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ASSESSMENT OF THE STATUS OF MARINE LITTER IN THE MEDITERRANEAN

In cooperation with

WHO

UNEP/MAP
Athens, 2011

Responsibility for the preparation of this document was entrusted to WHO/MED POL (Dr. G. Kamizoulis, Senior Scientist). The final draft, which was prepared by the following non-governmental organizations: the Mediterranean Information Office for Environment, Culture and Sustainable Development (MIO-ECSDE), the Hellenic Marine Environment Protection Association (HELMEPA), and Clean up Greece Environmental Organization, was reviewed by international experts and in house and the present document is the revised version.

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EXECUTIVE SUMMARY

The main objective of this assessment is to understand the current status of the marine litter problem in the Mediterranean, how it is dealt with by the countries of the region 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). It is the result of a joint effort of relevant authorities, IGOs, NGOs, scientists, and economic sectors in several Mediterranean countries, and has taken full consideration and can be regarded as the follow-up of the collective previous initiatives and activities of UNEP/MAP in its efforts to adequately address the problem of marine litter in the Mediterranean.

The assessment relied on the information collected from the completed questionnaires of fourteen Mediterranean countries, analysis of beach clean-up data mainly from the period 2002-2006, the monitoring and recording of litter floating on the sea surface for the duration of the study by HELMEPA member companies with ships traveling in or transiting the Mediterranean, existing literature and initiatives and the direct contacts with local authorities, non-governmental organizations and associations, as well as scientists and individuals, who could provide reliable data on marine litter (recorded or unrecorded). Efforts were made to provide useful statistics that could be further extrapolated to give a quantifiable estimation of the marine litter problem in the Mediterranean.

The main findings of the assessment can be summarised 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, where 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) (52% - based on item counts). This figure is in line with the global average in the same period (2002-2006). Marine litter from smoking related activities accounts for 40% (collected items) which is considerably higher than the global average.

- In terms of marine litter *floating in the sea,* plastics account for about 83.0%, while all other major categories (textiles, paper, metal and wood) account for about 17% (no. of items observed).

- 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 of waste, with a view to involving a wide range of stakeholders. Administrative coordination, budget allocation, technical capacity and weak enforcement remain the main 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 International Convention for the Prevention of Pollution from Ships (MARPOL)), marine litter management will be further strengthened.

- The economic impact of marine litter has not been addressed in the region while the specific to the region impacts on nature and humans need to be further identified and explored.

1. INTRODUCTION TO THE ASSESSMENT

1.1 The general framework: UNEP'S Marine Litter Programme

Marine litter is a complex and multi-dimensional problem with significant implications for the marine and coastal environment and human activities the world over. It originates from many sources and has a wide spectrum of negative environmental, economic, safety, health and cultural impacts. Despite efforts made internationally, regionally and nationally, there are indications that the marine litter problem continues to worsen.

The lack of global and regional strategies, deficiencies in the implementation and enforcement of existing international, regional and national programmes and lack of regulations and standards that could improve the situation are the main reasons that the marine litter problem persists.

The problem of marine litter was recognized by the UN General Assembly, which in its Resolution A/60/L.22 - Oceans and the Law of the Sea - of 29 November 2005 in articles 65-70 calls for national, regional and global actions to address the problem of marine litter. This GA resolution notes the lack of information and data on marine litter, encourages States to develop partnerships with industry and civil society, urges States to integrate the issue of marine litter within national environmental strategies, and encourages States to cooperate regionally and sub-regionally to develop and implement joint prevention and recovery programmes for marine litter. In response to the GA call, UNEP (GPA and the Regional Seas Programme), through its Global Marine Litter Initiative took an active lead in addressing the challenge, among others, by assisting 11 Regional Seas around the world in organizing and implementing regional activities on marine litter (Baltic Sea, Black Sea, Caspian Sea, East Asian Seas, Eastern Africa, Mediterranean Sea, Northwest Pacific, Red Sea and Gulf of Aden, South Asian Seas, South East Pacific and Wider Caribbean).

Taking into account the United Nations General Assembly Resolution, the Global Programme for Action framework, ongoing regional activities organised through the Regional Seas Programme of the United Nations Environment Programme and the outcome of the 2nd Intergovernmental Review of the Global Programme for Action, it has been agreed that the strategy to address the problem of marine litter at the regional level be based on the development and implementation of the Regional Action Plans for Marine Litter or Regional Strategies for the Sustainable Management of Marine Litter. It has also been agreed that the development and implementation of a Regional Strategy should pass through the following three phases:

- Phase I Assessment of the regional situation;
- Phase II Preparation of the Regional Strategy; including a regional meeting of experts and national authorities; and
- Phase III The integration of the Regional Strategy into the Programme of Work of the respective Regional Seas Programmes and the Implementation of the Regional Strategy at the national and regional level.

1.2 The Mediterranean context

Marine litter has been an issue of concern in the Mediterranean since the 1970s.

The Mediterranean countries adopted the Convention for the Protection of the Mediterranean Sea against Pollution (the Barcelona Convention) in 1976. Within the framework of this Convention the Mediterranean countries adopted in 1980 a Protocol for the Protection of the Mediterranean Sea against Pollution from Land-Based Sources. In the Protocol the importance of dealing with the problem of marine litter is recognized. In Annex I marine litter is defined as "Persistent synthetic materials which may float, sink or remain in suspension

and which may interfere with any legitimate use of the sea". The Protocol was amended in 1996. Protocol Annex I defines 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".

The Mediterranean was designated a Special Area for the purposes of Annex V of the MARPOL 73/78 Convention. However, this provision has not entered into force. Only very recently did the Mediterranean coastal States Parties to the MARPOL Annex V present a joint submission to the IMO's MEPC, notifying that adequate reception facilities for garbage were provided in their respective ports

UNEP/MAP, jointly with IOC and FAO, recognizing the lack of information on marine and coastal litter in the Mediterranean, convened in 1987 an *ad hoc* meeting on persistent materials (UNEP/IOC/FAO, 1991). The meeting recommended that a pilot survey be initiated in selected Mediterranean areas. The pilot survey was organised in 1988 by UNEP/MAP, in cooperation with IOC and FAO, with five participating countries: Cyprus, Israel, Italy, Spain and Turkey. Results of the survey were reviewed at the IOC/FAO/UNEP Review Meeting on the persistent synthetic materials pilot survey, which was 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).

The Eleventh 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.

Following the decision by the Contracting Parties, a Consultation Meeting on Marine and Coastal Wastes in the Mediterranean was held in 1999 and several documents were prepared. The meeting outlined a project on Marine and Coastal Litter Management, to be implemented in five phases. A general Questionnaire about Litter Management in Coastal Zones of the Mediterranean was sent to Mediterranean countries and the answers were analysed. The results of the assessment (MAP/UNEP, 2001) showed that the main sources of coastal litter in the region are river runoff, tourist activities and coastal urban centers. This result indicates that it is the inadequate management of coastal solid waste that is responsible for the presence of litter on the beaches, floating in the water and on the sea bed. In addition to the above mentioned results, almost all the Mediterranean countries have policies for the management of coastal solid waste but the enforcement of the policies is weak because of the poor coordination between different national and local administrations dealing with solid waste issues. However, only few countries have policies related specifically to marine litter. Local administration and municipalities are the ultimate responsibles for the management of coastal litter in the region. The role of the Ministry of environment is limited to the control aspects.

Based on these facts, MEDPOL built up a strategy to assist coastal local authorities to improve the management of coastal solid waste and prevent the introduction of litter into the marine environment. Along this line, MEDPOL implemented in 2004-2005, with the cooperation of RAMOGE and UNADEP, a pilot project at the Municipality of Tripoli, Lebanon in which direct technical and legal assistance has been provided together with a public awareness campaign (MAP/UNEP, 2004). A national replication strategy has been, as well, developed and agreed upon by all Lebanese coastal municipalities.

In 2003, UNEP/MAP, in cooperation with WHO, prepared Guidelines for Management of Coastal Litter for the Mediterranean Region. These guidelines (MAP/UNEP/MED POL, 2004) were prepared within the framework of the Strategic Action Programme (SAP) for the Mediterranean and are intended to help the responsible authorities, planners and field operators to place their national and regional development strategies within a context, which will allow them to protect the Mediterranean environment as best possible.

The Mediterranean Action Plan of UNEP with the support of the Regional Seas Programme of UNEP in 2006 developed a medium-term public awareness and education campaign on the management of marine litter in the Mediterranean with the overall objective to contribute to the protection of the environment and the sustainable development of the Mediterranean. UNEP/MAP opted to work with partner 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” carried out by the three partner organizations with the support of UNEP/MAP. The outcome of the project was a brochure produced in 11 Mediterranean languages, a series of awareness events and clean-ups and a publication which is a proposal of MIO-ECSDE, HELMEPA and Clean Up Greece to UNEP/MAP for a common regional approach on how to raise awareness and appropriately educate about marine litter with implementation at national and local level (Clean Up Greece/HELMPEPA/MIO-ECSDE, 2007). The latter has been developed for the general public as well as for all other stakeholders such as the maritime industry, the tourism sector, agriculture, regional and national authorities, NGOs, the media, etc.

Numerous international organisations 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 present, are considered as a reliable source of data and information.

This assessment is a follow-up and contribution to ongoing efforts in the development and implementation of a Regional Strategy for the Sustainable Management of Marine Litter in the Mediterranean, i.e. to fulfill Phase I: assessment of the Mediterranean regional situation.

1.3 Approach of the Assessment

The main objective of this assessment is to understand the current status of the marine litter problem, how it is 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 first step in the project was to collect all readily available information on marine litter in the Mediterranean by researching existing literature and initiatives and contacting relevant authorities, non-governmental organizations and associations, as well as individuals, who could provide reliable data on marine litter. In parallel, a questionnaire was prepared and sent by MED POL to the Mediterranean countries, in which comprehensive information was required about marine litter in the respective countries. Replies to the questionnaire were received from fourteen countries (Bosnia and Herzegovina, Croatia, Cyprus, Egypt, France, Greece, Israel, Italy, Lebanon, Malta, Monaco, Morocco, Tunisia and Turkey). Furthermore, in the framework of this assessment exercise HELMEPA invited its member managing companies with ships travelling in or transiting the Mediterranean to implement a program for the monitoring and recording of litter floating on the sea surface based on a specially designed Data Card.

2. ASSESSMENT OF THE SCALE OF THE PROBLEM

2.1. Amounts of marine litter in the Mediterranean

2.1.1 General

The issue of marine litter and related information on the amounts and their types 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.

Collection of information from local authorities is a task that requires considerable human resources directly and indirectly related to the subject along with a sophisticated central coordination mechanism. Unfortunately, this is not the case for the Mediterranean. However, a relatively systematic and reliable source for amounts and types of litter would be 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 are the following:

- The Italian environmental organization Legambiente coordinates every spring-summer beach clean ups in the Mediterranean.

- MIO-ECSDE organizes marine litter related events, including clean-ups, 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 clean-ups in September with around 115 countries worldwide, many of which 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 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.

All of the above initiatives succeed in gathering 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 clean-ups 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 in 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.).

2.1.2 Regional surveys

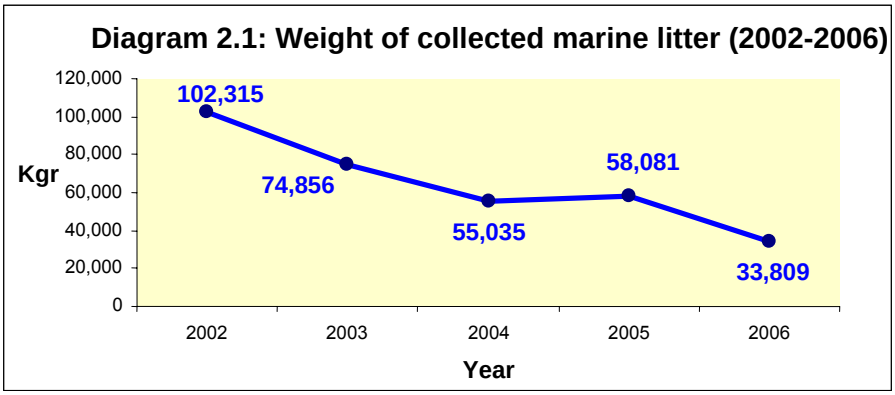
In view of the inconsistency of the surveys, the outcomes of the various initiatives as well as some deductions that would be useful in the drafting of a regional strategy on managing marine litter in the Mediterranean are presented herewith separately.

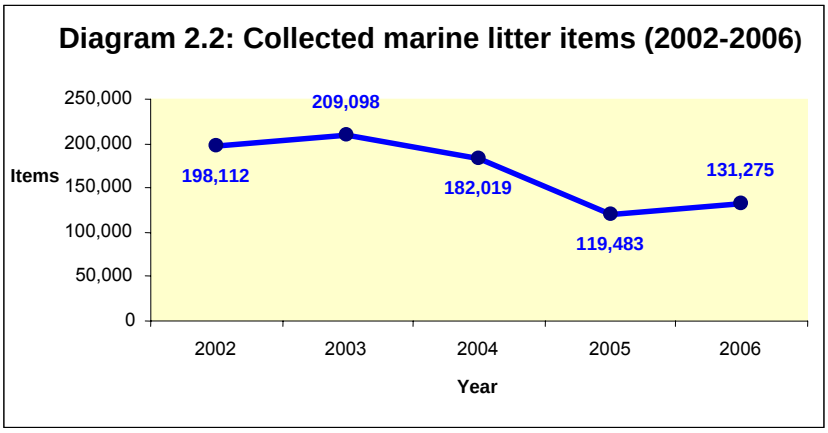
- **ICC campaign in the Mediterranean**

One of the key aspects of the ICC campaign is the recording of collected litter items on special data cards. Recorded data is analyzed to produce certain 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 2002-2006. The total data for the period under study is included in this report as Annex 1. Hereunder are the main findings from the analysis of this data.

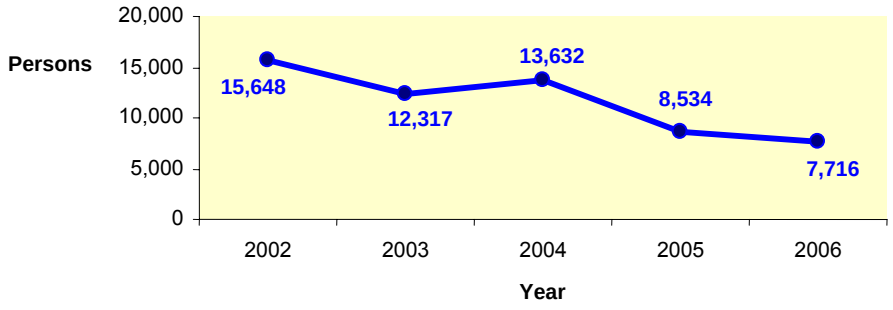
There is an overall decrease in the number of items and weight of marine litter collected in Mediterranean countries in the 2002-2006 period (diagrams 2.1 and 2.2). In general terms, this follows the decreasing trend in public participation and can be largely attributed to the latter.





Public participation in the ICC campaign in Mediterranean countries has been decreasing steadily during the 2002-2007 period (Diagram 2.3). Thus, from 15,648 volunteers participating in ICC 2002, participation reached 7,305 volunteers in ICC 2006, which corresponds to a decrease of over 50%.

Diagram 2.3: Public participation in Mediterranean ICC campaigns (2002-2006)



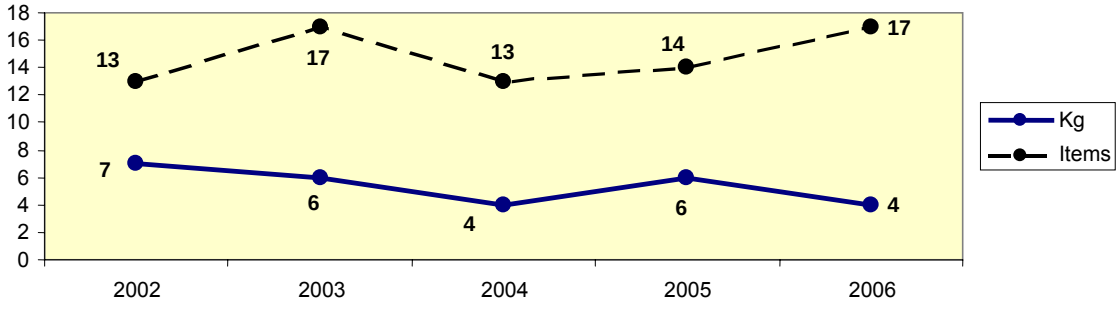
A slight increase in public participation in 2004 could be attributed to the higher number of countries (14) participating compared to the previous year (13 countries). Overall, the downward trend in public participation is closely matched by the decreasing number of Mediterranean countries participating in this global event: from 15 countries in 2002 down to 8 in 2007.

Although this declining trend can be associated with other factors, such as lack of promotion of the initiative by the organizers or country-specific circumstances i.e. political turmoil, natural catastrophes etc., it may also indicate either, or a combination of the following factors:

(i) a decrease in the environmental awareness and/or volunteer spirit of coastal inhabitants in the Mediterranean;
(ii) a shift of focus of the general public's attention to other current environmental concerns that have dominated media coverage in recent years i.e. global warming;
(iii) a reduced impact of environmental NGOs' action in the region.

Due to a number of changing variables every year i.e. number of volunteers, it is difficult to draw conclusions regarding the overall increase or decrease of marine litter in the Mediterranean during the period under study.

