



**UNITED NATIONS ENVIRONMENT PROGRAMME  
MEDITERRANEAN ACTION PLAN**



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**MED POL**

**GUIDELINES ON MANAGEMENT OF COASTAL LITTER  
FOR THE MEDITERRANEAN REGION**

**LIGNES DIRECTRICES SUR LA GESTION DES DÉTRITUS CÔTIERS  
POUR LA RÉGION MÉDITERRANÉENNE**



World Health Organisation

**MAP Technical Reports Series No. 148**

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UNEP/MAP  
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- Managing Coastal Areas
- Integrating the Environment and Development



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## FOREWORD

The riparian States of the Mediterranean Sea, aware of their responsibility to preserve and develop the region in a sustainable way, and recognizing the threat posed by pollution to the marine environment, agreed in 1975 to launch an Action Plan for the Protection and Development of the Mediterranean Basin (MAP) under the auspices of the United Nations Environment Programme (UNEP) and, in 1976, to sign a Convention for the Protection of the Mediterranean Sea against Pollution (the Barcelona Convention). The Convention entered into force in 1978 and was amended in 1995.

Recognizing that pollution from land-based activities and sources has the highest impact on the marine environment, the Contracting Parties to the Barcelona Convention signed in 1980 a Protocol for the Protection of the Mediterranean Sea against Pollution from Land-Based Sources (LBS Protocol). The Protocol entered into force in 1983 and was revised in 1996 to better cover industrial pollution sources and activities and to enlarge the coverage to include the hydrologic basin.

A Strategic Action Programme (SAP MED) to address pollution from land-based activities, which represents the regional adaptation of the principles of the UNEP Global Programme of Action (GPA) to address land-based pollution activities, was adopted by the Contracting Parties to the Barcelona Convention in 1997 as a follow up to the provisions of the revised LBS Protocol. The SAP MED identifies the major pollution problems of the region, indicates the possible control measures, shows the cost of such measures and establishes a work plan and timetable for their implementation.

In order to assist the Mediterranean countries in the long-term implementation of the SAP MED, particularly in the formulation, adoption and implementation of National Actions Plans (NAPs), a three-year GEF Project "Determination of priority actions for the further elaboration and implementation of the Strategic Action Programme for the Mediterranean Sea" was implemented by MAP, and in particular by the MED POL Programme, the MAP Regional Activity Centres and WHO/EURO. The project consists of numerous activities which include, among others, the preparation of regional guidelines and regional plans, whose main aim is to guide and assist countries to achieve the pollution reduction targets specified in SAP MED.

The present document is part of a series of publications of the MAP Technical Reports that include all the regional plans and guidelines prepared as part of the GEF Project for the implementation of the SAP MED.



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## SUMMARY

Waste in maritime environment arises from private and individual discharges scattered directly in sea but they can be also made far from shore and transported by natural vectors as rains, streams and wind up to the sea. They can go through long distances. This waste does not know the borders. The efforts of fight have to get organized in a harmonious way between countries to be able to see a reduction of this pollution of the Mediterranean Sea. Within each country the fight against this pollution has to get organized from programs of management of waste but they also have to include advice of management of the public spaces at the local levels (municipalities, communities of municipalities).

The plan of reduction of this pollution focuses essentially on two points:

- Reduce the number of discharge out of waste controlled circuits;
- Remove the largest amount of macro waste from the environment to reduce the quantities that circulate in maritime environment.

These objectives can be reached by elaborating organizational and financial programs for the management of the waste, which integrate the question of macro waste. These programs have to include the estimation of the deposit of waste produced in sea and in land. The quantitative and qualitative data concerning waste collected on beaches confronted with the meteorological data and with the anthropological context allow to know the origin of the loads and to target the actions to be led to reduce marine debris to the source. For waste produced from vessels, it is necessary, in every case, to facilitate the waste disposal in ports.

The programs thus have to include the means and the necessary tools to allow the local authorities to:

- Better know the characteristics of marine litter;
- Better organize their removals from the maritime environment;
- Better make the public and the authorities sensitive about this question.

The essential axis of the improvement of the consideration of the issue of marine debris goes through a modification of the personal values of the public with awareness campaigns which inform about the cost of macrowaste for communities, the environmental impacts, the quantities and categories of macro waste which we meet in the environment. The plans of fight against this pollution can be assessed and their efficiency reported to the public thanks to the observations and to the measures made in the field.

## **PREFACE**

These guidelines are intended to help the various potential participants better grasp the potential impact of marine waste, and to provide some recommendations aimed at enhancing the coordination of measures and practices for the appropriate management of such waste.

The aim is to offer the responsible authorities, planners and field operators the possibility of placing their national and regional development strategies within a context which will allow them to protect the Mediterranean environment as best possible. It is also a matter of creating a common reference framework in order to underscore the complex interactions between the problems relating to solid marine waste.

## **INTRODUCTION**

### **I. Regional context**

Following the outcome of MED POL Phases I and II, and the Agenda MED 21 recommendations, MED POL phase III (1996-2005) was adopted and launched in 1996, and has evolved in the direction of pollution control and training action for its implementation. This objective makes information available to the responsible authorities and planners in the various countries of the Mediterranean region, which puts them in a position to develop clean plans and ensure optimal sustained socio-economic development without leading to environmental degradation.

These guidelines for waste management can provide some helpful elements for the appropriate management of marine waste. This applies in particular to the identification of marine waste and its classification, anthropological and natural factors which contribute to their presence, in their classification, in the recognition of the organizational, legal and institutional systems concerning marine litter and waste, in the technical and logistical organization of waste management, and an approach concerning public participation with a proposal on the economic and financial means and mechanisms to be recommended.

### **II. General conditions**

The aim of the following section is to propose mechanisms which are applicable to the region as a whole, specifying certain needs, opportunities and demands. In order to respond as effectively and comprehensively as possible to these needs, the design and implementation of such mechanisms must be decided in such a way that they provide a simultaneous response at the national and regional levels, allowing the necessary flexibility to respond to national specificities but in a regional context.

The objective is to assist the governments of the coastal states in the Mediterranean region to build up their knowledge of the common problems to which they must face up, both in the Mediterranean Sea and in its coastal areas.

This approach reflects the special importance to be attached to the development of appropriate frameworks at the legal, institutional, and financial and community levels, and to capacity building so as to ensure the sustainability of waste management mechanisms.

This approach will need to be bolstered by project initiatives that will encourage participation by the private sector, in accordance with each country's priorities.

## SECTION A

### ASSESSMENT AND MANAGEMENT OF MARINE WASTE

#### 1. Characterization of coastal litter

Solid Marine Waste means any persistent manufactured or processed solid material, visible to the naked eye, which is discarded, disposed of, or abandoned in the marine and coastal environment.

