalities, since they are in addition to the regular costs of cleaning public places and of garbage collection and disposal that municipalities already face. Coello and Macías (2006) make the same observation about the regular cleaning of tourist beaches and the Estero Salado. In general, the costs associated to cleaning the coastline have not been internalized by the governments of the countries in the Southeast Pacific region.

Regional Programme for the Integrated Management of Marine Litter in the Southeast Pacific

The Regional Programme focuses on these key issues and proposes an eight year strategy within the framework of the Protocol for the Protection of the Southeast Pacific from Pollution from Land-based Sources to develop solutions. The general objective is to minimize the discharge of persistent solid wastes from land- and sea-based sources in the Southeast Pacific Ocean.

Objective 1. To increase the coverage of garbage collection systems in coastal municipalities and to ensure the appropriate disposal of persistent materials to prevent their release into the environment.

Recommended national actions

1. Give priority to investments in garbage collection and disposal systems in coastal municipalities and in those located on river basins draining into the Pacific Ocean.
2. Take the necessary measures in garbage management plans to avoid the 'escape' of persistent wastes that may become marine litter.
3. Establish systems to record and share information on the quantities and composition of garbage collected and disposed of.
4. Establish management indicators on garbage collection and disposal systems, especially in coastal municipalities.
5. Strengthen mechanisms for the control of illegal discard of garbage and sanction on offenders.

Regional actions

1. Through education and outreach efforts, facilitate the understanding of the problem of marine litter and how a more efficient collection of solid residues can contribute to the solution of litter generation.
2. Promote the exchange of experiences regarding the integrated management of garbage in the coastal zone of the region.
3. Prepare a practical guide for the integrated management of solid wastes in the coastal areas of the region.
4. Promote knowledge among coastal municipalities about the *Protocol for the Protection of the Southeast Pacific from Land-based Sources of Pollution*, requesting the commitment of local authorities in the management of persistent wastes that can become marine litter.
5. Promote that the Contracting Parties of the Protocol agree on goals for (a) coverage of garbage collection systems in coastal municipalities and (b) disposal in sanitary landfills and managed dumps in coastal municipalities.

Objective 2. To eradicate the discharge of persistent litter from vessels.

Recommended national actions

1. Adopt or implement, whichever be the case, Annex V of MARPOL 73/78.
2. Adopt regulations to prohibit the disposal of persistent litter from ships.
3. Establish control and auditing mechanisms to avoid discharge of persistent litter from ships.
4. Promote the adoption of codes of conduct by relevant stakeholders (e.g., fishing, tourism, shipping) in order to avoid the discharge of persistent litter at sea.

Regional actions

1. Promote understanding of the problem and impacts of marine litter (particularly plastic) discarded from ships by various sectors which operate in coastal and oceanic waters (e.g., fishing, freight and passenger transport, marine tourism and aquaculture).
2. Stimulate the exchange of experiences regarding regulations and control of litter discharge from ships.
3. Produce guidelines for the handling of solid wastes aboard small vessels.

Objective 3. To minimize the disposal of fishing gear in the coasts at sea.

Recommended national actions

1. Implement programmes to promote the adequate disposal of damaged or obsolete fishing gear (e.g., recycling, exchange).
2. Analyze the feasibility of incorporating regulations penalizing the abandonment of fishing gear at sea.
3. Analyze the feasibility of implementing identification mechanisms for fishing gear in order to establish responsibility of owners due to the impacts of abandoned gear on third parties and biodiversity.

Regional actions

1. Support actions to understand the problem and impacts caused by abandoned or discarded fishing gear in the region, in the framework of the *Protocol for the Protection of the Southeast Pacific from Land-based Sources of Pollution.*
2. Promote the understanding of impacts and costs caused by abandoned and discarded fishing gear.

Objective 4. To establish the volumes of production, patterns of distribution and accumulation, and impacts of marine litter in the region.

Recommended national actions

1. Analyze the relevant recommendation (article 65) included in Resolution A/RES/60/30 of the United Nations General Assembly of 29 November 2005.
2. Establish mechanisms to collect relevant information on the production of marine litter (e.g., production of litter per capita in coastal municipalities, records of discharges in dumps and sanitary landfills, production per capita of litter in ships).
3. Incorporate the issue of marine litter in national research agendas, encouraging universities and research institutes to take interest in key issues such as patterns of marine litter transport, identification of sites of accumulation and sinking and decay rates of different materials.
4. Promote research to quantify the negative impacts generated by marine litter and estimates of its associated costs.

Regional actions

1. Promote the standardization of concepts and definitions related to marine litter in the region (e.g., floating litter, demersal litter) as well as a common methodology for the collection of relevant information (e.g., quantification of floating litter, determination of density of litter on beaches, assessment of volumes of submerged litter) and assessment of the costs generated by negative impacts.
2. Promote regional cooperation on research of several aspects related to marine litter, following the guidelines of the *Protocol for the Protection of the Southeast Pacific from Land-based Sources of Pollution*.
3. Identify funding opportunities to support research projects to generate information for decision making.

Objective 5. To recognize the problem of marine litter as a priority issue in the agendas of the countries in the region.

Recommended national actions

1. Analyze relevant recommendations from Resolution A/RES/60/30 of the United Nations General Assembly.
2. Develop activities for:
    a. increasing awareness of the population on marine litter problems and their associated costs;
    b. municipalities and the institutions responsible for the management of solid wastes in coastal areas to recognize the link existing between their activities and the problem of marine litter; and
    c. relevant authorities (e.g., fishing, tourism, public health, environment, merchant marine) to be conscientious of the problem and impacts generated by marine litter.
3. If relevant, consider involving official support and recognition in celebrating the International Coastal Cleanup day as a mechanism for raising public awareness and to generate systematic data.
4. Present the problem to ministerial cabinets of the countries to promote the inclusion of the marine litter issue in national agendas.

Regional actions

1. Include the issue of marine litter in Ministerial and/or Presidential declarations.
2. Include the issue of marine litter, directly or indirectly, in the agendas of multiple meetings organized by CPPS, maintaining the issue present and generating interest of authorities and technicians.
3. Produce educational materials for awareness focused on key audiences.
4. Prepare booklets on the problem of marine litter for students of elementary and secondary levels.
5. Establish a site on marine litter in CPPS's website.
6. Submit for consideration of the Contracting Parties the institutionalization of the Regional Coastal Cleanup day.

Objective 6. To reduce the use of disposable containers and wrappings of persistent materials that can eventually become marine litter.

Recommended national actions

1. Support coastal municipalities to adopt regulations in order to:
    a. Discourage the use of containers and wrappings made of persistent materials with a high probability of turning into marine litter (e.g., plastic bags, disposable drink bottles, fast-food wrappings, and packaging tapes).
    b. Stimulate the minimization of commercial and industrial wastes (e.g., packaging material) and their recycling.
2. Establish incentives for the reduction, recovery, and recycling of persistent materials (plastics, glass, metals) that are part of the garbage, and to promote that recycling enterprises broaden their scope and coverage in coastal municipalities.
3. Promote among the general public a culture of recycling and responsible consumption.
4. Stimulate cleaner production and negotiate agreements with companies to assume responsibilities for withdrawing containers, wrappings and packaging made of persistent materials.

Regional actions

1. Promote the exchange of regional and international experiences in reducing disposable containers and wrappings, and encouraging the recovery and recycling of persistent materials from the region.
2. Implement a regional political declaration (at the ministerial or presidential level) related to the minimization of persistent wastes, clean production, recycling and responsible consumption as feasible alternatives to reduce the problem of marine litter.
3. Prepare a work booklet for pupils in the basic education encouraging responsible consumption and reducing the use of disposable plastic containers and wrappings.

Objective 7. To establish a regional policy on marine litter.

Recommended national actions

1. Evaluate the compliance of national regulations related to the problem of marine litter, obligations with respect to the *Protocol for the Protection of the Southeast Pacific from Land-based Sources of Pollution* and with section IX of Resolution A/RES/60/30 of the United Nations General Assembly.
2. Take the appropriate actions to strengthen the compliance of relevant national norms and obligations regarding the *Protocol for the Protection of the Southeast Pacific from Land-based Sources of Pollution*.
3. Discuss and outline proposals for a regional policy on marine litter.

Regional actions

1. Distribute the recommendations on marine litter of Resolution A/RES/60/30 from the United Nations General Assembly and the results of the Global Programme of Action Meeting (Beijing 2006). Additionally, National Focal Points will be requested to organize meetings with stakeholders involved in the subject.
2. Convene a workshop to analyze the degree of compliance of the *Protocol for the Protection of the Southeast Pacific from Land-based Sources of Pollution* and the efficacy of the measures adopted.
3. Establish a regional working group to outline a regional policy on marine litter. The proposal will be submitted for consideration to the Contracting Parties for its analysis and approval.
4. Organize ordinary biennial sessions as established within the *Protocol for the Protection of the Southeast Pacific from Land-based Sources of Pollution*, ensuring the analysis of the problem of marine litter as part of pollutants listed in Annex I.

Funding options

Implementation of the *Regional Programme for the Integrated Management of Marine Litter in the Southeast Pacific* would require funds from different sources. Actions at the national level would rely mainly on local and national funding sources to support development and expansion of waste management programmes and infrastructure; public awareness campaigns and communications; reception facilities in ports; and research activities.

Actions at regional level will require support from a variety of sources including government contributions, international cooperation – including the Global Programme of Action for the Protection of the Marine Environment from Land- based Activities and the Regional Seas Programme of the United Nations Environment Programme (UNEP); the Global Environment Fund for medium sized projects; and sponsorships from companies with a local presence that are linked to the issues.

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Marine litter in the Wider Caribbean
Overview and proposed Action Plan

Introduction

The Wider Caribbean Region (WCR) comprises the insular and coastal States and Territories with coasts on the Caribbean Sea and Gulf of Mexico as well as waters of the Atlantic Ocean adjacent to these States and Territories and includes 28 island and continental countries (Antigua & Barbuda, Bahamas, Barbados, Belize, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, St. Kitts & Nevis, St. Lucia, St. Vincent & Grenadines, Suriname, Trinidad & Tobago, United States of America, Venezuela, France Caribbean Territories, Netherlands Caribbean Territories and United Kingdom Caribbean Territories).

The surface area of the WCR is about 3.3 million km^2, with an average depth of 2,200 m and coastal length of 55,383 km. Some 41 million people live within 10 km of the coastline.

The Caribbean Environment Programme (CEP) was established in 1976 and is one of the UNEP – administered Regional Seas Programmes (RSPs). The CEP is managed by and for the countries of the WCR through the Caribbean Action Plan (1981) outlining regional environmental challenges. The Action Plan led to the 1983 adoption of the Convention for the Protection and Development of the Marine Environment of the WCR (Cartagena Convention), which provides the legal framework. The Convention, which entered into force in 1986, has been supplemented by three protocols addressing specific environmental issues: oil spills; specially protected areas and wildlife; and pollution from land-based sources and activities. The CEP provides the programmatic framework for the Convention. The Caribbean Regional Co-ordinating Unit (CAR/RCU) located in Kingston, Jamaica (created in 1986) serves as Secretariat to the CEP.

Marine litter is a significant pollution issue for the Caribbean region, damaging valuable natural resources including wildlife and sensitive aquatic and coastal habitats, affecting the quality of life of local inhabitants and visitors, and impacting the base economies and sustainability of the entire region. The ubiquitous presence of marine litter, coupled with its physical, ecological, cultural, and socio-economic complexities, poses one of the most severe threats to the sustainability of the Caribbean's natural resources – its sensitive habitats, wildlife and people.

UNEP CAR/RCU with support from UNEP's RSP conducted a pilot project on the development of a *Regional Action Plan on the Sustainable Management of Marine Litter in the Wider Caribbean* (RAP MaLi), with the objective to assist in the environmental protection and sustainable development of the WCR. As part of this project, a review document (*Marine Litter in the Wider Caribbean: A Regional Overview*) was prepared on the existing status of marine litter issues and programmes and reviewed at a workshop in Aruba (February 2007) jointly with International Maritime Organization/Regional Marine Pollution Emergency, Information and Training Centre (RAC/REMPEITC). Information for this assessment was obtained by UNEP's Caribbean regional consultant for marine litter, through background research and interactions with various participating States in the compilation of surveys and interviews with government representatives, as well as UNEP Focal Points and appointed national consultants.

The development of the draft RAP MaLi involved a host of international, regional and national experts who work on marine litter and other related conservation issues in the WCR. The RAP MaLi is a work in progress and is being integrated into national and regional programmes as appropriate and implemented as funding becomes available.

The objective of this chapter is to present a summary of the document *Marine Litter in the Wider Caribbean: A Regional Overview* that includes the assessment of the problem and the *Regional Action Plan on the Sustainable Management of Marine Litter in the Wider Caribbean (RAP MaLi)* (UNEP-CAR/RCU, 2008).

Saint Lucia (2003 ICC). © Caribbean Environment Programme

Assessment of the status of marine litter

Overview

Marine litter is more than an unsightly inconvenience for beach-bound vacationers or pleasure boaters; it's one of the world's most pervasive pollution problems affecting our oceans and inland waterways. It affects the economies and inhabitants of coastal and waterside communities worldwide. Over the past 40 years, organic materials (once the most common forms of litter) have yielded to synthetic elements as one of the more abundant components of solid waste. Durable and slow to degrade, plastic materials that are used in the production of packaging for beverages, food and a host of other products, made into packing straps and tarps, and synthetic nylon materials used in fishing line and gear can all become marine litter if they are discarded improperly into the marine environment. In addition, many of these items are highly buoyant, allowing them to be carried in currents for thousands of miles, endangering sensitive marine ecosystems and wildlife along the way. Cigarette filters and cigar tips, fishing line, rope and gear, baby diapers and nappies, six-pack rings, beverage bottles and cans, disposable syringes, batteries, tires – the litany of litter is as varied as the products available in the global marketplace, but this all shares a common origin. At a critical decision point, someone, somewhere, mishandled it, either thoughtlessly or deliberately while on land or on the water.

Analysis of the available marine litter data collected in the Caribbean region through various beach and underwater cleanup activities conducted by local community groups and government agencies indicates that the dominant source of marine litter is land-based (Coe and Rogers, 1997; UNEP, 2006 and Ivar do Sul and Costas, 2007). The ubiquitous presence of marine litter, coupled with its physical, ecological, cultural, and socio-economic complexities, poses one of the most severe threats to the sustainability of the natural resources of sensitive habitats and wildlife and people of the Wider Caribbean region, and indeed the world as a whole.

Much of the marine litter reaches the ocean after being dumped along roadsides or into creeks, rivers, storm drains and sewers. It also originates from beach areas visitors when neglect to take their “picnic” trash and litter home when they leave the beach, or carried from landfills (waste dumps) due to storms and coastal flooding. Other marine litter comes from activities on the water, including vessels (from small power boats, sailboats and yachts, to subsistence and commercial fishing vessels and large transport ships carrying human cargoes and commercial goods), fishing piers and marinas.

One of the most significant features of the Caribbean region is its hydrography and its relationship to the transboundary effects of marine litter throughout the region. The Caribbean Sea is dominated by the flows of the North Equatorial Current and, to a lesser degree, the South Equatorial Current which filters westward through the Lesser Antilles near Trinidad and Tobago (UNEP, 1984).

The hydrography of the Gulf of Mexico is more complex. The Caribbean Current enters the Gulf via the Yucatan Channel and exits to the east through the Straits of Florida as the Gulf Stream. In between, the Gulf Loop Current may take a variety of routes (Van Vleet *et al.,* 1983).

Circulation in the western Gulf of Mexico is less understood. The main body of the western Gulf is dominated by an anti-cyclonic gyre off Louisiana, Texas, and northern Mexico. Although eddies from the Loop Current occasionally pinch off and enter the western Gulf, there seems to be little exchange between the two areas, especially for the western to the eastern Gulf (Van Vleet *et al.,* 1983 and Atwood *et al.,* 1987).

Watershed dynamics related to freshwater entry from rivers and canals into the ocean are also important within the region as they relate to land-based sources of marine litter. The flow of these currents as they shift seasonally has a direct effect on the presence and deposition of marine litter in the region.

Marine litter data summary (1989-2005)

Winds, waves, currents, and regional land-use activities along with seasonal climatic variations can influence marine litter patterns and trends in deposition. Seasonality in marine litter patterns and trends should be considered when assessing the types, amount and sources. In the Caribbean region, which has weather patterns that can vary from island to island, but are dominated by a tropical climate with classic wet and dry seasons, the weather is conducive to year-round beach and other water-related activities thus resulting in a more regular influx of marine litter and other pollutants.

Many organizations are engaged throughout the year in a variety of marine litter removal activities from beaches, mangroves, rivers and other sensitive coastal habitats, including coral reef areas. However, the most consistent activity for marine litter monitoring in the Caribbean region is associated with the annual efforts conducted through the global beach cleanup event known as the International Coastal Cleanup, which is coordinated by Ocean Conservancy – a U.S. marine conservation and advocacy organization. Data from the International Coastal Cleanup (ICC) is recorded by category related to most dominant sources and documented activities that have been shown to generate various forms of litter (www.oceanconservancy.org/icc).

During the period of 1989-2005, marine litter data was documented during the annual ICC in 28 countries of the Caribbean region where a total of 6,781,537 marine litter items were removed from shoreline areas and underwater sites covering 12,139.5 miles by 440,544 volunteers and supporters. A summary of the marine litter counts per source category and which items ranked as the most abundant by percentage is presented in Table 1.

Dominant marine litter forms

When the Caribbean marine litter data is reviewed according to the item counts (number of pieces) collected during the annual ICC events, the composition of marine litter is dominated by the presence of remnants of convenience containers, packaging for food and beverages and smoking materials. This can be translated into a behavioural pattern exhibited by the public, wherever the caps of their favourite beverages litter the ground and their utensils and containers from consuming fast-foods end up somewhere other than an appropriate trash receptacle. Discarded beverage containers can be listed in a hierarchy from plastic to glass to metal, corresponding to apparent regional recycling efforts: metal cans are recycled more than glass, and glass more than plastic. Discarded cigarette filters are ubiquitous, a testament to poor smoker waste handling.

The ‘Top Ten’ listing of the marine litter collected in the Caribbean region from 1989 to 2005 provides a ‘roadmap’ as to what people are doing to create the litter problem. The leading marine litter forms are associated with food and beverage packaging and containers, smoking materials, and abandoned clothing left at the beach and are land-based sources:

A comprehensive report, *Marine Litter in the Caribbean*, including detailed country reports on marine litter composition and analysis, is available in PDF format and is posted on the UNEP CEP website.

