Final Survey on coastal zone - *Results*

Action C3

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

Objective

The present work describes results from the final survey carried out in 2016 on beaches and shallow water in the Pilot Area of the Maremola River basin (Pietra Ligure, SV) and the Control Area of the Cerusa River basin (Genoa). This phase aims at evaluating the effective impact of the project actions on the coastal environment in the pilot and in the control areas.

Monitoring has been conducted according to the operational "Guideline for monitoring and characterization of marine litter" used for the initial survey (available on the project website www.life-smile.eu), in order to compare results.

Monitoring Results on Pilot Area

Surveys were carried out in spring, on the same sampling units as for the initial survey, according to the Operational Guideline: on the beach, the area of the river mouth and two 100m long units were sampled, while for shallow waters four sampling units, 100 m long and 8 m wide, perpendicular to the shore, have been selected (Figure 2). Surveys were carried on after the positioning of the litter trap at the river mouth (see Action B3), that is, after an intense meteorological event that caused the river mouth to shorten from 70 m to about 35 m length (Figure 1).

For each survey unit a form was filled with characterization of the survey site, coordinates of starting and ending points and exposure to litter sources.

All items found on the sampling units were entered in the survey form, according to a master list of litter categories and items, a photo guide, produced to assist operators in the correct identification and allocation of recorded items. The photo guide has been modified during the project: new categories have been introduced, such as WEEE, and some have been modified to better fit the categories used for litter management. In fact, each item in the photo guide has also been matched to the corresponding EWC Codes.

Figure 1. Pilot Area, details of the Maremola river mouth.

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Figure 2. Sampling units in the Pilot Area of the Maremola river basin and surface density of litter found (number of items/square meters). The color refers to surface density of litter found The most critical area is the west side of the river mouth.

Beach survey

During the final survey on the beach in the Pilot Area, 935 items were collected, belonging to 94 different categories, with a total average density of 4,1 items/m. Table 1 shows the number of items/m in the different sampling units. We note that, similar to the initial survey, the river mouth and its west side in particular, shows the highest concentration of items.

Sampling units	num items/m
Maremola East side	3.6
Maremola River mouth -east side	4.0
Maremola River mouth – west side	7.8
Maremola West side	3.8

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

Figure 3 shows the percentage of litter found according to the type of material in the whole area. Synthetic polymer represents about 80% of the total amount of litter, uniformly distributed on the different sampling units. Natural wood was considered separately and was found to be present in small quantities.
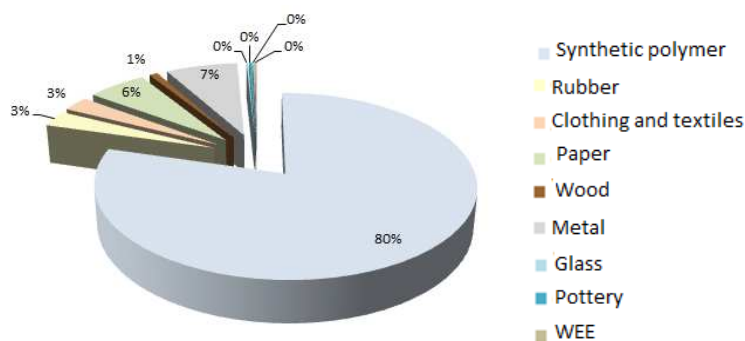

Figure 3. Litter composition according to the material

The items collected have been classified in eight classes according to their use. Not all items can be reconnected to their original use, mostly due to their state of degradation. Those items were then classified as "not identified". We can see from Figure 4 that an high percentage of the object belong to this class (54% in the final survey compared to 35% in the initial survey). We can notice a decrease from 25% to 7% of items related to "smoke and cigarette" , while other categories remain mostly unmodified, with "food and beverage" (from 18% to 17%) and "production activities and transportation" (from 13% to 9%) being the most critical ones.
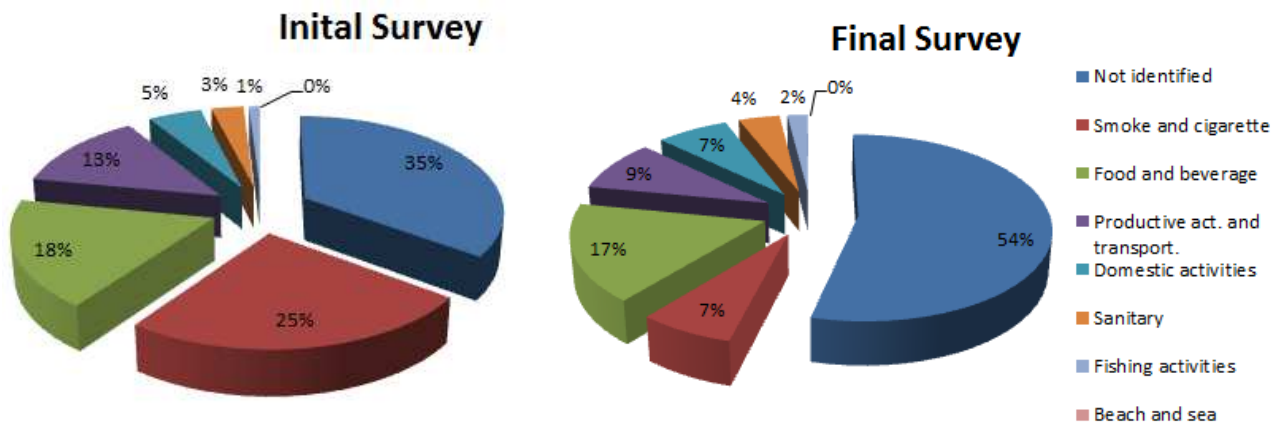