- 1.1 It is not easy to quantify such a heterogeneous pollutant in the vast and diversified marine environment; Marine waste is composed of all types of waste which build up in the oceans, the seas, on the shore and along the entire coastline. These wastes are more and more complex, and made of several materials which have each specific impacts (oil of engines, hydrocarbons, ink on newspapers and packaging). It is also composed of persistent artificial substances, in other words synthetic and plastic materials, which are a cause for great concern.
- 1.2 In decreasing order of quantity, the main components of waste to be found along the coasts are: plastics (scraps, sheeting tins, bottles, bags, containers), wood (driftwood, crates), metal (food and drinks cans, sprays), glass (bottles), expanded polystyrene (a special type of polyurethane plastic), fishing tackle, rubber, and various other objects (fabric, paper, cardboard, foodstuffs).
- 1.3 Plastic is the most commonly found type of pollutant on the shore. Plastic waste, including polystyrene, floating on the surface or driven ashore, accounts for more than 50% of the litter collected during clean-up operations. Plastic presents a specific problem since the self same qualities which make it so useful, its incorruptibility, its lightness, solidity and durability- also mean that it can persist for a very long time in the environment.
- 1.4 Pieces of glass, wood and tin cans also turn up on our beaches. However, wooden building waste and also other wood products such as painted woods, boat pieces and bulky items should not be confused with wood debris from nature such as tree trunks and branches, which is not classified as waste. (Whatever their origin, natural or man-made, these wooden fragments must be sometimes removed from beaches or from waters to assure a good use of the sea. This clean-up then requires significant means).
- 1.5 Waste, because of their physical characteristics, can be found everywhere and be conveyed by winds, rainy waters and currents. Winds transport the lightest waste in the air and push at sea the ones which float. Their action combines with that of the waves. Marine debris can be floating on the surface, can be floating beneath the surface, can drift ashore or can be lying on the bottom. They float not only because of their density (e.g. wood or polystyrene), but also because of their shape (e.g. empty bottles and cans, etc.). Waste is also to be found on the seabed, composed in particular of metal objects, water-saturated wood, glass, fishing tackle and certain plastics (sheeting, bags, containers, bottles).

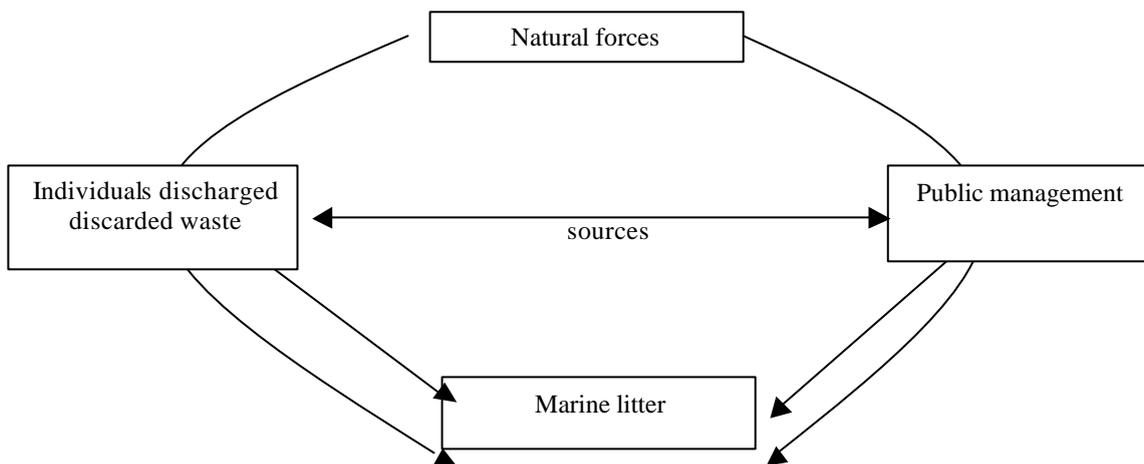
#### 2. Origin of coastal litter

2.1 The main sources of waste are domestic and industrial activities, with waste being dumped directly or indirectly into the sea, or in coastal dumps; the towns, the rainwater sewers, the sewage waters network, ships, particularly ocean-going ones, may also dump their waste directly into the sea. It is obviously very difficult to specify the sources in those cases where there are several involved. The beach-going public also leaves large amounts

of litter behind. Finally, marine debris arise from scattered individual discharges wherever they are directly made at sea or on land. Waste can also be dumped in bigger quantities by private persons from the coast or waterways or directly into the sea from commercial vessels or yachts.

2.2 Natural forces (winds, rain, currents) (naturally) carry waste up to the coasts. The stormwaters flush the streets and the entire watershed, transporting numerous waste. The strong winds on unsecured waste dumps can take away plastic bags and waste from dustbins. Storms and torrential rains sometimes convey waste and wood, which is necessary to handle in very large quantities.

2.3 This understanding of the processes of circulation of waste clearly indicates the public sectors, which are involved in the management of the sources and the vectors of marine litter (management of streams, cleaning of streets and coasts, maintenance of rainwater networks, management of the waste dumps, commitment of the public through awareness campaigns). Marine debris also arise from a badly suited public management.



**Figure: marine litter's sources and vectors**

| Sources of Coastal Solid Waste                      |  |   |  |
|---|--|---|--|
| Land Based<br>(Group of responsible actors)         |  | Marine Origin                                     |  |
| Private discharges                                  | public or private Management                           | private discharges                                | public management  |
| Inhabitants   | Maintenance of shore                                   | Sailors   | Navy   |
| Tourists  | Maintenance of streets                                 | Yachtmen  | Zones of submarine accumulation<br>Knowledge of the quality of stock |
| Beach Going Public                                  | Maintenance of Rainwater sewers                        | Passengers on commercial Boats                    | Waste dumped directly into the sea                                   |
| Recreative fishermen                                | Maintenance of Streams                                 | Management of waste aboard the commercial vessels |  |
| Professional fishermen                              | Discharges in border of streams and coastal waste dump | Inhabitants of platform                           |  |
| Users of ports and Harbours                         | Wastewater treatment system                            | Management of waste on platforms                  |  |
| Homes, Industries, Commercial & Touristic Complexes | Management of waste in ports                           |   |  |

2.4 The main producers of coastal solid waste are in particular:

- a. Inhabitants, holiday-makers, recreative fishermen, sailors and tourists that carelessly leave behind all sorts of things on the beaches;
- b. The passengers of commercial vessels, freighters, passenger ships, and commercial fishing vessels, which dump waste at sea, or which accidentally lose some of their cargo;
- c. Managers of construction sites or industrial, commercial, and touristic activities who thoughtlessly dump their waste;
- d. Responsible parties that practice and let practice inappropriate methods of clean-up of streets, management of streams, waste dumps, and local sewage outlets.
- e. Inland waters (rivers) entering into the sea can also carry solid wastes that are easily observed near the river mouths.