Table 1. Caribbean ICC marine litter total counts and 'top ten' items

Caribbean ICC marine litter items	Total counts (1989-2005)	Top 10 items
Shoreline & recreational activities		
Bags (paper & plastic)	716,182	10.6% (3)
Balloons	23,333	
Beverage bottles (glass)	467,801	6.9% (6)
Beverage bottles (plastic) 2 litres or less	716,070	10.6% (4)
Beverage cans	289,825	4.3% (9)
Caps, lids	805,165	11.9% (1)
Clothing, shoes	211,548	3.1% (10)
Cups, plates, forks, knives, spoons	768,745	11.3% (2)
Food wrappers/containers	514,281	7.6% (5)
Pull tabs	129,019	
Shotgun shells/wadding	7,125	
Six-pack holders	127,066	
Straws, stirrers	327,278	4.8% (8)
Toys	52,463	
Ocean/waterway activities		
Bait containers/packaging	10,394	
Bleach/cleaner bottles	140,924	
Buoys/floats	43,974	
Crab/lobster/fish traps	18,309	
Crates	14,516	
Fishing line	32,648	
Fishing lures/light sticks	41,001	
Fishing nets	30,931	
Light bulbs/tubes	47,914	
Oil/lube bottles	140,359	
Pallets	50,865	
Plastic sheeting/tarps	61,493	
Rope	84,753	
Strapping bands	22,350	
Smoking-related activities		
Cigar tips	26,257	
Cigarette lighters	35,185	
Cigarettes/cigarette filters	427,933	6.3% (7)
Tobacco packaging/wrappers	29,683	
Dumping activities		
55-gallon drums	27,341	
Appliances (refrigerators, washers, etc.)	3,544	
Batteries	7,481	
Building materials	141,688	
Cars/car parts	11,505	
Tires	28,223	
Medical/personal hygiene		
Condoms	22,269	
Diapers	74,311	
Syringes	23,056	
Tampons/tampon applicators	26,729	
DEBRIS TOTALS	**6,781,537**	**77.4%**

Source: Ocean Conservancy, 1989-2005 ICC Data Reports. http:// www.oceanconservancy.org/ICC

Marine litter source categories and indicators

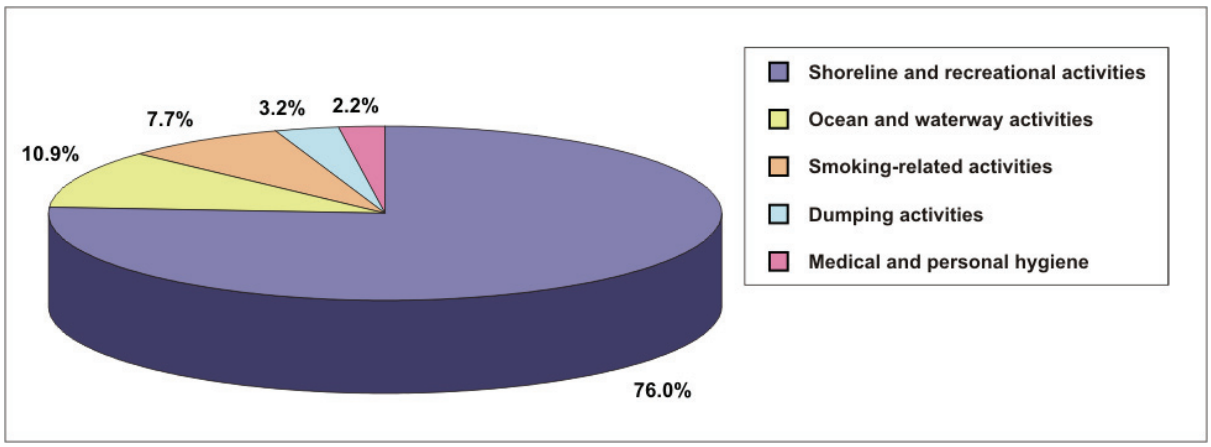
The types of marine litter generally associated with activities and sources that have been documented by researchers and assessed from data collected during the annual ICC and used in the Caribbean region for select monitoring and outreach efforts are presented in Table 2.

Table 2. Marine litter source categories and indicators

Marine litter sources & activities	Marine litter indicators
Shoreline & recreational: indiscriminate and intentional littering by beachgoers, picnickers, participants at waterside sports and festival events, washing down creeks and rivers, and litter carried from streets, drains, gutters and culverts.	Bags, balloons, beverage bottles (plastic) 2 liters or less, beverage bottles (glass), cups/plates/folks/ knives/spoons, food wrappers/containers, pull tabs, 6-pack rings/holders, shotgun shells/wadding, straws/stirrers, children's toys
Ocean/waterway: improper handling of solid wastes from recreational fishing/boating, subsistence/commercial fishing and shipping, military ships, cruise ships, and oil and gas offshore rigs.	Bait containers/packaging, bleach/cleaner bottles, buoys/floats, crab/lobster/fish traps, crates, fishing line, fishing lures/light sticks, fishing nets, light bulbs/tubes, oil/lube bottles, pallets, plastic sheeting/tarps, rope, strapping bands for packaging/cargo
Smoking: improper disposal and littering of smoking-related materials and packaging by smokers.	Cigarettes/cigarette filters, cigarette lighters, cigar tips, tobacco packaging/wrappers
Dumping: improper disposal of building and construction materials, drums, tires, cars/car parts, household trash and appliances.	Appliances, car/marine batteries, building materials, cars/car parts; 5 to 55-gallon drums, tires
Medical/personal hygiene: discarded materials into sewer systems, dumped into storm drains (along roadways and culverts), toilets, and litter left by beachgoers.	Condoms, diapers, syringes, tampons/tampon applicators passed from sewage systems *NOTE: Discarded medical supplies and expired medicines are also a potential hazardous debris/litter source.*

Marine litter sources in the Caribbean (1989-2005)

The dominant source of marine litter documented based on the historical ICC data (primarily from beach areas and some underwater activities) from the Caribbean region is attributed to land-based-sources (LBS) at 89.1 percent, with 10.9 percent attributable to ocean-based sources (OBS). Land-based sources of marine litter are reported to have a profound impact on tourism (and other economic sectors), as well as human health and safety. Ocean-based marine litter forms (e.g. fishing nets, gear and supplies, rope, fish traps, sheeting/tarps, and strapping bands) can also be very harmful to wildlife (entanglement and ingestion) and damaging to sensitive aquatic habitats, including coral reefs and sea grass beds. All of these can have monumental impacts on the region, its resources and its people.



Shoreline/Recreational Activities (LBS), Ocean/Waterway Activities (OBS), Smoking Activities (LBS), Dumping Activities (LBS), Medical/Personal Hygiene (LBS).
**Source: Ocean Conservancy, ICC Data Reports. http://www.oceanconservancy.org/ICC*

Problems and impacts associated with marine litter in the Caribbean region

Economy and aesthetics: Marine litter that collects along the beautiful beaches and waterways in the Caribbean detracts from the aesthetic beauty and enjoyment of those areas. It also impairs the enjoyment of these resources by locals, and negatively affects tourism. The result are extensive expenditures by both the private and public sectors of valuable and very limited financial resources and manpower to maintain these areas.

Human health and safety: Litter can also be a hazard to human health and safety. Discarded fishing line, rope and plastic bags can wrap around and damage boat propellers, or be sucked into boat engines. Medical wastes and drug paraphernalia lying on beaches can carry diseases, and broken glass and other sharp objects lie in wait for a child's bare foot on his favourite beach.

Habitat destruction: Marine litter can also result in habitat destruction by affecting water quality and causing physical damage to sensitive ecosystems. The coral reefs in the Caribbean are very susceptible to the impacts of marine litter as well as sea grass beds and bottom-dwelling species occupying these underwater habitats.

Wildlife: Aquatic (and also many shore-based) wildlife can often have lethal encounters with marine litter. Many species, including sea turtles, seabirds, and other wildlife in the Caribbean, can accidentally ingest trash, mistaking it for their food. Abandoned and lost fishing nets and gear, discarded fishing line and other forms of marine litter can become entangled on coral reefs damaging them extensively and pose a hazard to other marine wildlife.

Sources of marine litter

Determining the origin of all of the marine litter is no easy task since trash and litter can travel long distances before being deposited on our shorelines or settling on the bottom of the ocean, bay, or riverbed. Marine litter sources are generally classified as either land-based or ocean/waterway-based, depending on how the marine litter enters the water. Other factors such as ocean current patterns, climate and tides, and proximity to urban centres, industrial and recreational areas, shipping lanes, and fishing grounds influence the types and amount of marine litter that are found on the open ocean or collected along beaches and waterways or under water.

Marine litter from land-based sources blows, washes or is discharged into the water from adjacent land areas. Sources include beachgoers; fishermen; materials manufacturers, processors, and transporters; shore-based solid waste disposal and waste processing facilities; sewage treatment and combined sewer overflows; inappropriate or illegal dumping; and general public littering.

Both legal and illegal waste handling practices contribute to marine litter. These include the inadvertent release of trash from coastal landfills and garbage illegally dumped from water transports; recreational beach and roadside litter; and the illegal dumping of domestic and industrial garbage into coastal and marine waters.

People can also generate marine litter when at sea. Ocean/waterway-based contributors include subsistence and commercial fishing boats/vessels; merchant, military, and research vessels; recreational boats and yachts; cargo and cruise ships; and offshore petroleum platforms and associated supply vessels. Litter can end up in the water through accidental loss or system failure; antiquated waste management practices; or illegal disposal and indiscriminate littering and dumping.

Legislation, policies and institutional arrangements

Legislation

When acknowledging the harmful effects of marine litter on a sensitive ocean and vulnerable coastal habitats, it is obvious that laws and regulations are needed to address marine litter issues. Historically, after years of irresponsible dumping practices, there are laws regulating at sea and shore-side dumping. Unfortunately, the widespread nature of marine litter, its ability to traverse territorial borders, and the difficulties in identifying the sources have made effective laws difficult to draft and even harder to enforce. In the Caribbean region there are various examples of laws and policies related to solid waste and littering that have been developed and which form a substantial foundation for a strategy to address the broad-based issue of marine litter.

The types of regulations that currently exist in the Caribbean region related to marine litter include legislation that focuses on public health and sanitation, watershed management, sewerage and wastewater management, solid waste management, coastal zone management, natural resource management (including fisheries, habitat conservation/protection, and species protection), shipping and port regulations, recycling of (beverage) containers and other materials, dumping regulations, and general anti-littering laws. A listing of the various laws and policies that are currently in operation in select countries of the region are described in the report *"Marine Litter in the Wider Caribbean: A Regional Overview"* posted on the UNEP CAR/RCU website.

Regionally there are no specific laws that address marine litter, except for the United States with the *Marine Debris Research, Prevention and Reduction Act,* which establishes a programme to identify, assess, reduce and prevent marine litter and its effects on the marine environment. This was ratified in December 2006 and is currently being implemented through federal programmes (http://www.commerce.senate.gov/pdf/marinedebris_mark.pdf).

International and regional treaties and conventions

There are several existing regional and international treaties and conventions that address the jurisdiction and handling of marine litter from land-based and ocean-based sources in the Caribbean region and across the globe.

The international and regional treaties and conventions that address various aspects of marine litter relative to the Caribbean region include:

- Convention for the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Convention), 1972;
- International Convention for the Prevention of Pollution from Ships (MARPOL 73/78), Annex V and 'Special Area' designation;
- United Nations Convention on the Law of the Sea (UNCLOS), 1982 ;
- Convention for the Protection and Development of the Marine Environment in the Wider Caribbean Region (Cartagena Convention,1996) and Protocol on Marine Pollution from Land-based Sources and Activities (signed in 1999);
- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Basel Convention);
- FAO Code of Conduct for Responsible Fisheries;
- Fish Stocks Agreement (UNFSA); and
- Regional Fishery Management Organizations (RFMOs).

Institutional arrangements

An extensive regional network exists in the Caribbean, which brings together numerous agencies, organizations and associations involved in the management of marine litter – its creation, handling, abatement, reduction and prevention. This network includes health, environmental, conservation, education, tourism, and waste management bodies, which, through their regional and local programmes and initiatives for solid waste and natural resource management and other related activities, form a powerful base for regional interaction and collaboration in dealing with the marine litter problems that plague the region.

Several international organizations are positioned to address marine litter problems in the Caribbean region through their programming and institutional collaborations. Some have been doing so for some time. These are the International Maritime Organization (IMO), United Nations Educational, Scientific, and Cultural Organization (UNESCO), Intergovernmental Oceanographic Commission (IOC) and the Sub-Commission for the Caribbean and Adjacent Regions of the Intergovernmental Oceanographic Commission of UNESCO (IOCARIBE), the UNEP Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (UNEP/GPA) and the Regional Seas Programme of UNEP.

Other regional organizations have also supported activities related to marine litter and form a solid foundation for a regional initiative. The leading regional coordinating group is the United National Environment Programme/Caribbean Environment Programme (UNEP-CEP), which is the Secretariat for the Protocol Concerning Pollution from Land-Based Sources and Activities in the Wider Caribbean Region (LBS). Projects in support of this Protocol are implemented through UNEP CEP's Biennual Work Plan and Budget and primarily though the Assessment and Management of Environmental Pollution sub-programme (AMEP). These projects and activities also support Global Programmes such as implementation of the

Programme of Action for the Small Islands Developing States (SIDS) of the Eastern Caribbean and the SIDS Mauritius Strategy (http://www.cep.unep.org/).

Other regional organizations with programmatic interests in marine litter reduction and prevention include the Organization of Eastern Caribbean States, Caribbean Environmental Health Institute, Caribbean Network for Integrated Rural Development and Caribbean Shipping Association. Numerous conservation organizations have taken the lead on addressing marine litter issues in their community-based programming, lead by the Caribbean Conservation Association and the Caribbean Youth Environmental Network.

With tourism representing such a substantial component of the economy in the Caribbean, several tourism-related organizations have been involved in various aspects of the marine litter issue including the Caribbean Shipping Association, Caribbean Hotel Association, Caribbean Alliance for Sustainable Tourism, Caribbean Tourism Organization, the International Council of Cruise Lines and the Florida-Caribbean Cruise Association.

Because marine litter problems have long been recognised as a problem by Caribbean governments, numerous national institutional arrangements have been developed to address this environmental problem. These include solid waste management agencies, environmental and natural resource agency conservation and management programmes, port authority operations, tourism board programmes, and maritime activities including fishing, boating, and other vessel operations.

In any effective pollution prevention initiative, successful partnerships between public, private and NGO sectors play a critical role in the success and sustainability of the effort. While the governments are typically charged with protecting the land and its people, they cannot and should not do this alone. Collaboration between these groups results in more efficient use of resources and builds linkages between the government and its people. The establishment of a ‘stewardship ethic’ among the people is essential in addressing pollution problems and their solutions.

Programmes and initiatives

Few formal marine litter monitoring programmes currently exist within the Caribbean region. However, over the years various programmes have been conducted by groups of States with some efforts having been made by NOAA (US) in collaboration with UNEP CEP and other regional fisheries organizations to develop underwater surveys. Numerous community cleanup programmes exist, but do not usually include the compilation of data on the types and amounts of marine litter for programme analysis. The leading effort to assess marine litter is conducted annually through the International Coastal Cleanup, which is held in most countries in the region.

National programme activities include beach cleanups and ‘adopt-a-beach’ efforts, public awareness campaigns for litter prevention and solid waste management, education projects conducted by the local schools for conservation, programmes for nature and wildlife reserves on marine litter, monitoring activities for water quality and coral reefs that include marine litter components, and yachting and boating programmes for environmentally safe boating.

The International Coastal Cleanup (ICC), which is coordinated globally by the US-based NGO – Ocean Conservancy, is an annual campaign that consists of a vast grouping of partners and participating countries that focus on public awareness of the marine litter issue and the collection of data on litter amounts, types and sources. One of the ICC’s primary goals is to trace pollution to its source and work to prevent it from occurring. Volunteers record marine litter information on data cards that identify the types, sources, and activities that produce the marine litter found along beaches and waterways. Information on the data card is grouped by the behaviour associated with the marine litter, including recreational, beach-going activities, smoking-related activities, ocean and waterway activities, activities associated with legal or illegal dumping, or activities resulting from improper disposal or handling of medical or personal hygiene materials. Data from the Cleanup provides the framework for government action to limit marine litter and to educate the public about litter and pollution prevention.

Since 1989, as many as 28 countries in the Caribbean region have participated in the annual ICC event.

Strengths, gaps and needs

Successful management of the problem of marine litter requires a comprehensive understanding of this issue including identifying the dominant forms of marine litter, their abundance and potential sources, and most importantly, the human behaviours and activities producing it. Conducting effective documentation and monitoring activities to assess the types and amounts of marine litter, coordinated public education programmes and waste management strategies, implementing effective policies supported by regional and international treaties and conventions, enforcement and compliance with national and local legislation and regulations, and governmental and private sector support can form the foundation for successful marine pollution prevention interventions that will ultimately lead to the reduction and abatement of the marine litter problems impacting the continental coastal regions and small islands of the Caribbean region (Sheavly, 2005).

As part of the UNEP CAR/RCU Marine Litter Project, surveys were administered to national consultants, National and Marine Litter Focal Points, along with external research and the following gaps and needs related to marine litter management were identified:

- **National monitoring programmes**. The need for establishment of national marine litter monitoring programmes was expressed so that information could be collected on a regular basis and used for programme development and assessment of interventions and reduction strategies. A regional database also needs to be established so that this information is accessible throughout the region.
- **Assessment of impacts of marine litter**. Research needs to be conducted to determine the various impacts of marine litter on wildlife and habitats and other indicators (e.g. invasive species transport and toxicity due to ingestion of materials). In addition, the economic impacts of marine litter need to be assessed to help prioritize and quantify the economic impact of this issue within government programmes, business and industry groups, and the public.
- **Education campaigns**. A comprehensive strategy needs to be developed and implemented for an education campaign series that can be accessed by government agencies and other organizations that includes radio and television advertisements, printed educational materials (brochures, posters) that can be used by government agencies, NGOs, business and industry groups, and educational components (curriculum aids/activity sheets) for use by educators in the integration of this issue into the school curriculum.
- **Effective legislation and enforcement**. Existing waste management legislation needs to be evaluated for its effectiveness and whether or not it is being enforced. In most cases, substantial legislation and regulations exist, but are poorly enforced due to a variety of reasons. MARPOL Annex V needs to be assessed to determine if it is functioning effectively in terms of reduction/prevention of ocean-based sources of marine litter.
- **Establish responsible government authority**. The authority for management of the marine litter issue in a country is spread among several agencies or not identified specifically. This line of responsibility and authority needs to be restructured to be more effective. Many agencies have partial responsibility for select components which leads to a division of resources and ineffectiveness in overall management of this issue. Collaborations between NGOs and government agencies where authority is defined and authorized between these groups could strengthen management and control efforts.

Trinidad (2006 ICC). © Caribbean Environment Programme

Recommendations for improvement

Despite knowing the causes of marine litter and how it enters the environment, we continue to facilitate its creation and deposition. Alternative materials that are less invasive or harmful to the environment exist, but they have not been successfully integrated into the economic mainstream. Lack of enforcement and inadequate compliance with existing laws that seek to control and prohibit marine litter make those laws ineffectual.

To fight these developments, we must create national strategies and opportunities that encourage people to reduce recycle and/or eliminate marine litter. We must continue with current efforts by governments and the private sector to increase awareness, establish marine litter abatement programmes, and change attitudes and behaviours that ultimately lead to marine litter impacting our ocean. Successful management of the problem requires a comprehensive understanding of both marine litter and human behaviour. Education and outreach programmes, strong laws and policies, and governmental and private enforcement are the building blocks for successful marine pollution prevention initiatives.

Proposed Regional Action Plan for Marine Litter (RAP MaLi) Management in the Wider Caribbean

The following recommendations are presented as a regional framework for marine litter management in the Caribbean region. Most of the proposed actions will need to be implemented at the national level, with a select group applicable on the regional level. These actions incorporate a prevention and/or responsive approach to addressing marine litter issues plaguing the Caribbean. UNEP-CAR/RCU will function as a coordinator of information and facilitator of new strategies and initiatives, as appropriate, for addressing marine litter issues in the region and ensuring synergies with other regional strategies and initiatives for pollution prevention, reduction and control and an integrated approach to solid waste management in the region.

Development of the draft *Regional Action Plan* has involved a host of international, regional and national experts who work on marine litter and other related conservation issues in the Wider Caribbean region. These experts included key UNEP staff, an international marine litter consultant, various government representatives associated with coastal zone management, environmental protection, fisheries, solid waste management, and tourism. Representatives from regional and national conservation NGOs that manage marine litter programmes and activities and conduct annual beach cleanups were also engaged as national consultants for marine litter.