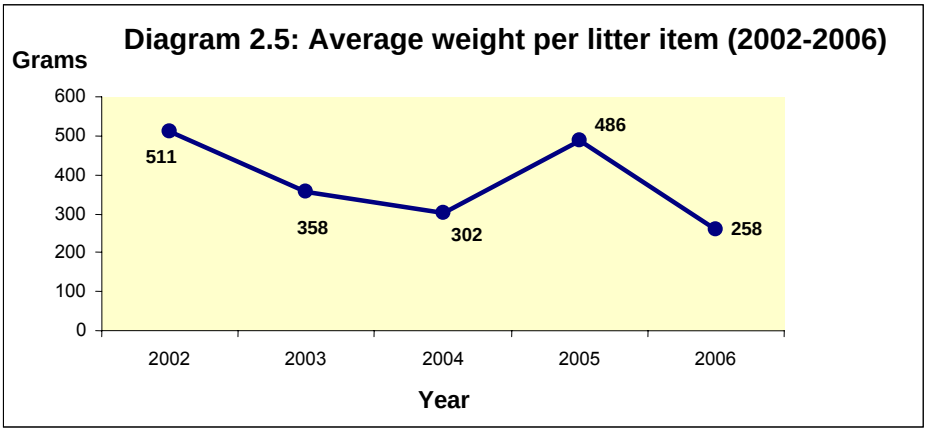
Diagram 2.4: Average litter items and weight per volunteer (2002-2006)



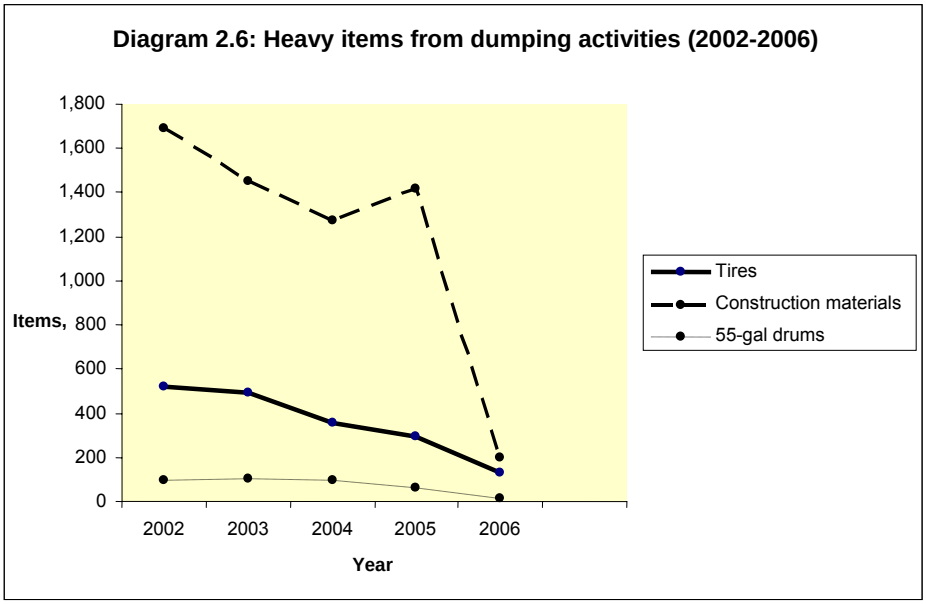
However, an interesting observation when examining the average number of litter items and weight per volunteer during the 2002-2006 period (Diagram 2.4) is that whereas the number of litter items per volunteer increases in the long run, the weight of collected litter per volunteer has a decreasing trend, with the exception of an increase between 2004 and 2005. The increase in litter items per volunteer between 2004-2005 is accompanied by an increase of the average weight per volunteer, which may indicate an overall increase in marine litter during that period. However, the following year (2006), while litter items per volunteer increase, the average weight per volunteer decreases once again rather than increases, as one would expect.

This finding indicates **that we may be facing a proliferation of lighter marine litter items in the Mediterranean e.g. plastics, aluminum and smoking-related litter, as opposed to heavier items from dumping activities e.g. household appliances, construction materials, tires, etc.**

Indeed, if we examine the average weight of litter items in the same period (Diagram 2.5), there is a steadily decreasing trend, with the exception of the 2004-2005 period. 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.

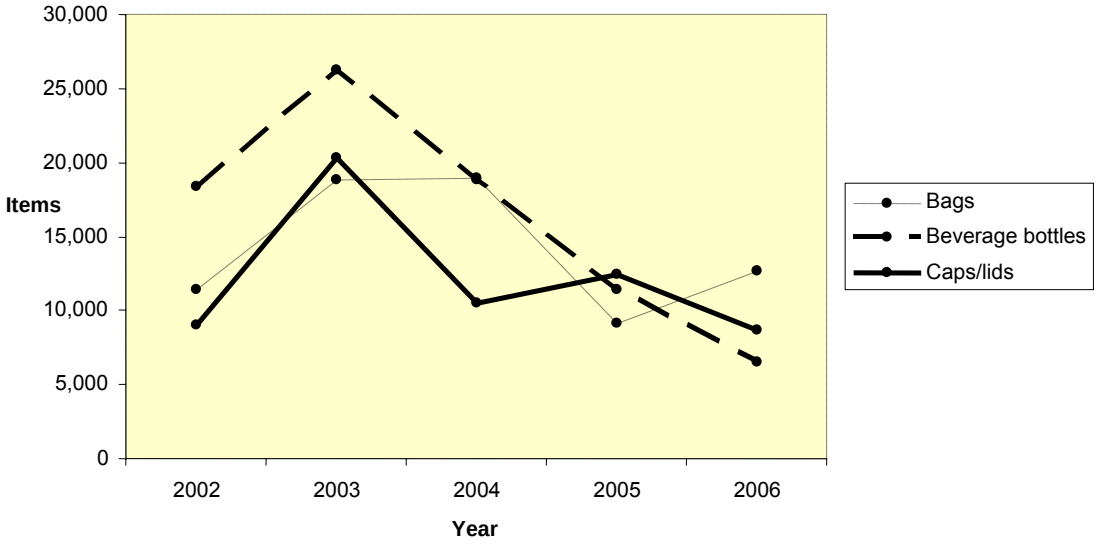


The above finding is further confirmed by an evident decrease in the number of heavy litter items resulting from dumping activities (Diagram 2.6), which particularly in the case of construction materials is severe.



There has also been a decreasing trend in the Top 3 plastic marine litter items since 2003 as we can see from Diagram 2.7. However, these can still be found in large numbers on Mediterranean beaches and in the sea and considering their highly persistent nature they constitute a major threat to the Mediterranean marine environment.

Diagram 2.7: Top 3 plastic items (2002-2006)



The decrease in heavier waste items and the predominance of lighter marine litter in the Mediterranean could be due to various factors. It may indicate a gradual increase in the environmental awareness of the general public who, conscious of the impact, do not use beaches as disposal sites for heavy garbage items so lightheartedly, as they did in the past. Therefore, the removal of these heavier items combined with the persistent nature of plastics and other lighter marine litter items which can still be found in considerable numbers in the Mediterranean, has led to the changing nature of marine litter in the region.

Another contributing factor may be the adoption and/or implementation of stricter legislation with regards to dumping activities, particularly in Mediterranean EU member-states. Or it may be due to a combination of the above and other factors beyond the scope of this study.

- ***"Clean up the Med"* and "*Clean up the World"* Results**

Diagram 2.8 presented below is based on the clean-up data submitted by "Legambiente" (2007) and "Clean up the World" (2007). This information provides a snapshot of the situation rather than a trend since the data is only for 2007. In some cases, like Turkey and France, the numbers of participating volunteers were not always recorded, while the litter collected, was recorded, grouped together and can be described as follows: Plastic, paper, cans, tins, wood, nylon bags, metal items.

Although there is participation of volunteers in most of the Mediterranean countries as indicated in 2007 (diagram 2.9) there is a lack of precise data of the litter collected. This is either due to missing data sheets or not forwarding the collected statistics to the organizing committees e.g. Turkey collected an enormous amount of litter, but did not submit the amount of volunteers.

Diagram 2.8: "*Clean up the Med*" and "*Clean up the World*" results 2007

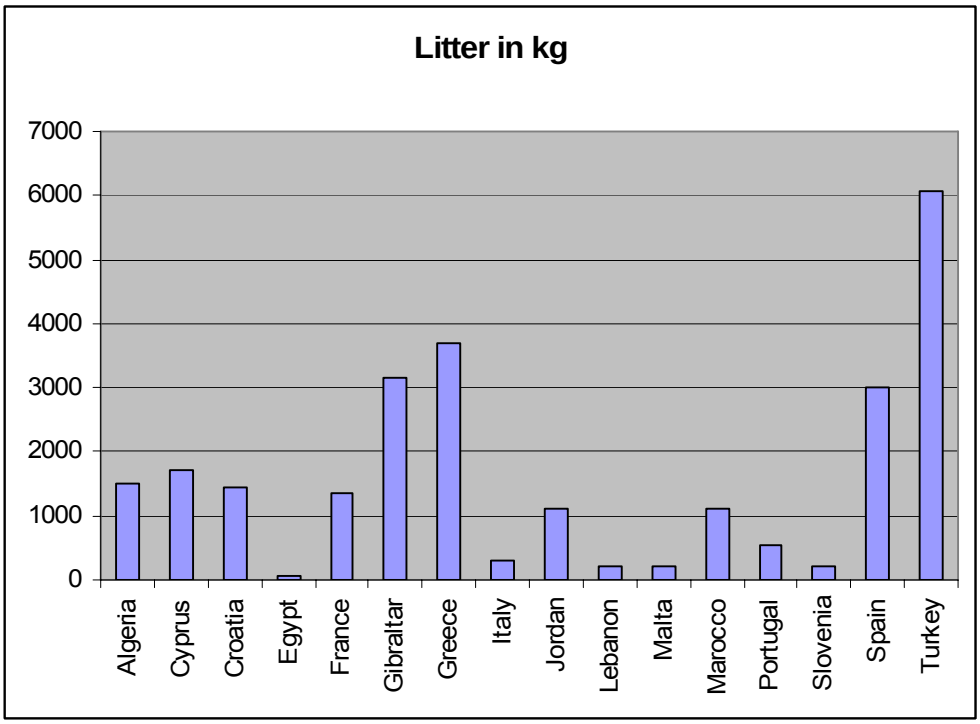
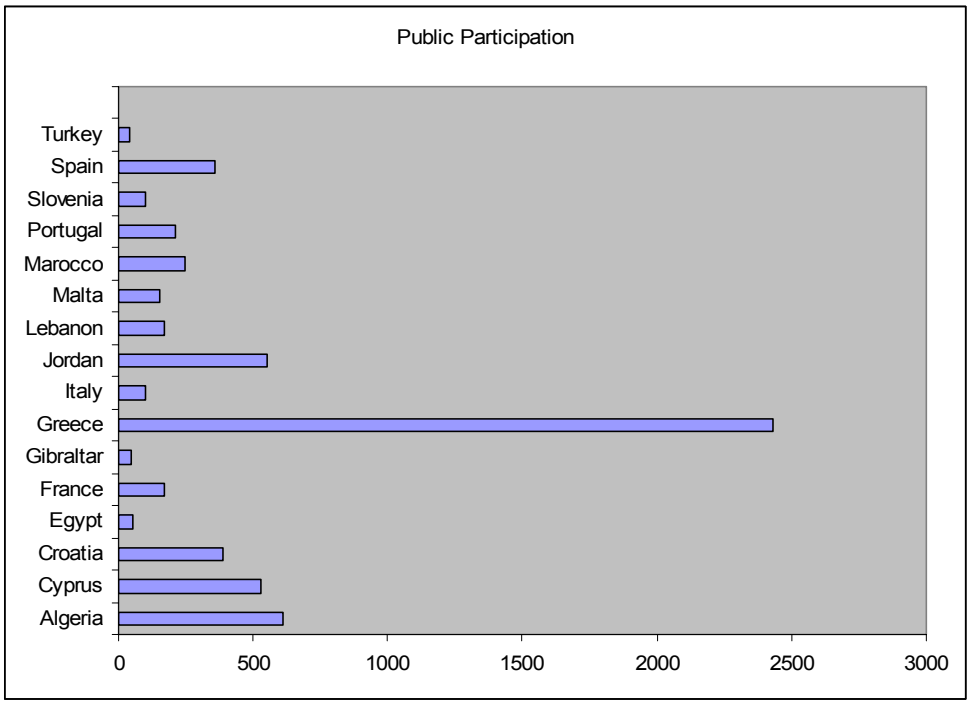


Diagram 2.9: Participation in the Mediterranean Countries (2007)

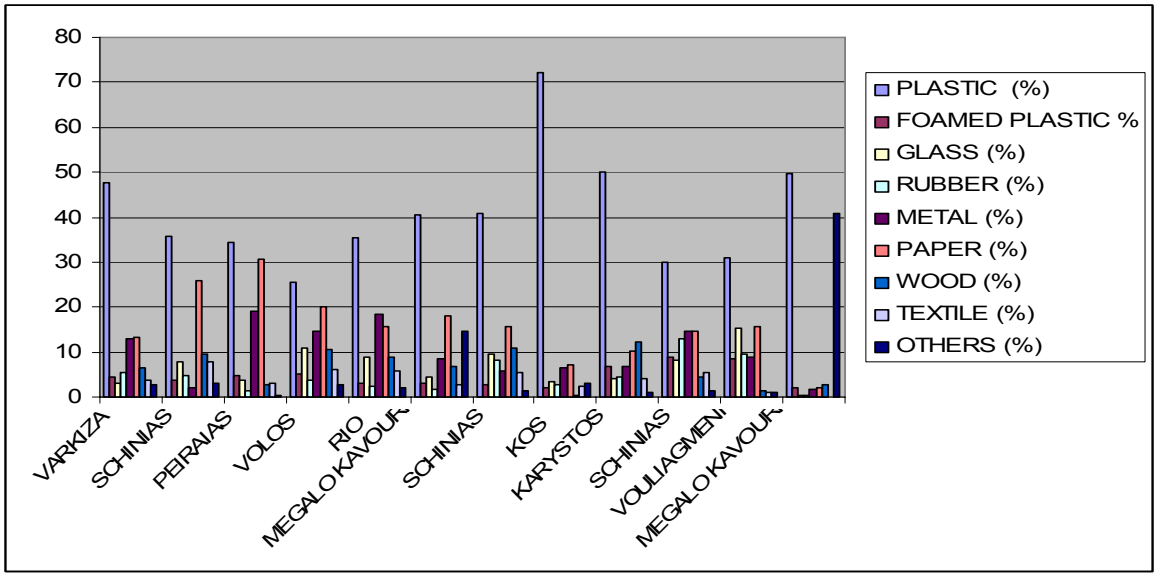


2.1.3 National Case Study

In Greece and at national level, *Clean up Greece* published an information leaflet on marine litter with an integrated data sheet for collected items while in parallel with the clean up actions it organizes educational workshops for school children on recycling and litter prevention in order to address the problem of Marine Litter in the Mediterranean. The data

sheets about the different types of litter collected for statistic purposes were filled out by participants of the environmental organization Clean up Greece (2008) during clean up actions with the following results over the period of 2004-2008:

Diagram 2.10: Beach Clean ups in Greece 2004 – 2008 (*Clean up Greece*)



As indicated in the above diagram, **plastic is the major part of litter collected by volunteers in beach areas, followed by paper.** The cause of this litter is either abandoned debris and/or, especially on islands, wind born cases. Cigarette butts, which play an important role in littering sandy beaches, are under the category "others", but usually not collected during these clean ups (unlike ICC), due to other visible and larger sized litter items. In isolated beach areas metal, rubber, glass and textile are increasing due to illegal dumping.

BOX 1: Achieving better results from clean up actions

In order to achieve better and exact results in clean up actions, volunteer groups should be informed about the necessity to submit standardized research data for statistical purposes concerning the problem of litter in the Mediterranean. Clean up actions by NGOs in the Mediterranean are usually organized to raise awareness and not so much for data collection. An integrated cleanup program in environmental education or education for sustainable development in schools for litter data research would not only increase awareness but also scientific relevance of items abandoned and their danger for our environment. Information sharing between and among NGOs and research institutes in the Mediterranean regarding litter data should be improved.

2.2 Types of marine litter in the Mediterranean

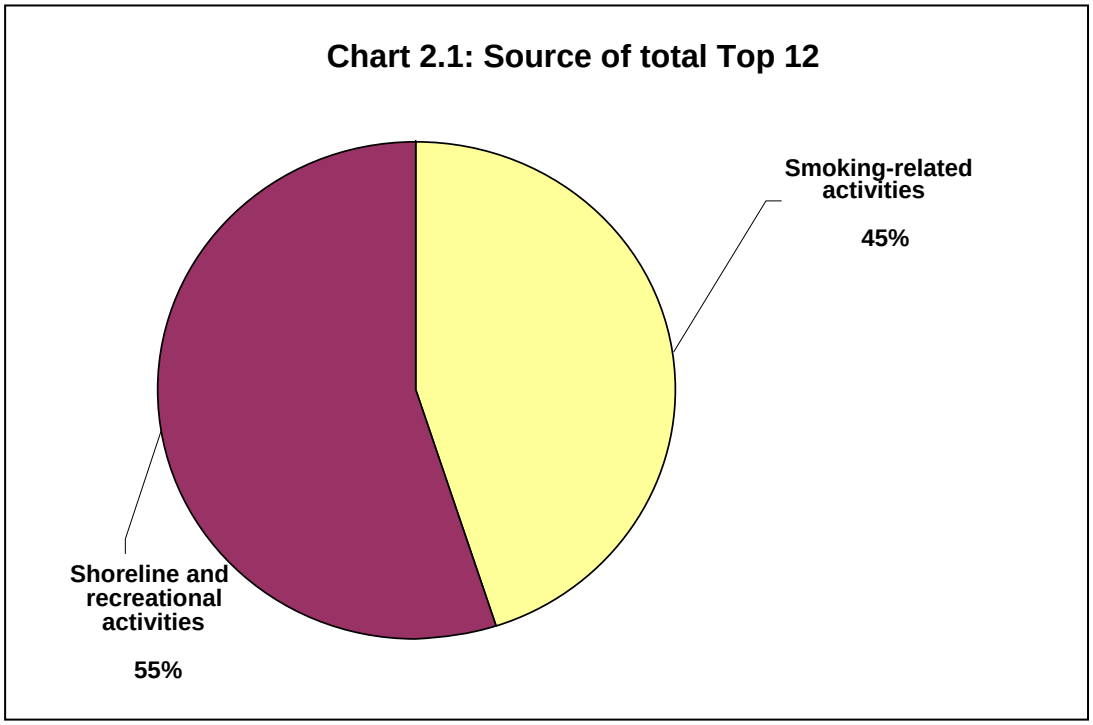
Marine litter in the Mediterranean includes a wide variety of substances also encountered in other marine and coastal areas of the world. The following information is based on data provided by the Ocean Conservancy and processed and analyzed by HELMEPA from beach cleanups in Mediterranean countries within the framework of the ICC campaign between 2002-2006.

The main types of litter found on Mediterranean beaches, floating on the sea surface or lying on the seabed are listed in Table 1 hereunder.

Table 1 **Main types of marine litter in the Mediterranean**
Plastics: bags, balloons, beverage bottles, caps/lids, food wrappers/ containers, six-pack holders, straws/stirrers, sheeting/tarps, tobacco packaging and lighters
Glass: beverage bottles, light bulbs
Paper and cardboard of all types
Metals: aluminum beverage cans, pull tabs, oil drums, aerosol containers, tin cans, scrap, household appliances, car parts
Polystyrene: cups/plates/cutlery, packaging, buoys
Cloth: clothing, furniture, shoes
Rubber: gloves, boots/soles, tires
Fishing related waste: abandoned/lost fishing nets/line and other gear
Munitions: shotgun shells/wadding
Wood: construction timber, crates and pallets, furniture, fragments of all the previous
Cigarette filters and cigar tips
Sanitary or sewage related litter: condoms, diapers, syringes, tampons
Other: rope, toys, strapping bands

Table 2 presents the Top 12 marine litter items collected from Mediterranean beaches and the seabed during ICC campaigns in the 2002-2006 period, which account for over 89% of total marine litter.