### 3. Impact of coastal litter

Coastal litter has a considerable negative effect on the environment in general and the impact caused is related to a number of issues, more than being simply visual pollution, waste also presents a shipping hazard, threatens public safety, damages fauna and flora, and may result in economic losses.

The stakes are numerous:

- Accidents;
- Clean-up cost;
- Indirect cost of the loss of customers;
- Degradation of the image of the countries for tourism;
- Loss of profit for the fishermen;
- Degradation of coasts, sea and bottom;
- Impacts on the fauna, the flora and the ecosystems;
- Environmental cost;

- Biodiversity loss of beaches cleaned mechanically;
  - Controversy and debate on the public and private responsibilities.
- 3.1 The increasing of both population and consumption, threatens to put this question in current events for a long time , a question that may even arise more seriously in the years to come if individual behaviours do not change.
  - 3.2 Throughout the world, the amount of marine waste is on the increase because of the increasing use being made of the sea for commercial and leisure reasons, and because of the proliferation of plastics and other non-biodegradable products.
  - 3.3 The effects of pollutants and other such like are only one means of assessing a pollution problem and, to a certain extent, setting a priority for solving it.

In fact, there are two primary kinds of direct damage to wildlife from solid waste at sea:

Entanglement: Animals may become entangled in discard or lost nets, trapping bands, systems of packaging drink cans and ropes or threads which can cause flesh wounds, strangulation and drowning.

Ingestion: Marine animals also mistake plastic items for usual food, which if ingested can cause starvation and poisoning. Animals concerned by the entanglements or the ingestions are weakened and constitute then easy preys.

Other threats to wild life from marine solid waste are smothering of seabed; environmental changes due to alien species and the biodiversity losses of the ecosystem of beaches from mechanical clean up.

- 3.4 Fishing nets and lines, elastic bands, strips and plastic bags, bits of rope, polystyrene and plastic are the greatest hazard. In fact, one of the direct consequences of the presence of waste affects aquatic life, which either by feeding on waste or becoming ensnared, run the risk of injury or death. Many species such as turtles, whales and dolphins, often mistake plastic matter for food. But plastic matter, when swallowed, can block the digestive tract, which means that the animals will starve to death.
- 3.5 The negative economic impact of marine waste is more difficult to assess. Waste can damage leisure craft and fishing vessels; it can lead to time being wasted, and costly repairs. Tangled up propellers, blocked cooler water intakes of engines and structural damage caused by contact with waste is a navigation hazard, and may give rise to costly repairs. Cases of ports and rivers, canals and lakes being blocked by waste are often heard of. The marine litter can be dangerous to both human and marine life.
- 3.6 The coastal tourism industry, ecotourism in particular, depends on clean, healthy beaches to attract a growing number of clients. Whatever their source, marine waste is a blot on our shores and may involve a disaffection of beaches by the tourists. Leaving waste on the beaches and other tourist or commercial sites is seen by the users themselves as major pollution or a great source of annoyance.
- 3.7 Moreover, even though the disposal of solid waste in controlled dumps or sanitary landfills appears to be an acceptable solution in the short and medium term, waste is frequently dumped in close proximity to the sea. Where rapid and thorough means for dispersal are not present, such as the vigorous flushing of a bay by the tide, the waste will simply remain on the shore or will migrate, thereby polluting it. In addition, the leachate produced from the degradation of waste, may be swept into the beach water thus polluting it and producing obnoxious odors.

#### **4. Decision-taking process**

- 4.1 Public policies intended to reduce or halt coastal degradation are of but limited effect. Since the approach is often sectoral, it has proven difficult to design such policies, which have generally turned out to be ineffective in the field. The following section recommends that the integrated management of coastal areas should be the chosen tool for laying the foundations for sustainable development capable of reducing or eliminating pollution, rectifying the other negative impacts, and preventing those which could well emerge in the future.
- 4.2 Solid waste is not always specifically mentioned in global or regional convention or action plans, but when political agreements address the need to sustain the health and productivity of seas and coastal areas and the need for integrated zone management of seas and coastal zones, the issue of solid wastes is well covered.
- 4.3 Waste management requires a thorough knowledge of the common shortcomings and problems, and a better objective approach to the achievements and efforts made in the area of marine and coastal management. This analysis is required in order to identify all the opportunities that are immediately available for the integrated and optimum management of this environment, especially as regards investment in the logistics of managing such waste.
- 4.4 On this basis, a good follow-up mechanism needs to be established for recommendations and guidelines in this field, particularly as far as the technical and logistical aspects are concerned, involving better legal and institutional organization and the correct application of the economic and financial mechanisms advocated.
- 4.5 Such mechanisms need to be easily applicable to the region as a whole, with needs, opportunities and demands being specified. In order to respond as effectively and comprehensively as possible to these needs, the design and implementation of such mechanisms must be decided in such a way as to provide a simultaneous response at both national and regional level, allowing the necessary flexibility to respond to national specificities but in a regional context.
- 4.6 National integrated solid waste management plans should be developed and endorsed by the responsible authorities and stakeholders. Waste management in coastal areas should be considered as a priority area within the national plan, in order to support the SAP where strict environmental measures for solid waste handling and management should be considered.
- 4.7 For this purpose, it is recommended that operational efficiency be sought through the optimum distribution of activities between the public and private sectors and the other actors in civil society, each in their own sphere of activity. Involving the private sector in the operational and competitive activities will provide the technical know-how and efficiency, and decentralising authority and responsibility in this way towards the lowest level able to assume it is a desirable move.
- 4.8 Proper management of coastal waste needs to be based on strict, on-going controls, which will be preventive, depending on the individual situation. Such controls can only be operational and effective if they are implemented within the framework of clear, consistent rules and regulations, and an economic and financial strategy based on two principles: "the polluter pays", and "production-recovery".

## 5. Coastal litter management practices

This type of pollution can be checked only by decreasing the discharges and by removing the largest amounts of marine litter from the environment. The reduction of the discharges can be reached through repeated awareness raising campaigns targeting these very users, and by an appropriate clean up of the public places in order to set a good example and to show the interest which the community carries in the neatness. The removal of waste can be obtained by providing the means for the cleaning, the collection of garbage and the transport because the operations of cleaning beaches and shores are highly expensive.

The coastal litter issue should not be seen separately but always as a part of the solid waste sector. It is indeed, strictly related to the solid waste management, although it needs more attention to be addressed, because of the delicate situation of the coasts.

The coastal solid wastes either from marine or land-based origin should be first collected. The collection from sea-platforms and ports and from ships and pleasure boats is mainly made within the port area in appropriate facilities. Regarding the collection of wastes of land-based origin, that are produced from installations on land and/or from direct discharge but also from run-off and generally from any other land-based source, it is usually accomplished mechanically from adequate collection points. Usually the responsible for the port collection are the port authorities in contrast with land-based origin collection, where the local authorities usually are responsible for the management of all types of solid wastes. Both the port and the local authorities can contract private firms to deal with the issue when the appropriate infrastructure is lacking.