Legislation, policies and enforcement

Numerous laws regulate litter and debris on both land and sea. Unfortunately, laws do not guarantee compliance. In addition to enforcement and penalties, a sense of environmental stewardship among ocean users is essential for laws to be effective. There are a host of national regulations and policies that are country-specific addressing solid waste management and other pollution concerns. However, specific marine litter legislation is very rare or not existent. Even when legislation exists, enforcement and compliance is often lacking.

An extensive array of national, regional and international policies currently exists in the Caribbean that forms a strong basis for dealing with marine litter problems. However, compliance issues exist in this region as they do in every other part of the world. In discussions with law enforcement representatives, who are besieged with a plethora of more serious, life threatening issues on a daily basis, the idea of processing tickets for littering violations or other waste management infractions were viewed as an impracticality. The importance of litter prevention and abatement must be elevated as a priority for coastal management.

Actions

Action 1: Evaluate existing legislation, regulations and enforcement practices that deal with marine litter and strengthen or enact new legislation/regulations as appropriate.

Action 2: Establish and/or enhance government sponsored ‘litter wardens’ or patrols in coordination/collaboration with municipal police/security forces and establish the infrastructure for compliance.

Action 3: Participate in the review of MARPOL Annex V and implementation of Annex V 'Special Area' status for the Caribbean region.

Action 4: Expand ratification and promote effective implementation of MARPOL Annex V and the LBS Protocol of the Cartagena Convention by all Caribbean States.

Action 5: Ensure that marine litter and ecosystem health issues are integrated into emergency management plans and procedures.

Action 6: Establish a clearinghouse of information on effective strategies and practices for enforcement of waste management practices.

Action 7: Mobilize resources for improving enforcement capacity for integrated waste management.

Institutional frameworks and stakeholder involvement

Government management of the marine litter issue in most States is dispersed among multiple agencies or not specifically identified. Many agencies have partial responsibility for select components, which leads to a division of resources and ineffectiveness in overall management of marine litter-related issues. It has been suggested that there needs to be reduced fragmentation and identification of clear lines of responsibility and authority in order to be more effective. Collaborations between NGOs and government agencies where authority is defined and authorized between these groups could strengthen management and control efforts.

Action 1: Develop and implement a model of a national management plan for marine litter.

- Establish country-specific, integrated waste management programmes and projects that are within the context of a National Waste Management Strategy.
- Encourage the development of industry guidelines that could be included in National Management Plans.
- Identify the key lead/responsible agency.
- Engage key stakeholders where a national agency is designated as the lead for this national effort.
- Establish or strengthen existing National Committees to ensure representation of all stakeholders and to identify clear roles and responsibilities.
- Conduct research and analyses related to marine litter that will be used to guide future policy decisions.
- Develop and implement an incentives programme to reduce marine litter.
- Develop economic instruments to provide opportunities for marine litter initiatives, such as recycling and reuse programmes.

Action 2: Establish the infrastructure for compliance with existing marine litter management legislation at the national and community levels.

Action 3: Establish a Caribbean Marine Litter Regional Working Group to coordinate and consult on appropriate actions for marine litter management.

Action 4: Provide training for judiciary/magistrates/enforcement officers and sensitization for politicians on marine litter issues.

Action 5: Present information on the marine litter issue at key environmental meetings and conferences in the region.

Monitoring programmes and research

A national marine litter monitoring programme can support an expanded understanding of the problem and function as an ongoing component of management strategies that deal with this pollution issue. Monitoring can be used to clarify the problem of marine litter – e.g., what are the types, what are the sources, how widespread is the problem. Data and research on marine litter can be used to help formulate management solutions – which must in turn be implemented by management agencies with support from private sector. Objectives for monitoring must be clearly delineated. Policy could be developed through monitoring efforts to produce legislation or funding for source-reduction programmes, to assess trends, to identify pathways by which marine litter gains access to the water, to assess wildlife and habitat impacts, to identify point sources, to quantify economic impacts and to help enforce regulations (Farris and Hart, 1995; Coe and Rodgers, 1997; and Sheavly, 2005).

Turtles are often victims of discarded nets. © Caribbean Environment Programme

Action 1: Design and implement a strategy to develop national marine litter monitoring pilot projects in the Caribbean region, that are aligned with the UNEP/IOC guidelines on survey and monitoring of marine litter, including standardized methods for data collection and reporting.

Action 2: Develop a regional, web-based database as a clearinghouse for marine litter information and research.

Action 3: Engage all stakeholders at community, national and regional levels in monitoring and research efforts.

Action 4: Solicit information/research from fisheries, wildlife, and other resource management agencies and programmes throughout the region on the impacts of marine litter on wildlife and ecosystems.

Action 5: Utilizing the *UNEP/IOC Guidelines on the use of Market-based Instruments to Address the Problem of Marine Litter,* UNEP-CAR/RCU will field test an assessment of the economic impacts of marine litter, including costs for cleanup efforts, maintenance of recreational beach areas, costs for lost or abandoned fishing gear, and the costs associated with the loss of recreational uses of coastal areas through a phased assessment.

Action 6: Conduct a GAP analysis of overlap of high density marine litter areas with areas of high sensitivity (endangered species, key habitats, etc) in order to prioritize cleanup and mitigation efforts.

Action 7: Review and disseminate research and information on the identification, removal and disposal of marine litter to enable more effective recovery efforts and disposal of marine litter.

Education and outreach

A regional strategy needs to be developed for a marine litter education campaign that can be accessed by government agencies, NGOs and other related organizations in the Caribbean. This campaign would incorporate an expansion in promotion and participation in the annual International Coastal Cleanup (ICC) and be implemented through a variety of venues, including radio and television advertisements (PSAs), web-accessible materials, and printed educational materials (brochures, posters) that can be used by government agencies, NGOs, and business and industry groups. In addition, specialized educational components (curriculum aids/activity sheets) are needed for use by traditional educators to support the integration of this issue into the general school curriculum.

Action 1: Develop and implement community-based public education campaigns for marine litter prevention, including specialized marine litter prevention programmes for key user-groups and stakeholders.

Action 2: Develop a regional campaign for the International Coastal Cleanup (ICC). Since 1989, 28 countries in the Wider Caribbean have participated on various levels in the ICC.

Action 3: Incorporate cultural issues, including popular culture icons in outreach programming to promote behavioural change.

Action 4: Incorporate marine litter issues into other community calendars and environmental events.

Action 5: Explore opportunities for integrating issues on marine litter into formal education curricula and programming.

Action 6: Collate best management practices, case studies and lessons learned on marine litter management at the community and national levels and communicate these with UNEP-CAR/RCU for regional compilation and dissemination.

Solid waste management strategies

Marine litter management is a significant component of solid waste management efforts in the Caribbean region. However, many national solid waste management strategies do not include specific activities relating to marine litter management. It is critical that there be an integration of marine litter management strategies with solid waste management strategies. An effort to coordinate programme activities, waste management strategies, and resources would prove beneficial for the people and environment of the Wider Caribbean Region.

Action 1: Maintain/develop specialized marine litter waste management strategies for public events – either as a separate strategy or part of an existing waste management strategy.

Action 2: Research hotel, restaurant and the marine transport industry BMP's for waste management practices and strengthen collaboration with the tourism sector for sharing of best practices and lessons learned.

Action 3: Develop and promote activities for national/regional recycling, reuse and waste diversion.

Action 4: Identify/promote international environmental certification programmes which include waste management and minimization.

Caribbean hotels are a major source of litter. © Caribbean Environment Programme

Action 5: Maintain/develop specialized waste management strategies for marine litter problems associated with seasonal and/or weather-related events.

Action 6: Improve port reception facilities to effectively manage ship generated wastes.

Implementation of the Regional Action Plan for Marine Litter Management will be coordinated by the UNEP-CAR/RCU and will include the development of a process for assessment and evaluation of the plan through the identification of targets, milestones and indicators. In addition, efforts to identify funding resources will be spearheaded by UNEP-CAR/RCU with support from Member States. Leveraging of resources will be explored for existing sources as well as the cultivation of new funding sources to support regional efforts for addressing marine litter.

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For UNEP/CEP publications cited in this overview which are available online, go to http://www.cep.unep.org/publications-and-resources/marine-and-coastal-issues

International Coastal Cleanup

Marine litter/debris has attracted increased international attention in recent years and has become a more prominent issue for regional, national and local governments, as well as other sectors. UNEP and its Regional Seas Programme (UNEP/RSP) and the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA) have developed and implemented a number of activities on the management of marine litter, including expanding involvement with 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.

The ICC has been operating since 1986 in the US and globally since 1989. The ICC has engaged 127 countries and territories in its 23 years, involving hundreds of NGOs, government agencies, various private sector and other civil society groups and organizations at the regional, national and local level. UNEP has long recognized the value of the ICC and has expanded that support through a partnership with Ocean Conservancy for cooperation on the development of a global report on marine litter and collaborating in the development of global monitoring guidelines for marine litter. In addition, an expanded participation of the UNEP Regional Seas in the annual ICC campaign has also been fostered.

This formal collaboration between Ocean Conservancy and UNEP was first initiated in June 2005 when the Ocean Conservancy was invited to speak at the *Sixth Meeting of the UN Open-ended Informal Consultative Process on Oceans and the Law of the Sea* and gave a presentation on the ICC and its global activities. As a result of this meeting, the UN General Assembly addressed the issue of marine litter/debris in its Resolution A/RES/60/30 - Oceans and the Law of the Sea - of 29 November 2005 which led to an expanded effort on marine litter programming. As part of this cooperation, UNEP/RSP invited Ocean Conservancy to participate in the *2nd Intergovernmental Review Meeting of the GPA* in Beijing, China (October 2006). Information on the ICC was presented by Ocean Conservancy's senior marine debris consultant at the Marine Litter Partnership Meeting, along with other marine litter initiatives being conducted in Australia, the Caribbean and by NOWPAP.

As a response to the UN GA and the ML partnership meeting, UNEP RSP proposed numerous actions, which the ICC and Ocean Conservancy could support. Some of the recommendations included:

- Efforts to establish a platform of a global partnership for the coordinated development and implementation of the UN GA Resolution A/RES/60/30 and UNEP's Global Initiative on Marine Litter. *Ocean Conservancy is part of that new platform*.

- Efforts to develop and strengthen ties with the private sector; commercial sectors such as industry, fishing, tourism, shipping, NGOs, academia, donor organizations and others. *The ICC is founded on working collaboratively with these groups as part of the ICC network and also works regionally with UNEP's CAR/RCU, MED, COBSEA, SACEP, CPPS, NOWPAP and others.*

- Launching and/or enhancing activities on development of economic instruments; prevention and management of abandoned and lost fishing gear; building on local and national programmes, development of regional programmes on marine litter; reception facilities for marine garbage and waste, including derelict fishing gear; development of substantive guidelines on the harmonization of monitoring and assessment systems on marine litter; cooperation between global and regional beach cleanup campaigns; and development of outreach and educational materials. *Ocean Conservancy has been involved in several programmes and activities related to abandoned and lost fishing gear, regional debris removal efforts, is partnering with NOWPAP and CAR/RCU on ICC activities in these regions, and is also working with UNEP on the development of standardized monitoring guidelines for marine litter.*

- Developing and implementing a series of regional actions on marine litter in several Regional Seas Conventions and Marine Litter Action Plans. *Ocean Conservancy worked with UNEP RSP to produce a global report on marine litter based on these regional action plans.*

This chapter presents a summary of International Coastal Cleanup (ICC) programme on the marine litter data that has been collected around the world since 1989. ICC events have been carried out in in 73 countries of the 12 Regional Seas that are part of the UNEP Marine Litter Initiative. The ICC is unique in that its acitvities of collecting data on the composition and abundance of marine litter provides the only global database of this information worldwide.

ICC in the Regional Seas

There has been significant ICC activity conducted in many of the Regional Seas countries around the world. There are 12 RSPs involved in UNEP's marine litter initiative and all have had some ICC activity conducted over the years by many of their Member States. Through this UNEP Initiative, more ICC activity has been generated as part of the efforts of the UNEP RSPs to engage the public in this pollution issue. Of the 12 Regional Seas currently participating in the UNEP ML Initiative, there are 73 countries and territories that have participated in the International Coastal Cleanup. Historically, the Wider Caribbean region has had the most extensive ICC activity. Ocean Conservancy also promoted ICC activities in the Caribbean region as part of its regional programming related to wildlife and ecosystem conservation efforts.

One vehicle for assessing the involvement of the public and other partners in the annual ICC is the compilation of the participation data from these events – how many people and how much marine litter was removed over what distance. Table 1 presents the most recent listing of participating country activities (2005, 2006 or 2007) within each Regional Sea, noting the total weights of marine litter collected, the distance cleaned during the ICC, a comparison of weight per distance covered and how many participants were reported in the cleanup event.

International Coastal Cleanup: an overview

Since 1986, the International Coastal Cleanup (ICC), coordinated by the Ocean Conservancy, has cultivated hundreds of thousands of volunteers and organizers in 132 countries 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. The data collected during the International Coastal Cleanup event is catalogued according to the behaviours and sources associated with the deposition patterns of debris.

The origins of the ICC began in 1985 with research conducted by Ocean Conservancy/OC (previously know as the Center for Environmental Education/CEE and the Center for Marine Conservation/CMC) on plastics in the marine environment. Contracted by the U.S. Environmental Protection Agency, Office of Toxic Substances, CEE produced the report *Plastics in the Ocean: More Than a Litter Problem* (1988), which was the first study in the United States to identify plastics as a significant marine debris hazard. Coupled with OC's ongoing conservation efforts on the protection of sea turtles, seals, whales, other marine wildlife and coral reef systems, the issue of marine debris became a significant component of the organization's advocacy work and an important vehicle for engaging the public in marine conservation issues.

The report's findings prompted and then supported the efforts of the U.S. Congress to adopt MARPOL 73/78 Annex V enacting national legislation to limit the dumping of garbage from boats and to help control land-based sources of marine debris, such as stormwater systems and combined sewer systems. The implementing legislation for Annex V that also extended the dumping regulations to vessels in all navigable waterways of the United States was the Marine Plastic Pollution Research and Control Act (MPPRCA) of 1987. One of the components of MPPRCA was the mandate to assess the effectiveness of marine debris legislation. The National Marine Debris Monitoring Program (NMDMP) was later developed to assess the effectiveness of this legislation and other programming in the US.

Recognizing the need for public education and involvement in solving the marine debris problem, MPPRCA required the Administrator of the U.S. Environmental Protection Agency (EPA), the Administrator of the National Oceanic and Atmospheric Administration (NOAA), and the U.S. Coast Guard to conduct a public education programme on the marine environment. It also directed the EPA Administrator, along with the Secretary of Commerce and the U.S. Coast Guard to conduct a program to encourage the formation of volunteer groups to assist in the monitoring, reporting, cleanup, and prevention of ocean and shoreline pollution. These Congressional authorizations provided critical federal endorsement and support for programs like the International Coastal Cleanup.

The U.S. Commission on Ocean Policy Report was released in September 2004 and cited the International Coastal Cleanup and the National Marine Debris Monitoring Program as significant tools in characterizing the types, amounts and sources of marine debris collected along the beaches and waterways in the U.S. and its territories. In June 2005 at the sixth United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea (UNICPOLOS), the ICC was presented as a model for addressing public awareness on marine debris issues and the characterization of the debris types, sources and impacts reported around the world through its 23 year campaign.

Table 1. UNEP Regional Seas participation in ICC events (2005, 2006 or 2007)

UNEP regions and countries (ICC 2005/2006/2007)	kg	km	kg/km	# people
Baltic Sea (HELCOM)			**192.71**	
Denmark (2007)	300.10	3.86	77.75	60
Estonia (2007)	1,776.72	4.02	441.97	74
Finland (2007)	991.51	198.11	5.00	114
Germany (2006)	1,200.66	3.22	372.88	32
Latvia (2007)	1,100.19	1,008.10	1.09	45
Poland (2007)	2,164.04	448.36	4.83	261
Black Sea			**181.21**	
Bulgaria (2006)	525.71	1.61	326.53	48
Turkey (2007)	10,860.00	1,649.58	6.58	3,051
Ukraine (2005)	49.90	*NR*	—	34
Caspian Sea			**0.17**	
Iran (2006)	600.56	3,496.36	0.17	184
East Asian Sea (COBSEA)			**725.53**	
Australia (2007)	2,495.90	2,346.91	1.06	450
People's Republic of China (2007)	431.41	23.34	18.48	232
Indonesia (2007)	1,545.54	37.01	41.76	296
Republic of Korea (2007)	113,618.27	27.52	4,128.57	4,672
Malaysia (2007)	3,075.27	1,717.82	1.79	999
Philippines (2007)	117,014.90	400.24	292.36	51,247
Singapore (2007)	10,137.43	31.70	319.79	3,082
Thailand (2007)	10,484.24	2,422.39	4.33	3,505
Vietnam (2007)	22.00	11.27	1.95	16
Eastern Africa (WIO)			**283.35**	
Kenya (2007)	4,904.69	194.73	25.19	1,376
Mozambique (2007)	1,200.21	1.93	621.87	40
South Africa (2007)	20,700.53	587.29	210.66	9,211
Tanzania (2007)	1,419.79	5.15	275.69	132
Mediterranean			**76.69**	
Croatia (2005)	54.43	3.22	16.90	6
Cyprus (2007)	502.17	222.73	2.25	171
Egypt (2007)	898.11	22.37	40.15	268
France (2005)	3,684.53	16.09	229.00	146
Greece (2007)	9,765.66	63.09	154.79	2,330
Israel (2007)	13,206.34	21.73	607.75	1,345
Italy (2005)	2,351.42	33.79	69.59	526
Libya (2007)	22.00	1.45	15.17	26
Malta (2007)	281.68	7.40	38.06	47
Spain (2005)	7,720.60	41.84	184.53	751
Turkey (2007)	10,860.00	1,649.58	6.58	3,051
Northeast Atlantic (OSPAR)			**142.51**	
Belgium (2007)	2,426.27	8.05	301.40	219
Denmark (2006)	300.10	3.86	77.75	60
Finland (2007)	991.51	198.11	5.00	114
France (2005)	3,684.53	16.09	229.00	146
Germany (2006)	1,200.66	3.22	372.88	32
Ireland (2006)	34.02	3.22	10.57	10
Netherlands (2005)	1,705.51	12.87	132.52	127