Table 2 **Top 12 marine litter items in Mediterranean (2002-2006)**		
Item	**Counts**	**%**
Cigarettes/Cigarette filters	222,563	27
Cigar tips	86,146	10
Plastic bottles 2 lt 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	15,488	1.9



As indicated by the above Chart, **55% of the Top 12 litter items originate from shoreline and recreational activities including mainly plastics (bottles, bags, caps/lids etc.), aluminum (cans, pull tabs) and glass (bottles)**.

These litter items are highly persistent and do not degrade quickly in the environment, which allows them to continue increasing over time and to travel vast distances with sea currents and winds, impacting the remotest parts of the Mediterranean.

The remaining 45% of the Top 12 marine litter for the 2002-2006 period 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%) and is certainly an area that has to be addressed by policy makers and targeted by awareness raising campaigns.**

By far the No. 1 marine litter item 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 2002-2006, which corresponds to almost 4 cigarette filters per volunteer, while the global average in 2006 was only 0.2 cigarette filters per volunteer.

Collection of marine litter – *Clean up Greece*

Table 3 below provides an indication of the necessary time for the decomposition of various litter items in the marine environment. It is worth noticing the fact, still unknown to the majority of the public, that it may take between 1-5 years for a cigarette filter to decompose in the marine environment. The slow decomposition of cigarette filters is mainly due to contained substances such as foamed plastic and chemicals, which may also cause serious health problems to marine fauna and flora.

Table 3

How long does it take for marine litter to decompose?

glass bottle	1 million years
fishing line	600 years
plastic bottle	450 years
aluminum can	80-200 years
rubber boot sole	50-80 years
plastic cup	50 years
tin can	50 years
nylon fabric	30-40 years
plastic bag	10-20 years
cigarette filter	1-5 years
woolen clothes	1-5 years
plywood	1-3 years
waxed milk carton	3 months
apple core	2 months
newspaper	6 weeks
orange peel	2-5 weeks
paper towel	2-4 weeks

Source: The Ocean Conservancy, "Pocket Guide to Marine Debris", 2005.

2.3 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 to implement a program for the monitoring and recording of litter floating on the sea surface.

A specially designed Data Card (Annex 2) for the recording of marine litter at sea along with the publication *"Public Awareness for the Management of Marine litter in the Mediterranean"* and an invitation letter to contribute to the study was sent to the following HELMEPA members and other stakeholders of the maritime community.

Maritime stakeholders
104 shipping companies-members of HELMEPA managing 446 member- vessels (tankers, dry cargo carriers, container and passenger vessels)
Association of Greek Coastal Shipping Companies
Association of Greek Passenger Shipping Companies
Panhellenic Seafarers Federation
Union of Greek Shipowners
Union of Shipowners of Mediterranean Cargo Vessels

The Association of Greek Passenger Shipping Companies, the Panhellenic Seafarers Federation and the Union of Greek Shipowners sent notification to HELMEPA that they forwarded the data cards to their members with instructions to contribute to the study.

Between the period February – April 2008 14 reports were received by 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 down to the Suez Canal. In total, observations of 1,051.8 nautical miles (n.m.) of Mediterranean Sea resulted in the recording of 500.8 Kg of marine litter.

The response is considered positive taking into consideration the following elements:

- only a segment of HELMEPA member-vessels travel in or transit the Mediterranean,
- limited timeframe available for the implementation of the study, and
- inhibiting factors associated with ships' operation i.e. limited spare time for crew to engage in litter monitoring activities, adverse weather conditions, etc.

Annex 3 provides details of HELMEPA member-vessels that participated in the survey while Map 1 depicts the surveyed sea areas in the Mediterranean. The recorded amounts and types of marine litter are presented in Tables 4 and 5.

Hereunder are the main findings from the analysis of the recorded data.

- The total length of observation for floating marine litter carried out by HELMEPA member vessels was 1,051.8 nautical miles (1,947 kilometers) corresponding to an area of observation of around 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

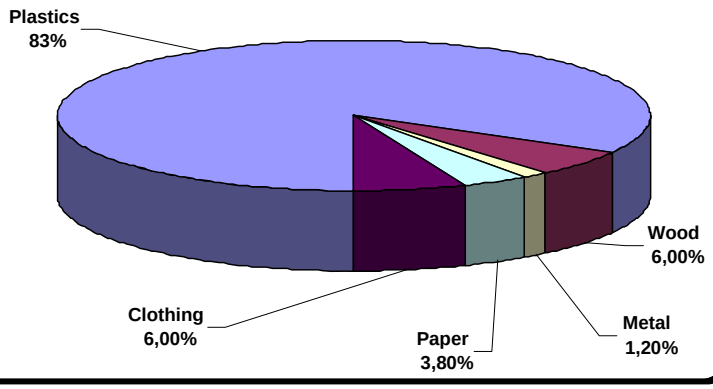
Mediterranean Levantine Sea), in the Alboran Sea between Spain and Morocco, and in the Adriatic Sea.

- The total number of items of marine litter that was recorded was 366 items corresponding to a concentration of one item per 3 n.m. or 2.1 items per km^2. The concentration of marine litter ranged from 0.08 to 71 items/n.m. Relatively higher concentrations of marine litter were observed along routes close to coastal areas while there were cases where lengthy observations (more than 120 n.m.) revealed no existence of marine litter.

- Plastics accounted for about 83.0% of marine litter items, while all other major categories (textiles, paper, metal and wood) accounted for about 17%, as the following graph shows.

Chart 2.2: Major types of marine litter

(in terms of number of items observed)



- 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 the following, conservative assumptions.

    - Each **rope** piece was considered to be made of synthetic material (polypropylene or polyester with a diameter more than 45mm) corresponding to a length of 10 meters and weighing 15.5 kg.
    - Each **pallet** was considered to be a standard rough wooden pallet 0.8 m long, 1.2 m wide and weighing 15 kg.
    - Each **buoy** was considered to be made of PVC or other plastic with a diameter of about 0.3 m and weighing 3.5 kg.
    - Each assembly of **fishing nets** was considered to be made of polyethylene weighting 0.2 kg.
    - Each **metal drum** was considered to be an empty 55 gallon steel drum weighing 15.0 kg.
    - Each **paperboard** item was considered to have a dry weight of 0.18 kg while for the other plastics, standard commercial packaging materials were taken into account.

Map 1
Surveyed sea areas by HELMEPA member-vessels
in the Mediterranean Sea

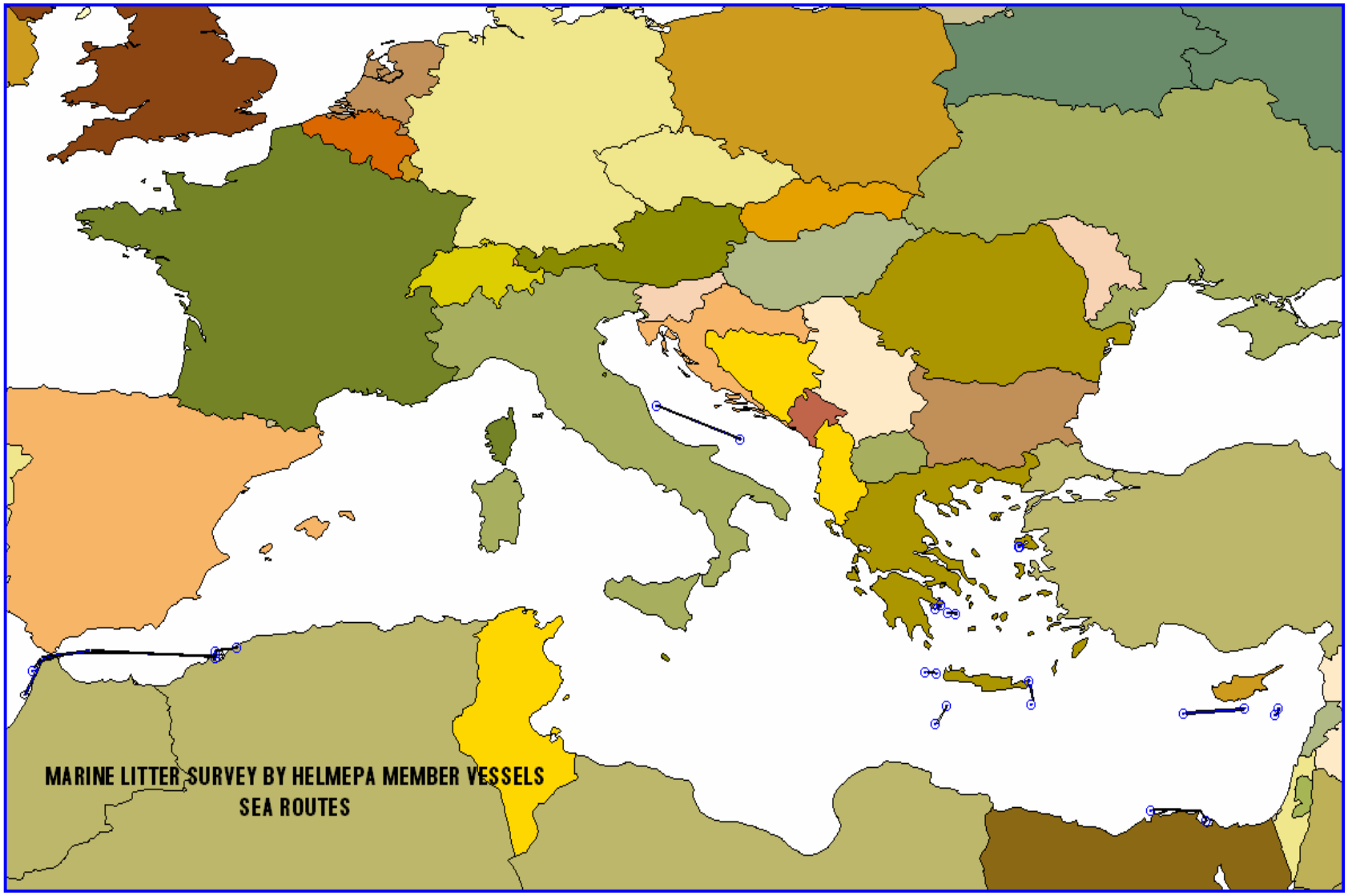
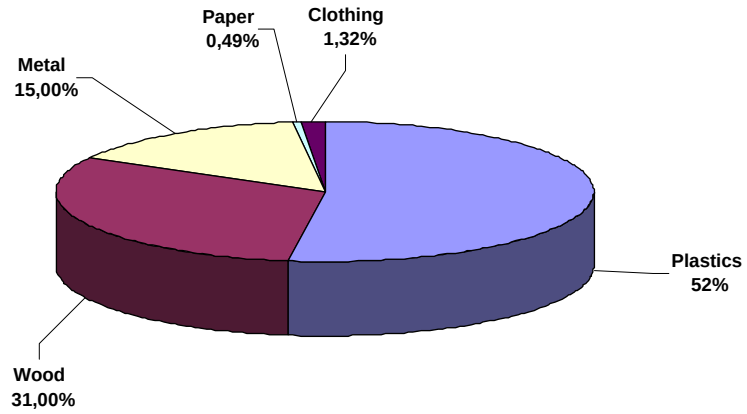


	Table 4: Number of items recorded Marine Litter Survey by HELMEPA Member Vessels											
Sea area surveyed	**Fishing Nets**	**Wooden Pallets**	**Plastic Packaging**	**Ropes**	**Plastic Bags**	**Clothing**	**Steel Drums**	**Wooden trace**	**Buoys**	**Paperboard boxes**	**Plastic bottles**	**Plastic containers**
Mytilini sea (Northeastern Mediterranean)			**50**			**6**			**5**		**10**	
Saronikos Gulf (off Athens)			**25**		**30**						**8**	**4**
Mirtoon Sea (South Aegean)								**1**				
Off South Cyprus	**6**								**8**			**2**
East coast of Crete												**1**
Myrtoon Sea (South Aegean)	**3**											**2**
West Mediterranean		**2**	**3**	**1**	**10**		**1**		**8**			
Off Algeria				**5**					**6**			
Gibraltar					**30**							
Off Egypt	**3**	**2**			**1**		**1**		**3**			
Adriatic Sea					**9**	**6**			**5**	**12**	**9**	**6**
South Crete		**2**					**3**	**12**			**4**	

Table 5: Approximate Weight of Items Recorded (kilograms) Marine Litter Survey by HELMEPA Member Vessels													Kgrs	km² of sea surface surveyed	Kgrs/km²
Sea area surveyed	**Fishing Nets**	**Wooden Pallets**	**Plastic Packaging**	**Ropes**	**Plastic Bags**	**Clothing**	**Steel Drums**	**Wooden trace**	**Buoys**	**Paperboard boxes**	**Plastic bottles**	**Plastic containers**			
Mytilini sea (Northeastern Mediterranean)			25.0			1.8			17.5		0.2		44.5	0.185	240.0
Saronikos Gulf (off Athens)			12.5		0.1						0.16	0.8	13.56	0.55	24.6
Mirtoon Sea (South Aegean)								2.5					2.5	0.92	2.7
Off South Cyprus	1.2								28			0.4	29.6	18.7	1.5
East coast of Crete												0.2	0.2	5.18	0.03
Myrtoon Sea (South Aegean)	0.6											0.4	1.0	3.51	0.28
West Mediterranean		30	1.5	15.5	<0.1		10.8		28				85.9	53.8	1.5
Off Algeria				77.5					21				98.5	1.29	76.3
Gibraltar					0.1								0.1	50	0.002
Off Egypt	0.6	30			<0.1		10.8		10.5				51.9	5.7	9.1
Adriatic Sea					<0.1	1.8			17.5	2.1	0.18	1.2	22.78	8.3	2.74
South Crete		30					32.4	30.0			0.08		92.48	0.04	2312.0
													500.8	150.575	

- The average quantity of marine litter was estimated to be 230.8 kg/km^2 ranging from 0.002 to 2,627.0 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/n.m.

Chart 2.3: Quantities of major types of marine litter



- **The survey verified the overwhelming presence of plastics in the Mediterranean Sea both in terms of number of items observed and mass estimation**. Safe 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 relatively easily carried by wind and currents and can circulate in the open sea.

- It should be noted that most types of plastics contain additives in their polymer matrix offering an extended product life, better protection against heat, light or chemicals. Their concentration in the plastics depends to a great extent from less than 1% (foaming agents) to 40% (flame retardants, plasticizers and stabilizers) and the slow degradation of plastics at sea might cause leaching of these additives, e.g. heavy metals (see section 3.2 “Secondary pollution from marine litter”).

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 analyze data on litter at sea provided by member-vessels with the view to present it at international fora in which the Association participates.

The findings of this study will also be presented to the Correspondence Group for the Review of MARPOL Annex V of the International Maritime Organization, in which HELMEPA participates.

2.4 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 centers, 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.

According to the Joint Group of Experts on the Scientific Aspects of Marine Environmental Pollution (GESAMP) (1991), land-based sources account for up to 80 percent of the world's marine pollution. Much of the litter reaches the ocean by beach-going activities, being blown into the water, or is carried by creeks, rivers, and storm drains/sewers to ocean areas. Other litter comes from activities on the water, including vessels (from small sailboats to large ships), offshore drilling rigs and platforms, and fishing piers.

As this study is primarily based on the analysis of data collected within the framework of the ICC campaigns in Mediterranean countries, the classification system used is based on that applied by the *Ocean Conservancy*. According to the latter, cleanup coordinators record the litter they collect in the source-based categories listed in Table 6.

Table 6

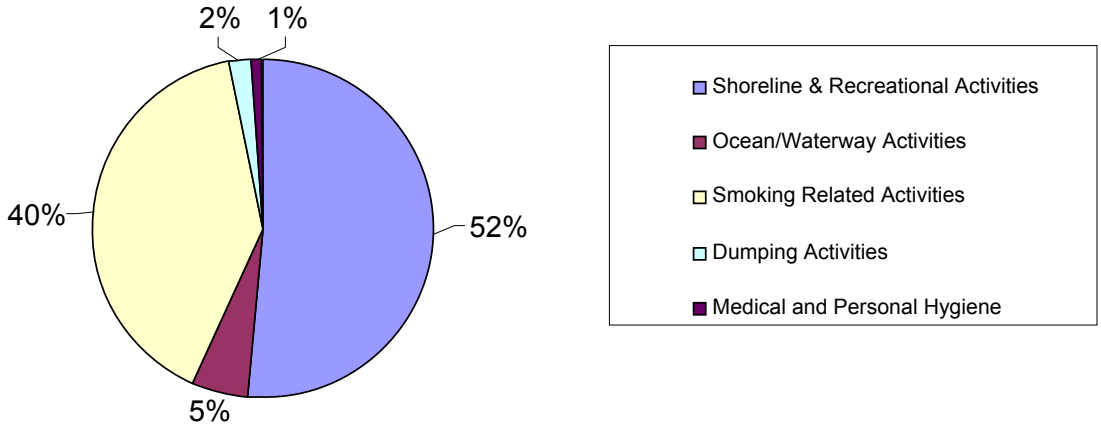
Classification of marine litter by source
(in accordance with *Ocean Conservancy's* ICC campaign – with minor adjustments)

Shoreline and Recreational Activities
Litter from land-based activities such as fast food consumption, beachgoers, picnics, sports and recreation, festivals, as well as litter washed from streets, parking lots and storm drains and as a result of poor waste disposal schemes and illegal dumping. Litter items classified in this category include plastic bags, balloons, beverage bottles (plastic & glass) and aluminum cans, caps/lids, clothing, cups/plates/forks/knives/spoons, food wrappers/containers, pull tabs, shotgun shells/wadding, six-pack holders, straws/stirrers and toys
Sea/Waterway Activities
Recreational fishing and boating, commercial fishing, cargo/military/passenger and cruise ship operations and offshore industries such as oil drilling. Litter items included bait containers, bleach/cleaner bottles, buoys/floats, crab/lobster/fish traps, crates, fishing nets and lines, fishing lures/light sticks, light bulbs/tubes, oil/lube tubes, pallets, plastic sheeting, rope and strapping bands.
Smoking-Related Activities
Improper disposal of cigarette filters, cigar tips, lighters and tobacco product packaging is common on both land and sea.
Dumping Activities
Legal and illegal dumping of construction materials, large household items, etc. often results in coastal litter. Other litter items classified in this category include batteries, cars/car parts, tires and 55-gal drums.
Medical/Personal Hygiene
This litter can result from people improperly disposing of waste in toilets and city streets. Since medical and personal hygiene litter often enters the waste stream through sewer systems, its presence on the beach can indicate the presence of other, unseen pollutants. Litter items classified in this category includes condoms, diapers, syringes and tampons.