Figure 4. Monitored items in the Maremola Pilot Area during Initial and Final Survey. Classification by use.

In addition to the number of items counted, a weight indicator was also considered to quantify litter according to six classes of materials considered relevant in terms of reusability or recyclability. However, the weight is not easy to determine as it is dependent on whether litter items are wet or dry and whether they are covered with or full of sand. The six classes are:

1. Rigid plastic packaging (PET, HDPE, mixed polyolefins)
2. Flexible plastic packaging
3. Metal packaging
4. Metal scrap
5. PVC pipes
6. Other items (except for biomass)

Figure 5. Example of monitored items in the Maremola Pilot Area during Final Survey.

Figure 6. Monitoring activities.

The total weight of the material, about 14.250 g, and its state of degradation, leads to the consideration that the marine litter found cannot be considered of any interest for possible reusability or recyclability.

Shallow water survey

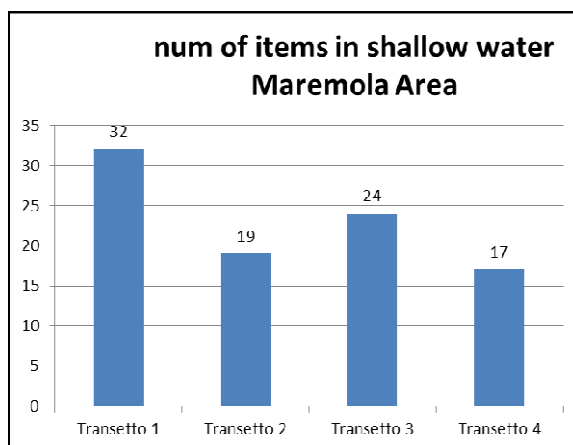In the Pilot Area 92 items were found, with similar density in the four sampling units (Figure 7).

Figure 7. Number of items per sampling unit.

The items found are composed mostly (83%) of synthetic polymer. Classification of the items collected according to their use shows an high percentage of the objects have no identifiable use (42% in the final survey compared to 56% in the initial survey), a decrease in presence of items related to "smoke and cigarette" (from 17% to 4%), and a dominant presence of items related to fishing activities (19%).
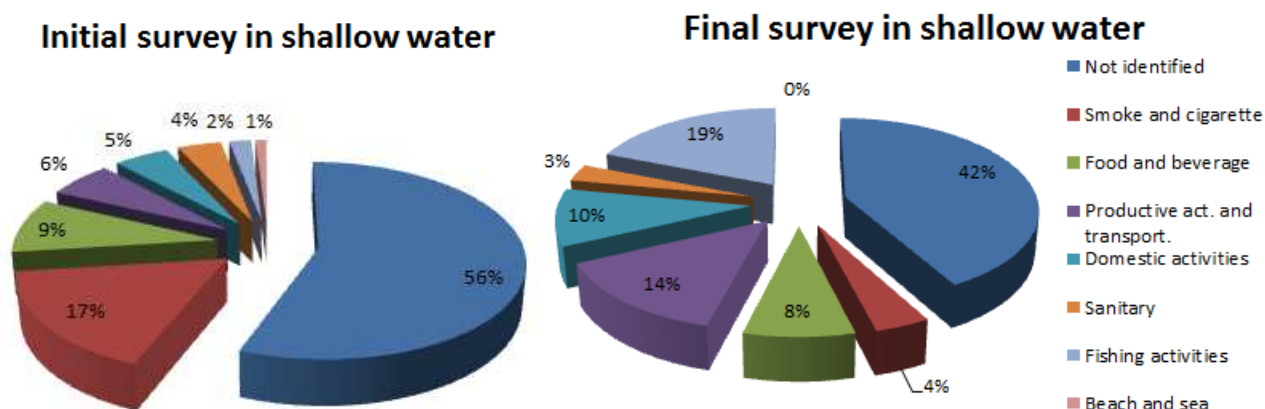

Figure 8. Monitored items in the Maremola Pilot Area during Initial and Final Survey. Classification by use.

