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6.1.5. - N. 1 test of devices to support the collection of river waste

ACT 6.1

WP 6

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1. Introduction

Within the framework of the MARLESS Project, this report describes the action realized by Veneto Region, with the support of Consorzio di Bonifica Veneto Orientale, as part of the WP6 “Pilot Actions to prevent, recover, process marine litter”, which main aim is to demonstrate the feasibility of several new technologies in the field of marine litter prevention, recovery and processing. In particular, this action comes down to Activity 6.1 “River agreements to reduce plastic discharge into the sea”, and its objectives of contributing in the definition and implementation of district planning tools at the basin and hydrographic sub- basin level.

As described in D.6.1.1 Identification of a river basins, within the Project partnership two Italian regions, mainly affected by the riverine litter issue, have been identified:

- Veneto Region
- Autonomous Region Friuli Venezia Giulia

These areas, indeed, are crossed by significant rivers and can be considered heavy industrialized. Considering also the high touristic presence, especially during summer seasons, the selected regions can be considered at risk regarding the issue of waste disposal and the consequent accumulation of riverine and marine litter.

In this framework the Veneto Region carried out the so-called “Monitoring and interception of floating waste at the Vela Channel” a pilot action aimed at testing new technologies to reduce the presence of riverine litter. Furthermore, the site chosen for the implementation of the pilot action extend on a narrow area near the inlets towards the Venice Lagoon of a high landscape value.

2. Methodology

2.1 Planning of the intervention

As one of the Project MARLESS pilot actions to prevent, collect and process of marine waste, the instrumentation described in this deliverable aims to intercept floating waste along river rods, as well as catching the riverine litter before they can reach the coastal areas and the sea. Therefore, this intervention aims not only at the collection, but also at the monitoring and classification of waste, in order to have qualitative and quantitative elements that can give the estimation of the riverine litter problem size.

The project, realized by Veneto Region with the support of Eastern Veneto Consortium of Remediation (Consorzio di Bonifica Veneto Orientale), consists in planning, installation, testing and utilization of this new technology.

Since this is a pilot action, it can be considered experimental and could be extended, re-evaluated and possibly improved for re-use or replication at other sites. Furthermore, this infrastructure can contribute with this pilot action to refine the design of actions and installations, including systematic, for future implementations.

The infrastructure has been realized in the Vela Channel, which flows into the Sile river and ends in the Venice Lagoon transporting all the material present in its watercourse, for the interception, monitoring and recovery of floating waste. For this intervention, also an adjustment of the channel side profile for a length of 10 meters in hydraulic left has been realized, in order to allow more stability and to give indications to the workers that periodically intervene to collect the accumulated material.

2.2 Geographical setting

The site chosen for the implementation of the pilot action is the Vela Channel, which is included in the area of the Consorzio di Bonifica, on a narrow area near the inlets towards the Venice Lagoon and is included in the municipal territory of Quarto d'Altino (VE).



ORTOFOTO_2015
ORTOFOTO 20 cm [2015] CONSORZIO TeA – TUTTI I DIRITTI RISERVATI

Figure 1: Intervention area.

The portion of the Vela Channel chosen for the installation is characterized by the accumulation of waste that takes on significant dimensions, due to the presence of a hydraulic "siphon barrel", clearly visible along the provincial road SP43.

So far, the problem of the accumulation of waste at the siphon barrel has been managed in collaboration between Consorzio di Bonifica, Comune di Quarto D'altino and Veritas S.p.A. (the company that is in charge of the collection and disposal of urban waste).

All the measures to collect floating material presented considerable technical difficulties, linked to the extension of waste over the entire width of the watercourse, requiring the frequent activity of litter recovery not only from land, but also with the support of a boat to drive the movement of the material toward the shore.