During the recent years, special attention is paid to operations which may led to recovery, such as recycling and reclamation of metals and metal compounds, of organic substances which are not used as solvents (recyclable plastics, and of other inorganic materials). These operations are used for all solid wastes in general, regardless their origin and consequently the coastal solid wastes after their collection follow the same operations as for all solid wastes.

Following their collection with or without recycling, the disposal operations include the tipping underground, the land treatment and composting, and the sanitary landfills, operations that are generally indicated as dumping in the soil. Another method is the incineration in appropriate facilities so as to avoid any harm to the environment. Other methods include biological and physico-chemical treatment that are not specified in the disposal operations and that result in final compounds or mixtures which are disposed by means of the above mentioned operations.

5.1 It should be pointed out that the solid waste sector can be divided into two quite distinct categories:

- on the one hand, collection and transport to the transfer center, the waste dump or the disposal facility;
- on the other, the disposal and elimination of waste in appropriate facilities (recycling facilities, incinerators, public waste dumps, etc.).

5.2 Bearing in mind the numerous sources of waste and therefore of operators in maritime areas, as well as the broad geographical scope to be covered, this analysis will essentially be based on the exhaustive collection of information from the countries in the Mediterranean basin having been the subject of initial surveys to this end in particular.

- 5.3 Coastal waste management can be approached in two ways: on the one hand, the management of waste originating on the land, and on the other, waste of marine origin (sea, ships, platforms, etc.).
- 5.4 As regards marine origin, the sources of waste at sea have first and foremost to be identified and defined (ports, harbors, territorial waters) and then the type of management employed has to be specified both as regards collection, transport, and regarding treatment or elimination.
- 5.5 Under the term “ships and other artificial structures”, three categories of source can be identified:
- mobile structures;
  - fixed structures;
  - temporarily fixed structures.

A particular type of structure can be assigned to one of these three categories.

- 5.6 A ship is a floating building composed of three main compartments, namely:
- the engine compartment;
  - the crew compartment (living quarters);
  - the cargo compartment.
- 5.7 With the exception of passenger ships, where the cargo compartment is replaced by the passenger compartment, these compartments generate the same types of waste irrespective of the class of ship, and according to the following classification:
- a. cargo-related waste;
  - b. waste related to ship maintenance;
  - c. accidental waste: either from the cargo or due to running operations (transfer from cargo holds, etc.);
  - d. engine-related waste: changing the engine oil, cleaning and changing filters, leaks from tubes and pipes, maintenance of material and use of chemicals, cleaning of the engine room (liquid wastes);
  - e. domestic and similar waste (liquid wastes).

- 5.8 As for the class of ship, two can be distinguished according to the waste generated:
- cargo ships (freighters, roll-on roll-off, and oil tankers)
  - passenger ships.

- 5.9 The volume of waste produced by such ships and platforms can be considered according to the size of the ship and/or the number of passengers.

Generally speaking, the crew of cargo ships (freighters or RoRos, oil tankers, ore carriers, chemical transporters) has the same number of members so it can be considered that the amount of domestic and similar waste discharged is the same for all ships irrespective of their size. Engine waste, however, is closely related to the size of the vessel and the power of its engines.

- 5.10 For passenger ships, the volume of domestic and similar waste is higher, because of the number of people on board. Waste generation is proportionate to the number of passengers. For fishing vessels and pleasure craft, the waste generated is also

proportionate to the number of passengers. Platforms, however, need to be considered on a case-by-case basis.

- 5.11 The following is a qualitative recapitulative table of the sources of waste from passenger ships, RoRos, freighters, oil tankers, chemical tankers, tugs, fishing vessels and pleasure craft.

| Type of discharge |                      | Sources of discharge |                  |                 |             |
|-------------------|----------------------|----------------------|------------------|-----------------|-------------|
|                   |                      | Machinery            | General services | Passenger areas | Cargo areas |
| Liquids           | Oily waste           | X                    | X                |                 | X           |
|                   | Bilge water          | X                    |                  |                 | X           |
|                   | Hydrocarbons         | X                    |                  |                 |             |
|                   | Cargo                |                      |                  |                 | X           |
|                   | Other*               | X                    | X                | X               |             |
| Solids            | Domestic and similar |                      | X                | X               |             |
|                   | Packaging            | X                    | X                | X               |             |
|                   | Material waste       | X                    | X                |                 | X           |
|                   | Cargo                |                      |                  |                 | X           |

\* Chemicals and additives, treatment of boiler water, detergents, waste water.

- 5.12 As regards the management of waste from mobile and fixed platforms, solid waste from the engine compartment is mainly the result of maintenance operations (dirty rags, worn-out mechanical parts, packaging). This waste material should be collected and stored on site, until they are transported and delivered to the designated waste management system.
- 5.13 The storage of marine solid waste has to be performed as per standardized guidelines. These should be set as per the type of material to be stored (physical, chemical, and biological properties), and the duration of storage. The storage facilities should be regularly inspected and adequate maintenance schemes followed.
- 5.14 As regards land-based sources, urban households, distribution and service activities and industrial enterprises generate solid waste. Its nature and volume varies according to the type of city, the area and the time. It requires the establishment of collection and management services (destruction, recycling, reclamation, and treatment), with these activities usually falling to the local authorities and regional environmental administrations.
- 5.15 People leave plastic bags, various kinds of food packaging, beverage cans and cartons, toys, cigarette butts, etc. in public spaces (surrounding rivers, streets, beaches and other coastal visited zones). A good management of waste implies a good management of public spaces. Frequent clean up of these spaces prevent waste from being flushed in case of strong rains and flood. An appropriate management of the garbage including a number of picking up adapted to the volume avoids that accumulation of waste out of the garbage containers to be taken out by the natural vectors. Waste bins should be located on the beaches, in visited and camping areas, and they should be emptied frequently.

The streams' clean up plans have to include the problem of marine litter. Banks can be covered with waste during the floods. They are retaken in the following floods. The programs must be able to include technical, human and financial means, which take into account the question of marine debris. The State is generally responsible for the River Public Domain and the local residents are in charge of maintenance. However,

the current tendency is the dereliction of agricultural activities, and more and more grounds in borders of streams are in fallow lands. Maintenance work is getting more and more scarce. Local authorities and the State must be able to organize and allow the restoration of streams.

For the floating waste in streams, programs can also include this question by allowing the hydroelectric dams to hold and permit collection of this waste. These programs have to incite the administrators of these dams to proceed to this management without binding them financially.

Regarding rainwater sewers in the cities, streets and trenches are very often considered as dustbins. The municipal services particularly must make sure that their clean-up operations are as meticulous as possible in order to prevent waste from reaching the sea this way. These sewers are not always linked with wastewater treatment plants. They must be regularly maintained so that the accumulations of waste, which often take place in case of rainy episode, are not washed to the sea in the following episodes. Thus the maintenance, as required for streams, has to follow the important rainy episodes.