Monitoring Results on Control Area

For the Control Area of the Cerusa River basin, the final survey was conducted in April 2016 on the beach, and in shallow water during August 2016, due to persistent adverse weather conditions.

Surveys were carried out on the same sampling units as for the initial survey: on the beach, the area of the river mouth (about 75 m length) and a 100m long unit on the east side of the river mouth were sampled; while for shallow water four sampling units, 100 m long and 8 m wide, perpendicular to the shore, were selected (Figure 11). 3662 items were collected on the beach, and 118 on shallow water. In total, about 130 kg of material. The area shows a big difference in quantity of litter between the east and west side of the river mouth, both on the beach ("Cerusa Foce Pon" being the down drift side of the river mouth) and shallow waters (area 3 and area 4 are the down drift areas in shallow waters). The west side of the river mouth showed a particular accumulation zone on the western part (this area is indicated as "Cerusa Foce Pon.W" in Figure 9).
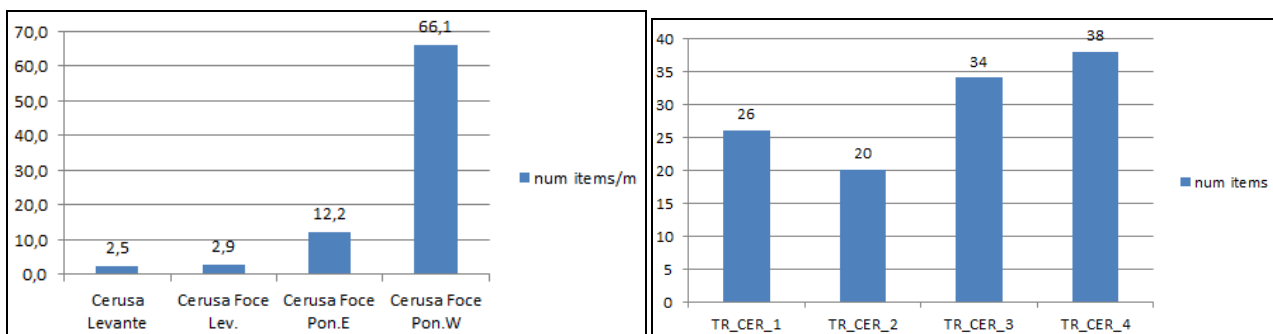

Figure 9. Number of items found in the different sampling units in the Cerusa control Area. On the left side results of monitoring beach, on the right side results of monitoring in shallow waters.

The map in Figure 11 shows the amount and surface density of litter in each area. Green color indicates a quantity of litter < 0.1 items/m^2, considered a spot presence. The yellow color, density of 0.1-0.25 items/m^2, represents a widespread presence of waste, but not enough to affect the use of the area. The orange colour, density of 0.25-0.40 items/m^2, represents a critical situation, where the density begins to affect the use of the area. The red color, with a density > 0.40 items/m^2, indicates a high criticality, where not only the use of the area is greatly compromised, but the risk of dispersal of waste by the action of the sea is high.
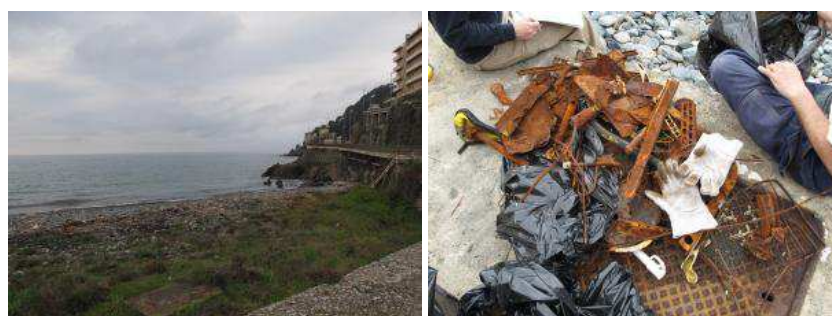

Figure 10. Detail of sampling area (left image) and litter found (right image).

Figure 11.Sampling units for marine litter in the Control Area of the Cerusa river. The number indicated represents the number of items collected, while the color indicates litter surface density (number of items per m^2).