UNEP regions and countries (ICC 2005/2006/2007)	kg	km	kg/km	# people
Norway (2007)	110.04	3.06	35.96	45
Portugal (2005)	385.10	4.83	79.73	55
Spain (2005)	7,720.60	41.84	184.53	751
United Kingdom (2007)	28,884.90	189.10	152.75	4,147
Northwest Pacific (NOWPAP)			**1,256.52**	
People's Republic of China (2007)	431.41	23.34	18.48	232
Japan (2007)	37,196.89	48.44	767.90	16,450
Republic of Korea (2007)	113,618.27	27.52	4,128.57	4,672
Russian Federation (2007)	44.45	0.40	111.13	32
Red Sea & Gulf of Aden (PERSGA)			**87.23**	
Egypt (2007)	898.11	22.37	40.15	268
Saudi Arabia (2007)	865.77	6.44	134.44	212
South Asian Seas (SAS)			**126.32**	
Bangladesh (2007)	528.12	98.01	5.39	375
India (2007)	58,156.94	104.29	557.65	6,873
Maldives (2005)	2,122.36	20.92	101.45	307
Sri Lanka (2007)	232.69	3.70	62.89	19
Southeast Pacific (CPPS)			**1,812.38**	
Chile (2006)	96,040.47	397.42	241.66	6,697
Colombia (2007)	534.79	7.24	73.87	219
Ecuador (2007)	913.99	49.57	18.44	230
Panama (2007)	865.91	6.12	141.49	99
Peru (2007)	4,649.32	4.02	1,156.55	2,500
Wider Caribbean			**762.97**	
Bahamas (2007)	5,383.69	49.57	108.61	1,037
Barbados (2007)	1,085.07	3.22	336.98	74
Belize (2007)	3,833.37	117.64	32.59	2,218
British Virgin Islands (2006)	709.87	8.05	88.18	162
Cayman Islands (2007)	51.26	3.22	15.92	35
Colombia (2007)	534.79	7.24	73.87	219
Costa Rica (2007)	596.47	5.95	100.25	253
Cuba (2007)	480.81	2.41	199.51	37
Dominica (2007)	25,809.41	8.05	3,206.14	577
Dominican Republic (2007)	2,585.48	10.30	251.02	253
Grenada (2007)	368.32	3.22	114.39	18
Guyana (2007)	4,025.63	9.66	416.73	345
Haiti (2005)	106.14	*NR*	—	40
Honduras (2007)	963.88	7.24	133.13	61
Jamaica (2007)	1,922.60	25.75	74.66	546
Mexico (2007)	82,352.19	1,850.43	44.50	8,010
Netherlands Antilles (2007)	163,028.28	14.48	11,258.86	602
Nevis (2007)	1,960.59	14.00	140.04	163
Panama (2007)	865.91	6.12	141.49	99
St. Kitts (2007)	1,662.42	11.67	142.45	388
St. Lucia (2007)	3,909.06	16.90	231.31	386
St. Vincent & Grenadines (2007)	7,050.19	20.60	342.24	685
Trinidad & Tobago (2007)	15,402.50	394.45	39.05	2,250
Venezuela (2007)	417.30	7.40	56.39	110
TOTALS for UNEP ICC activities	**1,022,744.48**	**20,182.98**	**—**	**151,287**

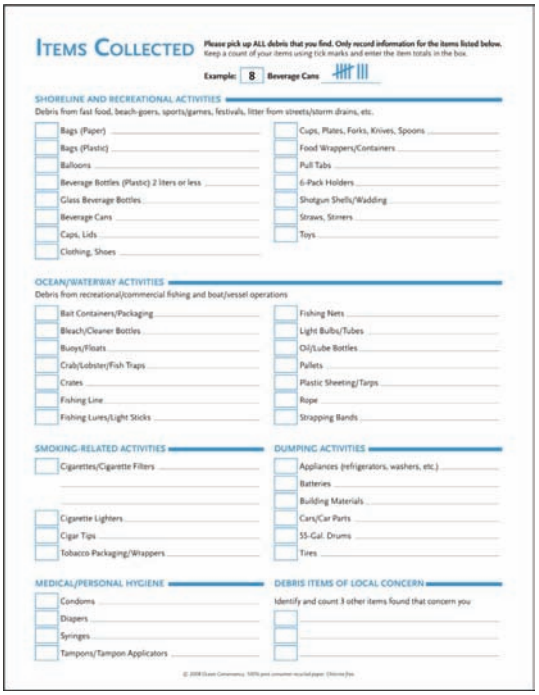
Source: Compiled from 2005-2007 ICC reports, Ocean Conservancy, 2006-2008. NR (data not reported)
The International Coastal Cleanup, with Ocean Conservancy's support, was a contributing effort to advance the ratification of another piece of national legislation on marine debris expanding its scope to include international collaboration. The Marine Debris Research, Prevention and Reduction Act, signed into law in 2006, established programs to identify, assess, reduce and prevent marine debris and its effects on the marine environment and navigation safety. The Act also directed NOAA and the U.S. Coast Guard to re-establish the Interagency Marine Debris Coordinating Committee, to develop a federal marine debris information clearinghouse and work with the international community to reduce the marine debris problem on a global scale. This international mandate provides a direct link between UNEP RSP's Marine Litter Initiative and the extensive debris work being conducted in the US.

The first Cleanup event occurred in 1986 in Texas (US). 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. Cumulatively, since the ICC began, it has included all 56 U.S. states and territories and 132 countries and territories bordering every major body of water on the planet. During the past 23 years in frigid, temperate, and tropical climates; and in time zones that span the globe, over seven million people have recorded data on more than 103 million pieces of debris from shorelines and underwater sites all around the world. International Coastal Cleanup website: http://www.oceanconservancy.org/icc.

ICC data card

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 (then CEE). The ICC data card, which has been further developed over the years to provide a 'snapshot' assessment of the types and amounts of debris found during the annual Cleanup, is in the form of a classic survey, tally card. While the ICC does not employ a rigorous, scientific protocol for its methodology, it does provide very useful information related to the types and abundance of marine debris worldwide.

The ICC data card includes 43 debris items and groupings targeting recognized debris-producing activities and sources. The data cards developed through the ICC have evolved from the original cataloging tool for debris forms based on material type (glass, paper, hard and foamed plastic, metal, rubber and wood) to a focus on the behaviors and activities that produce the debris as an approach for prevention and abatement. The result has been the creation of a unique, global database of information collected at beach and underwater cleanups around the world.


ITEMS COLLECTED

Please pick up ALL debris that you find. Only record information for the items listed below.
Keep a count of your items using tick marks and enter the item totals in the box.

Example: 8 Beverage Cans

SHORELINE AND RECREATIONAL ACTIVITIES
Debris from fast food, beach-goers, sports/games, festivals, litter from streets/storm drains, etc.

Bags (Paper)
Bags (Plastic)
Balloons
Beverage Bottles (Plastic) 2 liters or less
Glass Beverage Bottles
Beverage Cans
Caps, Lids
Clothing, Shoes
Cups, Plates, Forks, Knives, Spoons
Food Wrappers/Containers
Pull Tabs
6-Pack Holders
Shotgun Shells/Wadding
Straws, Stirrers
Toys

OCEAN/WATERWAY ACTIVITIES
Debris from recreational/commercial fishing and boat/vessel operations

Bait Containers/Packaging
Bleach/Cleaner Bottles
Buoys/Floats
Crab/Lobster/Fish Traps
Crates
Fishing Line
Fishing Lures/Light Sticks
Fishing Nets
Light Bulbs/Tubes
Oil/Lube Bottles
Pallets
Plastic Sheeting/Tarps
Rope
Strapping Bands

SMOKING-RELATED ACTIVITIES

Cigarettes/Cigarette Filters
Cigarette Lighters
Cigar Tips
Tobacco Packaging/Wrappers

DUMPING ACTIVITIES

Appliances (refrigerators, washers, etc.)
Batteries
Building Materials
Cars/Car Parts
55-Gal. Drums
Tires

MEDICAL/PERSONAL HYGIENE

Condoms
Diapers
Syringes
Tampons/Tampon Applicators

DEBRIS ITEMS OF LOCAL CONCERN

Identify and count 3 other items found that concern you

Figure 1. 2008 ICC data card © Ocean Conservancy

The data from the Cleanup provides the framework for assessment of the scope of marine debris pollution worldwide and comparisons among the various regions of the world. This 23-year old event continues to provide an effective vehicle for carrying the message about this global problem, the role civil society, business and industry and governments in its creation and what needs to be done to develop solutions for this global problem.

During 1998 and 1999, a data review and analysis by Ocean Conservancy's marine debris staffs and other technical experts resulted in a revision in 2000 of the ICC data card into a format that addressed a "source approach" for assessing marine debris collected during the annual event. Counting various innocuous debris forms (e.g. pieces of glass, metal or plastic) did not provide adequate information in addressing the sources and users producing the debris. Understanding where the debris originates in terms of use helps to target the user-groups and other sources for prevention and abatement. The 2008 ICC data card has been further updated to help identify specific debris that impact ecosystems and wildlife (Figure 1).

The ICC data and its subsequent analyses have been used globally to help identify the types, sources and activities that produce the debris found along beaches and waterways. 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.

ICC marine debris source categories

The categories used for cataloging the debris collected during the ICC includes specific source and activity groups – shoreline and recreational activities, ocean/waterway activities, smoking-related activities, dumping activities, and medical/personal hygiene. The following categories were developed based on the annual debris data collected during the International Coastal Cleanup from 1986-2000 and other research (see Table 2). These "source/activity" categories formed the foundation for assessing the types, amounts and sources of marine litter collected along beaches and waterways, both on land and underwater.

Table 2. Listing of marine debris sources and activities used in the ICC

Marine debris sources and activities
Recreational/shoreline activities and sources: indiscriminate and intentional littering by beachgoers, picnickers, participants at waterside sports and festival events, washing down creeks and rivers, and litter carried from streets, drains, gutters and culverts.
Ocean/waterway activities and sources: improper handling of solid wastes from recreational fishing/boating, subsistence/commercial fishing and shipping, military ships, cruise ships, and oil and gas offshore rigs.
Smoking-related activities: improper disposal and littering of smoking-related materials and packaging by smokers.
Dumping: improper disposal of building and construction materials, drums, tires, cars/car parts, household trash and appliances.
Medical/personal hygiene: discarded materials into sewer systems, dumped into storm drains (along roadways and culverts), toilets, and litter left by beachgoers.

Source: 2007 International Coastal Cleanup Report (Ocean Conservancy, 2008).

ICC results

The data collected and analyzed from the annual Cleanup has been used locally, nationally and internationally to help influence policy decisions, spawn campaigns for recycling programmes, support public education programs, launch adopt-a-beach programmes, and even storm water system overhauls and legislative reform. A compilation of all the marine debris data collected in the ICC from 1989-2007 is presented in Table 3 by source category.

Table 3. International Coastal Cleanup results – global totals (1989-2007)

Debris items/sources	Counts	Debris items/sources	Counts
Shoreline/recreational activities		Oil/lube bottles	712,183
Bags (paper & plastic)	9,711,238	Pallets	353,831
Balloons	896,617	Plastic sheeting/tarps	934,410
Beverage bottles (plastic) < 2 litres	5,684,718	Rope	2,215,329
Beverage bottles (glass)	4,991,860	Strapping bands	599,296
Beverage cans	4,796,554	**Subtotal**	**9,804,058**
Caps/lids	9,398,977	**Smoking-related activities**	
Clothing/shoes	1,728,085	Cigarettes/cigarette filters	25,407,457
Cups/plates/forks/knives/spoons	7,426,964	Cigarette lighters	794,945
Food wrappers/containers	9,191,575	Cigar tips	814,407
Pull tabs	1,087,595	Tobacco packaging/wrappers	698,914
Six-pack holders	701,167	**Subtotal**	**27,715,723**
Shotgun shells/wadding	173,623	**Dumping activities**	
Straws, stirrers	4,508,085	Appliances	32,114
Toys	1,034,696	Batteries	273,986
Subtotal	**61,331,754**	Building materials	1,979,026
Ocean/waterway activities		Cars/car parts	171,360
Bait containers/packaging	220,702	55-gallon drums	160,517
Bleach/cleaner bottles	717,426	Tires	523,977
Buoys/floats	741,377	**Subtotal**	**3,140,980**
Crab/lobster/fish traps	236,615	**Medical/personal hygiene**	
Crates	269,715	Condoms	292,590
Fishing line	955,697	Diapers	429,446
Fishing lures/light sticks	647,004	Syringes	187,925
Fishing nets	873,260	Tampons/tampon applicators	345,133
Light bulbs/tubes	327,213	**Subtotal**	**1,255,094**
		Total debris counts	**103,247,609**

Source: Compiled from annual ICC data reports. Center for Marine Conservation/Ocean Conservancy, 1989-2007.

'Top ten' marine debris items from the ICC

When the ICC data is reviewed globally according to the number of items collected during the annual ICC events, the composition of debris is dominated by the presence of remnants of convenience containers and packaging for food and beverages and smoking materials. This information can be interpreted as a behavioural pattern exhibited by the public where evidence of inadequate smoker waste-handling behaviour is reflected in this listing with improperly discarded cigarette filters. This is followed by caps and lids of their favourite beverages and food wrappers that end up on the ground along with the bags that they carried these purchases. Disposable utensils have ended up somewhere other than an appropriate waste receptacle instead of being taken back home and possibly reused. The appearance of all forms of beverage containers listed in a hierarchy from plastic to glass to metal also corresponds with current patterns of usage and a need to implement (or expand) recycling efforts. The presence of straws and stirrers on this list reflects the casual behaviour of consumers who once they finish their beverages, then toss the straw (or beverage stirrers) somewhere other than into a proper waste receptacle. The final debris item in the list is rope, which connects directly to derelict/abandoned fishing gear and alerts us to the problems of those debris items in terms of wildlife and other hazards.

Table 4. 'Top ten' marine debris items – ICC global (1989-2007 combined)

1989-2007 'Top ten' marine debris items – global ICC totals		
Debris items	**Number of items**	**Percent of total**
Cigarettes/cigarette filters	25,407,457	24.6
Bags (paper & plastic)	9,711,238	9.4
Caps/lids	9,398,977	9.1
Food wrappers/containers	9,191,575	8.9
Cups/plates/forks/knives/spoons	7,426,964	7.2
Beverage bottles (plastic) <2 litres	5,684,718	5.5
Beverage bottles (glass)	4,991,860	4.8
Beverage cans	4,796,554	4.6
Straws, stirrers	4,508,085	4.4
Rope	2,215,329	2.1
Total debris items	**103,247,609**	**80.7**

Source: Compiled from annual ICC data reports, Center for Marine Conservation/Ocean Conservancy (1989-2007).

A review of the total global ICC data indicates that the dominant types and sources of debris are primarily attributed to land-based activities resulting from what we consume (including food wrappers, beverage containers, cigarettes and related smoking materials), what we use in transporting ourselves by sea, and what we harvest from the sea (fishing nets and gear that are left in the sea). Industries affiliated with the aforementioned products and services play a critical role in debris management and abatement. Only with their involvement and support can we create effective solutions to the debris problem. A review of the data collected during the International Coastal Cleanup reveals that the dominant sources of debris emanate from land-based sources and activities, globally. This does not mean that the other sources and activities are to be considered less important – all forms of debris can be harmful and need to be reduced and abated.

'Top ten' ICC data

The most abundant marine debris forms provide a 'snapshot in time' of what is entering the ocean and waterways around the world. Tables 5-16 were compiled based on marine debris totals from each participating country and then averaged regionally. A percentage was then calculated on the total debris collected. The 'top ten' marine debris items account for 73.8 to 94.6 percent of the total marine debris collected in the presented Regional Seas.

Table 5. Baltic Sea – 'top ten' debris

Baltic Sea 2005/2006/2007 ICC – 4 countries		
Item	**Number of items**	**Percent of total**
Cigarettes/cigarette filters	13,424	37.4
Caps/lids	3,148	8.8
Food wrappers/containers	2,776	7.7
Beverage bottles (plastic) < 2 L	2,350	6.5
Beverage bottles (glass)	2,107	5.9
Beverage cans	1,682	4.7
Tobacco packaging/wrappers	1,578	4.4
Pull tabs	1,295	3.6
Bags (paper and plastic)	924	2.6
Clothing/shoes	911	2.5
Total debris	**35,925**	**84.1**

Table 6. Black Sea – 'top ten' debris

Black Sea 2005/2007 ICC – 2 countries		
Item	**Number of items**	**Percent of total**
Cigarettes/cigarette filters	345	22.4
Beverage bottles (plastic) < 2 L	323	20.9
Beverage bottles (glass)	227	14.7
Bags (paper and plastic)	183	11.9
Caps/lids	110	7.1
Beverage cans	105	6.8
Cups/plates/forks/knives/spoons	51	3.3
Food wrappers/containers	40	2.6
Clothing/shoes	33	2.1
Shotgun shells/wadding	18	1.2
Total debris	**1,542**	**93.0**

Table 7. Caspian – 'top ten' debris

Caspian Sea 2006 ICC – 1 country		
Item	**Number of items**	**Percent of total**
Caps/lids	300	22.0
Beverage cans	200	14.6
Beverage bottles (plastic) < 2 L	200	14.6
Bags (paper and plastic)	150	11.0
Beverage bottles (glass)	150	11.0
Food wrappers/containers	120	8.8
Straws/stirrers	100	7.3
Plastic sheeting/tarps	30	2.2
Batteries	25	1.8
Oil/lube bottles	18	1.3
Total debris	**1,366**	**94.6**

Table 8. East Asian Seas – 'top ten' debris

COBSEA 2006/2007 ICC – 8 countries		
Item	**Number of items**	**Percent of total**
Cigarettes/cigarette filters	31,040	17.5
Bags (paper and plastic)	21,270	12.0
Caps/lids	17,930	10.1
Food wrappers/containers	16,344	9.2
Beverage bottles (plastic) < 2 L	11,105	6.3
Straws/stirrers	10,452	5.9
Beverage bottles (glass)	8,098	4.6
Plastic sheeting/tarps	5,595	3.2
Rope	5,350	3.0
Buoys/floats	4,713	2.7
Total debris	**177,139**	**74.5**

Table 9. Eastern Africa – 'top ten' debris

Eastern Africa (WIO) 2007 ICC – 4 countries		
Item	**Number of items**	**Percent of total**
Caps/lids	14,679	13.3
Bags (paper and plastic)	14,044	12.7
Beverage bottles (plastic) < 2 L	11,209	10.2
Food wrappers/containers	10,127	9.2
Cigarettes/cigarette filters	7,431	6.7
Straws/stirrers	6,670	6.0
Beverage bottles (glass)	6,603	6.0
Clothing/shoes	6,181	5.6
Rope	4,116	3.7
Fishing line	2,288	2.1
Total debris	**110,354**	**75.5**

Table 10. Mediterranean Sea – 'top ten' debris

MED 2005/2007 ICC – 11 countries		
Item	**Number of items**	**Percent of total**
Cigarettes/cigarette filters	14,376	29.1
Caps/lids	3,296	6.7
Beverage cans	3,119	6.3
Beverage bottles (glass)	2,721	5.5
Cigarette lighters	2,551	5.2
Beverage bottles (plastic) < 2 L	2,522	5.1
Straws/stirrers	2,314	4.7
Bags (paper and plastic)	2,018	4.1
Food wrappers/containers	1,954	4.0
Cigar Tips	1,543	3.1
Total debris	**49,453**	**73.8**

Table 11. Northeast Atlantic – 'top ten' debris

OSPAR 2005/2006/2007 ICC – 11 countries		
Item	**Number of items**	**Percent of total**
Cigarettes/cigarette filters	35,297	16.0
Food wrappers/containers	28,104	12.7
Caps/lids	27,463	12.4
Rope	17,992	8.1
Fishing nets	17,642	8.0
Beverage bottles (plastic) < 2 L	17,484	7.9
Beverage cans	11,457	5.2
Cups/plates/forks/knives/spoons	10,665	4.8
Fishing line	9,326	4.2
Bags (paper and plastic)	9,116	4.1
Total debris	**220,877**	**83.4**

Table 12. Northwest Pacific – 'top ten' debris

NOWPAP 2007 ICC – 3 countries		
Item	**Number of items**	**Percent of total**
Cigarettes/cigarette filters	63,425	24.3
Food wrappers/containers	32,190	12.3
Caps/lids	29,425	11.3
Beverage bottles (glass)	21,514	8.2
Bags (paper and plastic)	18,439	7.1
Rope	12,890	4.9
Beverage cans	12,261	4.7
Beverage bottles (plastic) < 2 L	8,844	3.4
Batteries	8,134	3.1
Cups/plates/forks/knives/spoons	7,058	2.7
Total debris	**261,317**	**82.0**

Table 13. Red Sea/Gulf of Aden –'top ten' debris

PERSGA 2007 ICC – 2 countries		
Item	**Number of items**	**Percent of total**
Beverage cans	506	15.0
Cups/plates/forks/knives/spoons	446	13.2
Bags (paper and plastic)	418	12.4
Cigarettes/cigarette filters	313	9.3
Food wrappers/containers	270	8.0
Beverage bottles (glass)	262	7.8
Beverage bottles (plastic) < 2 L	154	4.6
Caps/lids	144	4.3
Fishing line	111	3.3
Straws/stirrers	108	3.2
Total debris	**3,372**	**81.0**

Table 14. South Asian Seas – 'top ten' debris

SAS 2005/2007 ICC – 3 countries		
Item	**Number of items**	**Percent of total**
Bags (paper and plastic)	47,104	28.4
Food wrappers/containers	18,821	11.3
Cigarettes/cigarette filters	18,147	10.9
Tobacco packaging/wrappers	13,929	8.4
Clothing/shoes	13,214	8.0
Beverage bottles (plastic) < 2 L	5,999	3.6
Beverage bottles (glass)	5,866	3.5
Straws/stirrers	4,287	2.6
Caps/lids	3,670	2.2
Rope	2,641	1.6
Total debris	**166,104**	**80.5**

Table 15. Southeast Pacific – 'top ten' debris

CPPS 2005/2006/2007 ICC – 5 countries		
Item	**Number of items**	**Percent of total**
Caps/lids	71,382	22.5
Beverage bottles (glass)	58,947	18.6
Beverage bottles (plastic) < 2 L	25,721	8.1
Bags (paper and plastic)	25,720	8.1
Six-pack holders	19,362	6.1
Cigarettes/cigarette filters	16,577	5.2
Food wrappers/containers	14,031	4.4
Clothing/shoes	10,975	3.5
Beverage cans	10,724	3.4
Cups/plates/forks/knives/spoons	9,450	3.0
Total debris	**316,731**	**82.9**

Table 16. Wider Caribbean – 'top ten' debris

CAR 2005/2006/2007 ICC – 21 countries		
Item	**Number of items**	**Percent of total**
Beverage bottles (plastic) < 2 L	251,651	16.8
Caps/lids	192,418	12.8
Beverage bottles (glass)	160,814	10.7
Bags (paper and plastic)	148,411	9.9
Cigar tips	95,825	6.4
Food wrappers/containers	93,414	6.2
Cups/plates/forks/knives/spoons	85,222	5.7
Beverage cans	80,484	5.4
Cigarettes/cigarette filters	43,954	2.9
Straws/stirrers	42,546	2.8
Total debris	**1,500,847**	**79.6**

Source for Tables 5-16: Compiled from 2005-2007 ICC reports, Ocean Conservancy, 2006-2008.