It should be noted that this classification system has certain drawbacks i.e. litter from food consumption is included only in the *Shoreline and Recreational Activities* category, whereas in reality it can also be from crews/passengers on board all types of vessels and boats. However, this system provides a good overall basis for classifying marine litter items according to the activities that produce them and for monitoring their increasing/decreasing trend.

Chart 2.4 presents the sources of marine litter in the Mediterranean for the 2002-2006 period in accordance with data provided by Ocean Conservancy and analyzed by HELMEPA (as referred in Chart 2.1 for the top 12 litter items)

Chart 2.4: Sources of marine litter (2002 - 2006)

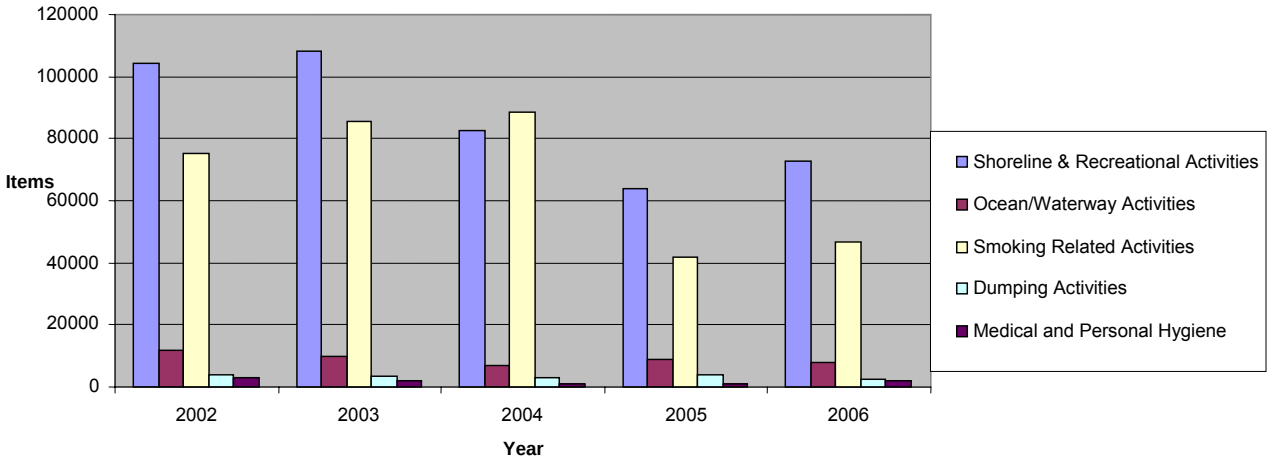


According to the analysis of data collected between 2002-2006, **52% of marine litter in the Mediterranean originates from shoreline and recreational activities.** In general terms, **this figure is in line with the global average.** As we can see in Chart 2.5, shoreline and recreational activities were the main source every year of the period under study except for 2004, when it was surpassed by smoking-related waste.

Marine litter from smoking related activities accounts for 40% of total marine litter in the same period. Although the number of litter items from smokers dropped significantly between 2004-2005, since 2005 it is on the rise again. The figure for the 2002-2006 period in the Mediterranean **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 worrying observation when looking at Chart 2.5 is that marine litter from shoreline and recreational activities and from smoking-related activities continues to increase between 2002-2003 and 2005-2006 despite the considerable decrease in the numbers of volunteers participating in the ICC campaigns in Mediterranean countries in the same years.

Chart 2.5: Sources of marine litter by year (2002 - 2006)



Sea and waterway activities account for 5% of marine litter in the Mediterranean and have remained steadily low throughout the period under study. This could be largely 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 improved in recent years.

Prohibitions regarding the disposal of solid wastes are particularly strict in sea areas with special characteristics, such as the Mediterranean, which is termed a Special Area under the MARPOL International Convention. The Marine Environment Protection Committee (MEPC) of the International Maritime Organization (IMO) at its 57th Session (31st March – 4th April 2008), has adopted an MEPC resolution establishing the date on which the MARPOL Annex V (Regulations for the Prevention of Pollution by Garbage from Ships) special area regulations shall take effect in the Mediterranean Sea. MEPC decided that the discharge requirements for special areas of MARPOL Annex V shall take effect, for the Mediterranean Sea, on **1st May 2009**. Consequently, **for all ships, as from 1st 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.

BOX 2: The Mediterranean Sea as a *Special Area* under Annex V of the International Convention for the Prevention of Pollution from Ships (MARPOL)

Although the Mediterranean Sea was designated as a Special Area under Annex V of the International Convention for the Prevention of Pollution from Ships (MARPOL), the special area status of the Mediterranean Sea had not yet taken effect, as, according to MARPOL Annex V, the Government of each Party to the Convention, the coastline of which borders the special area in question, should notify the International Maritime Organization (IMO) that adequate reception facilities are provided in its ports within the special area.
Between 2002 and 2004, a technical assistance regional project financed by the European Commission's MEDA Fund related to port reception facilities in the Mediterranean region ("Port reception facilities for collecting ship-generated garbage, bilge waters and oily wastes – MED.B7.4100.0415.8)" was implemented by the Regional Marine Pollution Emergency Response Centre (REMPEC) of the Mediterranean Action Plan in ten Mediterranean coastal States. Moreover, REMPEC carried out similar activities in other Mediterranean countries.
The results of the assessment carried out in relevant ports within the framework of these REMPEC activities concluded that adequate port reception facilities for garbage were provided. Thus, the conditions required for the special area status of the Mediterranean Sea to take effect with regard to MARPOL ANNEX V were in practice being met.
In view of this, the 8th Meeting of REMPEC Focal Points (Malta, 7-11 May 2007), agreed that the Mediterranean coastal States Parties to the MARPOL Annex V present a joint submission to the IMO's MEPC, notifying that adequate reception facilities for garbage were provided in their respective ports. The Meeting also accepted the proposal of Cyprus to present the relative joint submission to MEPC, and agreed to entrust REMPEC to co-ordinate this initiative at regional level. Subsequently, the Centre prepared and co-ordinated the co-sponsorship of the relative document which was submitted to the last session of MEPC by Cyprus on behalf of Albania, Algeria, Croatia, Cyprus, Egypt, France, Greece, Italy, Lebanon, Malta, Monaco, Montenegro, Morocco, Slovenia, Spain, Syria and Tunisia.

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 shoreside 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, customs regulations, etc. Furthermore, coastal municipalities must make sure that the waste left in reception facilities is properly taken care of 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 harbors and marinas where even greater problems exist.

Equally low are the figures for marine litter relating to ***dumping activities and medical/personal hygiene*****,** which are 2% and 1% respectively.

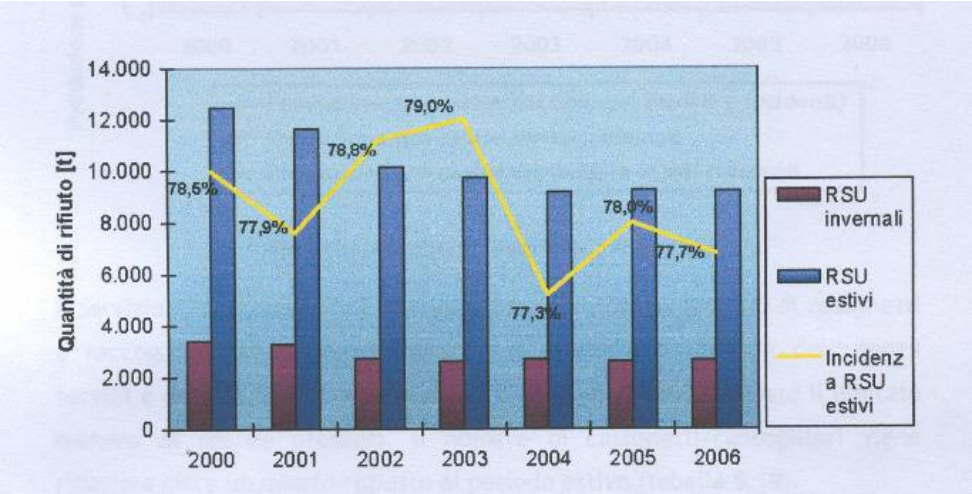
From the above evidence, it is clear that **marine litter from shoreline and recreational activities and from smoking related activities are two areas for priority action by regional policies or awareness raising campaigns in the Mediterranean.**

Marine litter from **shoreline and recreational activities** has its root cause in the fact that the situation of solid waste management in most Mediterranean countries is still very poor. Funding, awareness and participation of individuals and good practices are insufficient in this area. 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.

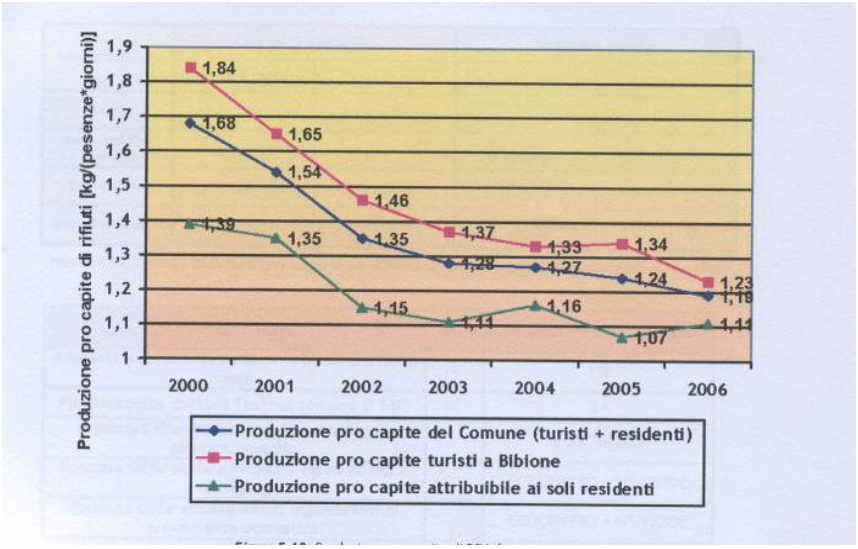
The overall goal in the Mediterranean should be to meet the main objectives of the Global Programme of Action for the Protection of Marine Environment from Land-based Activities (GPA) on marine litter, i.e. to establish controlled and environmentally sound facilities for receiving, collecting, handling 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 collection and recycling of litter. Reduction of waste at source, reuse, recycling (including composting), energy recovery, and proper landfilling 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 that were sent to them in the framework of this assessment have responded that most of the above are priorities in the waste management schemes under development (see chapter 5).

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 revenue is 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 summer season the inhabitants of seaside towns sometimes are twice as much as in wintertime. In some tourist areas more than 75% of the annual waste production is generated in summer season. According to statistics from holiday destinations in the Mediterranean (Bibione/Italy and Kos/Greece – see figures below)) tourists generate an average of 10% to 15% more waste than inhabitants.

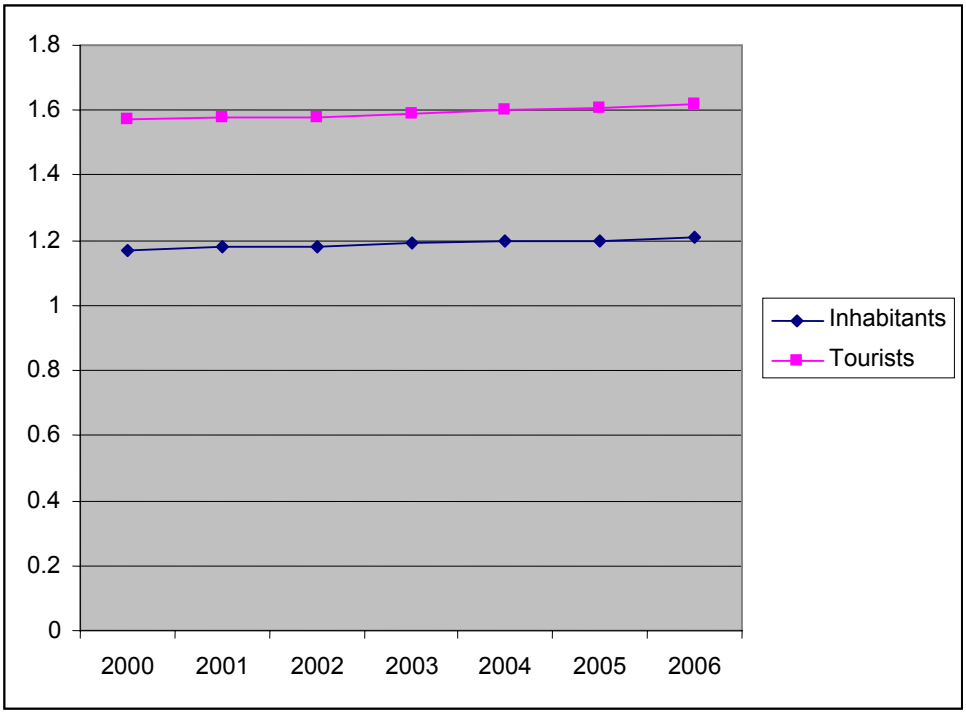


Total waste production in t in Bibione/Italy

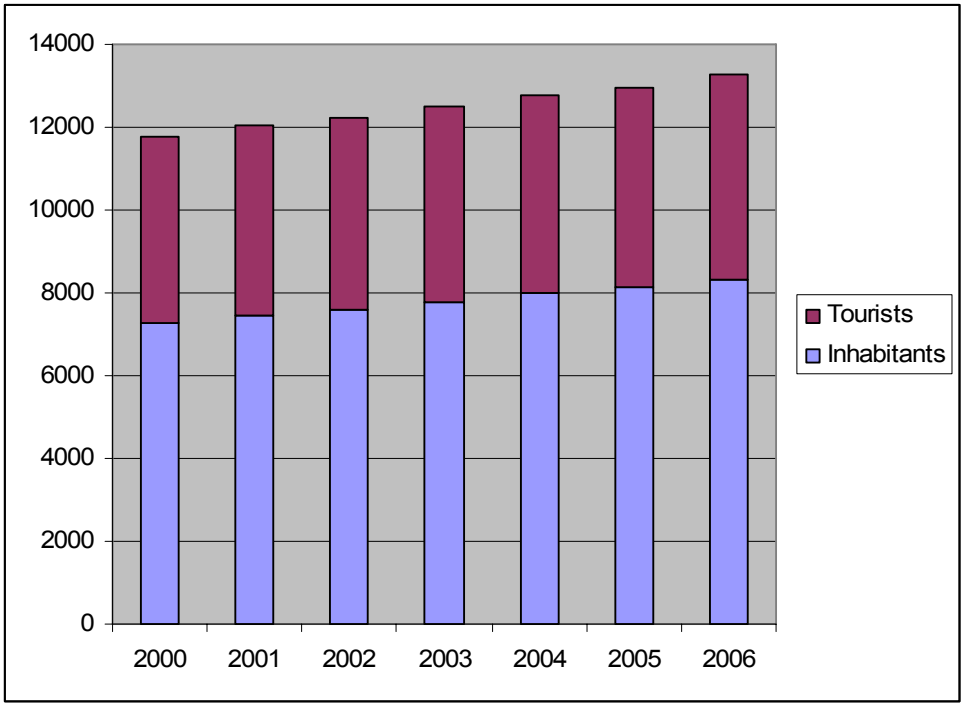


Waste production per capita (tourists and residents, tourists only, residents only) in Bibione/Italy

(Source: Comune di San Michele al Tagliamento, 2006)



Waste production per inhabitant and tourist/day in kg on the Island of Kos/Greece

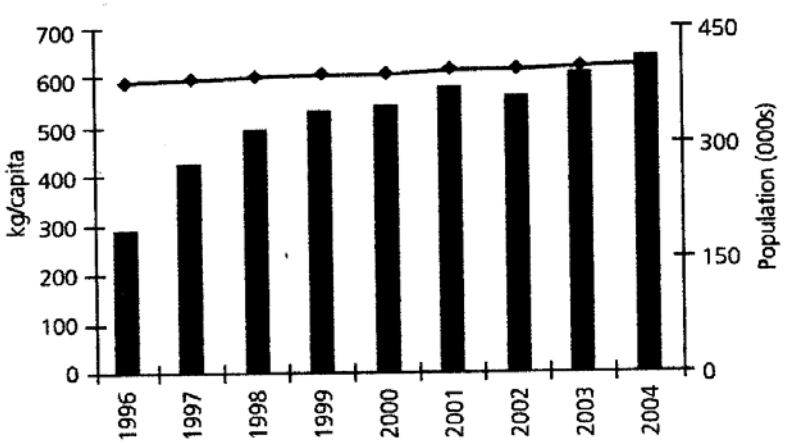


Total waste production in t on the Island of Kos/Greece

(Source: Municipality of Kos, 2007)

Given the fact that the tourism period of Kos is from April to October, 70% of the total waste is produced in the tourism season. The data is based on a research of the Municipality of Kos in 1991, updated in 2001, with an estimation of 0,5% of augmentation for the following years.

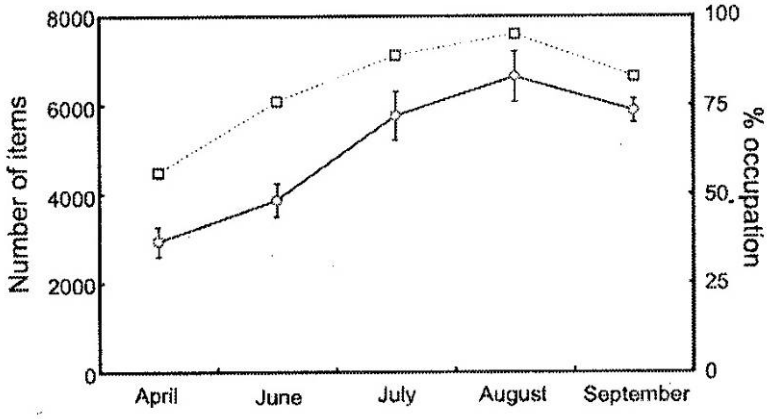
Malta, where over 20% of its GNP is generated from tourism, realized an increase of packaging (37% of municipal solid waste) in 2004 and introduced “bring-in sites” with 400 stations installed by 2006 (State of the Environment Report Malta, 2005). Unfortunately no new data regarding the results of the introduction is yet available and the latest report from 2005 still shows an increasing waste production per capita and tourism.



Population and municipal waste generated per capita in Malta

(Source: State of the Environment Report Malta, 2005)

Research funded by the Balearic Government in 2005 (Martinez-Ribes *et al.*, 2007) focused on the origin and abundance of beach debris in the Balearic Islands, including Mallorca, Menorca and Ibiza, main areas of tourism destination. 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 summertime is twice as much as in winter.



