# *Initial Survey on coastal zone* - *Results*

## *Action A1*

**LIFE – SMILE: Strategies for MarIne Litter and Environmental Prevention of Sea Pollution in Coastal Areas**

## Objective

The present work describes results from the initial survey carried out on beach and shallow water of the Pilot Area of the Maremola river Basin (coast of Pietra Ligure) and the Control Area of the Cerusa river Basin (Genoa) to provide a description of the initial state of the areas.

The monitoring has been conducted according to the operational Guideline for monitoring and characterization of marine litter for beach and shallow coastal waters and aims at getting a better understanding on amounts and sources of marine litter on Ligurian Coast for effective and focused mitigating measures. Since Pilot and Control areas are subject to periodical maintenance cleaning activities, especially during summer season, surveys were planned to be held far form the last cleaning.

## Monitoring Results on Pilot Area

On the Pilot area the initial survey was carried out on beach and shallow water.  For the beach litter survey two 100m long and one 70 m long sampling units were selected along the Maremola river basin mouth, while for the shallow waters survey four sampling units, 100 m long and 8 m wide, perpendicular to the shore, have been selected, as described in the operational Guideline and shown in Figure 1.

Surveys were carried out in spring (mid-March till mid-April), according to the operational Guideline.

For each survey unit a form is filled with characterization of the survey site, coordinates of start and end points of the sampling unit and litter exposure.

All items found on the sampling unit were entered in the survey form, according to a master list of litter categories and items, a photo guide including pictures of all litter items, produced to assist operators in the correct identification and allocation of recorded items.

**Figure 1. Left side: Sampling units for Marine litter in the Pilot Area of the Maremola river basin, 1 section of 100 m along the east side of the river mouth ("bagni Aurelia"), River mouth (east and west side), 1 section of 100 m along the west side of the river mouth. The arrow shows the dominant littoral current. Right side: Sampling units for shallow waters in the Pilot Area.**

**Figure 2. Pilot Area, Maremola river basin mouth.**

*Beach survey*

The unit in which litter is assessed on the coastline is number of items/m. Weight is an important information though it can be problematic to measure because it is dependent on whether litter items are wet or dry and whether they are covered with or full of sand. Table 1 shows that the number of items/m in the three sampling units is quite similar on the east and west survey areas and, slightly higher at the river mouth.

| Sampling units | num items/m |
|---|---|
| Maremola River mouth | 6.4 |
| Maremola East side | 6.0 |
| Maremola West side | 5.5 |

**Table 1. Number of items/m per sampling unit.**

In the Pilot Area 1599 items were found, belonging to 106 different litter categories, with a total average density of 5,9 itmes/m. The most frequent item found is "cigarette butt", representing over 20% of the total amount of litter found. Items were then classified according to the type of material. Table 2 shows the number of items in the different sampling units according to the type of material, while the last column shows the percentage of litter found according to the type of material. We can see that synthetic polymer represents about 73% of the total amount of litter. In general, the three sampling units show similar percentages of different type of material, with a higher presence of metal, glass and pottery at the river mouth. This observation agrees with the idea that materials are transported by the stream flow, and in particular the heavier materials that cannot easily be moved by the current, deposit at the river mouth each sampling unit.

Among the synthetic polymer, 29% are cigarette butt, 16% are pieces of plastic with size of 2,5-50 cm, 7% small pieces of plastic smaller than 2,5cm and 7% candy wrapper. Natural wood was considered separately and was found to be present in small quantities.

| MATERIAL (num items) | Maremola East side | Maremola West side | Maremola River mouth | Maremola East side (%) | Maremola West side (%) | Maremola River mouth (%) | Tot (%) |
|---|---|---|---|---|---|---|---|
| Synthetic polymer | 457 | 432 | 280 | 76 | 79 | 62 | 73,1 |
| Rubber | 7 | 15 | 3 | 1 | 3 | 1 | 1,6 |
| Clothing and textiles | 3 | 11 | 1 | 0 | 2 | 0 | 0,9 |
| Paper | 62 | 56 | 46 | 10 | 10 | 10 | 10,3 |
| Wood | 4 | 9 | 5 | 1 | 2 | 1 | 1,1 |
| Metal | 58 | 17 | 48 | 10 | 3 | 11 | 7,7 |
| Glass and pottery | 10 | 1 | 62 | 2 | 0 | 14 | 4,6 |
| Other categories | 2 | 5 | 5 | 0 | 1 | 1 | 0,8 |

Table 2. Number of item in the different sampling units and percentage (last column) of litter found according to the material.

| MATERIAL (num items/m) | Maremola East side | Maremola West side | Maremola River mouth | Tot (items/m) |
|---|---|---|---|---|
| Synthetic polymer | 4,57 | 4,32 | 4,00 | 4,33 |
| Rubber | 0,07 | 0,15 | 0,04 | 0,09 |
| Clothing and textiles | 0,03 | 0,11 | 0,01 | 0,06 |
| Paper | 0,62 | 0,56 | 0,66 | 0,61 |
| Wood | 0,04 | 0,09 | 0,07 | 0,07 |
| Metal | 0,58 | 0,17 | 0,69 | 0,46 |
| Glass and pottery | 0,10 | 0,01 | 0,89 | 0,27 |
| Other categories | 0,02 | 0,05 | 0,07 | 0,04 |

Table 3.Number of item/m in the different sampling units according to the material.