Marine debris impacts

It is documented by the research community that when debris is allowed to enter the environment – through both accidental and intentional discharges – it can result in significant impacts to wildlife and sensitive ecosystems, human health and safety and economy of coastal areas. These impacts can be felt locally and have biological and socioeconomic implications that indicate that with continued population growth and development and inadequate solid waste management, this global problem will continue to get worse.

The International Coastal Cleanup provides important information through the types of debris that are tabulated related to the scope of potential impacts that can result from the introduction of marine debris into the environment. Volunteers record any animal entanglements due to marine debris that are observed during the ICC event (see Table 17). In 2007, 235 animals were found entangled in various debris forms with fishing line, nets and ropes accounting for 71.9 percent of total entanglements (Ocean Conservancy, 2008).

Table 17. Wildlife/marine debris entanglements identified during 2007 ICC – global results

Type of marine debris	Invertebrates	Fishes	Reptiles	Birds	Mammals	Amphibians	Total	Percent
Balloon ribbon/string	0	0	0	4	1	0	**5**	**2.1**
Beverage can	1	1	0	0	0	0	**2**	**0.9**
Building materials	2	0	0	0	2	0	**4**	**1.7**
Crab/lobster/fish traps	2	1	0	0	0	0	**3**	**1.3**
Fishing line	22	32	5	43	8	0	**110**	**46.8**
Fishing nets	13	12	0	6	4	0	**35**	**14.9**
Glass bottle	3	2	1	0	2	0	**8**	**3.4**
Miscellaneous	2	0	2	5	1	0	**10**	**4.3**
Plastic bags	2	3	0	12	5	0	**22**	**9.4**
Plastic container	0	0	0	0	1	0	**1**	**0.4**
Rope	1	9	2	6	5	1	**24**	**10.2**
Six-pack holders	0	2	0	1	0	0	**3**	**1.3**
Tire	0	1	1	0	0	0	**2**	**0.9**
Wire	1	0	4	4	1	0	**6**	**2.6**
Totals	**49**	**63**	**11**	**81**	**30**	**1**	**235**	**100**
Total Percentage	**20.9**	**26.8**	**4.7**	**34.5**	**12.8**	**0.4**	**100**	

Source: 2007 International Coastal Cleanup Report. (Ocean Conservancy, 2008)

Example of a national monitoring program developed from the ICC

The National Marine Debris Monitoring Program was an experiment designed to standardize marine debris data collection in the United States using a scientifically valid protocol to determine marine debris status and trends. The US Environmental Protection Agency engaged Ocean Conservancy (known then as CMC) to work with a Federal Marine Debris Work Group to develop and implement a national monitoring programme to assess the status of marine debris. Ocean Conservancy developed, field-tested and implemented this scientific, marine debris monitoring programme for the United States utilizing a national network of 600 trained volunteers who monitored over 100, 500 meter sites in 21 coastal US states and two territories.

The development of the research protocol for the National Marine Debris Monitoring Program (NMDMP) was based on data and experiences from the International Coastal Cleanup and other marine debris research to assess the accumulation rates, types and amounts of debris dependent on their geographical location, oceanographic and meteorological conditions, and proximity to land-based or ocean-based sources. As a result, nine regional designations were developed for the monitoring programme based on prevailing current patterns, marine debris information, and logistics. The purpose of this study was to answer the following research questions:

1. Is the amount of debris on our coastlines changing over a five-year period?
2. What are the major sources of the debris?

This study involved volunteers and groups who conducted monthly surveys from 1996 to 2007, devoting considerable time and effort to implement and conduct the field monitoring for assessing the status of marine debris along U.S. coasts. The programme was implemented progressively, one region at a time, starting in the Gulf of Mexico area in 1996, with full implementation nationwide in the fall of 2001 and ending in the spring of 2007. The timeframe for analysis of the data in the study was determined to be a period of five consecutive years with surveys conducted every 28 ± 3 days (13 surveys/year a total of 65 surveys per site) in order to achieve the specified percent change in the debris (30%, with a power of 0.84 and a Type 1 error rate of 0.10). Data for this study were recorded by the volunteer survey teams on a specialized data cards. The information recorded included 30 debris-indicator items grouped into three source categories of debris: ocean-based, land-based, and general sources (items that may originate as either ocean- or land-based debris).

Statistically the NMDMP results revealed that there was no significant change in the total amount monitored along the coasts of the United States between September 2001 and September 2006. The sources of debris were also analysed and showed a significant increase for indicator items classified as “general” – specifically plastic bags and bottles and strapping bands However, when the data was examined regionally, there was high variability among regions and sites within regions and the data was influenced by seasonal parameters and other activities (Sheavly, 2007). NMDMP volunteers successfully implemented this programme and produced the first national baseline of data that can be used in the United States to build a programme for marine debris prevention and reduction. The protocol used in this study has established a sound foundation for development of future monitoring efforts in the US. Ocean Conservancy shared this protocol with UNEP to assist in the development of a global monitoring effort for ML focusing on the results and lessons learned from this experiment. National Marine Debris Monitoring Program website: http://www.oceanconservancy.org/nmdmp.

Summary

The information that is being collected and compiled through the International Coastal Cleanup and the US National Marine Debris Monitoring Program provide a valuable information base that can be used to help catalog and analyse the main sources and activities responsible for marine debris pollution. The partnership between Ocean Conservancy and UNEP RSP provides a good base for working collectively to address marine debris/litter issues worldwide – sharing information and strategies that can be adopted by regional groups. Marine litter problems will not have a ‘one size fits all’ solution. The diversity in the types and amounts of debris is as varied as the many sources producing it. Only through changes in human behavior and informed choices in products and packaging, can this pollution issue be effectively addressed and dealt with worldwide.

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Chapter 3
Analysis of regional review documents and action plans on marine litter

Introduction

UNEP signed agreements with 12 Regional Seas Conventions and Action Plans Secretariats on the development and implementation of regional activities on marine litter. As an initial phase of these agreements, each of the 12 regions was asked to prepare a regional review and assessment document on marine litter. In addition, eight of the participating Regional Seas agreed to develop, on the basis of their assessment documents, Regional Action Plans (RAP) for management of marine litter.

The agreements specified that the assessments should be prepared by a regional consultant based on national reports and other available information. The primary output of the work of the regional consultant was the regional review and assessment document, which provided clear information on the scale, sources, gaps, needs and recommended priorities to address the problem of marine litter in the region. The main conclusions and proposals of the document were to be used as a basis for decisions and proposals to address the problem and to develop, if feasible, a Regional Action Plan for the management of marine litter.

All 12 regions prepared their respective review and assessment documents and seven of the participating regions developed Regional Action Plans for management of marine litter. The Mediterranean will prepare its RAP later in 2009.

This chapter presents an analysis of these documents, with particular emphasis on:

Status of marine litter at the regional level: (1) amounts, (2) impacts and (3) sources;

Analysis of legislative and institutional components from assessment documents: (1) regional/national marine litter initiatives – legislation and policies; (2) regional institutional arrangements; (3) national institutional arrangements; and (4) national programmes of outreach; and

Analysis of Regional Action Plans: (1) strategy; (2) legislation, policies and enforcement; (3) institutional framework and stakeholder involvements; (4) monitoring programmes; (5) education and outreach; (6) mitigation activities; (7) funding and sustainability; and (8) similarities among Regional Action Plans of participating regions.

Status of marine litter at the regional level

The following is an analysis of the regional assessments for marine litter with emphasis on (1) amounts, (2) impacts and (3) sources of the marine litter problem.

Amounts

No systematic or comprehensive regional measurements of the amounts of marine litter were conducted in the 12 participating regions, and only the Baltic Sea, Black Sea, Mediterranean, Northeast Atlantic, Northwest Pacific and Wider Caribbean provided limited data on the amounts of ML in their respective regions. The great majority of these reported marine litter on beaches, some reported litter in open waters, and a very few dealt with marine litter on the sea floor. The use of differing methodologies to collect and measure marine litter did not permit valid comparisons among the participating Regional Seas or even systematic status and trend analyses.

An important and ongoing source of information on marine litter on coastlines and beaches of the world is the Ocean Conservancy's International Coastal Cleanup (ICC). ICC events have been organized since 1989 in many countries around the world. From the UNEP-assisted Regional Seas in the marine litter project, a total of 73 countries have participated in the ICC. Unfortunately, most of the participating regions did not fully report the results of their annual events. These results could, potentially, offer a unique

comparative analysis of the marine litter problem among the participating Regional Seas. Review and analysis of the results collected through ICC events is presented in this report in the section on the ICC. Another potential source of information is WWF, which is also collecting information on marine litter.

Without the systematic collection of reliable data on amounts of marine litter using an internationally approved methodology, no serious assessment of the extent of the problem can be made, and consequently no proper response to the problem can be planned or implemented.

Table 1 below presents an overview of the information on marine litter reported in regional review documents. It is clear that use of differing methodologies to collect and measure marine litter inhibits valid comparisons among the participating Regional Seas.

Table 1. Overview of information on marine litter provided by the Regional Seas

Region	Coast/beach	Coastal water	Open water	Sea floor
Baltic Sea	WWF Naturewatch Baltic event reports 30-50 pieces of litter per 500 m of coast/beach for the years 1999-2005. ICC regional event in 2004/2005 collected 2-328 kg (4-181 pieces) of litter per 500m of coast. The average for 15 beaches in Finland in 1994 was 11 kg/260 pieces of marine litter per 100 m of coastline. In 2004 Coastwatch Estonia collected 60 pieces/500 m from beaches in autumn and 82/500 m in spring. In districts of Estonia the amount of litter per 500 m of coastline varied from 90 to 316 kg. In the seven largest Latvian coastal towns, 9,537 m^3 of litter was found on beaches during 10 months of 2006. In 2006, in St. Petersburg (including the banks of the Neva River), 1,128 m^3 of litter was found in an area of 540 m^2, of which 48 m^3 was seaweed. Near the city of Göteborg, 11,464 plastic bags were removed manually from the coast throughout the year (Hall 2000).	In the summer of 2006, 9,300 kg of litter was collected from four Polish ports. In 2005, 1,016 m^3 of litter was collected in the port waters of St. Petersburg, 19 m^3 in Vyborg/Vysotsk and 132 m^3 in Kaliningrad.	In a 1996 study 1.26±0.82 items of litter per hectare were found in the waters of the western Baltic Sea. In the Pärnu region of Estonia it is estimated that the amount of marine litter at sea has decreased from 100-200 tons in 1995-1996 to 1 ton in 2006.	
Black Sea (BS)	The study of the unorganized sandy and pebble beaches of the Crimea, Ukraine (autumn 2002 - summer 2003, 12 surveys) found a great predominance of plastic (80–98 percent of recorded pieces) in comparison with glass (2-20 percent). The density of polymeric garbage on the beaches was from 2,698 to 55,000 pieces/km^2, while the density of glass bottles ashore fluctuated between 280 and 1,455 pieces/km^2. The average overall values were estimated as: density of plastic objects – 16,348 ± 5,076 pieces/km^2; mass of plastics objects – 1,910 ± 612 kg/km^2; density of glass objects (bottles only) – 674 ± 107 pieces/km^2; and mass of glass objects (including bottles) – 552 ± 96 kg/km^2. The ICC event in 2003 on the Black Sea Turkish coast resulted in collection by 2009 individuals of 8,215.4 kg of marine litter along 21.3 km of the coast. However, the collected amount varied from 58.4 kg/km in Rize to 1,395.1 kg/km in Trabzon. The composition of marine litter (for all ICC Turkish sites, not only for the Black Sea localities), with regard to its possible sources, was estimated as: 50.8 percent in 2003 and 46.2 percent in 2004 for shoreline and recreational activities, and 44.7 percent in 2003 and 50.6 percent in 2004 for smoking-related activities. Dumping activities were considered responsible for 0.8-1.1 percent of marine litter objects only. In Bulgaria five popular beaches in Bourgas, Pomorie and Sozopol were monitored during March-July 2001. In Bourgas (6 surveys of 500m	Aerial marine litter surveys in the internal and territorial waters of the Russian Black and Azov Seas in 2003, 2004 (150 days) and 2005 (160 days) resulted in a total of 918 sightings of floating litter in 2004 and 949 in 2005. Vessel-based line transect surveys were carried out in 2003 in the Ukrainian part of the Kerch Strait and within the entire 12-mile-wide territorial waters of Ukraine in the Black Sea. A total of 479 sightings (591 pieces) of floating plastic marine litter		An underwater inventory of marine litter in selected areas of Istanbul was carried out in 2005 and a total of 1,606 pieces of 224 different types was recorded, of which 31% was from glass, 25% from plastic and 21% from metal.

Region	Coast/beach	Coastal water	Open water	Sea floor
Black Sea (continued)	of beachfront), 1,087 litter items were collected, including 170 plastic bottles, 142 plastic bags, 142 food cans and 152 bottle caps. In Pomorie (9 surveys of 3 beaches) 3,409 litter items were collected, including 303 bottle caps, 295 wrappings for alimentary products, 249 plastic bags and 241 plastic bottles. For Sozopol (6 surveys of 2 beaches) 6,710 litter items were collected, of which 637 were bottle caps, 795 wrappings for alimentary products, 692 plastic bags, 575 cigarette packages and 505 plastic bottles. On 10 May 2003, huge quantities of petroleum tar balls were found washed ashore along 30 km of sandy beach in western Crimea. The clots were collected from an area of 1,600 m^2 and weighed. The concentration of this contaminant was estimated as high as 11,600 kg per km^2 of beach. Numerous 'spontaneous heaps' of marine litter were sighted during aerial surveys conducted in 2003-2005 along unpopulated portions of the Russian Black Sea and Azov Sea coasts. Such marine litter deposits are known to be present on the sandy northeastern coast of the Kerch Strait, and in some other areas. In May 2004 (during snowmelt floods), the total volume of marine litter on the coast of the Sochi area was estimated to be as much as 12,000 m^3.	were recorded in the Ukrainian Black Sea between the Danube Delta to the west and Kerch Strait to the east. The aggregate mass of plastic marine litter floating on the entire surface of the Ukrainian Black Sea was estimated at 18,559 kg. The expected general density, absolute amount and aggregate mass of floating plastics were estimated for Ukrainian waters of the Kerch Strait as: 65.7 pieces/km^2, 22,667 pieces and 2,652 kg, respectively.		
Caspian	Marine litter is a new and emerging concern to all Caspian littoral states. Despite its importance, data on the amount, levels and impacts of marine litter in the region is still very sparse.			
East Asian Seas (EAS)	The current state of knowledge about the extent of the marine litter problem is very poor in the East Asian Seas region. From national surveys of marine litter it appears that the only COBSEA member country that has a formal nationally coordinated marine litter survey and monitoring programme is the Republic of Korea. In Australia a number of *ad hoc* marine litter surveys were undertaken at various sites by different parties. In most of the other countries, the ICC provides some limited data on the current situation at the participating sites where ICC activities are conducted each year.			
Eastern Africa/ West Indian Ocean (EA/WIO)	Very little data exists on quantities, types, trends, sources and sinks of marine litter, other than in South Africa, which has an ICC in coastal areas. All countries report that litter is concentrated around urban areas, and some countries also report litter from coral reefs, beaches, ports and fishing areas.			
Mediterranean (MED)	ICC campaign results show that there is an overall decrease in the number of items (from 198,112 to 131,275) and weight (from 102,315 kg to 33,809 kg) of marine litter collected in Mediterranean countries from 2002 to 2006. Public participation in the ICC campaign in Mediterranean countries has decreased during the 2002-2007 period (from 15,648 to 7,305 people). The average weight of litter items in the same period showed a steadily decreasing trend, with the exception of the 2004-2005 period.		Floating marine litter was observed in the Mediterranean (Feb. – April 2008). Observations covered 1,052 nautical miles (1,947 km), and an area of around 173 km^2. The total number of items recorded was 366	