## **6. Waste collection and transport**

- 6.1 In most cases, waste management is the responsibility of the municipalities and the Ministry responsible for the environment, with tasks and prerogatives as well as operational activities and follow-up being shared with relevant Ministries and local authorities.
- 6.2 Since the local authorities are usually primarily responsible for waste management, they must ensure the viability and sustainability of the collection system to be established. This system could quite easily be sub-contracted to private firms (even though it is accepted that at present their involvement is limited). Their participation is highly recommended and is advisable provided that the framework for such a partnership is well prepared, and that the objectives are professionalism and a sense of responsibility.
- 6.3 The principles are as follows:
  - a. the creation of a framework favourable to global and integrated management of the solid waste sector at regulatory and institutional, but also at financial and fiscal level that may be applicable;
  - b. the quest for efficiency through the best possible distribution of activities between the public and private sectors and the other actors in civil society, each within its sphere of competence; the involvement of the private sector in operational and competitive activities will provide technical know-how and efficiency;
  - c. a clear definition of roles, avoiding any overlapping and incompatibility in the sharing of competence, and in particular separating control and operational activities;
  - d. decentralization of authority and responsibility to the lowest level capable of assuming them.
- 6.4 Each party must be fully and unequivocally responsible for the waste it generates. It must select and establish a method for appropriate collection and transport, either under State control (collection using its own resources), or through specialized firms approved by the bodies concerned.

## 7. Handling of wastes

In handling the wastes in general and particularly the coastal litter, it should be highlighted that special attention is to be addressed to the different operations so as to avoid the environmental degradation. Therefore, sorting and reduction at source that may lead to recycling and reclamation are also preferable than collecting and dumping the wastes.

The elements available for managing waste streams are, in order of priority:

- reduction at source;
- sorting;
- recycling and reclamation;
- sub-surface containment "sanitary landfilling" and other methods of elimination (incineration and other treatment techniques).

### A. Waste recovery

- 7.1 It is mainly the level of resources available, the socio-economic and cultural context and the commitment of the various actors, as well as their endorsement of good management practices, which govern the balance between these various options and the observance of this order of priorities.
- 7.2 Sorting is an essential preliminary step before recycling and disposal of marine solid waste. Sorting may be conducted at source or in a central sorting facility prior to recycling.
- 7.3 The benefits of recycling need no further emphasis:
- a. it permits a reduction in the waste streams to be treated, thus helping to lower the cost of treatment, and it prevents the overloading of waste dumps;
  - b. it preserves natural raw material resources and decrease the environmental pollution;
  - c. it provides new raw material for specific industries;
  - d. it decreases the volume of imports;
  - e. it generates jobs.
- 7.4 Recycling, however, involves an often complex chain of interdependent activities, and requires the mobilization of a large number of public and private actors. The success of the activity depends on the efficacy of all the links in the chain. The reclamation chain, however, is only viable if it forms part of an economic circuit.
- 7.5 Recycling has two facets: an industrial facet and a waste management facet. A purely industrial and commercial approach to recycling does not always guarantee the viability of this activity. Its feasibility is facilitated if the environmental benefits are taken into account.
- 7.6 The role of the public authorities is to strive, in cooperation with the professionals, to combine the two approaches; to establish the appropriate regulatory and institutional environment, and to define the economic instruments and adequate incentives for each channel.
- 7.7 A targeted awareness and sensitization strategy should be developed and implemented. It should focus on the positive economic and environmental benefits of recycling, and on the role of the general public and the solid waste producers in the recycling program.

7.8 Taking all these facts into account, and identifying the type of marine waste that can be recycled, it can be seen that, on the one hand, in view of the difficulty of mobilizing the potential and minimum stocks recyclers require, and, on the other, the degree of contamination of this waste and its lack of homogeneity, this type of waste is of little interest to recyclers.

**B. *Disposal operations***

7.9 Disposal usually concerns end waste (waste from waste) or waste that can no longer be reclaimed. It concerns countries that have already moved ahead and established installations for the appropriate reclamation and treatment of waste.

7.10 Waste incineration, which effectively reduces the waste volume up to 90%, while at the same time produces energy, is a practice for waste management applied worldwide. By practicing incineration the solids change state that result to waste reduction. Even if incineration is perfectly performed, the heavy metals are not destroyed and therefore when it is practiced, strict environmental rules, complying with the current standards, should be applied, taking also into consideration the air emissions.

7.11 If needs be, sub-soil containment in controlled dumps or sanitary landfills remains the solution for other countries. A waste dump must involve the region as a whole, without taking into account the administrative boundaries between places that are close to the dump.

7.12 Environmental directives are continually calling for more appropriate choices to be taken for the location of these dumps. Even though the level of control is constantly improving, these dumps should no longer be sited on the coasts or on the banks of watercourses or on areas with reach groundwater or high groundwater tables. The waste may be blown away, there may be accidental discharge, and as a result waste is spilt and carried towards the coast or the sea.