*Use*

One of the objectives of the monitoring is getting a better understanding on sources of the marine litter found on the shore. The items collected have therefore classified in 6 classes according to their use. Not all items can be reconnected to their original use, due mostly to their state of degradation. Those items were then classified as "not identified".

We can see from Table 3 that 35% of the object belong to this class, where we can recognize all those pieces of plastic of different measures that could not be attributed to a specific use. Again, items related to "smoke and cigarette" represent a big percentage (25%) of the total amount of items found; 18% of the items are related to "food and beverage", and 13% are related to productive activities and transportation. Among those, a big part are related to constructions. Furthermore, it was observed that about 20% of the total marine litter found on the beach was composed by packaging, mostly made of plastic.

| Classes according to use | Maremola East side | Maremola West side | Maremola River mouth | TOT % |
|---|---|---|---|---|
| Food and beverage | 75 | 85 | 163 | 18 |
| Beach and sea | 1 | 0 | 1 | 0 |
| Fishing activities | 7 | 2 | 3 | 1 |
| Domestic activities | 33 | 23 | 40 | 5 |
| Productive activities and transportation | 83 | 76 | 66 | 13 |
| Smoke and cigarette | 114 | 223 | 120 | 25 |
| Not identified | 206 | 175 | 246 | 35 |
| Sanitary | 27 | 19 | 4 | 3 |
| Total | 546 | 603 | 643 | 100% |

Table 4.Number of item in the different sampling units and percentage (last column) of litter found according to their use.

### Shallow water survey

In the Pilot Area 156 items were found, with higher density in the sample unit down drift the river mouth (area 3).
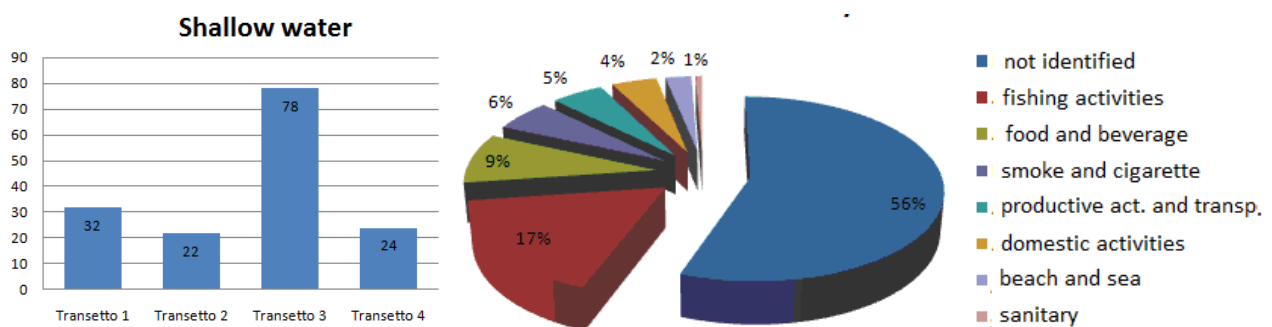


Figure 3. Left image: nr. of items/m per sampling unit. Right image: nr. of items/m, classification by use.

The items found belong to 39 different litter categories, mostly (51%) synthetic polymer, represented by pieces of plastic with size of 2,5-50 cm, for which we can't define the original use. There is a significant percentage of items related to fishing activities (17%), as well as "food and beverage" (9%) and "smoke and cigarette" (6%).



Figure 4. Example of items found in shallow waters.

### Monitoring Results on Control Area

For the Control Area of the Cerusa river basin, the survey was conducted only on the beach, in two selected sampling units: the river mouth of about 150 m length, and a 100m unit on the east side of the river mouth (Figure 5). The area shows a big difference in quantity of litter between the river mouth, where approximation counting the number of items has been necessary as the quantity was so high that every single item could not be counted directly, and the 100 sample unit, where the number of items was of the same order of the number of items found on the Pilot Area. 92% of the litter is synthetic polymer, composed mostly by pieces of plastic with size of 0-2,5 cm (47% of all items found and 51% of all synthetic polymer).

Due to the type of items found, only 38% was classified according to a specific use, 17% of which was related to food and beverage, 9% to productive activities and transportation and 6% domestic activities.



**Figure 5. Sampling units for Marine litter in the Control Area of the Cerusa river basin 1 section of 100 m along the east side of the river mouth River mouth (east and west side). Right side: Picture of the monitoring 100m sampling unit.**

### Conclusions

The use for the initial survey carried on in 2014 of the detailed monitoring protocol realized according to the guidelines defined at European level and adapted to the local environment gives a picture of the initial situation of marine litter presence and composition in the Pilot and Control areas. Information on the type of material is fundamental to any study on possible recovery or reuse of the marine litter. Results show that in the Pilot Area synthetic polymer is the main category identified with a percentage of 73% on beach and 51% on shallow waters.

Even though it has not been possible to identify with necessary precision the sources of all the marine litter found on coastal zone, due to the high level of degradation, it has been possible, however, to identify some of the main classes of use. For instance, items related to smoke and cigarette represent 21.7% of the total amount of litter found on both beach and shallow waters, while 11% is related to productive activities, especially constructions. These results can be the basis to implement effective and focused mitigating measures.