Region	Coast/beach	Coastal water	Open water	Sea floor
	Therefore, while the average litter item weighed 511 grams in 2002, it weighed only 258 grams in 2006, which constitutes close to a 50% decrease in weight.		items (one item per 3 nm or 2.1 items per km). Plastics accounted for about 83 percent of items, while all other major categories (textiles, paper, metal and wood) accounted for about 17 percent. The average quantity of marine litter was estimated to be 230.8 kg/km^2.	
Northeast Atlantic (OSPAR)	The highest levels recorded during the OSPAR Pilot Project were in the Greater North Sea Region with 600-1400 items per 100 m of beach surveyed in the Northern North Sea and 200-600 items per 100 m in the Southern North Sea. In the Celtic Seas levels were also high with 600-800 items per 100 m; however, levels were higher in the south, as shown by the MCS Beachwatch Survey in 2007 where 3,230 items per km were monitored in the southwest of England compared to 1,057 items per km in Northern Ireland. Marine litter levels on the Bay of Biscay and Iberian Coast were much lower, with only 100-300 items per 100m. In France, anecdotal evidence from local authorities suggests that on average around 30 tonnes of marine litter are collected per km per year.		In the Greater North Sea the background study of plastic particles in the stomachs of fulmars showed a reduction in the amount of litter at sea during the late 1990s, with the average amount of plastic per bird falling from 0.5 g to 0.3 g. However, this reduction leveled off around the year 2000 and there has been no downward trend in recent years.	Amounts of marine litter at sea remained consistent but show varied spatial distribution, with litter on the seabed varying significantly from 0 to 101,000 pieces of litter per km^2. In the Bay of Biscay strong seasonal variation was noted with seven times more litter found on the seabed in winter compared to summer.
Northwest Pacific (NOWPAP)	In NPEC annual surveys in Japan from 2002 to 2005, approximately 570 pieces (3,864 g) of marine litter were found in the coastal area, on average, per 100 m². The annual average number varied from 360 in 2002 to 707 in 2003, and the annual average weight varied between 532 g in 2005 and 4,482 g in 2004. In NPEC annual surveys in Korea from 2002 to 2005, approximately 30 pieces of marine litter were found in the coastal area, on average, per 100 m². The annual average number varied between 20 in 2005 and 53 in 2004 and the annual average weight was from 20 g in 2005 to 269 g in 2003. In NPEC annual surveys in the Russian Far East from 2002 to 2005, approximately 70 pieces (822 g) of marine litter were, on average, found in the coastal area per 100 m². The annual average number ranged from 53 in 2003 to 98 in 2005 and the annual average weight was between 97.4 g in 2005 and 1,515 g in 2002. In NPEC annual surveys in the People/s Republic of China from 2003 to 2005, approximately 120 pieces of marine litter were, on average, found in the coastal area per 100 m². The annual average number was between 64 in 2003 and 166 in 2005 and the average weight varied from 128 g in 2002 to 1,982 g in 2005.			
Red Sea and Gulf of Aden (PERSGA)	Of about 1.2 tonnes of marine litter collected in Jordan during 2003-2005, plastic and rubber debris together represented 59 percent, metals 18 percent, glass 15 percent, and the rest (fishing equipment, paper and others)			

Region	Coast/beach	Coastal water	Open water	Sea floor
	represented 8 percent. In Yemen, qualitative estimates of the quantities of marine litter suggest that plastics and metals are also the dominant types. Noticeably, litter accumulates mostly with piles of plastic bags in Al Salif City on the Red Sea coast of Yemen. In the Hadramout Inshore (Gulf of Aden). Over 25 types of litter, including rubbish and discarded fishing gear, were reported along one kilometre. In Djibouti, litter and refuse consist mostly of plastics, glass bottles and discarded fishing nets throughout the Iles des Sept Freres and Ras Siayyan, especially in areas frequented by people.			
South Asian Seas (SAS)	The ICC event in India has been conducted since 2002. In 2005 253.6 tons of litter was collected by 14,850 persons along 238.5 km of the coast. In 2006, 307.5 tons of litter was collected by 27,362 persons. From the amount collected 22 percent were building materials, 13 percent plastics, 11 percent polystyrene, 10 percent metals and 8 percent monofilament fishing line. The ICC event in Bangladesh in 2006 resulted in the collection of 230 kg of litter from a 14 km stretch of the Cox's Bazaar Sea beach. About 2.5 million people in Chittagong Metropolitan City in Bangladesh generate daily about 480 tons of solid wastes and excreta which find their way into the Karnaphuli River through 5 main open canals and finally into the Bay of Bengal. Elliot's Beach, a 2 km part of the Marina coastline in suburban Chennai, India, is a source of about 30 m^3 of litter (about 1.5 tons) during weekdays, about twice the volume and weight during weekends and holidays, and 2.5 times more during the summer vacation. Ship-breaking activities in the Chittagong area in Bangladesh, where close to 100 ships are being dismantled every year, pose a potential threat to the coastal intertidal zone and its habitat and are an abundant source of beach litter.			
Southeast Pacific (CPPS)	Regional ICC estimates 30,333 tons of litter on the ICC day in 2005. Alfaro (2006), reports an increase from 0.35 kg/m^2 on the beach in 2002 to 0.94 kg/m^2 in 2005			
Wider Caribbean (CAR)	During the period of 1989-2005, annual ICC events in 28 countries of the Caribbean region reported a total of 6.7 million items of debris (of which over 5 million were shoreline/recreational activity-related) collected by 440,544 volunteers and supporters from shoreline areas and underwater sites covering 12,139 miles(19,400 km). The most abundant litter categories (by percentage) were: caps and lids – 11.9; cups, plates, forks, knives and spoons – 11.3; bags (paper and plastic) – 10.6; beverage bottles (plastic) – 10.6; food wrappers and containers – 7.6; beverage bottles (glass) – 6.9; cigarettes and cigarette filters – 6.3; straws and stirrers – 4.8; beverage cans – 4.3; and clothing and shoes – 4.3.			
Internation-al Coastal Cleanup (ICC)	73 countries from 12 Regional Seas have participated in annual ICC events and some are mentioned above. Results from such events, as reported by the regions and obtained from ICC annual reports, are described below.			

Impacts

Limited information on the effects and impacts of marine litter was provided by seven of the 12 Regional Seas participating in the marine litter initiative. This information revealed that there was no common denominator for marine litter impacts among the regions. Among the reported impacts were: (1) economic effects; impacts on aesthetics and tourism, human health and safety; habitat destruction, and effects on wildlife (Wider Caribbean); (2) effects on human health and tourism (Eastern Africa); (3) impacts on the marine environment from illegal, unreported and unregulated fishing (Black Sea); (4) coastal tourism impacts (Red Sea); (5) impacts on wildlife, especially marine turtles, seabirds and similar species (South Asian Seas); and (6) impacts on marine environment of abandoned, lost or otherwise discarded fishing gear (East Asian Seas).

Sources

Marine litter sources are generally classified as either land-based or sea/waterway-based, depending on how the debris enters the water.

The major land-based sources of marine litter are: wastes from legal and illegal dumpsites located on the coast or on the banks of rivers; rivers and floodwaters; industrial outfalls; discharge from storm water drains; untreated municipal sewerage; littering of beaches and coastal picnic and recreation areas; tourism and recreational use of the coasts; fishing industry activities; ship-breaking yards, and others.

The major sea-based sources of marine litter are: shipping (merchant, public transport, pleasure, naval and research) and fishing (vessels, angling and fish farming) activities; offshore mining and extraction (vessels, and oil and gas platforms); authorized and unauthorized dumping at sea; abandoned, lost or otherwise discarded fishing gear; illegal, unreported and unregulated fishing activities; tsunamis; hurricanes and other natural disasters, and others.

Litter can end up in the water through accidental loss or system failures; outdated and inadequate waste management practices; public behaviours leading to illegal waste disposal and/or indiscriminate littering and dumping.

Adequate quantitative and qualitative knowledge of the sources is extremely important because it serves as the main basis for managerial decisions on actions to prevent, reduce and control problems caused by marine litter.

Litter collected on a South Asian beach. © SACEP

Analysis of legislative-institutional components of assessment documents

The problems associated with managing marine litter should encompass a vast array of issues including solid waste management, public health, sustainable development and tourism coordinated with the conservation of natural resources. The foundation for addressing such pollution problems, as with any other pollution issues, lies in (1) effective legislation and polices to guide activities, (2) a framework for administering and implementing these regulations and (3) programmes to promote compliance and changes in behaviours through education and outreach. The following section presents an overview of the information presented in the regional marine litter overviews related to regional and national instruments, programmes, institutional frameworks and outreach effort to address marine litter.

Regional/national marine litter initiatives – legislation and policies

While there are existing regional protocols and national laws regulating the dumping of trash at sea and on shore, the global nature of marine litter, the inability to confine it within territorial boundaries, and the complexity of identifying litter sources have made effective laws difficult to draft and even harder to enforce. The following describes specific regional protocols and national legislation addressing marine litter:

Regional institutional arrangements

In any effective pollution prevention initiative, successful partnerships between public and private sectors play a critical role in the success and sustainability of the effort. While our governments are typically charged with protecting the land and its people, they cannot and should not do this alone. Collaboration between these groups results in more efficient use of resources and builds linkages between the government and the people. The establishment of a stewardship ethic in the population is essential in effectively addressing pollution problems.

Many of these institutional arrangements have evolved to deal with numerous environmental issues. These multifaceted networks provide an effective basis for solid waste management strategies, environmental and natural resource agency conservation and management programmes, port authority operations, tourism board programmes and maritime activities – including fishing, boating, and other vessel operations.

An extensive global network exists among the many entities which deal with the creation, handling, abatement and prevention of marine litter. These include health, waste management, environmental, conservation, education and tourism organizations as well as government agencies and civil society. Through these programmes and initiatives, these organizations form a powerful base for effective interaction and collaboration in dealing with the many problems associated with marine litter.

National institutional arrangements

With the continued global and regional recognition that marine litter poses problems for the environment and its inhabitants, numerous institutional arrangements have emerged from the implementation of national solid waste management strategies, environmental and natural resource agency conservation and management programmes, port authority operations, tourism board programmes and maritime activities – including fishing, boating, and other vessel operations.

National programmes and outreach

As marine litter is a significant component of the solid waste management issue, it is critical that there be an integration of marine litter management strategies with solid waste management strategies. An effort to coordinate programme activities, waste management strategies and resources would prove beneficial to all dealing with marine litter. An effort to combine programme activities where there is inclusion of marine litter issues would be both effective and productive.

Litter collected during a beach cleanup, Japan. © NOWPAP

Analysis of Regional Action Plans

Introduction

During the period of 2005-2008, 12 Regional Seas have been participating in UNEP-assisted regional activities for the management of marine litter. Seven of the 12 regions (Wider Caribbean, Southeast Pacific, Black Sea, Red Sea and Gulf of Aden, South Asian Seas, East Asian Seas and Northwest Pacific) prepared Regional Action Plans (RAPs) on the management of marine litter as part of their regional efforts. Of those seven, the RAPs of East Asian Seas and the Northwest Pacific were formally adopted at the regional level and the RAP for the Wider Caribbean was endorsed by the countries of the Wider Caribbean as a guiding framework for future work on marine litter in the region. The RAP for the Mediterranean is being prepared and will be finalized in late 2009. The remaining four Regional Seas did not prepare formal RAPs, but provided information as part of their respective regional overview documents, recommendations and proposals for actions to be taken in order to address their regional marine litter management issues.

The main goal of these various RAPs on marine litter was to consolidate, harmonize and implement necessary environmental policies, strategies and measures to bring about sustainable integrated actions and activities to mitigate marine litter in the respective regions.

The following section presents an analysis of the RAPs of those Regional Seas that prepared such documents. This analysis contains a brief overview of all those Regional Seas for strategy; legislation, policy and enforcement; monitoring programmes; education and outreach; mitigation activities; funding and sustainability and a review of the similarities among the RAPs of participating regions.

Strategy

The development of both national and regional strategies was identified in the RAPs of most of the RSP marine litter initiatives based on existing programmes and practices. Tackling marine litter issues requires a varied, comprehensive and integrated approach which encompasses the cultural and socio-economic aspects of this global problem. Although in many cases marine litter is a significant component of solid waste management, waste management strategies in most regions do not include specific activities relating to marine litter. An integrated approach to solid waste management, including marine litter, is essential in dealing effectively with this global problem.

Legislation, policies and enforcement

While there are laws regulating the dumping of trash at sea and on shore, the global nature of marine litter, its inability to be confined within territorial boundaries, and the complexity of identifying litter sources have made effective laws difficult to draft and even harder to enforce. Unfortunately, laws do not guarantee compliance. In addition to enforcement and penalties, a sense of environmental stewardship among ocean users is essential for laws to be effective.

At the global level, there are several conventions and agreements applicable to marine litter issues, including the United Nations Convention on the Law of the Sea, General Assembly Resolutions; the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities; MARPOL 73/78 Annex V; the London Convention and the London Protocol; and the Basel Convention. Many countries are not members of these legal regimes.

At the regional level, there are no specific legal instruments dealing with marine litter, although litter is addressed in several regional conventions and protocols on controlling marine pollution.

At the national level, only the Wider Caribbean and Northwest Pacific regions have countries with specific national legislation addressing marine litter. Most countries have general legislation addressing solid waste management, public health issues, sustainable development and tourism coordinated with the conservation of natural resources that is directly or indirectly related to marine litter. It is not usually dealt with in policies or laws as a separate category of waste, and is considered to be part of the general solid waste stream.

Several regions (e.g. Baltic Sea, Wider Caribbean, Mediterranean, Northeast Atlantic and South Asian Seas) stated in their reports that there needs to be better coordination within national governments to effectively address marine litter issues among national and local government agencies and voluntary organizations. Clear lines of responsibility and authority need to be identified in order for marine litter management to be more effective. A majority of the regions, including the Wider Caribbean, Caspian, Eastern Africa and Red Sea and Gulf of Aden, also acknowledged the inadequacy of implementation and enforcement of existing laws and regulations related to solid waste management.

Institutional framework and stakeholder involvement

With the growing recognition that marine litter poses global and regional problems for the environment and human communities, numerous institutional arrangements have emerged. These include (1) the development and implementation of national solid waste management strategies; (2) environmental and natural resource conservation and management programmes; (3) port authority operations; (4) on-board programmes for tourist vessels; and (5) maritime activities related to fishing, shipping, boating, and other vessel operations. Responsibility for marine litter issues is usually shared by different government agencies, with environmental ministries typically taking the lead for land-based sources and maritime administrations taking responsibility for sea-based sources. Local governments or waste management authorities tend to be responsible for general waste management matters. Work related to marine litter issues is usually nested within other activities related to solid waste and natural resource management.

In all participating regions, there are numerous community and beach cleanup programmes at the national level that are managed by various government agencies, private sector agencies and NGOs, with a few that involve the quantification of marine litter types and sources. The leading effort to assess marine litter is conducted annually through the International Coastal Cleanup.

Among the more focused programmes at the regional level is the *Baltic Strategy on Port Reception Facilities for Ship-generated Wastes* (the Baltic Strategy). The HELCOM Member States have been implementing this strategy, which is a complex set of measures to prevent the illegal discharge of waste into the Baltic Sea and provide for economic incentives to deliver wastes, including garbage, onshore.

Among the programmes at the national level, particularly impressive is the *National Integrated Management Strategy for Marine Litter* (NIMSML) of the Republic of Korea. The programme clearly designates the lead agency as the Ministry of Maritime Affairs and Fisheries (MOMAF). NIMSML details clear structures and procedures for the involvement of all other relevant government agencies, local governments, NGOs, research institutions, the private sector and local communities. It also indicates a variety of funding mechanisms, a national awareness campaign, a nationally coordinated marine litter survey and monitoring programme linked to physical cleanups; integration with the broader national solid waste management effort, a concerted technological research and development programme, and a major effort to address the problem of abandoned, lost or otherwise discarded fishing gear (ALDFG). NIMSML

also includes an innovative scheme where fishermen are paid to return waste fishing gear to port and even non-fishing gear that they collect in their nets.

Monitoring programmes

The need for establishment of national marine litter monitoring programmes was identified by most of the RAPs so that information could be collected on a regular basis and used for programme development and assessment of interventions and reduction strategies. Monitoring could also be used to help clarify the problem of marine litter, e.g., what are the types, what are the sources and how widespread is the problem. Data and research on marine litter can be used to help formulate management solutions, which must in turn be implemented by management agencies with support from the private sector. Ongoing monitoring activities can then be used to assess the effectiveness of management strategies, legislation and other activities designed to control this pollution problem.

Research needs to be conducted to assess the various impacts of marine litter on wildlife and habitats and other indicators (e.g., invasive species transport and toxicity due to ingestion of materials). In addition, the economic impacts of marine litter need to be assessed to help prioritize and quantify the costs of this issue within government programmes, business and industry groups and the public.

Policies could be developed through monitoring efforts to produce legislation or funding for source-reduction programmes, assess trends, identify pathways by which debris gains access to the water, assess wildlife and habitat impacts, identify point sources, quantify economic impacts, estimate the loss of ecosystems goods and services and help enforce regulations.

The challenges in marine litter monitoring are only partly the result of insufficient data and public awareness of the problem; they mostly arise from the lack of standardization and compatibility between assessment methods used and results obtained in these projects. It is worth noting that the first regional marine litter monitoring effort to employ a standardized methodology to assess marine litter on beaches was developed in western and northern Europe (OSPAR).

Data collection with National Marine Debris Monitoring Program (US). © Ocean Conservancy

Education and outreach

In any effective pollution prevention initiative, community-based education programmes are necessary if the public is going to become fully engaged in the process to protect their own environment and quality of life. The establishment of a stewardship ethic among the people is essential in addressing pollution problems and their solutions. Cultural issues have a significant role in addressing the public's behaviour regarding littering laws and compliance. In addition, the cultural aspects of the audience being targeted should be taken into account and should include coordination with law enforcement agencies in addressing behaviours and attitudes related to waste management and prevention.

A majority of the participating Regional Seas reported that education and public awareness campaigns are essential tools contributing to environmental protection, and that raising public awareness that encourages people to change their attitudes and behaviours, which is an essential component of efforts to mitigate marine litter.

Several Regional Seas reported that numerous organizations and government groups routinely conduct public education campaigns to support their missions and programme objectives that include marine conservation issues and marine litter prevention. Over the years, outreach materials for marine litter have been developed by many coastal zone management and solid waste management programmes and conservation NGOs. While several Regional Seas initiatives (e.g., Baltic Sea, Black Sea, Wider Caribbean, Mediterranean, Northwest Pacific and Northeast Atlantic) have developed regional public awareness campaigns related to marine litter, several have noted a lack of these programmes in their regions (e.g., South Asian Seas, East Asian Seas, and Eastern Africa) and the necessity of their future development.

Mitigation activities

Current assessments of marine litter abatement and control have identified numerous linkages that are multi-sectoral, ranging from integrated solid waste management approaches that result in more adequate waste management infrastructures, improvements in port reception facilities, better defined legislation that specifically addresses marine litter and improved compliance and enforcement, expanded public awareness efforts and economic incentives and controls to support abatement and reduction of marine litter.

Marine litter is only one part of the broader problem of solid waste management, which is more generally linked to the protection and conservation of the marine and coastal environment as well as to sustainable development. Most national solid waste management programmes do not include specific activities related to marine litter management. It is critical to integrate marine litter management strategies with solid waste management strategies. An effort to coordinate programme activities, waste management strategies, and resources would prove beneficial for the people and environment in every region.

Because of inadequate funding in most regions (e.g., Eastern Africa, South Asian Seas, East Asian Seas and Wider Caribbean), the basic infrastructure and operational systems for effective waste management either do not exist or have become overloaded, inefficient and/or unsustainable. The increasing amounts of solid waste in the coastal zones, and the inherent difficulties related to collection and cleanup, are detrimental to the economies of many countries, especially those dependent on coastal fisheries and tourism.

Funding and sustainability

The various approaches and strategies being developed to address marine litter in the Regional Seas face financial challenges compounded by the diversity of governmental structures. It has been suggested that appropriate ministries and departments that deal with solid waste management and marine litter issues collaborate to share resources. In addition, it is also important to engage the private sector in developing strategies and programmes on marine litter that can be sustained long-term.

The fact that marine litter crosses institutional and administrative departments and funding infrastructures is partially why this pollution issue is so difficult to manage. This opinion has been voiced by most Regional Seas programmes participating in the UNEP Global Initiative on Marine Litter. Most regions reported an inadequacy in the funding necessary for sustaining a basic system and infrastructure for effective waste management at the national level.

Research on the economic impacts of marine litter – especially as they relate to coastal tourism, fisheries and recreation – can help justify the financial outlays needed to deal with the litter problem. The research should include valuation of threatened natural resources and the goods and services they provide. This will

help make the case to governments, business and industry groups, and the public that their money is well-spent, and that the application of appropriate economic instruments and incentives is appropriate.

Economic incentives and measures and market-based instruments (taxes, fees, fines, penalties, liability and compensation schemes, subsidies and tradable permit schemes) have a potentially important role to play in addressing the problem, when used as part of an integrated strategy.