Monthly variation of debris items (open circle) and percentage of hotel occupation for the corresponding date (squares) in the Balearic islands

(Source: (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% reduction of littered beaches. Raising public awareness with leaflets and competitions in tourism and public areas supported the strategy and the ongoing efforts will be continued on a yearly basis to tackle the litter problem on the shorelines of Israel (see also chapter 4).

The above cases however demonstrate that there is a lack of standardization and compatibility between methods used and therefore only an estimation of the different results in the Mediterranean is possible. In areas where environmental programs are integrated in tourism and municipal management, there is a visible reduction in waste production.

Awareness campaign on how to avoid plastic litter in the Mediterranean - *Association for the Protection of Nature and the Environment (APNEK)*

As Table 7 shows, the countries belonging to the Facility for Euro-Mediterrenean Investment and Partnership (FEMIP) countries (Algeria, Egypt, Israel, Gaza/West Bank, Jordan, Lebanon, Morocco, Syria, Tunisia) and Turkey have seen outstanding tourism development over the last five years. Despite political unrest in some of the Mediterranean Partner Countries, the total annual average growth rate in 2006 was 12%, measured in terms of tourist arrivals, with tourist expenditure increasing even faster. These growth rates are impressive in that they are double the world average.

These facts are outlined in a summary sheet prepared by FEMIP (2007), based on a recently completed analysis of the tourism strategies and policies of the nine Mediterranean partner countries, plus Turkey, prepared by the European Investment Bank (EIB) (http://www.euromedinfo.eu/site.168. news.en.3750.html)

Table 7

Predicted Tourist Arrivals in FEMIP Countries 2006 to 2010

Country	Tourist Arrivals 2006 Millions	Annual Average Growth % 2001 -2006	Tourist Arrivals 2010 Millions	Annual Average Growth % 2006-2010
Algeria	1.4	11.2	2.7	14.4
Egypt	9.1	14.8	12.2	7.5
Gaza/West Bank	Na	Na	Na	Na
Israel	1.8	13.3	2.4	10.7
Jordan	3.2	6.5	4.7	10.0
Lebanon	1.1	11.7	1.6	14.9
Morocco	6.6	8.5	10.0	19.4
Syria	8.0	24.0	12.6	16.3
Tunisia	6.6	5.4	8.7	7.0
Turkey	19.8	15.5	33.2	15.0
Total	**57.6**	**12.2**	**88.1**	**11.6**

.Source: FEMIP governments' predictions

However, Tourism needs a clean environment. Therefore the efficient handling of solid waste is a key issue in the planning of tourism zones and in the requirements/regulations by governments to the tourism developers. With globalisation 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 above mentioned FEMIP study, Governments may be in a weak position, with local travel and tourism becoming reliant on international tour operators and developers. A closer partnership between public and private sectors at the local and national levels will be required to establish a win-win situation with local and national interests. 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.

Big tourism companies, such as "TUI" with cooperation 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. This data is kept for internal use only, but still changes are visible. 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 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.

3. ELEMENTS ON THE ENVIRONMENTAL EFFECTS AND SOCIO-ECONOMIC LOSS OF MARINE LITTER IN THE MEDITERRANEAN

Even the remotest parts of the Mediterranean are affected by marine litter. The impacts of marine litter on the environment and coastal communities are multi-faceted. It spoils the landscape and may affect the marine ecosystem. Pollutants contained in litter are extracted and diluted into rainwater, freshwater or marine water (see "Assessing secondary pollution from marine litter" below) and may enter the food chain. Marine litter constitutes a major source of aesthetic pollution on Mediterranean beaches, which has a major impact on tourist inflow to an area and results in costly cleanup activities.

3.1 Impacts on wildlife and humans

Besides being an eyesore, marine litter also poses hazards and dangers for wildlife and people. Marine litter kills more than one million seabirds and 100,000 marine mammals and turtles each year. Unfortunately, every year ICC volunteers find a variety of marine wildlife species entangled in or injured by marine litter items. Although Box 3 refers to some very interesting impacts of litter on the Mediterranean marine ecosystem, there is a general lack of available data on marine wildlife in the Mediterranean. It is therefore interesting to see the most recent statistics released by the Ocean Conservancy based on the findings of ICC 2007.

In 2007, 378,000 ICC participants in 76 countries worldwide encountered 237 entangled animals. Birds represented nearly 35% of entangled wildlife followed by fish (27%), invertebrates (20%) mammals (almost 13%) reptiles (almost 5%) and amphibians (less than 1%). Discarded monofilament fishing line is perhaps the single-most dangerous litter item accounting for 65% of entanglements found during ICC 2007. In fact, derelict fishing gear, which includes fishing line, nets, rope, lures and light sticks, and crab/lobster/fish traps, represented 72% of all entanglements.

A detailed account of the ICC 2007 findings regarding entanglements of marine wildlife worldwide is presented in Table 8 hereunder.

Table 8

ICC 2007 - Entangled animals worldwide

Type of litter	Invertebrates	Fishes	Reptiles	Birds	Mammals	Amphibians	Total	Percentage
Ballon 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	0	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%**	

BOX 3: The impact of Marine Debris on Marine Ecosystems (Galil, 2006)
Source: Galil/National Institute of Oceanography (Israel)

When settled on the seafloor marine debris alters the habitat, either by furnishing 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. Near the Maltese islands, where high concentrations of floating debris were found near busy shipping lanes, a small turtle was seen at the surface attempting to swim with a large piece of what appeared to be plastic sheet wrapped around its shell. A study of the loggerhead sea turtle*, Caretta caretta*, found that 8 of the 92 turtles inadvertently caught by Maltese fishermen were affected by marine debris. The turtles examined had ingested transparent, milky white or light blue plastic, styroform and nylon debris, possibly mistaking them for jellyfish. At low ingestion levels debris may cause dietary dilution by replacing food with non-nutritive material that, if persistent, may reduce growth. If large enough, these items can lodge in the turtle's gastrointestinal tract, injuring the animal or causing its death. Indeed, one of the turtles examined had a plastic piece 16cm² removed from its intestines during necropsy.

Pelagic loggerhead juveniles are indiscriminate generalist predators frequently found in convergence zones where surface marine debris is likely to accumulate. Forty-one of 54 juvenile loggerhead turtles illegally captured off the northeastern Spanish Mediterranean coast and examined had plastic debris lodged in their intestines, though most of the debris was small enough to pass through the digestive tract without causing obstruction.

However, the high frequency of occurrence of debris in the loggerhead guts in the Mediterranean is reason for concern. 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 much 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 (Figure 1).

Fish with plastic 'necklace' (B.S. Galil)

During its pelagic phase floating debris furnishes a new, anthropogenic substratum 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. The resident community of plastic debris in temperate and warm seas may include representatives of encrusting bryozoans, algae, hydroids, molluscs, serpulid, polychaetes and barnacles. The most common of the 14 macrobenthic species identified from floating debris collected off the Ligurian coast were the lepadomorph barnacle *Lepas pectinata* and the isopod crustacean *Idotea metallica*, frequently found in the offshore fouling community. However, individuals of species rarely found floating offshore, like seagrass epibionts, were identified as well, 'rafting' on plastic debris.

Microscopic examination of plastic flotsam off the Catalan coast (northwestern Mediterranean) revealed the presence of benthic diatoms and potentially harmful dinoflagellates including *Alexandrium taylori*, a species notorious for forming blooms. It is suggest that "drifting plastic debris as a potential vector for microalgae dispersal". The sheer volume of floating debris aids the dispersal of epibionts and multiplies chances of introducing them into new regions: two cases of alien-bearing plastic debris had been documented, though none yet from the Mediterranean Sea.

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.

The problem is compounded by the fact that a very high percentage of marine litter is plastic-based and therefore does not degrade quickly in the environment. This assessment has therefore included a chapter on the contribution of marine litter to marine environmental pollution with trace metals (i.e. secondary pollution).

3.2 Secondary pollution from marine litter

In 2005 a methodology on secondary pollution from leaching of pollutants from litter found on beaches was developed by the Laboratory of Environmental Chemistry of University of Athens (Chalkiadaki, 2005) i.e. determination of pollutants, mostly heavy metals, in the leachates through laboratory simulation of natural processes. 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, either on the beaches or in the sea. This was obtained by treating and extracting substances from various categories of litter i.e. different types of plastic bags and cigarette buts, by considering (a) the total metal content of litter - this represents the “accumulative” impact at the end of decomposition of the litter eventually after many years to be found in the water column but mostly in the sediment: (b) by using slightly acidic water – representing metal easily extractable by rainwater and (c) marine water representing metal easily extractable by sea water prior to the decomposition of litter.

The results of the study showed that marine litter indeed acts as a secondary source of trace metals with cigarette buts (in increasing level 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.

For the assessment of the *total metal content* of marine litter we can use the more recent and thorough investigation carried out by the Laboratory of Environmental Chemistry of the University of Athens (Tsichlis) summarized in the following Table 9.

The table provides the total content in mg/kgr for six metals (Zinc, Chromium, Copper, Nickel, Lead and Cadmium) determined in eight different categories of litter namely: plastic packaging (bags, etc.), other plastics, textiles, paper packaging, printed paper, other categories of paper, composite waste items (paper and/or plastic and/or/metal) and organics-garbage. The various categories obviously contribute in different percentages on the various beaches. To overcome the problem which frequently arises when “clean-up activities record “total” amount of collected litter rather than separated and standardized, the Uof A has considered a typical urban sample deriving from the greater Metropolitan Area of Athens. This is represented by the so-called “cumulative sum” given in the table. Against this “calculated” sum there is the “measured” sum that was produced by measuring typical samples of municipal waste collected from the entire area of Athens. The proximity between the calculated and the measured metal content is very good for the majority of the metals. Only for copper do the two values deviate, but the reason for this has not been determined yet.

Table 9: Heavy metals in mixed waste and in its various sub-categories
Greater Metropolitan Area of Athens (10/2007, 11/2007, 12/2007, 1/2008)

	Zn **mg/kg**	**Cr mg/kg**	**Cu mg/kg**	**Ni mg/kg**	**Pb mg/kg**	**Cd mg/kg**
Plastic packaging	191 *± 99.8*	11.6 *± 7.96*	32.4 *± 22. 2*	3.67 *± 0.85*	33.7 *± 49.0*	1.52 *±3.79*
Other plastics	637 *± 816*	32.4 *± 78.1*	237 *± 757*	3.35 *±1.95*	193 *± 332*	7.51 *±15.4*
Textiles	150 *±88.1*	39.8 *±92.7*	35.4 *±29.1*	2.73 *±2.44*	68.3 *±106*	0.22 *±0.19*
Paper packaging	102 *±37.9*	13.87 *±14.3*	25.2 *±8.38*	6.43 *±9.73*	13.4 *±0.44*	1.43 *±4.39*
Printed paper	68.0 *±28.4*	12.7 *±6.22*	35.7 *±26.6*	3.61 *±1.34*		0.08 *±0.12*
Other categories of paper	97.9 *±49.5*	11.6 *±5.75*	10.9 *±5.95*	4.33 *±2.58*		0.08 *±0.06*
Composite	34.9 *±21.2*	6.18 *±1.41*	13.3 *±7.01*	1.96 *±1.88*	1.05 *±0.74*	0.06 *±0.01*
Organic	412 *± 562*	52.5 *± 39.3*	625 *±1428*	12.4 *±9.61*	15.5 *±22.6*	0.92 *±1.53*
Cumulative sum	**206 *±152***	**25. 2 *±14.6***	**194 *±410***	**5.19 *±4.47***	**13.3 *±13.8***	**1.04 *±1.15***
Measured values	**185 *±58.8***	**15.9 *±6.91***	**40.2 *±31.8***	**4.89 *±3.41***	**13.89 *±25.5***	**0.54 *±0.77***
n	*12*	*12*	*12*	*12*	*12*	*12*

For the assessment of *the readily leachable fractions of metals* (on the coast through rainwater washout and in the seawater with direct contact with marine water) the following tables are given.

Tables 10 and 11 refer to three different types of plastic packaging, namely “black”, “white” and “blue” plastic bags treated for two months (shaken continually in carefully monitored (as per pH and oxygen content) water. Table 10 below provides the content in mg of metal per gr of plastic bag extracted by rainwater and seawater respectively.

Table 10 Content of metal per gr of plastic bag extracted by rainwater and seawater				
mg/gr of plastic bag	**Cd**	**Cu**	**Pb**	**Zn**
Rainwater				
black	0.426	0.207	0.071	21.50
white	0.703	0.386	0.115	31.30
blue	0.478	0.256	0.248	15.00
Seawater				
black	0.045	0.112	0.498	11.10
white	0.102	0.433	0.306	21.00
blue	0.081	0.331	2.09	14.60

Table 11 provides the metal content per bag extracted by rainwater and seawater. This is given in order to facilitate calculation based on clean-ups where the results are given per item number.

Table 11 Metal content per bag extracted by rainwater and seawater (in mg)				
plastic bag	**Cd**	**Cu**	**Pb**	**Zn**
Rainwater				
Black	3.56	1.73	0.593	180
White	3.03	1.66	0.495	135
Blue	4.40	2.35	2.28	138
Seawater				
Black	0.376	0.935	4.16	92,7
White	0.439	1.86	1.32	90.5
Blue	0.745	3.04	19.2	134

Table 12 provides the results per km of beach based on the 16,200 m of beaches that were cleaned by HELMEPA in 2002 (1,170 plastic bags).

Table 12 Metal content per km of beach based on specific amounts of collected plastic bags (in mg)				
plastic bag	**Cd**	**Cu**	**Pb**	**Zn**
Rainwater				
Black	0.257	0.125	0.043	12.97
White	0.219	0.120	0.036	9.735
Blue	0.317	0.170	0.165	9.959
Seawater				
Black	0.027	0.068	0.300	6.70
White	0.032	0.135	0.095	6.53
Blue	0.054	0.220	1.390	9.70

Table 13 provides the metal content in mg per gr of cigarette tip extracted by rainwater and seawater respectively over a period of three months, whereas Table 14 provides the results per km of beach based on the 21,780 m of beaches that were cleaned by HELMEPA in 2003 (14,083 cigarette filters).

Table 13
Metal content per gr of cigarette tip extracted by rainwater and seawater

mg/gr of cigarette tip	Cd	Cu	Pb	Zn
Rainwater				
1st month	0.015	1.57	0.326	9.740
2nd month	0.034	1.81	0.570	14.60
3rd month	0.039	2.08	0.935	15.60
Seawater				
1st month	0.019	1.180	0.375	3.410
2nd month	0.049	1.440	0.496	4.380
3rd month	0.078	1.760	0.657	6.330

Table 14
Metal content per km of beach based on specific amounts of collected cigarette tips

mg/km of beach	Cd	Cu	Pb	Zn
Rainwater				
1st month	2.00	208	43.2	1290
2nd month	4.50	240	75.4	1930
3rd month	5.16	275	124	2060
Seawater				
1st month	2.50	156	49.7	451
2nd month	6.45	191	65.8	580
3rd month	10.3	234	87.0	838

With the further treatment and extrapolation of the information compiled in the framework of this assessment from the Mediterranean clean up activities (see section 2 “Assessing the scale of the problem”) – *a task not possible to fulfill within the limited timeframe for this assessment* - it would be very useful to develop a pilot application to determine what secondary pollution is produced by the predominant litter items in the Mediterranean. Of course a series of standardizations would need to be established, e.g.:

- Standardization of litter items in terms of weight
- Standardization of coast length cleaned or sea area for floating or sea floor debris
- classification of coast type (frequented by tourists or not, proximity to urban centre or waste disposal site, cleaned-up regularly or not, etc.)

- other standardisations of clean-up information (specific grouping of litter items, error margins, etc.)

At a second step, further extrapolation and useful assumptions could be made on the short and long-term implications of secondary pollution from trace metals in marine litter items based on the time it takes for each litter item to decompose as given in Table 3 *"How long does it take for marine litter to decompose?"*

3.3 Socio-economic impacts

Lost or discarded fishing gear can have financial implications for the fishing industry, which will have to replace it. In addition, "ghost fishing" (entrapment of marine life in discharged fishing gear) from lost nets also kills thousands of fish. 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 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 clean-ups. 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 specifically in the Mediterranean. But stating the obvious one would argue that the collection, treatment and disposal of solid waste involve considerable economic and environmental costs. Generating less waste would therefore be better both for the economy and the environment of the region.

4. PRESENTATION OF INDICATIVE MARINE LITTER MONITORING PROGRAMS IN THE MEDITERRANEAN

Marine Litter Monitoring (MLM) Programs

Various studies have dealt with the problem of debris in the marine environment. Most of the data concern floating debris or litter along the coast, particularly on beaches where it is abundant. Although the debris is quite variable in type, plastics 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 marine currents. Municipalities in gulf or harbor areas have mostly problems with floating debris, instead tourist beaches with airborne or abandoned litter.

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 marine litter found on beaches has been available in most of the countries and the statistic sheets give an overview of debris found in the Mediterranean countries.

There is a lack of official statistics of most of the Mediterranean Countries. The challenges in dealing with this problem are 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, and makes it difficult to compare data from different regions and to make an overall assessment of the marine litter pollution situation for the entire Mediterranean region. Nevertheless these MLM Programs are an indicator of methods, which could be used to address the problem of Marine Litter in the Mediterranean.

Herewith are presented in chronological order, some indicative MLM programmes that have taken place in the Mediterranean.

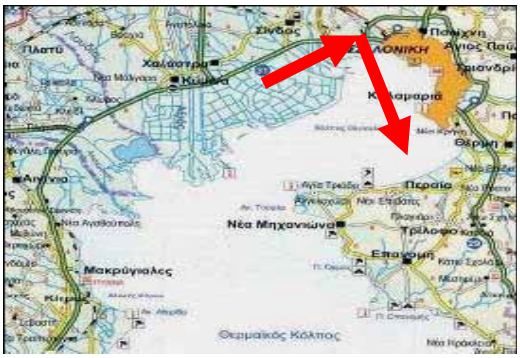
Map 2: Indicative Marine Litter Monitoring Programs in the Mediterranean in the last years

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

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

The Gulf of Thessalonica and Piraeus /Greece

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

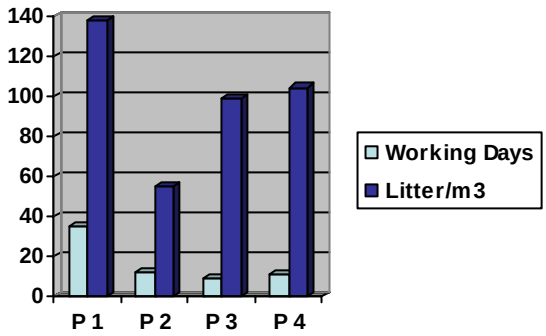


Litter Collection Area

Total amount of solid waste collected from 1.6.2007 – 22.1.2008 = 395,5 m^3

Collection Periods:

P1: 1.6.-31.7.07
P2: 1.8.-31.8.07
P3: 1.-31.12.07
P4: 1.1.-22.1.08



Collected solid waste types:

- *Plastic*
- *Dead rats*
- *Wood and cloth*
- *Cloths*
- *Seagrass*
- *Metals*
- *Plastic bags*
- *Others*

Clean up activity - *Turkish foundation for Combating Soil Erosion, for Reforestation and the Protection of Natural Habitats (TEMA)*

During the above collection period no estimation of amounts per waste type was effected. The collection and estimation is continuing on a monthly basis. According to information provided by the Ministry of Macedonia & Thrace a seabed clean up will be affected in the Gulf of Thessalonica during the next month and all data will be available to Clean up Greece.