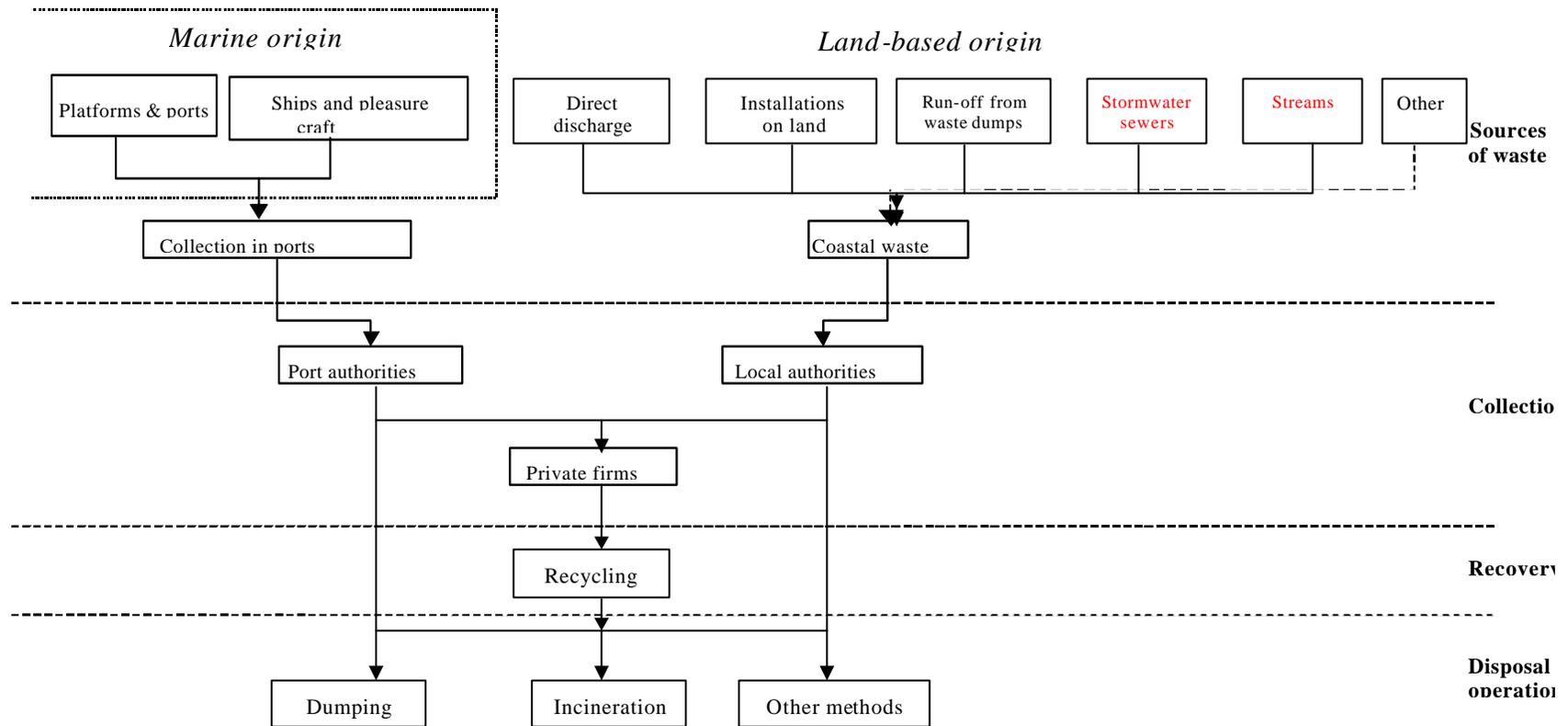


Figure: Flow chart of coastal waste management

## SECTION B

### MONITORING OF COASTAL LITTER MANAGEMENT ASPECTS

#### 1. Legal and institutional recommendations

- 1.1 It must be borne in mind that regulatory and legal action alone is likely to be powerless to protect the coast in the long term, and needs to be accompanied by decisive action regarding economic mechanisms. This means that agencies capable of defining the development objectives in given areas should operate within the framework of regional and national development scenarios, and they must be given the necessary resources for implementation.

Of equal importance is the need to apply proper management methods when dealing with coastal litter, so as to supplement efficiently the legal framework.

- 1.2 The following are some of the actions which appear to be the most urgent or necessary:
- a. Exchange of experience (and possible projects) to take advantage of the special characteristics and complementary elements between the various coastal regions.
  - b. Combined use of modern digital geographical information resources directed particularly at the processing of environmental and developmental data.
  - c. Firm decisions in favor of flexibility for certain installations so that they can subsequently be adapted to changing situations and allow forward-looking management.
  - d. Identification of financial and legal incentives and instruments for the installations that commit themselves to the change.
  - e. Identification of those parts of the coastal strip which are most threatened by future development, and the formulation of appropriate planning schemes for the areas to be developed, designating as of now the areas for total protection, and those with aquaculture potential.
  - f. Conducting strategic environmental assessment for the policies and plans.
  - g. Systematic consideration of the impact on the soil and on the site through environmental impact assessments for developmental projects in coastal regions.
  - h. Protection of a significant proportion of the landside and marine coastal strip in each country as soon as possible, through legislation, purchase, consultation with the population or private owners.
  - i. Prohibition of intentional discharge of litter in neighborhoods and into water courses, ponds, basins, etc., having as their natural or artificial outlet the sea and the shore.
  - j. When developing construction projects for the coastal strip, identification of any adverse effects on the infra-coastal area.
  - k. Establishment of better linkage or coordination between coastal development and development of the hinterland, so as to relieve congestion along the coast.
  - l. On the legal level, it is recommended that regulations be adopted to:
    - give a sense of responsibility to those who intervene to maintain the public places and in possession of waste (administrators of public domains, producers, transporters, or those responsible for treatment and disposal);
    - allow for classification of waste by nature and origin;
    - recommend the use of biodegradable packaging materials especially for objects intended to be abandoned in the wilds (agriculture, balloons) and on ships and platforms;
    - require regular and specific follow-up of waste from production to disposal;
    - require the introduction of national and regional solid waste management plans;

- establish enforcement procedures on the coastal zone ( period and frequency of clean up according to zones, frequency of the collections adjusted to the fillings);
- impose severe penalties on offenders through the application of the “polluter payer” principle, and prepare the necessary legal context to be able to apply this principle;
- on the institutional level, it is recommended that financial and fiscal incentives relating to investment or exploitation be adopted to encourage the privatization of waste collection, transport and treatment.

### 1.3 Specific actions and measures at source

#### ***Merchant ships, offshore platforms, pleasure crafts***

Efforts should, first of all, be made to reduce the generation of waste onboard ships and platforms according to existing legislation. Waste management plans are needed for larger vessels and platforms, and preparations for proper waste management should be made in advance also by those onboard smaller vessels and pleasure craft. These management plans must be shown on board in very visible places for everyone. Waste should be stored onboard and discharged ashore in a proper reception facility. Also, 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 – the management chain must not be broken.

#### ***Fishing Vessels***

Efforts should be made to reduce the generation of waste onboard and preparations should be made for storage of waste onboard until one comes ashore (waste produced by the crew or waste coming from fishing nets). The return of waste collected at sea by the fishermen must be encouraged. Fishing gear, particularly drift nets, should be marked to make it possible to find them again if they are lost at sea. No fishing gear should ever be deliberately discarded but taken ashore for proper disposal.

#### ***Municipal landfills - sewage treatment – hazardous wastes management***

Coastal communities/municipalities and those along rivers should make sure that open landfills for household waste as well as industrial waste are eliminated, as part of their overall waste management strategy. Sewage treatment, in adequately equipped facilities, should be a priority for municipalities, in order to avoid litter mixed with sewage. It is thus recommended that municipalities make sure that trenches are not considered as dustbins any more., and lead actions to encourage the public to dispose of waste in garbage containers rather than in trenches or on roads.

#### ***Households***

Sewage-related waste should never be flushed down the toilet but treated as any other kind of household waste. And household waste should be sorted and taken proper care of.

#### ***Beach-goers, campers etc.***

All beaches and camping grounds should be sufficiently equipped with waste bins to cater for the needs of visitors using these locations. Organized beaches, as opposed to unorganized ones, usually are well equipped with waste collecting facilities and is within the responsibility of the administration to dispose properly the coastal wastes produced by the swimmers. In the case of unorganized beaches, however, people should preferably always take home their own trash and make sure that it is properly sorted and disposed of for maximum recycling. Programs or panels of information should indicate the good behavior to be adopted in natural environment.