The required investments to make Annex V of MARPOL 73/78 operational could come from port operators and from established funding mechanisms within each country. Research will require support from national research funds and from regional and international cooperation agencies. Actions for public awareness and communication will require multiple sources of support, including sponsorships and partnerships.

Similarities among Regional Action Plans of participating regions

This section highlights the similarities among Regional Action Plans (RAPs) and proposed actions of the participating Regional Seas. It is clear that the Regional Seas programmes, working independently, have a number of similarities in their approaches to marine litter management. The following are the main similarities among the Regional Seas RAPs:

- All considered Integrated Waste Management efforts as an important component of their RAPs.
- Only Australia, Republic of Korea and the United States have specific legislation on marine litter.
- Most (if not all) acknowledged that existing legislation could be an umbrella for addressing marine litter issues.
- Most acknowledged that existing laws needed to be better enforced.
- All RAPs included some mention of education and outreach as an important strategy for working on marine litter. Behavioural changes are also needed for this issue to be dealt with effectively.
- Almost all acknowledged the need to improve port reception facilities related to waste management.
- Several RAPs expressed the need for the marine litter issue to be recognized as a priority issue by national governments and for those governments to identify the responsible agencies to manage marine litter.
- Most acknowledged the need for marine litter control programmes to be implemented at the national level, with some activities applicable regionally.
- Most often mentioned was a lack of acceptable marine litter data and the need to have access to a marine litter monitoring strategy that was harmonized. OSPAR, NOWPAP and CAR have some form of marine litter monitoring, and all will work with the new IOC/UNEP marine litter guidelines.
- All mentioned participation in the ICC.
- Most mentioned national sources of funding for national programmes with some international support as needed.
- Not all RAPs addressed ALDFG issues.
- All mentioned the need to understand the financial impacts of marine litter and the implementation of economic instruments to help deal with marine litter.

Chapter 4
The way forward

Introduction

Human society produces and consumes enormous quantities of various manufactured products, many of which are discarded as solid waste and can end up in the oceans as marine litter. Most types of marine litter have very slow rates of decomposition, leading to gradual but significant accumulations in the coastal and marine environment. Marine litter is found in all oceans of the world, not only near densely populated areas, but also in remote places far from obvious human sources. Marine litter can produce a broad spectrum of negative environmental, economic, safety, health and cultural impacts.

Marine litter is a complex and multi-dimensional problem with significant implications for marine and coastal environments and human activities worldwide. The problems it can cause are both socio-cultural and multi-sectoral, rooted primarily in poor solid-waste management practices, the lack of infrastructure, various human activities, an inadequate understanding on the part of the public of the potential consequences of their actions, the lack of adequate legal and enforcement systems, and inadequate financial resources.

Conclusions

Due to the nature of the marine litter problem, a wide variety of approaches and strategies must be implemented if the oceans are to receive a reduced load of marine litter. Since the majority of marine litter originates from land-based sources and activities, the primary emphasis on controlling marine litter should focus on preventing the inflow of litter to the sea.

In spite of international, regional and national efforts to reverse current trends, the problem continues to grow. As a result, there is an increasingly urgent need to tackle this issue through better enforcement of national regulatory systems, expanded outreach and educational campaigns at national, regional and global levels and the employment of strong economic instruments and incentives.

Review and analysis of the 12 regional assessment documents on marine litter, seven Regional Action Plans on the management of marine litter and three global reviews on specific topics (marine litter monitoring; abandoned, lost or otherwise discarded fishing gear; and economic instruments) revealed a widespread lack of systematic, scientific knowledge on the sources, amounts, fates, trends and impacts of marine litter, which hampers the development and implementation of effective mitigation actions. This deficiency, in combination with the lack of specific legislation, effective law enforcement and adequate funding, are the primary reasons that the problems of marine litter are far from being solved. Unless effective action is taken it will only continue to worsen in the years to come.

The 12 regional assessment documents provided available information on amounts, impacts, sources, legislation, policies, institutional arrangements, programmes and outreach on marine litter. The seven Regional Action Plans on the management of marine litter included information on strategy, legislation, policies, enforcement, monitoring programmes, education and outreach, mitigation activities, funding and sustainability.

This final chapter provides a discussion of the general conclusions and proposed recommendations of this overview, and also offers conclusions and recommendations related to nine specific issues that are important for the understanding, control and reduction of the global problem of marine litter.

Recommendations

Strategies for the management of marine litter

- Each of the Regional Sea programmes should develop a Regional Action Plan or Strategy to address the problem of marine litter, either within the framework of their regional convention or protocol or as an independent instrument and document. Those RAPs should be sustainable and long-term in their

nature, incorporating basic principles of preventive actions and strategies, but they should be routinely updated to adjust to changing circumstances or conditions.

- Marine litter is a global problem and mitigation actions should be developed around a global framework, coordinated at the regional level and implemented at the national level through development and implementation of national action plans or strategies that address marine litter.

- National action plans or strategies should be based on (1) development, implementation and enforcement of national legislation for waste management, which includes marine litter, (2) enhancement of national institutional mechanisms, (3) strengthening of public, governmental and private sector partnerships, (4) raising public awareness and education, and (5) development of a framework for engaging key stakeholders and partners.

- Regional and national marine litter monitoring programmes, based on internationally accepted methodologies should be developed and implemented.

- Port reception facilities for handling ship-generated wastes and old/damaged fishing nets should be improved. A reduction of the disposal of fishing gear at sea and in coastal areas should be promoted.

- Financial resources and essential funds for the management of marine litter should be identified.

- Responsible UN organizations (e.g. UNEP, IMO, FAO, IOC) should enhance and coordinate their efforts to work on the marine litter problem This work has to be carried out in close cooperation with civil society, including the scientific community, academia, the private sector and NGOs.

Legislation, policies, compliance and enforcement

- The legal basis for management of marine litter (conventions, laws, regulations, action plans, etc.) should be enhanced and enforced through the development of appropriate national laws and regulations for more effective control and reduction on the problem.

- Efforts should be made in countries to improve law enforcement systems so that relevant, existing legislation is implemented and effectively enforced. One such effort would be to provide training for judicial officials/magistrates/enforcement officers, and the sensitization of politicians on marine litter issues to aid in enforcing violations.

- Governments need to elevate the significance of marine litter as a national priority and designate a responsible government authority for the management of marine litter issues.

- All Regional Seas conventions and action plans should cover the issue of marine litter either in specific legal instruments (conventions and protocols) or through Regional Action Plans for marine litter management.

- Any country which has not ratified MARPOL Annex V, or taken actions to implement it effectively, should do so.

Institutional framework and stakeholder involvement

- At the regional level, legal and institutional frameworks (e.g. conventions, protocols, Regional Action Plans) addressing marine litter (including legislation, monitoring and mitigation measures) should be agreed upon, developed and implemented through appropriate national laws and regulations..

- At the governmental level, clear responsibility for management of marine litter should be mandated and efficient coordination among various governmental structures should be achieved in order to ensure effective implementation of programmes and activities and enforcement of legislation and regulations.

- Efforts should be made to involve and engage all relevant stakeholders in the activities leading toward the holistic and integrated approach of controlling and abating marine litter.

- All relevant stakeholders should be identified and particular efforts should be made to involve the private sector and other relevant members of civil society in actions to address the problem of marine litter.

- Cooperation with, and among, specific sectors (fisheries, shipping, tourism, diving, local authorities, etc.) is of utmost importance in addressing the problem of marine litter.

Integrated solid waste management

- Marine litter problems should be resolved by and treated as part of integrated waste management approaches.

- Technically adequate collection and cleanup systems and disposal sites should be developed as part of an Integrated Waste Management programme.

- The number and operations of dump sites and landfills in close proximity to the sea and on river banks should be limited.

- Activities for local and national recycling, reuse and waste diversion programmes should be developed and promoted.

- Reception facilities and administrative measures should allow and encourage fishermen to return their used or damaged fishing nets and gear to ports for disposal in an environmentally responsible manner.

- Port reception facilities should be improved to effectively manage ship-generated wastes and support full implementation of MARPOL Annex V in the participating Regional Seas.

The International Coastal Cleanup can help provide key information on the amount of litter on shorelines. © Ocean Conservancy

Amounts and sources of marine litter

- Regional programmes for the collection of reliable data on the amounts and sources of marine litter (monitoring) should be developed and implemented, based on internationally accepted monitoring methodologies. Such monitoring should include beaches, coastal waters, and seabed assessments.

- Efforts should be made to enhance a systematic knowledge of the sources, amounts, trends, fates and impacts of marine litter on the marine and coastal environments.

- Reports should be published, at regular intervals and at national, regional and global levels, on the status and trends of marine litter, to include reliable and comparable data on the amounts and sources of marine litter.

- A clearing house of information on marine litter data should be developed at the regional and global levels and appropriate marine litter databases at the national level.

- Regional assessment studies on the status of marine litter should be prepared in the Arctic, Northeast Pacific, ROPME region, Pacific, and West and Central Africa.

Lethal litter. © Ocean Conservancy

Impacts and effects of marine litter

- Research should be conducted on the impacts of marine litter on wildlife and habitats, and supplemented and harmonized at the regional and (as appropriate) global levels in order to draw conclusions which are both validated by reliable data and comparable among regions.

- Research should be carried out on the socio-economic impacts of marine litter and its effect on the goods and services provided by ecosystems for use in supporting management decisions and funding.

- Cooperation should be fostered among natural resource agencies, academia conducting field research and conservation groups to help collect information on wildlife entanglements and habitat impacts from marine litter.

Monitoring programmes and research

- The guidelines for marine litter survey and monitoring programmes for beaches, floating litter and the sea floor, developed by IOC/UNEP through the Regional Seas, should be distributed and implemented at the national, regional and global levels.

- In regions that particularly lack information on marine litter, rapid assessment activities and/or projects should be developed and implemented.

- Support and guidance should be provided through the Regional Seas Programme to develop and implement regional monitoring activities among Member States.

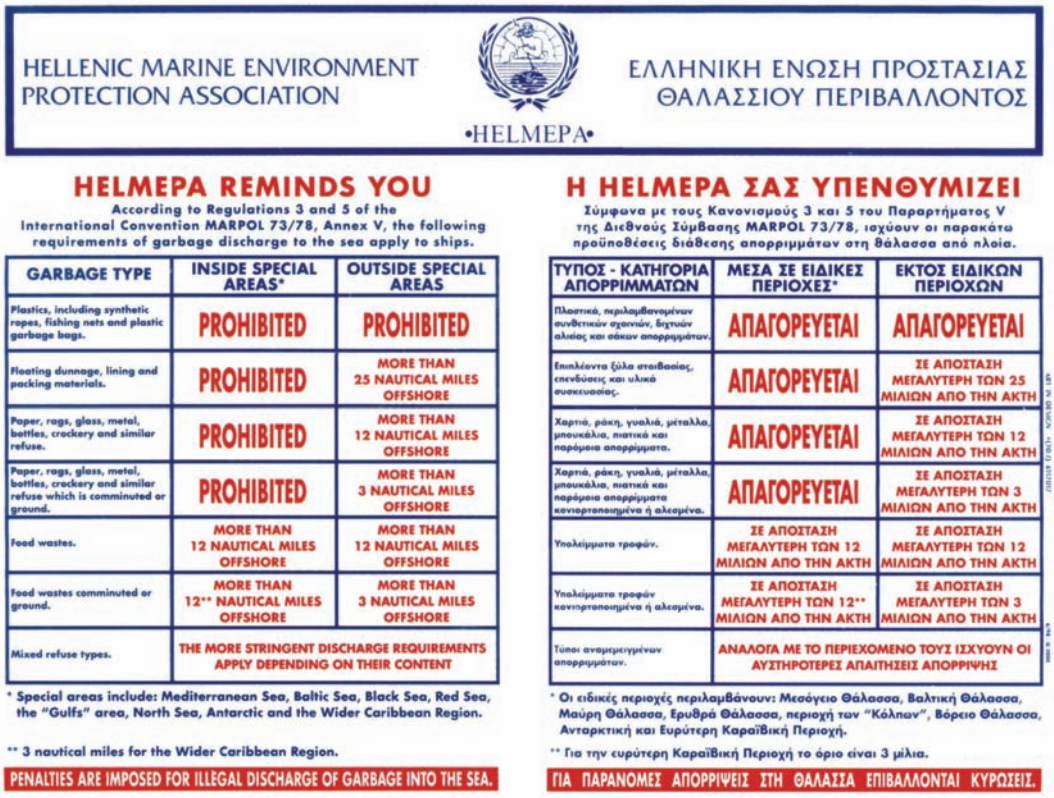
- Monitoring and assessment efforts should be invested in verifying whether changes in management or policies have indeed improved the status of marine litter.

- Research activities should be supported and implemented on abundance and fluxes, trends and fate and ecological and socioeconomic impacts of marine litter.

- Research on the effectiveness of market-based instruments, as they pertain to marine litter and the costs and benefits of various marine litter abatement programmes, should be expanded and should include direct and indirect costs and benefits (environmental as well as economic).

- Additional studies are needed to assess the effectiveness of measures to prevent and reduce marine litter and to provide useful guidance to managers and decision makers on marine litter mitigation.

- Adequate funding is needed to support research projects on the types, sources, impacts and other aspects of marine litter as a basis for improved policy making and programme development.



HELLENIC MARINE ENVIRONMENT PROTECTION ASSOCIATION

•HELMEPA•

ΕΛΛΗΝΙΚΗ ΕΝΩΣΗ ΠΡΟΣΤΑΣΙΑΣ ΘΑΛΑΣΣΙΟΥ ΠΕΡΙΒΑΛΛΟΝΤΟΣ

HELMEPA REMINDS YOU

According to Regulations 3 and 5 of the International Convention MARPOL 73/78, Annex V, the following requirements of garbage discharge to the sea apply to ships.

GARBAGE TYPE	INSIDE SPECIAL AREAS*	OUTSIDE SPECIAL AREAS
Plastics, including synthetic ropes, fishing nets and plastic garbage bags.	PROHIBITED	PROHIBITED
Floating dunnage, lining and packing materials.	PROHIBITED	MORE THAN 25 NAUTICAL MILES OFFSHORE
Paper, rags, glass, metal, bottles, crockery and similar refuse.	PROHIBITED	MORE THAN 12 NAUTICAL MILES OFFSHORE
Paper, rags, glass, metal, bottles, crockery and similar refuse which is comminuted or ground.	PROHIBITED	MORE THAN 3 NAUTICAL MILES OFFSHORE
Food wastes.	MORE THAN 12 NAUTICAL MILES OFFSHORE	MORE THAN 12 NAUTICAL MILES OFFSHORE
Food wastes comminuted or ground.	MORE THAN 12** NAUTICAL MILES OFFSHORE	MORE THAN 3 NAUTICAL MILES OFFSHORE
Mixed refuse types.	THE MORE STRINGENT DISCHARGE REQUIREMENTS APPLY DEPENDING ON THEIR CONTENT	

* Special areas include: Mediterranean Sea, Baltic Sea, Black Sea, Red Sea, the "Gulfs" area, North Sea, Antarctic and the Wider Caribbean Region.

** 3 nautical miles for the Wider Caribbean Region.

PENALTIES ARE IMPOSED FOR ILLEGAL DISCHARGE OF GARBAGE INTO THE SEA.

Η HELMEPA ΣΑΣ ΥΠΕΝΘΥΜΙΖΕΙ

Σύμφωνα με τους Κανονισμούς 3 και 5 του Παραρτήματος V της Διεθνούς Σύμβασης MARPOL 73/78, ισχύουν οι παρακάτω προϋποθέσεις διάθεσης απορριμμάτων στη θάλασσα από πλοία.

ΤΥΠΟΣ - ΚΑΤΗΓΟΡΙΑ ΑΠΟΡΡΙΜΜΑΤΩΝ	ΜΕΣΑ ΣΕ ΕΙΔΙΚΕΣ ΠΕΡΙΟΧΕΣ*	ΕΚΤΟΣ ΕΙΔΙΚΩΝ ΠΕΡΙΟΧΩΝ
Πλαστικά, περιλαμβανομένων συνθετικών σχοινιών, δικτύων αλιείας και σάκων απορριμμάτων.	ΑΠΑΓΟΡΕΥΕΤΑΙ	ΑΠΑΓΟΡΕΥΕΤΑΙ
Επικλύοντα ξύλα στοιβασίας, επενδύσεις και υλικά συσκευασίας.	ΑΠΑΓΟΡΕΥΕΤΑΙ	ΣΕ ΑΠΟΣΤΑΣΗ ΜΕΓΑΛΥΤΕΡΗ ΤΩΝ 25 ΜΙΛΙΩΝ ΑΠΟ ΤΗΝ ΑΚΤΗ
Χαρτιά, ράκη, γυαλιά, μέταλλα, μπουκάλια, πιατικά και παρόμοια απορρίμματα.	ΑΠΑΓΟΡΕΥΕΤΑΙ	ΣΕ ΑΠΟΣΤΑΣΗ ΜΕΓΑΛΥΤΕΡΗ ΤΩΝ 12 ΜΙΛΙΩΝ ΑΠΟ ΤΗΝ ΑΚΤΗ
Χαρτιά, ράκη, γυαλιά, μέταλλα, μπουκάλια, πιατικά και παρόμοια απορρίμματα κονιορτοποιημένα ή αλεσμένα.	ΑΠΑΓΟΡΕΥΕΤΑΙ	ΣΕ ΑΠΟΣΤΑΣΗ ΜΕΓΑΛΥΤΕΡΗ ΤΩΝ 3 ΜΙΛΙΩΝ ΑΠΟ ΤΗΝ ΑΚΤΗ
Υπολείμματα τροφών.	ΣΕ ΑΠΟΣΤΑΣΗ ΜΕΓΑΛΥΤΕΡΗ ΤΩΝ 12 ΜΙΛΙΩΝ ΑΠΟ ΤΗΝ ΑΚΤΗ	ΣΕ ΑΠΟΣΤΑΣΗ ΜΕΓΑΛΥΤΕΡΗ ΤΩΝ 12 ΜΙΛΙΩΝ ΑΠΟ ΤΗΝ ΑΚΤΗ
Υπολείμματα τροφών κονιορτοποιημένα ή αλεσμένα.	ΣΕ ΑΠΟΣΤΑΣΗ ΜΕΓΑΛΥΤΕΡΗ ΤΩΝ 12** ΜΙΛΙΩΝ ΑΠΟ ΤΗΝ ΑΚΤΗ	ΣΕ ΑΠΟΣΤΑΣΗ ΜΕΓΑΛΥΤΕΡΗ ΤΩΝ 3 ΜΙΛΙΩΝ ΑΠΟ ΤΗΝ ΑΚΤΗ
Τύποι αναμεμιγμένων απορριμμάτων.	ΑΝΑΛΟΓΑ ΜΕ ΤΟ ΠΕΡΙΕΧΟΜΕΝΟ ΤΟΥΣ ΙΣΧΥΟΥΝ ΟΙ ΑΥΣΤΗΡΟΤΕΡΕΣ ΑΠΑΙΤΗΣΕΙΣ ΑΠΟΡΡΙΨΗΣ	

* Οι ειδικές περιοχές περιλαμβάνουν: Μεσόγειο Θάλασσα, Βαλτική Θάλασσα, Μαύρη Θάλασσα, Ερυθρά Θάλασσα, περιοχή των "Κόλπων", Βόρειο Θάλασσα, Ανταρκτική και Ευρύτερη Καραϊβική Περιοχή.