We can see from Figure 12 that 81% of the litter on the beach is synthetic polymer, while metal reaches 14%, mostly composed by metal scraps.
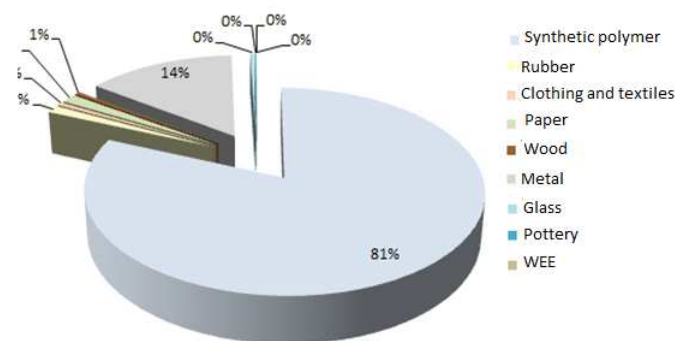

Figure 12. Litter composition according to the material.

Due to the type of items found, only 37% was classified according to a specific use, 5% of which was related to food and beverage, 11% to production activities and transportation and 12% domestic activities.

In general, we note a strong consistency with the categories found during the first monitoring (Figure 13).
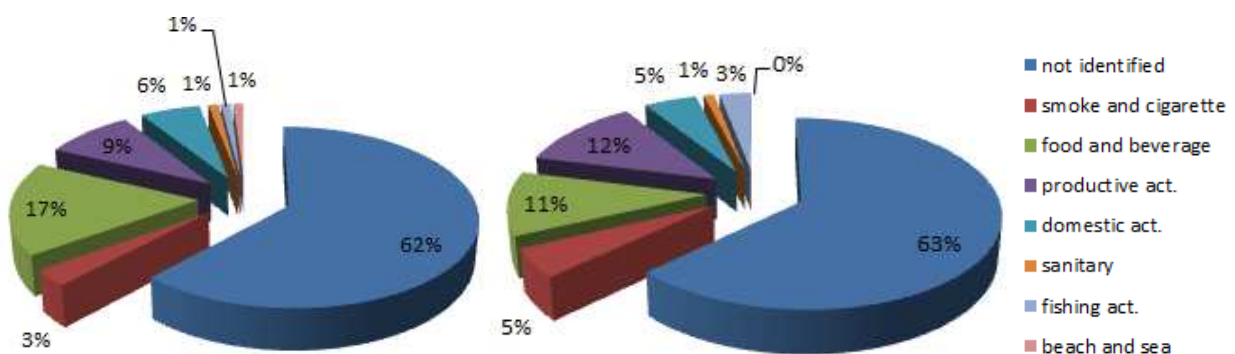

Figure 13. Classification of items according to the use. Initial (left) and Final (right) survey.

Conclusions

The initial survey carried on in 2014 produced a picture of the initial situation of marine litter presence and composition in the Pilot and Control areas. Results showed that synthetic polymer is the main category identified with a percentage of 73% on beaches and 51% on shallow waters in the Pilot area and 92% on beaches in the Control area.

Even though it was not possible to identify with precision the sources of all marine litter found in the coastal zone, due to the high level of degradation, it has been possible to identify some of the most critical classes of use. For instance, in the Pilot Area items related to smoke and cigarette represented 21.7% of the total amount of litter found, while 11% was related to production activities, especially construction. In the Control area 17% was related to food and beverage, while 9% to production activities.

The final survey carried on in 2016 aimed at evaluating the effective impact of the project actions on the coastal environment in the Pilot and in the Control areas. Results show in the Pilot Area a general decrease of about 30% of the number of items/m found: from 5.9 items/m on the beach in the initial survey (1589 items along 270 m of coastline) to 4.1 items/m on the beach in the final survey (935 items found along 230 m).

In particular, it is possible to observe a strong reduction of the number of items related to smoke and cigarette: on the beach the presence decreases from 1.56 items/m to 0.28 items/m (-82%), while in shallow water the presence decreases from to 9 items to 4 items (-55%).

Also in the Control Area we can notice a slight decrease in the number of litter found, from 15.9 items/m to 14.1 items/m in the final survey (-11.5%), but this is probably influenced by the cleaning activities that had been carried on along the beach right before the monitoring activities. In fact, along the river mouth the amount of litter is substantially unchanged. In general, the control area shows a significant difference in presence of marine litter between the river mouth and the rest of the coastline, where the area is interested by cleaning activities. This area shows a presence of litter of the same magnitude of the beaches in the Pilot Area, while along the river mouth the presence of litter is almost 3 times higher, with a presence that greatly compromises the use of the area, with a risk of dispersal of waste by the action of the sea.