## 2. Public participation

- 2.1 Public participation is vital for the best possible management of waste, particularly by encouraging the reduction of waste at source. This preventive action is aimed in particular at individual people producing, holding or managing waste, whether in mobile or fixed installations at sea (ships, platforms, etc.) or on the coast (beaches, ports, bathing resorts, etc.). This is also a priority because if waste is not generated there is a saving in terms of collecting and eliminating, and the cheapest waste to eliminate will always be waste which was never produced in the first place!
- 2.2 Communication and awareness raising are essential to any solid waste management strategy, irrespective of the origin of the waste. Regulation and control of compliance are necessary, along with incentives, but do not suffice to achieve the goals set.
- 2.3 It is a very difficult task to change the behaviour of the various generators of waste, because it concerns everyday actions. It affects the population as a whole, and the economic actors. Furthermore, proper conduct is often neither natural nor spontaneous. The adoption of behaviors and ways of ecological management by the public actors represents the first axis of public awareness on this issue.
- 2.4 The information influences the personal values and the personal values influence the behaviour. It is a question of modifying the personal values by giving the moral motivations which will bring about changes in behaviors. In the solid waste sector, communication and public awareness policy should be based on a number of elements, including in particular the following:
- a. The development of general awareness raising and sensitization campaigns (reforms, costs, etc.), around which specific thematic campaigns can be organised. The subjects to be approached are:
    - the explanation of the role of the natural vectors on the transport of waste (rains, winds);
    - the impacts of the solid waste on the fauna, the flora and the ecosystem;
    - the quantities and the categories of marine debris found on the coasts and in the sea;
    - the costs due by the dispersal of waste in the environment (cost of the cleanings, the loss of profit for the fishermen, the aesthetic degradation of the landscapes with tourist vocation);
    - urge consumers to avoid the multiplication of unnecessary packaging, objects with unique use development, and objects with short active life and long post-use duration promotion.
  - b. Assessment of the current level of awareness of the target groups, and identification of their actual needs;
  - c. Development of appropriate cost-effective communication and educational tools;
  - d. The use of channels and media adapted to the target public and to each level of society;
  - e. Proper long-term planning as a complement to the various programs and reforms;
  - f. Mobilization of all the actors in civil society: public authorities at the national and local levels, NGOs, educators, etc.;
  - g. Assessment of the impact and effectiveness of the campaigns conducted;
  - h. Initiatives for cleaning up the beaches, undertaken by NGOs should be encouraged and promoted.
- 2.5 In addition, public participation is also of the utmost importance in taking the decisions needed to achieve appropriate and sustainable waste management.

### 3. Economic proposals

- 3.1 Over the last few decades, socio-economic development has radically changed the Mediterranean coast. The Mediterranean coastline constitutes a narrow border between the land and the sea, where numerous new installations to be constructed converge and compete, whether this be industry (heavy and processing industry), energy (power stations), tourism, aquaculture, multimodal transport, technical centers, etc.
- 3.2 One of the most useful tools for the better management of coastal litter consists on the identification of financial and legal incentives and instruments. Their application, as in a lot of other cases, will considerably contribute to the improvement of the existing situation.
- 3.3 The coastal characteristics of the “sectors of activity” concern area (e.g. land use planning), because of their mandatory or preferred siting: fishing and aquaculture; desalination of seawater; processing of imported materials; cooling of thermal power stations; loading/unloading of petroleum products; seaside tourism and pleasure craft; land/maritime transport interfaces; international transit, etc. Such a system of operation in coastal areas involves particularly complex interaction or retroaction because of the density of activities.
- 3.4 The economic and financial strategy in this sector is based on two principles:
  - the polluter pays, and
  - the production/recovery principle.
- 3.5 The ideal cost recovery system, which should be the aim wherever possible, should be fair, easy to administer, and economically impartial, and it should generate sufficient resources.
- 3.6 Whenever possible, the cost of environmental degradation, resulting from improper solid waste management, should be calculated and integrated within the economic analysis. Packaging constitutes the most important part of marine debris. So, when an economic system is implemented to achieve their sorting and their selective collection, it would be logical that it also includes assistance to the actors responsible for the removal of this waste of packaging on the littoral space. In addition, it encourages their quantitative and qualitative evaluations and the understanding of the anthropological and natural factors at the origin of this waste.
- 3.7 Fairness means that people in the same circumstances should contribute to the same extent, and that people’s ability to pay should be taken into account. Easy to administer means that the effort involved in paying, collecting and auditing should be kept to a minimum. Finally, impartiality is ensured through non-interference in economic decisions, unless such interference is sought.
- 3.8 The advantages of proper management can be felt at the national, local and individual levels. This is why it would be natural to try to mobilize the resources needed for management from amongst the various beneficiaries.

- 3.9 A financing system should start to be introduced which reflects costs, and it should therefore be proportional to the type and the volume of waste. An economic instrument following an appropriate financial analysis, in the form of a tax would complement local taxes. This would encourage reduction at source, and would send a clearer message to generators of waste, as well as fostering changes in behavior with a view to better waste management.
- 3.10 The direct and indirect costs of the marine litter should be calculated in order to be integrated within systems of waste collection and treatment.
- 3.11 Finally, striking a balance in this sector may require a contribution by the State, which is justified by the need to preserve national interests in the light of the external elements in this sector. It would help to ensure that the national community as a whole did not have to bear the additional direct and indirect costs incurred by inadequacies in the management of the waste sector.
- 3.12 It should be pointed out that waste management is a local activity and it is not always easy to encourage its mechanization. The socio-economic consequences, however, are not automatic. In order to make them a reality and as important as possible, the strategy in the sector should be:
- a. to pursue the policy of inciting the public sector to participate in environmental services;
  - b. to encourage the emergence of new professions in the sector, and make them more professional;
  - c. to develop and adapt the techniques of clean up on shore according to the type of coast, intervention in difficult access environment;
  - d. to promote waste management professions and enhance the image of the profession and sector amongst young people;
  - e. to encourage the creation of micro-enterprises by giving them financial and institutional incentives;
  - f. to design and implement appropriate national training and capacity-building activities.
- 3.13 The mobilization of the resources required for the proper management of waste is a priority for the sector. To ensure its viability and its financial balance, it is recommended in particular that:
- a. the waste management issue be included in the fiscal reform program and considered as a priority public service;
  - b. the marine debris issue be integrated into the management of waste;
  - c. the results of this local reform be monitored and its effectiveness enhanced;
  - d. other cost recovery systems be explored and developed by sector;
  - e. any deficit could be made good by a State contribution.

#### **4. Controlling waste management**

- 4.1 The control function in solid waste management has several facets, which we suggest should be placed in three categories:
- environmental controls;
  - regulatory controls and
  - contractual controls.