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

The volume of marine litter fluctuated from 1.47 m^3 per day to 3.46 m^3 per day, while the average volume was estimated to be 1.89 m^3 per day. During the summer season when the operation of the passenger port is extremely high (*it should be noted that Piraeus is the largest port in Europe and the third largest in the world in terms of passenger transportation, servicing 19,000,000 passengers annually*) the volume of marine litter is significantly higher reaching an average of 2.96 m^3 per day. Although quantitative information in respect of the origin of the debris does not exist, it appears that domestic garbage from passengers and litter ending up to sea via urban sewers are the prevailing categories.

The coastline of Israel ("Clean Coast" Program)

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

In June 2005, the Israeli Ministry of Environmental Protection (MoEP) launched the "Clean Coast" program, applying the "Environmental Problem Solving" concept. The program that

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

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

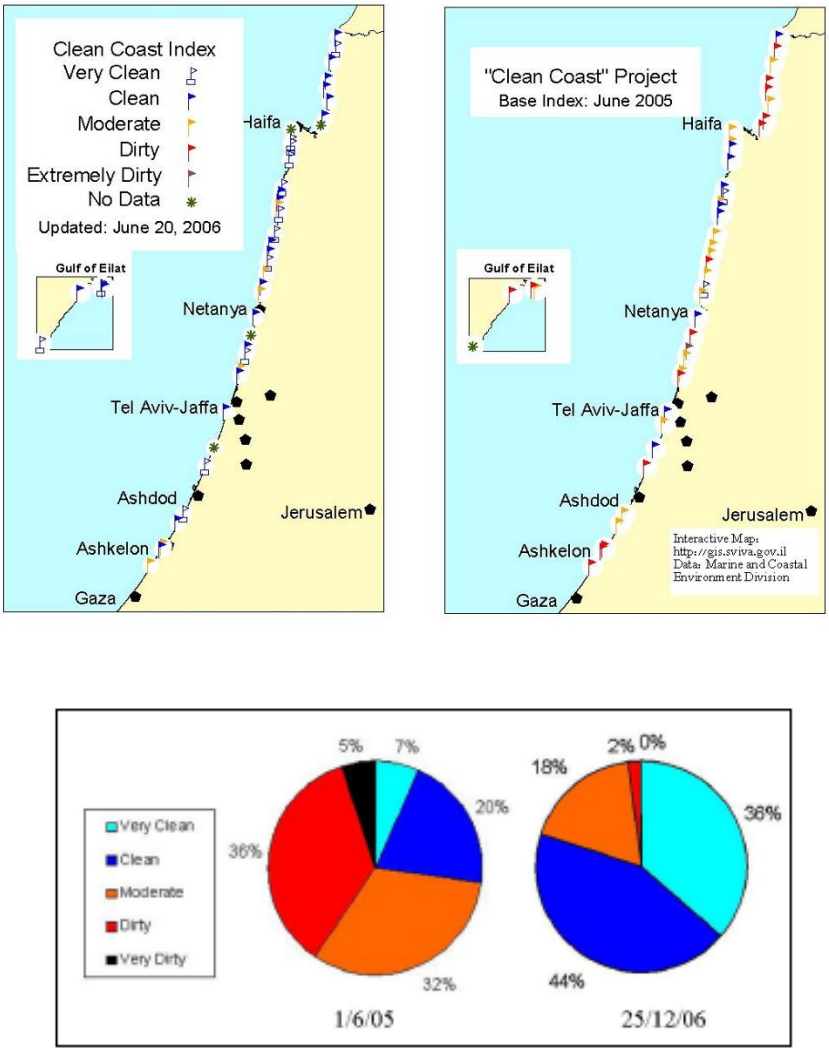


Figure 4.1: Clean Coast Index (CCI) at the beginning of the programme and at the end of 2006

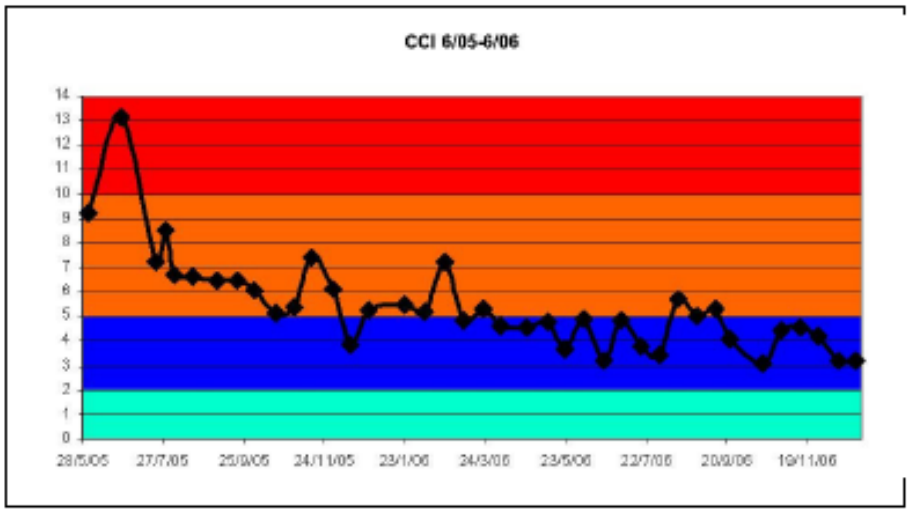
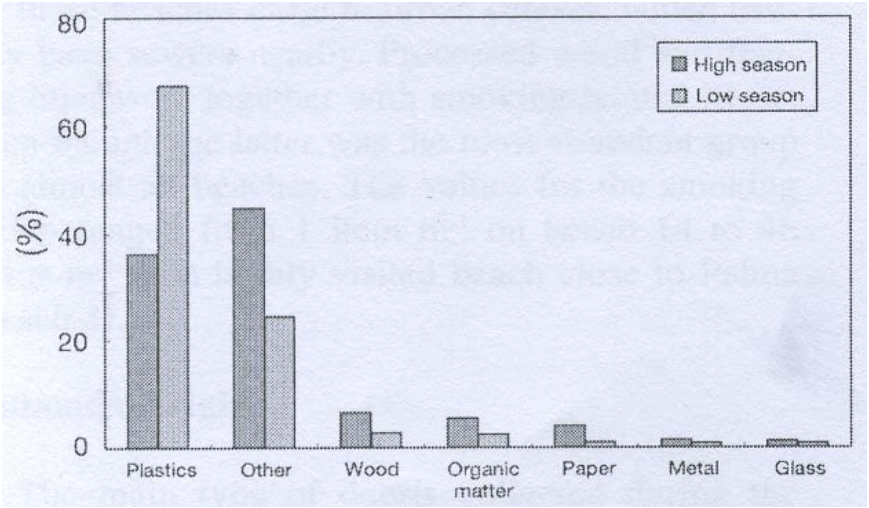


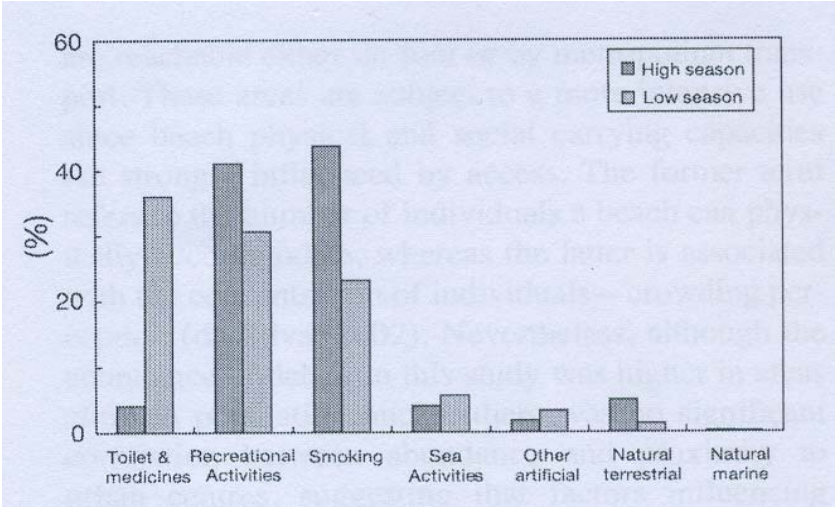
Figure 4.2: National CCIs from the beginning of the programme to the end of 2006
(Source: Ministry of Environmental Protection, 2006)

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

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



Litter Composition in low and high season



(Source: Martinez-Ribes *et al.*, 2007)

Estimated origin of the litter collected in low and high tourist season

Island of Sardinia/Italy

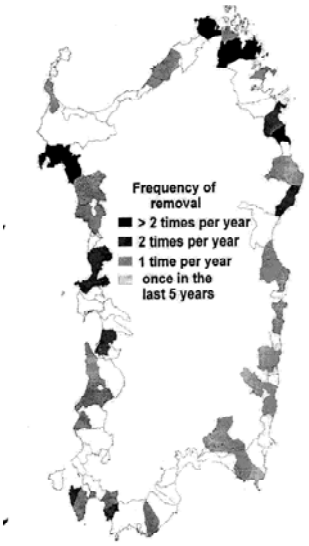
Removal of beach-cast *Posidonia oceanica* seagrass litter, called ‘‘banquettes,’’ is a common practice on Mediterranean shores to allow the recreational use of beaches. Ongoing removal practices of *P. oceanica* banquettes were analyzed on the island of Sardinia in 2004 to quantify this phenomenon on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

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

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

Banquette removal:

	Number of Cases (N = 44)	Removal Amounts (Total = 106,180 m³)	Beach Length Interested (Total = 114 km)
Month of Removal			
April	9	50,200	17.6
May	2	5000	1.2
June	28	31,240	78.4
July	5	19,740	16.9
Machine Used			
By hand	6	230	12.8
Grid/beach cleaner	13	21,500	41.7
Front-end loader	25	84,450	59.6
Dumping			
Authorized plant	23	21,700	52.2
Unautho-rized ground	17	35,980	52.2
Beyond a dune	4	48,500	9.3

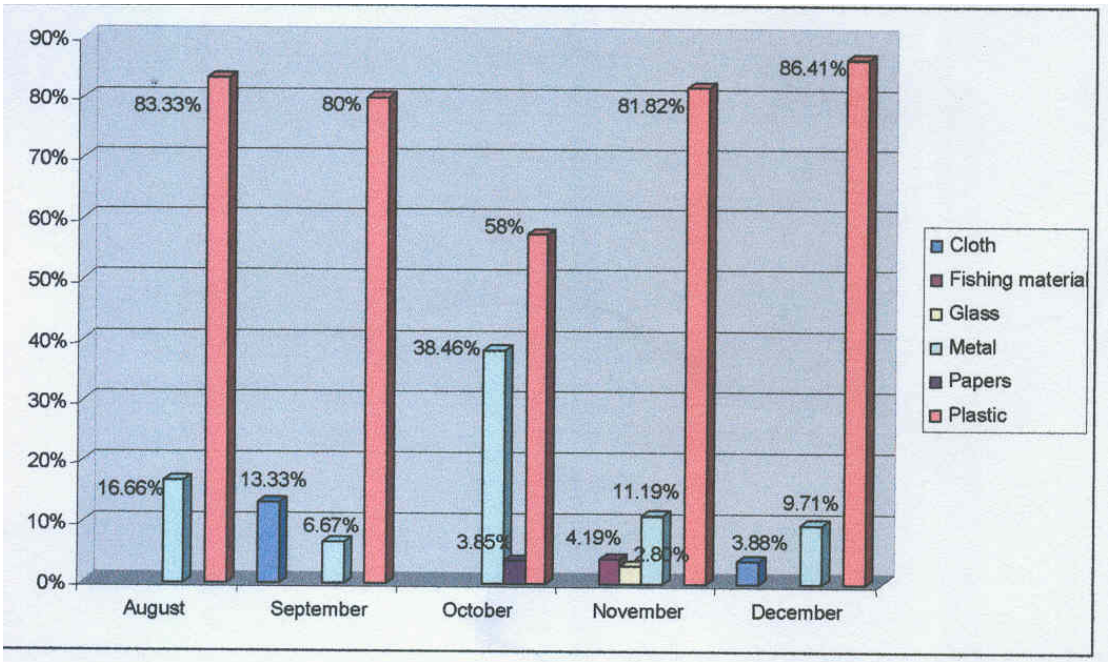


(Source: De Falco et al., 2007)

Coasts of El-Mina and Tripoli/Lebanon

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

Analysis of the data also revealed that the occurrence of the different litter categories occurred at different frequencies according to the month of sampling (Graph 2). Plastic and metal were present over the five month period while the other litter categories occurred in some months and not others. The lowest percentages were recorded in the month of October, coinciding with the end of the tourism season and dry weather. August and September experience high tourism activities, while the first rains start at the end of October and intensify in November and December. This might explain the difference in percent waste collected during the five month period.



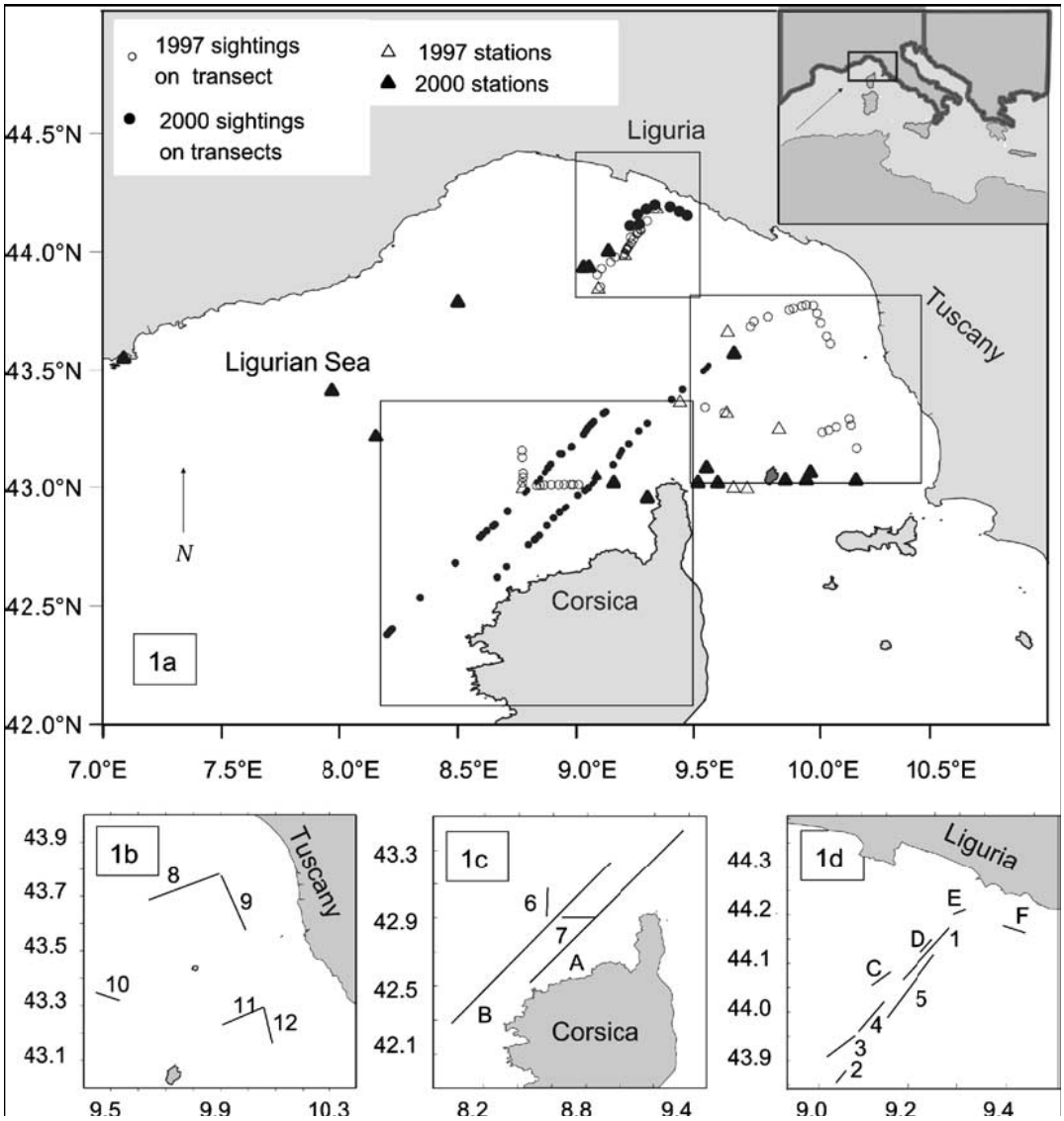
Graph 2: Percent distribution of litter categories per month

(Source: Marine Resources & Coastal Zone Management Program, 2005)

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

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

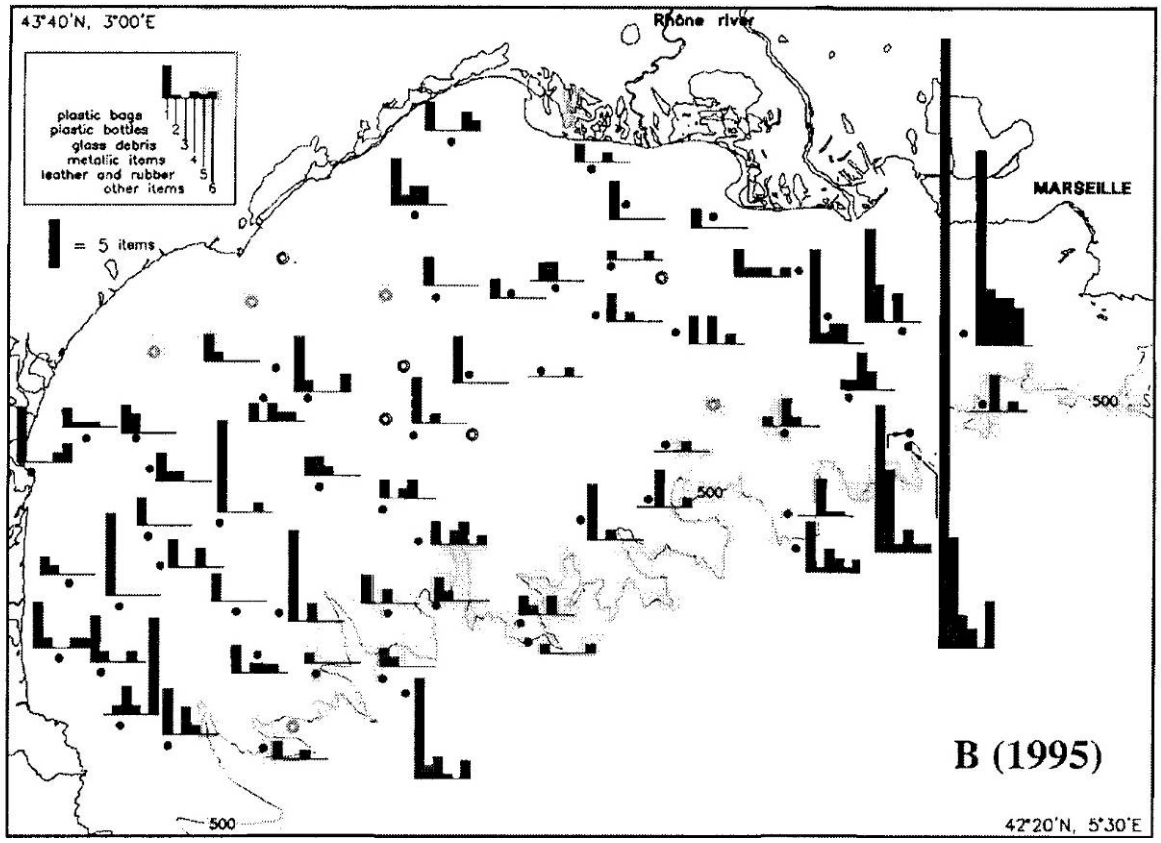
Map of the Ligurian Sea showing the locations of debris sightings during transects and the locations of the fixed stations for the 1997 and 2000 cruises.