** Για την ευρύτερη Καραϊβική Περιοχή το όριο είναι 3 μίλια.

ΓΙΑ ΠΑΡΑΝΟΜΕΣ ΑΠΟΡΡΙΨΕΙΣ ΣΤΗ ΘΑΛΑΣΣΑ ΕΠΙΒΑΛΛΟΝΤΑΙ ΚΥΡΩΣΕΙΣ.

HELMEPA placard for ships on Annex V MARPOL 73/78.

Education and outreach

- Existing public awareness and education programmes should be expanded to include marine litter issues; develop, share and disseminate outreach materials; and develop and promote voluntary beach and waterway cleanup campaigns, including Ocean Conservancy's International Coastal Cleanup, Clean Up the World, 'adopt-a-beach' campaigns and others. All programmes should be evaluated periodically to assess their effectiveness in changing public attitudes and behaviours related to marine litter.

- New approaches towards public awareness and cleanup of beaches should be developed and promoted, such as 'adopt-a-beach' campaigns, with civil society and the private sector.

- Capacity building and awareness programmes should be developed among all stakeholders and key user-groups related to marine litter issues.

- Guidelines and initiatives on the reduction and abatement of marine litter that engage specific target groups (user-groups and stakeholders) should be developed. These may include community administrators, tourism operators, ship owners and operators, crews, port users, fishermen, pleasure craft users, divers and civil society.

- A determined and sustained global awareness and outreach programme should be developed to bring about a cultural shift and behavioural change in the global fishing sector through modern communication strategies.

- Major efforts to develop public awareness and change public attitudes and behaviours towards the generation and cleanup of marine litter have to be made. Outreach and education campaigns,

combined with large scale public cleanup campaigns should be encouraged worldwide. Cleanup campaigns can be used to mobilize greater public interest and support but the focus should be on reducing and preventing pollution caused by litter.

Monitoring should be systematic, well-planned and carried out according to a standard methodology. © Ocean Conservancy

Funding and sustainability

- Studies on the direct economic impacts of marine litter and on the loss of services and goods provided by affected ecosystems should be supported and implemented in order to help prioritize and quantify the economic impacts of this issue within government programmes, business and industry groups and the public. This could be carried out as case studies or smaller pilot projects and replicated as resources become available.

- In many coastal regions municipal and harbour authorities spend a large part of their budgets cleaning up marine litter and other wastes. The funds they spend need to be calculated so that those responsible for creating marine litter will know the true costs to society due to their activities.

- A variety of strategies incorporating regulations, market-based instruments and community initiatives are required to effectively address the marine litter problem. Cleaning up marine litter is an expensive process and it is economically preferable that vigorous prevention measures, including public education and awareness-raising, be undertaken to reduce the amount of litter entering the marine environment. Only then can cleanup programmes be effective.

- New funding sources should be cultivated in order to support regional efforts for addressing marine litter issues of prevention and removal.

- Regional programmes for marine litter should be incorporated into national budgets to support implementation and participation.

- More traditional approaches should be considered, such as the ‘polluter pays principle’ and the use of specific, direct funding mechanisms to fund marine litter mitigation efforts.

- A programme of innovative economic incentives/measures must be developed to prevent and reduce the abandonment, loss and the discarding of fishing gear at sea.

- Special global, regional and national efforts should be made to address the problem of abandoned and lost fishing gear. The devastating environmental and economic impacts of this problem and its large quantities involved require special approaches that will focus on and involve the fishing sector.

Acronyms

ACCOBAMS	Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area
ALDFG	Abandoned, lost or otherwise discarded fishing gear
ALFG	Abandoned and lost fishing gear
AMDS	Australian Marine Debris Survey
ANZECC	Australian and New Zealand Environment and Conservation Council
APEC	Asia Pacific Economic Cooperation
BAT	Best Available Technology
BEP	Best Environmental Practice
BOD	Biological Oxygen Demand
BS SAP	Strategic Action Plan for the Protection and Rehabilitation of the Black Sea
BS	Black Sea
BSC	Commission on the Protection of the Black Sea Against Pollution
BS-ML-SAP	Strategic Action Plan for Management and Abatement of Marine Litter in the Black Sea Region
CAC	Command and control
CAR/RCU	Caribbean Regional Co-ordinating Unit
CBD	Convention on Biological Diversity
CCAMLR	Commission for the Conservation of the Antarctic Marine Living Resource
CCI	Clean Coast Index
CEARAC	Special Monitoring and Coastal Environmental Assessment Regional Activity Centre
CEE	Center for Environmental Education
CEP	Caribbean Environment Programme
CEP	Caspian Environment Programme
CIESM	International Commission for Scientific Exploration of the Mediterranean Sea
CITES	Convention on Trade of Endangered Species
CMC	Center for Marine Conservation
COBSEA	Coordinating Body on the Seas of East Asia
CPPS	Comisión Permanente del Pacífico Sur / Permanent Commission for the Southeast Pacific
CSD	Commission on Sustainable Development of the UN
CUW	Clean Up the World
CZM	Coastal Zone Management
CZMP	Coastal Zone Management Plan
DINRAC	Data and Information Network Regional Activity Centre
DOE	Department of Environment
EA/WIO	Eastern Africa / West Indian Ocean
EAS	East Asian Seas
ECA	Environmental Conservation Act
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EPA	Environmental Protection Agency
ESCAP	Economic and Social Commission for Asia and the Pacific
EU	European Union

FAD	Fish Aggregating Device
FAO	United Nations Food and Agriculture Organization
FAP	Floatables Action Plan
GA	General Assembly
GCMRN	Global Coral Reef Monitoring Network
GDP	Gross Domestic Product
GEF	Global Environment Facility
GEO	Global Environment Outlook
GESAMP	Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection
GIS	Geographic Information System
GIWA	Global International Waters Assessment
GOOS	Global Ocean Observing System
GPA	Global Programme of Action for the Protection of the Marine Environment from Land-based Activities
GT	Gross tonnage
HDPE	High density polyethylene
HELCOM	Helsinki Commission/The Baltic Marine Environment Protection Commission
HELMEPA	Hellenic Marine Environment Protection Association
IAEA	International Atomic Energy Agency
ICAM	Integrated Coastal Area Management
ICARM	Integrated Coastal Area and River Basin Management
ICC	International Coastal Cleanup
ICRI	International Coral Reef Initiative
ICZM	Integrated Coastal Zone Management
IEEP	Institute for European Environmental Policy
IGBP	International Geosphere-Biosphere Programme
IGO	Inter-Governmental Organization
IMDM	Integrated Marine Debris Management
IMO	International Maritime Organization
IOC	Indian Ocean Commission
IOC	Intergovernmental Oceanographic Commission of UNESCO
IOCARIBE	Sub-Commission for the Caribbean and Adjacent Regions of IOC
ISBA	International Sea Bed Authority
ISWM	Integrated Solid Waste Management
IUCN	International Union for the Conservation of Nature and Natural Resources
IUU	Illegal, unreported and unregulated
IWM	Integrated Waste Management
JICA	Japan International Co-operation Agency
KIMO	Kommunenes Internasjonale Miljøorganisasjon
KMMAF	Korean Ministry of Maritime Affairs and Fisheries
LAFG	Lost and abandoned fishing gear
LBS	Land-based Sources
LC	London Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter
MALITA	Marine Litter Activity
MAP	Mediterranean Action Plan

MARPOL	International Convention for the Prevention of Pollution by Ships
MBIs	Market-based instruments
MCS	Marine Conservation Society
MED	Mediterranean
MEPC	Marine Environment Protection Committee of IMO
MERRAC	Marine Environmental Emergency Preparedness and Response Regional Activity Centre
MIO-ECSDE	Mediterranean Information Office for Environment, Culture and Sustainable Development
ML	Marine litter
MOMAF	Ministry of Maritime Affairs and Fisheries
MoU	Memorandum of Understanding
MPA	Marine Protected Area
MPPRCA	Marine Plastic Pollution Research and Control Act
MSSD	Mediterranean Strategy for Sustainable Development
MSW	Municipal Solid Waste
NAP	National Action Plan
ND	No data available
NEA	National Environmental Act
NEAP	National Environmental Action Plan
NEPAD	New Partnership for Africa's Development
NGO	Non-governmental organization
NIMSML	National Integrated Management Strategy for Marine Litter
NIO	National Institute of Oceanography
NMDMP	National Marine Debris Monitoring Program
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOWPAP	Northwest Pacific Action Plan
NPA	National Programme of Action
OC	Ocean Conservancy
OECD	Organisation for Economic Cooperation and Development
OPRC	Convention on Oil Pollution Preparedness, Response, and Co-operation
OSPAR	Convention for the Protection of the Marine Environment of the Northeast Atlantic
PADH	Physical alteration and destruction of habitats
PADI	Professional Association of Diving Instructors
PAH	Polycyclic aromatic hydrocarbons
PAME	Protection of the Arctic Marine Environment
PCB	Polychlorinated biphenyl
PERSGA	Regional Organization for Conservation of Environment of the Red Sea and Gulf of Aden
PET	Polyethylene terephthalate
PHC	Petroleum hydrocarbons
POPs	Persistent organic pollutants
PPP	Public-Private Partnerships
PTS	Persistent toxic substances
PVC	Polyvinyl chloride
RAMSAR	Convention on Wetlands of International Importance, especially as Waterfowl Habitat
RAP	Regional Action Plan

RAPMaLi	Regional Action Plan on the Sustainable Management of Marine Litter in the Wider Caribbean
RFBs	Regional Fisheries Bodies
RFMOs	Regional Fishery Management Organizations
RLC	Remote Litter Classes
ROPME	Regional Organization for the Protection of the Marine Environment of the sea area surrounded by Bahrain, I.R. Iran, Iraq, Kuwait, Oman, Qatar, Saudi Arabia and the UAE
ROVs	Remotely Operated Vehicles
RPA	Regional Programme of Action
RSPs	Regional Seas Programmes
SACEP	South Asia Cooperative Environment Programme
SAP	Strategic Action Program
SAS	South Asian Seas
SASAP	South Asian Seas Action Plan
SIDS	Small Island Developing States
SOE	State of the Environment
SPREP	South Pacific Environment Programme
SWFC	Southwest Fisheries Science Center
TDA	Transboundary Diagnostic Analysis
TURMEPA	Turkish Marine Environment Protection Association
TWG	Technical Working Group
UAE	United Arab Emirates
UK	United Kingdom
UN	United Nations
UNCED	UN Conference on Environment and Development
UNCLOS	United Nations Convention on the Law of the Sea
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNGA	United Nations General Assembly
UNICPOLOS	United Nations Consultative Process on the Law of the Sea
US	United States
USA	United States of America
USAID	United States Agency for International Development
USD	US dollar
WB	The World Bank
WCR	Wider Caribbean Region
WHO	World Health Organization
WIO	Western Indian Ocean
WIOMSA	Western Indian Ocean Marine Science Association
WMO	World Maritime Organization
WTO	World Trade Organization
WTO	World Tourism Organization
WWF	World Wide Fund For Nature (International); World Wildlife Fund (US and UK)

Glossary

Abandoned fishing gear

Fishing nets and gear that are deliberately dumped at sea with no intention by fishers to retrieve it for whatever reason.

Abandoned, lost or otherwise discarded fishing gear (ALDFG)

Collective term for fishing nets and gear that have been abandoned, lost or otherwise discarded (see separate glossary entries). Often referred to as “derelict fishing gear” in fishing references.

Benthic litter

On the sea floor (seabed) – benthic litter is litter found laying on or entangled with objects on the seabed (sea floor).

Benthic organisms

Bottom dwelling organisms.

Benthos

Collective synonym for benthic organisms, but frequently also applied to the floor of the deepest part of a sea or ocean.

Biological diversity (Biodiversity)

The diversity of life, often divided in three levels: genetic (diversity within species); species (diversity among species); and ecosystem (diversity among ecosystems).

Civil society

Civil society is composed of the totality of voluntary civic and social organizations and institutions that form the basis of a functioning society as opposed to the force-backed structures of a state (regardless of that state's political system) and commercial institutions of the market.

Clean Up the World

Clean Up the World is a global campaign that inspires communities to clean up, fix up and conserve the environment.

Clearinghouse

A clearinghouse is an institution that collects and distributes information or it is an informal channel for distributing information or assistance.

Coastal area

An entity of land and water effected by the biological and physical processes of both the sea and land and defined broadly by the purpose of managing the use of natural resources.

Contamination (marine)

An anthropogenic (human influenced) increase in the concentration of a polluting substance in the marine environment.

Discarded fishing gear

Fishing nets and gear or parts thereof that are deliberately thrown overboard without any intention for further control or recovery.

Dumping at sea

The deliberate disposal at sea of wastes or other matter or any deliberate disposal of vessels or other man-made structures.

Ecology

The branch of science studying the interactions among living things and their environment.

Economic-incentive instruments

Economic-incentive instruments are regulations that encourage behavior through price signals rather than through explicit instructions on pollution control levels or methods.

Economic instruments

Economic instruments are fiscal and other economic incentives and disincentives to incorporate environmental costs and benefits into the budgets of households and enterprises.

Ecosystem

A community or multiple communities of organisms together with their physical environment. A conceptual view of the interaction within and independence among species and communities emphasising the nature of the flow of materials and energy among these components and the feedback loops from one part to another.

Eutrophication

Increased primary productivity caused by the anthropogenic enrichment of a water body with nutrients. In the context of the present report the term is used only when the increased production results in negative impacts such as harmful algal blooms, oxygen deficiency, or the overgrowth of corals by seaweeds.

Fishing gear

Tools and equipment (e.g. nets, ropes, lures, line, pots, traps) for the capture of aquatic resources. This definition includes all items/elements onboard fishing vessels that are used for fishing purposes, including fish aggregating devices (FADs).

'Ghost' fishing

The term used to describe the capture of marine organisms by lost, abandoned or otherwise discarded fishing gear or parts thereof. Effectively, the capture of fish and other species that takes place after all control of fishing gear is lost by a fisher. For example, a lost, abandoned or discarded gillnet might continue to 'fish' with subsequent mortality to the enmeshed fish. Ghost fishing is often cyclical and the pattern, duration and extent will depend on a large number of factors including the gear type, water depth, currents and local environment.

Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA)

The GPA, adopted in 1995 by the 109 governments and the European Commission, is a global programme to protect and preserve the marine environment from the adverse environmental impacts of land-based activities. UNEP was tasked with the Secretariat function and established the GPA Coordination Office.

Habitat

The physical space where an organism, population or species lives. Habitats are usually categorised by particular physical or biological characteristics.

Hazardous waste

Waste which has properties that may make it harmful to human health or the environment.

Integrated coastal zone management (ICZM)

Integrated coastal zone management is a process for the management of the coast using an integrated approach, regarding all aspects of the coastal zone, including geographical and political boundaries, in an attempt to achieve sustainability.

Integrated waste management

Integrated waste management is the integration of various waste treatment methods to produce an environmentally and economically sustainable waste management system.

International Coastal Cleanup

Ocean Conservancy’s International Coastal Cleanup engages people to remove trash and debris from the world’s beaches and waterways, to identify the sources of debris and to change the behaviors that cause pollution.

Land-based sources

Those sources causing pollution from coastal disposal or from discharges that emanate from rivers, estuaries, coastal establishments and outfall structures.

Litter

Waste (garbage and trash) disposed of in the wrong place by unlawful human action and can vary in size of incident, occurrence or items. Discarded or lost manmade materials resulting from inappropriate human activities.

Lost fishing gear

The accidental loss of fishing gear at sea.

Marine environment

The oceans, seas, bays, estuaries, and other major water bodies, including their surface interface and interaction, with the atmosphere and with the land seaward of the mean high water mark.

Marine litter

Any litter that has entered into the marine environment, including manufactured materials (including processed timber) found on beaches or material that is floating or has sunk at sea. In some countries organic material (e.g. faeces or food waste) are included as litter. In this document organic waste has not been included.

Maritime

Things related to the sea or ocean.

Market-based instruments

Instruments of environmental policies in which a change in technology, behaviour or product is encouraged through financial incentives.

Mitigation

Elimination or reduction of frequency, magnitude, or severity of exposure to environmental, economic, legal, or social risks, or minimization of the potential impact of a threat or warning.

Monitoring of litter

Repeated surveys of beaches, seabed and/or surface waters to determine litter quantities such that information can be compared with baseline data to see if changes occur through time and / or in response to management arrangements.

Non-governmental organization (NGO)

An organization, usually non-profit, that is not part of the central, local or municipal government.

Ocean Conservancy

Ocean Conservancy is a US-based marine conservation organisation that promotes healthy and diverse ocean ecosystems and opposes practices that threaten ocean life and human life.

Oceanic gyre

A very large, more or less circular, pattern of water circulation, in an open ocean basin.

Outreach

Outreach is an effort by individuals in an organization or group to connect its ideas or practices to the efforts of other organizations, groups, specific audiences or the general public.

Pollution

Pollution is the introduction of contaminants into an environment that causes instability, disorder, harm or discomfort to the ecosystem, i.e. physical systems or living organisms.

Port reception facilities

Port facilities for the reception of wastes relating to cargo residues; ship repair activities; fishing nets and gear; oily waste (sludge, oily bilge water and other residues); sewage; and garbage.

Preventative management

Management approach that seeks to prevent the initial damage (i.e. an ex-ante measure as opposed to curative management that is implemented ex-post).

Regional Coordinating Unit (RCU)

Regional Coordinating Unit for any of the various UNEP Regional Seas Programmes (see RSP).

Regional Seas Action Plans

The Regional Seas programmes function through an Action Plan. In most cases the Action Plan is underpinned with a strong legal framework in the form of a regional Convention and associated Protocols on specific problems.

Regional Seas Conventions

International conventions established for the protection of the regional marine and coastal environemnt. At present the following conventions are in effect: Abidjan Convention (West and Central Africa); Antigua Convention (Northeast Pacific); Barcelona Convention (Mediterranean); Bucharest Convention (Black Sea); Cartagena Convention (Wider Caribbean); Helsinki Convention (Baltic Sea); Jeddah Convention (Red Sea and Gulf of Aden); Kuwait Convention region (ROPME Sea area); Lima Convention (Southeast Pacific); Nairobi Convention (Eastern Africa); Noumea Convention (South Pacific); Oslo Paris Convention (Northeast Atlantic); and Teheran Convention (Caspian).

Regional Seas Programme (RSP)

The Regional Seas Programme was launched in 1974. Currently, eighteen regions are covered by the Regional Seas family. Thirteen regional seas programmes have been established under the auspices of UNEP. The East Asia (COBSEA); Eastern Africa; Mediterranean; Northwest Pacific; West and Central Africa and Wider Caribbean programmes are directly administered by UNEP. The Black Sea; Northeast Pacific; Red Sea and Gulf of Aden; ROPME Sea Area; South Asian Seas (SAS, SACEP); Southeast Pacific (CPPS) and South Pacific (SPREP) programmes are independently administered by their regional secretariats. Furthermore, five regional partner programmes are in place in the Antarctic (CCMLAR), the Arctic (PAME), the Baltic Sea (HELCOM), the Caspian and Northeast Atlantic (OSPAR).

Sea-based sources (ocean-based sources)

Ship-generated wastes, oil and gas platforms, fishing and boating activities.

Solid waste management

Solid waste management is the collection, transport, processing, recycling or disposal, and monitoring of solid waste materials.

Stakeholders

Individuals, groups of individuals and non-governmental and government entities that have either a direct or indirect interest or claim which will, or may, be affected by a particular decision or policy.

Survey of litter

Structured set of procedures to provide a quantitative assessment of the amount of litter in a given location.

Trans-boundary

Polluted air or water, or any other waste that is generated in one country and migrates to another.

Visual litter survey

A survey conducted by visual assessment rather than by physical collection of litter items. Typically visual surveys are used when litter items can be seen (observed) but not collected, for example, when using underwater cameras or when observing from airplanes or ships travelling at sea.

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