- 4.2 Environmental control of projects and services provided is generally conducted as part of prevention in the context of environmental impact assessments. At the implementation level, it must be followed by the measures recommended in the impact assessments in order to ensure the elimination or effective diminution of the negative impacts. It involves professional monitoring by qualified personnel, as in all other stages of the environmental performance of the technologies and processes adopted in the transport, treatment, and disposal operations based on the set standards. This task is usually incumbent upon the Ministry responsible for the environment and the local authorities.
- 4.3 Regulatory control concerns compliance with the relevant regulations for the sector, and various types of infringement:
- a. immediate violation (such as incineration in the open);
  - b. violation in *flagrante delicto* such as the discharge of waste in the natural environment;
  - c. violation concerning the marine and transboundary movement of waste.
- 4.4 Proper management of marine and coastal waste must be based on on-going and stringent controls. They should be preventive or curative according to the situation; they can only be operational and effective if they are implemented within a clear regulatory framework, which provides for prosecution and strictly applied penalties where necessary.
- 4.5 The regulations should in particular make it mandatory for producers and those in charge of eliminating waste to keep a follow-up register containing all necessary indications as to the designation of the waste, transport operations treatment and elimination, etc.
- 4.6 For transporters, consignment notes are also required in order to follow the movement of waste. A waste tracking system may be developed whenever feasible.
- 4.7 The following are the guidelines for controls:
- a. controls must be based on the existing institutional framework;
  - b. controls must give the public entities jointly responsible for collection and treatment services a sense of responsibility;
  - c. controls must be carried out in a spirit of cooperation and transparency between the operators and the control authorities;
  - d. public and private operators should be subject to the same rules and standards, and enjoy the same exemptions.

## **5. The need for an information system on coastal waste**

- 5.1 The waste sector in general, and the marine waste sector in particular, lacks quantitative data, particularly on waste streams. Accurate and reliable information is essential in order to:
- a. identify the priorities for action and plan effectively;
  - b. enlighten decision-making;
  - c. inform and promote awareness amongst all generators of waste and monitor the environmental impact of the sector.
- 5.2 Development of quantitative and qualitative indicators for marine solid waste. The indicators should be common among the different Mediterranean countries and should be compiled and analyzed based on set time intervals, using the same methodology and techniques. These would enable proper monitoring (both self and external

monitoring) and provide scientific criteria for the evaluation of changing trends and needed mitigation measures.

- 5.3 There is a growing need for reliable and regular statistics on the sector, particularly on:
- a. per capita generation of waste;
  - b. average amounts and types of solid waste generated by ships, pleasure boats, platforms, ports, etc.;
  - c. different categories of waste streams;
  - d. composition of waste and trends;
  - e. quantity of waste collected each day;
  - f. presence of driven litter;
  - g. presence of floating litter;
  - h. quantification and specification at the regional and local levels and variations over time and according to the season;
  - i. the percentage collected, treated and disposed, according to the type of waste;
  - j. the cost of managing waste and the institutional framework.
- 5.4 Such an information system should be designed and proportioned according to needs and how they develop, as well as to resources. It could be implemented in a modular and progressive fashion based on the developed indicators. For this purpose it will be necessary to:
- a. assess needs and identify the relevant data to be collected;
  - b. define the optimum frequency for the collection and updating of data;
  - c. identify the actors involved in data collection;
  - d. define the methods and conditions for disseminating information;
  - e. assess the cost of setting up and running such a system and
  - f. identify sources of financing.

## **6. Methods for monitoring coastal litter**

- 6.1 Methods elaborated by scientists which consist in drawing transects on beaches where objects are counted, weighed and their nature defined. The operation is repeated several times by taking into account the coefficient of tide, the weather report and the orientation of the beach. This counting can be performed many times. In France, it is developed in 1982 within FREMER (Institut Français de Recherche pour l'Exploitation de la Mer). Other methods were elaborated by Israeli, Greek researchers and of other countries of the Mediterranean basin. But there is still no common method to all the countries in the Mediterranean Sea. It appears that no country has developed so far a monitoring method for its entire coastline.
- 6.2 In 1997, on initiative of the OSPAR Convention (Convention for the protection of the marine environment of the North-East Atlantic), an international project is elaborated to set up a marine debris' method of monitoring. These measures are intended to estimate the current and future efficiency of police duty and the international legislation. It consists of measuring marine debris on two zones, one of 100 metres, other one of 1 km, 4 times in the year on most possible sites in every country.
- 6.3 In 2000, the main part of the zones of observation is situated in the North Sea. The steering committee of this operation invites the observers to join this project to increase its geographic coverage and facilitate the applications through the area of application of the OSPAR agreement. The major difficulties lie in the choice of the zones of studies which have to present comparable characteristics. It indeed appears difficult to use the same method of measure on very different zones. The absence of tide and the cleaning frequency in the Mediterranean Sea are factors influencing the analysis of the results.

The Mediterranean context shows particular characteristics as the climate with seasonal torrential rains, important and very steep rocky coastal zones. These zones are lined by beaches or creeks usually less than 1 km in length.

- 6.4 It is preferable that the potential local actors capable of making the measures be already involved in a pre-existent method which is favorable to the proposed counting which is very detailed. In the Netherlands and in the United Kingdom, surveys were made through groups of volunteers being a part of non-governmental organizations.
- 6.5 To know the characteristics of marine litter, it is necessary to be able to implement investigations on a wide scale of time and space in order to understand where they come from and to know the various measures which could be taken against them. Every coastal zone has its own characteristics from the point of view of marine waste. The previous history can result from the adjacent stream, from the nearby city, from the repeated passage of the commercial vessels off coasts. The ways of intervention are local.

The measurement of bacteria or chemicals in a volume of water is known, but the size and volume of this "macropollution" necessitates the use of unusual modes of apprehension. The protocols of measure of the methods developed in the various laboratories are usually demanding and require detailed countings. The means needed to proceed to these regular statements and over a long enough period are important. Associations supervised by scientists can perform these investigations.

- 6.6 Another method was developed, tested and validated in 38 municipalities on 3 littoral departments of the Provence-Alpes - Côte d'Azur region in France from 1998 till 2000 within the framework of a thesis. The monitoring method requires the local actors in charge of the cleaning operations to estimate the volume and the relative proportions of the various categories of marine debris which they collect on the cleaned zones. It does not aim at counting waste down to a single object. It offers a vision of this pollution as a whole. It gives an idea of the quantities. But what is the most interesting is that it allows to follow the evolution of the quantities and the categories during the year. By connection with the weather conditions and the visiting frequency, it allows to target the origin and thus the public sectors at which it is necessary to act to fight effectively against them. These results thus inform about the evolution intra annual and inter annual of the litter in the sea.

This method can be refined by regularly making precise countings of the contents of dustbins and by confronting them with the evaluations. This system of measurement is self-learning in time because technical operators and managers can adjust their policy of management upstream by observing the evolution of waste on the shore.

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