(Source: Aliani et al., 2003)

Deep sea floor off the French Mediterranean Coast

The distribution and abundance of large marine debris were investigated on the continental slope and bathyal plain of the northwestern Mediterranean Sea during 3 oceanographic cruises undertaken in June 1994, July 1995 and April 1996 (Galgani *et al.*, 1996). Different types of debris were enumerated, particularly pieces of plastic, plastic and glass bottles, metallic objects, glass and diverse materials including fishing gear. The results showed considerable geographical variation, with concentrations ranging from 0 to 78 pieces of debris/ha. In most stations sampled, plastic bags accounted for a very high percentage (more than 70%) of total debris. In the Gulf of Lions, only small amounts of debris were collected on the continental shelf. Most of the debris was found in canyons descending from the continental slope and in the bathyal plain, with high amounts occurring to a depth of more than 500 m.



Densities of debris in the Gulf of Lions in relation to depth

Depth (m)	Tows	Total area (km^2)	Total debris	Plastics	Debris (km^{-2})
<200	57	3.03	337	229 (68%)	111.2
200-1000	21	0.816	568	483 (85%)	696
>1000	10	0.17	631	537 (85%)	3712

(Source: Galgani et al., 1996)

5. 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 (Annex 4). The questionnaire was a follow-up of that which was sent in 2000, 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.

Fourteen countries were able to reply to the questionnaire in the time period they were given: Bosnia and Herzegovina, Croatia, Cyprus, Egypt, France, Greece, Israel, Italy, Lebanon, Malta, Monaco, Morocco, Tunisia and Turkey (see Annex 6 for tables summarizing the replies). Although the 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 (see summary in Annex 5). Furthermore, they made it possible to identify some developments, even reversals of trends.

In terms of the policy framework the majority of the countries integrate coastal litter management in their national policies with few opting for more specific management of marine litter based on special litter management policies. Beaches and ports are still the focus of the policies and strategies. However, 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, coastal zones should witness more attention in the coming years. Litter management in relation to merchant ships, pleasure craft and marinas is integrated in most countries’ policies and practices mainly due to existing related international conventions and with the coming into effect in 2009 of the Mediterranean Sea as a *Special Area* (under Annex V of the International Convention for the Prevention of Pollution from Ships (MARPOL)) (see Box 2) this will be even further strengthened.

The majority of the countries continue still, after eight years, to not target seabed litter management.

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 follow 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, is a clear deduction from the latest set of replies. There is, however, a clear indication that private sector involvement (a proposal of the 2001 Guidelines) is increasing which may be construed as an effort of the countries to apply one of the least demanding on their part recommendation of the 2001 Guidelines.

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.

The replies to the question relating to the identification of the sources of marine litter were not all given in percentage of contribution and furthermore vary considerably from country to country. What can be deduced however is that the majority of marine waste comes from coastal areas.

Only four countries completed the tables with information on coastal sites where uncollected waste has accumulated (Egypt, Israel, Lebanon and Tunisia). In the case of Egypt and Lebanon sites mentioned in 2000 are also mentioned in 2008 which shows that improvement of the situation is not marked.

Cost effective abatement programmes with a high level of public awareness and participation were rated as the two priorities for on-the-ground action. Funds allocation and sectoral professional awareness closely follow 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.

Most of the countries that replied are undergoing a series of policy reforms covering the whole range from waste prevention practices all the way to environmentally sound disposal of waste, with a view to involving a wide range of stakeholders. However, no country has any kind of cross-border collaboration scheme on the issue of marine litter management.

The last chapter (6) of this document which lists some of the gaps, needs and proposals as a basis for setting priorities for actions has taken into consideration all of the observations that have been made in the paragraphs above.

6. GAPS, NEEDS AND PROPOSALS AS A BASIS FOR SETTING PRIORITIES FOR ACTIONS

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.

BOX 4: Main legal and institutional frameworks affecting the Mediterranean

- Local Agendas 21
- National legislation on waste management and environmental protection
- The Barcelona Convention and its Protocols
- The Mediterranean Strategy for Sustainable Development (MSSD)
- The Mediterranean Marine Pollution Assessment and Control Programme (MED POL) of UNEP/MAP
- The EU Environmental Strategy for the Mediterranean and Horizon 2020
- The EU Marine Strategy Directive
- The EU Thematic Strategy on the Prevention and Recycling of Waste
- The international Maritime Organisation (IMO) Convention for the prevention of pollution from ships (MARPOL 73/78 – Annex V)
- The Global Programme of Action (GPA) for the Protection of the Marine environment from Land-based Activities; the Regional Seas programme
- The Basel Convention

- There is non-existent, insufficient or ineffective coordination among the various institutions and authorities, national and regional, involved in environmental management and more specifically in waste management. It is thus necessary to:
  (i) ensure the involvement and cooperation of administrative stakeholders at different levels and regional/national scales,
  (ii) 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 waste. Most commonly there is a lack of:
  - liability for bad practices of handlers of waste (producers, transporters, or those that are entrusted with disposal);
  - lack of classification of waste by nature and origin;
  - lack of regular and specific monitoring of the waste from production to disposal;
  - lack of effective penalties for offenders;
  - lack of 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 technical tools, means and expertise, at regional and national levels, necessary in order to focus and prioritize actions for a better management of coastal waste.

- There is very little and inconsistent information on quantities, flows, handlers of marine litter. The lack of reliable statistical information is a serious bottleneck in most of the FEMIP countries. Available data and information are often useless for planning and investment purposes. Urgent actions are required to improve the present situation.

- There is 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 i.e. public - private partnerships) in terms of the need to protect and preserve the marine environment from macro-waste.

- Awareness campaigns and educational programmes have been isolated and short-term efforts and have addressed in a non-integrated way 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 as of 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. 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 clean up operations, etc.

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ANNEXES

ANNEX 1

DATA FROM MEDITERRANEAN BEACH & UNDERWATER CLEANUPS

(ICC campaigns 2002-2006)

	LAND			UNDERWATER			TOTAL		
State	**People**	**Kg**	**Km**	**People**	**Kg**	**Km**	**People**	**Kg**	**Km**
Bosnia	5	35	1	16	22	1	21	57	2
Croatia	42	377	8	14	100	1	56	477	9
Cyprus	3,095	6,975	275	295	1,729	1,359	3,390	8,704	1,634
Egypt	5,014	51,402	282	1,595	11,384	140	6,609	62,786	422
France	315	3,761	20	160	4,215	38	475	7,976	58
Greece	6,052	26,402	208	465	23,614	47	6,517	50,016	255
Israel	4,471	22,517	34	205	2,123	7	4,676	24,640	41
Italy	2,905	19,835	111	371	2,510	90	3,276	22,345	201
Jordan	3,930	2,761	12	318	1,571	4	4,248	4,332	16
Lebanon	50	82	1	70	273	n/d	120	355	1
Malta	135	873	24	256	3,831	7	391	4,704	31
Palestine	11	34	3	54	112	1	65	146	4
Portugal	854	1,874	6	65	486	5	919	2,360	11
Spain	1,424	20,090	79	340	3,051	56	1,764	23,141	135
Turkey	24,747	77,422	1,079	517	3,730	97	25,264	81,152	1,175
Tunisia	7	136	1	12	762	1	19	898	1
Total	**53,057**	**234,576**	**2,141**	**4,753**	**59,511**	**1,853**	**57,810**	**294,087**	**3,994**

ANNEX 2

•HELMEPA•

DATA CARD FOR MONITORING MARINE LITTER AT SEA

For the best use of the information from the data cards, you are kindly requested to answer all questions in clear writing. Also, we would welcome any photographs from large items or concentrations of marine litter at sea.

Name of ship: ……. Managing company: …….

Date of observation (dd/mm/yy) ... /… /.... Sea area: ……

Geographical coordinates of observation (latitudes - longitudes): Start ……../…… Finish: ……../……

Length of observation: …… (nautical miles)

Anticipated monitoring width from point of observation from bridge, deck etc: ……..…… (meters)

TYPES OF LITTER

(Use lines for recording the items (e.g. 𝍸) and place the total number in the left box (e.g. 4)

⇐ Fishing nets…….		⇐ 55-gal drums…….. …..……	
⇐ Wooden pallets.. ……		⇐ Crates ……..…	
⇐ Plastic sheeting…….		⇐ Buoys/floats ……..…..	
⇐ Ropes……		⇐ Cardboard boxes……..	
⇐ Plastic bags……..		⇐ Plastic bottles……..…….	
⇐ Clothing (sails etc.)……		⇐ Plastic containers	

Record here other items you observe (in the case of large concentrations of litter, provide an approximate estimation of the volume or sea surface covered or take a photograph, if possible) and any problems you encounter with regards to solid waste management.

.....
.....
.....

Please send the completed data card and relevant photographs to HELMEPA's offices by email training@helmepa.gr or fax: +30 210 9353847

ANNEX 3

Data from HELMEPA member-vessels on floating marine litter in the Mediterranean Sea					
Name of vessel	**Managing company**	**Sea area monitored**	**Date of monitoring**	**Length of observation** (nautical miles)	**Marine litter observed?**
M/T "ALIOS HERA"	Kyla Shipping Co.	Mytilini Sea	20 February	1 nm	Yes
M/T "ALIOS POSEIDON"	Kyla Shipping Co.	Mirtoon Sea	28 February	5 nm	Yes
M/T CAP DIAMANT	Euronav Ship Manag'nt Hellas Ltd.	Gibraltar-Strait of Arzew	11 March	270 nm	Yes
RO-PAX "OLYMPIA PALACE"	Minoan Lines Shipping Co. S.A.	Adriatic Sea	12 March	90 nm	Yes
M/T "CAP DIAMANT"	Euronav Ship Manag'nt Hellas Ltd.	Algeria Arzew Port	15 March	7 nm	Yes
M/T "CAP ROMUALD"	Euronav Ship Manag'nt Hellas Ltd.	Arzew - Gibraltar	18 March	120 nm	No
M/T "ALIOS HERA"	Kyla Shipping Co.	Saronic Gulf	20 March	3 nm	Yes
LNG CARRIER "MARAN GAS ASCLEPIUS"	Maran Gas Maritime Inc.	Off Egypt - Suez Canal	21 March	103 nm	Yes
M/T "ALIOS TRITON"	Kyla Shipping Co.	South Coast of Cyprus	23 March	101 nm	Yes
M/T "ALIOS TRITON"	Kyla Shipping Co.	East Coast of Cyprus	24 March	28 nm	Yes
M/T "ALIOS TRITON"	Kyla Shipping Co.	Steno Antikithiron	26 March	19 nm	Yes
LNG CARRIER "UUM BAB"	Maran Gas Maritime Inc.	South Crete	30 March	1 nm	Yes
M/T "CAP DIAMANT"	Euronav Ship Manag'nt Hellas Ltd.	Algeria Arzew Port	14 April	291 nm	Yes
M/T "ALIOS POSEIDON"	Kyla Shipping Co.	Eastern Mediterranean	22 April	13 nm	Yes

ANNEX 4

MED POL QUESTIONNAIRE ABOUT LITTER MANAGEMENT IN COASTAL ZONES

A. GENERAL QUESTIONS

Country name: _____

Date: _____

Respondent name: _____

Affiliation: _____

Position: _____

Address: _____

_____

_____

_____

B. POLICY ISSUE

The aim of this question is to identify the gaps in the national environmental policy regarding the protection of coastal areas from litter pollution. In this context, human settlements, industry, beach goers and ships are considered as sources of litter. As the litter issue could be totally absent in the national environmental policy, then it may be covered by other policy such as national health policy.

B.1 Does the national environmental policy target litter management in:

	YES	NO
- Coastal zones	☐	☐
- Beach	☐	☐
- Sea water	☐	☐
- Seabed	☐	☐
- ports	☐	☐
- Commercial ships	☐	☐
- Touristic ships (marinas)	☐	☐
- Fishing ports or terminals	☐	☐
- Rivers	☐	☐

B.2 What kind of national policy covers the coastal litter issues

- ☐ **National waste management policy**
- ☐ **Specific litter policy**
- ☐ **Other policy (indicate)**

B.3 Have the issues of land-generated and vessel/ship-generated wastes been integrated in plans and policies?

YES	NO
☐	☐

Have relevant agencies got the means / capacity to execute its tasks (staff, budgets, expertise)?

YES	NO
☐	☐

If not, have the main obstacles been identified?

- ☐ **Lack of human resources**
- ☐ **Lack of funds**
- ☐ **Lack of information**
- ☐ **Lack of coordination between stakeholders**

What are the main constraints that prohibit environmentally sound coastal litter handling, in terms of;

- ☐ **Administrative and legal matters (including adequate laws, regulations, rules, standards, policies and approvals required).**
- ☐ **Technology & infrastructure requirements (e.g. treatment plants, incinerators, landfills, reception facilities, compaction, laboratories and analytical equipment, transport services)**
- ☐ **Support services (e.g. monitoring and policing services, operator training facilities, public information and education)?**

What plans and actions have been identified to improve the situation in problem areas identified above, and have all environmental issues been addressed?

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

C. LITTER MANAGEMENT STRATEGIES

	National Level						Coastal zones level (beach, coast, ...)						Ships				
The institutional aspect of litter management is crucial in reducing the pollution of marine environment by litter. **C.1 Who is responsible for the litter management issue?**	**Ministry of Environment**	**Other Ministry**	**The region**	**Municipalities**	**Coast guards**	**Private sector**	**The region**	**Municipalities**	**Regional environmental administration**	**Coast guards**	**Private sector**	**Other administration**	**Harbor authority**	**Local environmental administration**	**Coast guards**	**Private sector**	**Other administration**
Check the boxes																	

C.2 What is the responsibility of environmental authorities in the coastal zone litter management issue?	**Operational**	**Control & enforcement**	**Juridical**	**Follow up**	**No responsibility**
	☐	☐	☐	☐	☐

D. INDICATORS

Indicators are management tools that help managers in setting trends and evolutions of related phenomena and propose correction measures.

Countries, regional and international organizations have proposed a number of indicators to control the litter management systems. We are seeking the identification of the indicators adopted for litter management issue in order to transfer the experiences acquired through the Mediterranean region.

If the environmental authorities are responsible for the control and/or follow up to litter management in costal zones and ships, please indicate the indicators adopted.

D.1 Economical indicators:

- ☐ **Cost/ton./inh.**
- ☐ **Total expenditure/y**
- ☐ **% of the budget**
- ☐ **Cost of fleet maintenance/y**
- ☐ **Collection and transport**
- ☐ **Others**

D.2 Institutional and Legal indicators:

- ☐ **Total number of personnel in charge**
- ☐ **% of technical personnel**
- ☐ **Total number of regulations**
- ☐ **Number of new regulations issued/y**
- ☐ **Special regulations for beach**
- ☐ **Special regulations for ships**
- ☐ **Others**

D.3 Technical indicators:

- ☐ **Qt of waste generated per inh./y**
- ☐ **Qt of waste generated her hotel room/y**
- ☐ **Qt of waste collected/d**
- ☐ **Qt of waste transported/d**
- ☐ **Presence of uncollected waste on beach**
- ☐ **Presence of floating waste**
- ☐ **Presence of waste on the sea bed**
- ☐ **Existence of reception facilities in harbours**
- ☐ **Existence of municipality recycling programme**
- ☐ **Existence of recycling programme**
- ☐ **Others**

E. SOURCES OF LITTER IN COASTAL ZONES

The identification of the sources of litter that affect the Mediterranean marine environment is an essential step towards the implementation of a coastal solid waste management system. If the available information is scarce, an estimation of the importance of the sources (the percentage) would be highly appreciated.

E.1 According to the data available, what are the major sources of solid waste in coastal zones?

- Households (direct disposal)	☐	**%**
- Villages (direct disposal)	☐	**%**
- Runoff from cities	☐	**%**
- Ships	☐	**%**
- Pleasance boats	☐	**%**
- Tourist facilities	☐	**%**
- Runoff through rivers	☐	**%**
- Others (please specify)	☐	**%**

F. CLASSIFICATION OF COASTAL ZONES REGARDING THE PRESENCE OF UNCOLLECTED LITTER

Through this question, we are seeking the identification of few sites where an exhaustive assessment would be carried out in the future.

- Would you list the names of 5 to 10 coastal areas regarding the presence of uncollected litter:

_____

_____

_____

_____

_____

_____

_____

_____

F.1 Beach

Area name	Heavily polluted	Polluted
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

F.2 Sea water

Area name	Heavily polluted	Polluted
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

F.3 Sea bed

Area name	Heavily polluted	Polluted
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

G. ACTIONS NEEDED TO REDUCE THE IMPACTS OF MARINE LITTER

- **What are the initiatives and or programme which are under implementation to improve the impacts of coastal solid waste in your country?**

- **What is the potential for replicability of successful programmes?**

High ☐ **Low** ☐

- **Can existing codes of practice and/or regulations be built on and/or expanded to include good waste management practice?**

Yes ☐ **No** ☐

- **What are the priorities for on-the-ground actions?**

Financial incentives ☐ **Cost effective abatement programme** ☐

Allocation of funds ☐ **Public awareness** ☐

Changing social behaviors ☐ **Sectoral professional awareness** ☐

- **What are the existing coastal waste management / litter reduction strategies?**

Policy reform ☐ **institutional set up** ☐ **Law enforcement** ☐

Monitoring and evaluation ☐

- **What are the waste management priorities?**

  ☐ **Waste avoidance: practices, which prevent the generation of waste;**

  ☐ **Waste reduction: practices, which reduce waste;**

  ☐ **Waste reuse: direct reuse of waste materials for the same grade of use;**

  ☐ **Waste recycling: after segregation into recyclable and non-recyclable items, using valuable components of waste in other processes;**

  ☐ **Waste treatment: to reduce hazard or nuisance, preferably at the site of generation;**

  ☐ **Waste disposal: this should be done in the most environmentally sound manner.**

- **What is the stakeholders involvement in waste collection, treatment, disposal and recycling initiatives?**

  ☐ **Public and communities**

  ☐ **Government, organisations and public enterprises**

  ☐ **Local administration**

  ☐ **Private sector**

  ☐ **Governments of neighboring countries, in case of a regional strategy?**

This Questionnaire should be sent to:

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United Nations Environment Programme
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ANNEX 5

LITTER MANAGEMENT IN COASTAL ZONES OF THE MEDITERRANEAN BASIN
ANALYSIS OF THE QUESTIONNAIRE AND PROPOSALS FOR GUIDELINES

Meeting of the MED POL National Coordinators
Venice, Italy, 28-31 May 2001

SUMMARY

An analysis of the current situation of marine litter management in Mediterranean countries and the mechanisms which regulate and organize this activity leads to a certain number of conclusions, especially with regard to the general approaches, problems and common trends, and allows the institutional and operational mechanisms that govern the management and monitoring of marine and coastal areas in these countries to be identified.

The interest attached to protecting coastal zones (beaches, ports, etc.) in the context of an environmental protection programme has been highlighted. The majority of countries integrate coastal litter management in their national policies. Four countries have opted for more specific management of marine litter, with special litter management policies, paying particular attention to beaches and ports but slightly less to coastal zones.

In order to ensure rational litter management, the prerogatives and competence of the various actors must be defined so that responsibilities are allotted and shared in a consistent and unequivocal manner. The first finding is that, in an overall litter management system, the environmental authorities and local communities are the actors most involved in litter management. The role of municipalities is easy to understand because they are often responsible for litter collection, either directly or indirectly through private firms. The three actors responsible for litter management are ultimately the Ministry of the Environment, municipal authorities and port authorities. Other institutions may have parallel activities, often in association with the other three, for instance, the Ministry of the Interior, regional authorities or the Ministry of Transport.

Analysis of the indicators identified eight that should be recommended to Mediterranean countries. These are the indicators most commonly used for litter management in the countries consulted and are economic, institutional/legal, and technical indicators.

Regarding the origin of litter, direct disposal by households constitutes the main source, followed by the impact of tourism facilities and run-off from waste dumps, thus showing that marine litter mainly comes from coastal areas, even though disposal of litter from mobile or fixed marine installations is still common.

The development of guidelines for waste management calls for a full understanding of the lacunae and the common problems and a better objective approach to the achievements and the efforts made to manage the marine and coastal environment. This type of analysis is necessary in order to identify all the opportunities immediately available for integrated and optimum management of the marine and coastal environment, particularly as regards investment in the logistics for managing such litter. On this basis, a number of recommendations and guidelines are proposed concerning the technical and logistic

organization of litter management, the legal and institutional organization, an approach to public participation and, lastly, proposals for economic and financial mechanisms.

Such mechanisms must be applicable to the region as a whole, although certain needs, opportunities and demands can be specified. In order to provide the best and most comprehensive response to needs, the mechanisms must be designed and implemented in such a way as to provide a simultaneous response at the national and regional levels, providing the necessary flexibility to respond to national characteristics but within a regional context.

For this purpose, it is highly recommended that efforts be made to achieve operational efficiency through the optimum distribution of activities among the public and private sectors and other actors in civil society, each in its own particular branch. The involvement of the private sector in operational and competitive activities will provide technical know-how and efficiency and such decentralization of authority and responsibilities towards the lowest level capable of assuming them is desirable.

Proper management of marine and coastal litter must of course be based on ongoing and strict controls, which should be preventive or curative depending on the situation. The controls can only be operational and effective if they are within the framework of clear and consistent regulations and an economic and financial strategy based on two principles: “the polluter pays principle” and “the production/recovery principle”.

A financing system that reflects costs should be introduced and it should be proportional to the volume of waste. An economic instrument in the form of a tax would complement local taxes. This would encourage reduction at source and would convey a clearer message to generators of litter, as well as fostering changes in behaviour with a view to better waste management. A contribution by the State could be envisaged in order to promote and regularize the activity. This is justified by the need to preserve national interests in the light of the externalities in this sector and the frequent lack of any short-term related profitability. It would help to ensure that the national community as a whole did not have to bear the direct and indirect costs incurred by inadequacies in waste management.

Lastly, a system for following up and collecting information is recommended. The waste sector in general and the marine litter sector in particular lack quantitative data, particularly on waste streams. Such a monitoring system should be designed and adapted to needs and trends, as well as to resources. It could be implemented in a modular and gradual fashion.

ANNEX 6

SUMMARY TABLES OF 2008 COUNTRY QUESTIONNAIRE REPLIES

ACTIONS

What are the initiatives and or programme(s) which are under implementation to improve the impacts of solid waste in your country??	
BOSNIA	Solid Waste Utility, "Adopt a beach (river bank)" by local communities
CROATIA	Waste Management Strategy in the Republic of Coatia and the Waste Management Plan in the Republic of Croatia
CYPRUS	CAMP
EGYPT	
FRANCE	
GREECE	
ISRAEL	Clean Coast Programme
ITALY	Since 10/5/1999 the Ministry of Environment, Land and Sea has set up a public service to prevent and fight against marine pollution along all Italian coastlines by means of 58 naval vessels. 37 of these are coastal units having antipollution equipments able to collect solid and liquid waste and pollution. They are located near protected sea areas
LEBANON	Rehabilitation of Normandy sites; Containment of Abou Ali Tripoli Dumpsite; Study of the rehabilitation of Saida Dumpsite; Closing of Tyre Dumpsite
MALTA	Periodic marine clean ups
MONACO	Public awareness: - Pleasure boats (plates RAMOGE) , - schools, - users of bath installations
MOROCCO	After adoption of Law 28-00 related to the management of waste, the decrees of applications are in progress of development; Construction of a group of discharges to control domestic wastes
TUNISIA	Beach cleanups each summer
TURKEY	

What is the potential for replicability of successful programmes?	high	low
BOSNIA	√	
CROATIA	√	
CYPRUS	√	
EGYPT		√
FRANCE		
GREECE		
ISRAEL	√	
ITALY	√	
LEBANON	√	
MALTA	√	
MONACO	√	
MOROCCO	√	
TUNISIA	√	
TURKEY		

Can existing codes of practice and/or regulations be built on and/or expanded to include good waste management practice?	yes	no
BOSNIA	√	
CROATIA	√	
CYPRUS	√	
EGYPT	√	
FRANCE	√	
GREECE		
ISRAEL	√	

ITALY	√	
LEBANON	√	
MALTA	√	
MONACO	√	
MOROCCO	√	
TUNISIA	√	
TURKEY		

What are the priorities for on-the-ground actions?	financial incentives	cost effective abatement programme	allocation of funds	public awareness	changing social behaviors	sectoral professional awareness
BOSNIA			√	√	√	√
CROATIA	√	√	√	√	√	
CYPRUS	√	√		√		√
EGYPT		2	1	3	5	4
FRANCE						
GREECE						
ISRAEL	3	1	2	4	6	5
ITALY			√		√	
LEBANON	√	√	√	√		√
MALTA				√		
MONACO				√	√	
MOROCCO		√		√		
TUNISIA	2	6	1	4	3	5
TURKEY						

What are the existing coastal waste management/litter reduction strategies?	policy reform	institutional set up	law enforcement	monitoring and evaluation
BOSNIA	√			

CROATIA			√	√
CYPRUS	√		√	√
EGYPT	√		√	√
FRANCE				
GREECE				
ISRAEL	√	√		√
ITALY				
LEBANON	√	√		√
MALTA				
MONACO	√	√	√	√
MOROCCO			√	√
TUNISIA			√	
TURKEY	√		√	

What are the waste management priorities?	Waste avoidance	Waste reduction	Waste reuse	Waste recycling	Waste treatment	Waste disposal	
BOSNIA	√	√	√	√	√	√	
CROATIA	√	√	√	√	√	√	
CYPRUS		√	√	√	√	√	
EGYPT	√	√	√	√	√	√	
FRANCE	√	√	√	√			
GREECE							
ISRAEL	(√)	(√)	(√)	(√)	(√)	(√)	not directly to marine litter
ITALY	√	√	√	√	√	√	
LEBANON		√	√	√	√	√	
MALTA	√	√	√	√	√	√	
MONACO				√		√	
MOROCCO	√		√		√	√	
TUNISIA	√	√		√		√	
TURKEY	√	√	√	√	√	√	

What is the stakeholder involvement in waste collection, treatment, disposal and recycling initiatives?	Public and communities	Government, organisations and public enterprises	Local administration	Private sector	Governments of neignboring countries
BOSNIA	√	√	√	√	
CROATIA	√	√	√	√	
CYPRUS	√	√	√	√	
EGYPT					
FRANCE					
GREECE					
ISRAEL	√	√	√		
ITALY	√	√	√		
LEBANON	√	√	√	√	
MALTA		√	√	√	
MONACO	√	√			
MOROCCO	√			√	
TUNISIA	√	√	√	√	
TURKEY		√	√	√	

POLICY ISSUES

B1: Does the national environmental policy target marine litter in:	coastal zones	beach	sea water	seabed	ports	commercial ships	touristic ships (marinas)	fishing ports or terminals	rivers
BOSNIA									
CROATIA	√	√	√		√	√	√	√	√
CYPRUS	√	√	√	√	√	√	√	√	√
EGYPT	√	√	√	√	√	√	√	√	√
FRANCE					√	√		√	√
GREECE		√	√		√	√	√		
ISRAEL	√	√					√		
ITALY	√	√	√	√	√	√	√	√	√
LEBANON	√	√	√		√	√	√	√	√
MALTA									
MONACO	√	√	√		√	√	√		
MOROCCO	√	√							
TUNISIA	√	√		√	√	√	√	√	√
TURKEY		√			√	√	√		√

B2: What kind of national policy covers coastal litter issues	National waste management policy	Specific litter policy	other policy
BOSNIA	√		
CROATIA	√		
CYPRUS	√	√	√ (collection of garbage from ships)

EGYPT	√	√	√ (Set back line and EIA)
FRANCE			√ International conventions
GREECE	√		
ISRAEL		√	
ITALY	√		
LEBANON	√		
MALTA			
MONACO	√		
MOROCCO			
TUNISIA	√		√
TURKEY	√		

B3: Have land and vessel/ship generated waste been integrated in plans and policies?	yes	no
BOSNIA	√ (only land)	
CROATIA	√	
CYPRUS	√	
EGYPT	√	
FRANCE	√	
GREECE		
ISRAEL	√	
ITALY	√	
LEBANON	√	
MALTA		√
MONACO	√	
MOROCCO		

Main obstacles that have been identified?	Lack of human resources	Lack of funds	Lack of information	Lack of coordination between stakeholders
BOSNIA	√	√		
CROATIA	√	√	√	√
CYPRUS	√			√
EGYPT				√
FRANCE				
GREECE				
ISRAEL				
ITALY				
LEBANON		√	√	√
MALTA				
MONACO				
MOROCCO				

TUNISIA	√	
TURKEY	√	

TUNISIA				
TURKEY				

Have agencies got the means/capacity to execute their tasks (staff, budgets, expertise?)	yes	no
BOSNIA		√
CROATIA	√	(√)
CYPRUS	√	
EGYPT		√
FRANCE	√	
GREECE		
ISRAEL	√	
ITALY		
LEBANON		√
MALTA		√
MONACO	√	
MOROCCO		
TUNISIA	√	
TURKEY		

Main constraints that prohibit environmentally sound coastal litter handling?	Administrative and legal	Technology and infrastructure	Support services
BOSNIA	√	√	√
CROATIA	√	√	
CYPRUS	√		√
EGYPT	√	√	√
FRANCE			
GREECE			
ISRAEL	√		√
ITALY			√
LEBANON	√	√	√
MALTA	√		
MONACO			
MOROCCO		√	√
TUNISIA		√	√
TURKEY		√	

What plans and actions have been identified to improve the situation?	
BOSNIA	Federal Environment Strategy was elaborated in December 2007 - not yet approved. Republic of Srpska has not yet elaborated an Environment Strategy and Brcko District is in the procees of elaboration
CROATIA	Waste Management Strategy in the Republic of Croatia

CYPRUS	Revision of Strategic Waste Management Plan is in process, Waste reception facilities at ports since 1982 but now being carried out according to EC Directive 2000/59/EC and the P.I. 771/2003
EGYPT	National environmental action plan, Strategy fro Prevention of and response to marine pollution from ships in the Mediterranean
FRANCE	
GREECE	
ISRAEL	Clean Coast Programme
ITALY	
LEBANON	Draft law for Integrated Solid Waste Management has been prepared and sent to the Council of Ministers for pproval; Master Plan for rehabilitation of uncontrolled seafront dumpsites; National Plan for construction of SW Treatment Plants; EU fund for ISWM Projects
MALTA	
MONACO	The Sanitation Society of Monaco responsible for the collection of garbage and urban wastes cleans every day the water surface sections with the help of two sea scooters and one boat especially designed for this purpose. More over, removes regularly the used lubricated oils, the filters and the batteries for which, reception facilities for stocking these products are positioned around the ports. The garbage generated by the boats, is collected everyday from the containers placed on the docks.
MOROCCO	Reinforcement of the legal framework. Elaboration of a master plan and mechanisms for monitoring and control
TUNISIA	National Programme on Waste Management includes coastal zones; Stategy and Action Plan between the National Agency for the Protection of the Environment and the National Agency for Waste Management
TURKEY	

LITTER MANAGEMENT STRATEGIES

C1: Who is responsible for litter management?	National level						Coastal zones level (beach, coast…)						Ships				
	Ministry of Environment	other Ministry	the Region	Municipalities	Coast Guards	Private sector	the Region	Municipalities	Regional Environmental Administration	Coast Guards	Private sector	other Administration	Harbor Authority	Local Environmental Administration	Coast Guards	Private sector	other Administration
BOSNIA	✔		✔	✔				✔									
CROATIA	✔	✔	✔	✔		✔	✔	✔	✔		✔		✔			✔	
CYPRUS	✔	✔					✔	✔					✔				✔
EGYPT	✔	✔	✔		✔	✔				✔	✔	✔	✔	✔	✔	✔	✔
FRANCE		✔		✔		✔		✔					✔				✔
GREECE	✔			✔					✔				✔				
ISRAEL	✔	✔		✔				✔					✔				
ITALY	✔		✔	✔	✔			✔	✔	✔			✔		✔		
LEBANON	✔	✔	✔	✔			✔	✔	✔			✔	✔	✔			✔
MALTA	✔	✔											✔				
MONACO	✔																
MOROCCO	✔	✔		✔		✔		✔			✔						
TUNISIA	✔	✔	✔	✔		✔	✔	✔	✔		✔		✔			✔	
TURKEY	✔						✔	✔					✔	✔	✔	✔	✔

C2: What is the responsibility of environmental authorities in the coastal zone litter management issue?

	Operational l	Control and Enforcement	Juridical	Follow-up	No responsibility
BOSNIA	✔	✔		✔	
CROATIA		✔			
CYPRUS		✔			
EGYPT		✔		✔	
FRANCE	✔	✔	✔	✔	
GREECE		✔			
ISRAEL		✔	✔	✔	
ITALY		✔	✔		
LEBANON		✔		✔	
MALTA		✔			
MONACO				✔	
MOROCCO			✔		
TUNISIA	✔	✔	✔	✔	
TURKEY	✔	✔	✔	✔	

INDICATORS

D1: Economical Indicators

	cost/ton./inh.	total expenditure/y	% of the budget	cost of fleet maintenance/y	collection and transport	others
BOSNIA						
CROATIA	✔	✔	✔		✔	✔
CYPRUS						
EGYPT						
FRANCE	✔	✔				
GREECE						
ISRAEL						
ITALY						
LEBANON					✔	
MALTA						
MONACO						
MOROCCO						
TUNISIA		✔			✔	
TURKEY						

D3: Technical Indicators

	Qt of waste generated per inh./y	Qt of waste generated per hotel room/y	Qt of waste collected/d	Qt of waste transported/d	Presence of uncollected waste on beach	Presence of floating waste	Presence of waste on the sea bed	Existence of reception facilities in harbors	Existence of municipality recycling programme	Existence of recycling programme	Others
BOSNIA											
CROATIA	✔		✔	✔				✔			✔
CYPRUS											
EGYPT			✔		✔	✔	✔				
FRANCE	✔		✔	✔	✔	✔	✔	✔	✔		
GREECE											
ISRAEL					✔						✔
ITALY											
LEBANON	✔		✔	✔	✔	✔	✔				
MALTA											
MONACO		✔	✔					✔			
MOROCCO											
TUNISIA	✔		✔		✔			✔		✔	
TURKEY	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	

D2: Institutional and Legal indicators

	total # of personnel in charge	% of technical personnel	total # of regulations	# of new regulations issued/y	special regulations for beach	special regulations fro ships	others
BOSNIA							
CROATIA			✔	✔	✔	✔	✔
CYPRUS							
EGYPT				✔	✔	✔	
FRANCE							
GREECE							
ISRAEL							
ITALY							
LEBANON			✔	✔	✔	✔	
MALTA							
MONACO							
MOROCCO							
TUNISIA	✔	✔	✔		✔	✔	
TURKEY							

SOURCES OF LITTER IN COASTAL ZONES

E1: What are the major sources of solid waste in coastal zones? (%)	Households (direct disposal)	Villages (direct disposal)	Runoff from cities	Ships	Pleasance boats	Tourist facilities	Runoff through rivers	Others	
BOSNIA	✔	✔				✔			
CROATIA	✔	✔		✔	✔	✔			
CYPRUS									
EGYPT		5		70		25			
FRANCE									
GREECE									
ISRAEL				40				60	beach goers
ITALY									
LEBANON	10	✔	10	10			30	40	uncontrolled dumpsites
MALTA									
MONACO				✔	✔		✔		
MOROCCO	✔	✔							
TUNISIA	30			20	20		30		
TURKEY									