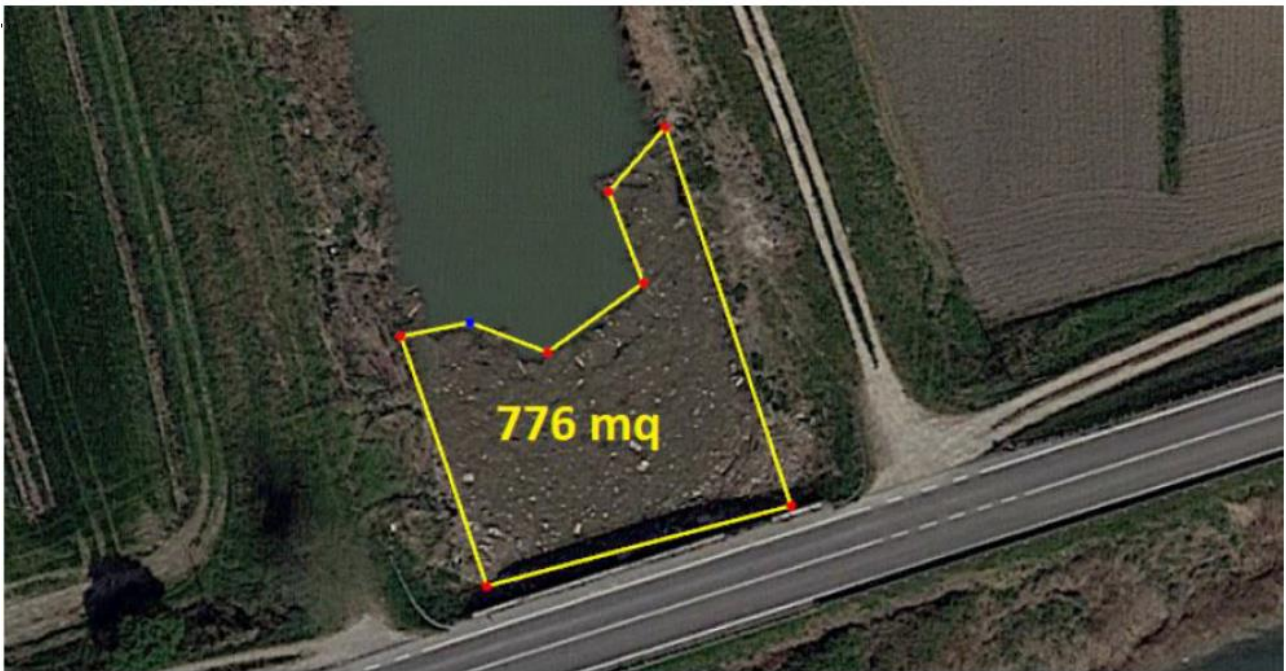


Figure 2: Floating litter accumulation on the Vela Channel.



Figure 3: Aerial photo of the portion of Vela Channel interested by the intervention.

2.2.1 Selected area: evaluation criteria

Among the criteria that helped to choose this point as a pilot installation site, in addition to the estimation of the riverine litter problem size and the high value of the specific area, also the the following factors have been considering:

- the Vela Channel is part of the network of the "high waters" that reach the sea without an intermediate mechanical lifting, and does not have transverse grids for interception of materials, element (usually present in all remediation watercourses before entering the pumping systems);
- the installation site can be reached from the road with a carriageable dedicated route, so the waste collected can be subsequently loaded on mechanical instrumentation and be disposed;
- a few meters upstream of the accumulation point there is an irrigation barrier managed by the Consorzio di Bonifica Veneto Orientale, on which the camera can be easily installed without building and placing new fixed structures such as poles or supports.

2.3 Implementation Phases

The implementation of the new device consisted in several phases:

1. *Realization of floating structure for waste interception:*

The structure consist in "floating wheels" which, thanks to their rotation (low current speed) help the transfer of waste to the caisson described in point 2. The device is constituted of an interception barrier of a length of approximately 21m, inclined 45° considering the direction of the current, capable of accumulating waste along the shore, as well as to help the storage in the floating caisson and its subsequent emptying with work vehicles operating from the bank of the Vela channel. The colours chosen for the floating wheels are as far as possible attenuated and similar to the natural colours of the insertion site.

2. *Realization of galvanized metal box for waste accumulation:*

The caisson are welded to 2 floats and realized on measure, adaptating them to the specific site of installation and are placed in water along the channel bank, in order to help the

emptying of the channel itself. The choice of floating typology allows to avoid fixed works in the riverbed, given the experimental nature of the intervention;

3. *Construction of anchorage structure:*

These anchorages will affect both the interception structure and the floating body;

4. *Supply and installation of monitoring system:*

The system consists of 2 videocameras, installed without new building and placing new fixed structures thanks to existing irrigation adjustment structures. They are connected via SIM data to a web drive system for remote control, with power supply from photovoltaic solar panels. The cameras allow both to monitor the level of filling of the storage tank, and to record frames on the floating material caching by the barrier. This system powers a software based on principles of artificial intelligence (object detection algorithm) that, thanks to an initial activity of recognition with operator, by "machine learning" is able to automatically identify the type of waste, and to elaborate them for statistics and analysis purposes. The image management portal, that acquires pictures with an interval of about 30 minutes, is optimized according to the battery life. The system is completed with an image analysis software (machine learning phase to start, and gradually improving), and an automatic recognition mechanism of the type of waste that allows to catalogue the type of intercepted materials. Furthermore, the 2 monitoring points are also respectively placed on those specific places on the watercourse to recognize waste and on the caisson and to monitor the level of filling and activate the operations team for emptying;

5. *Adjustment of the channel side profile:*

The adaptation allows a greater stability so periodically workers have to intervene in order to pick up the accumulated material.

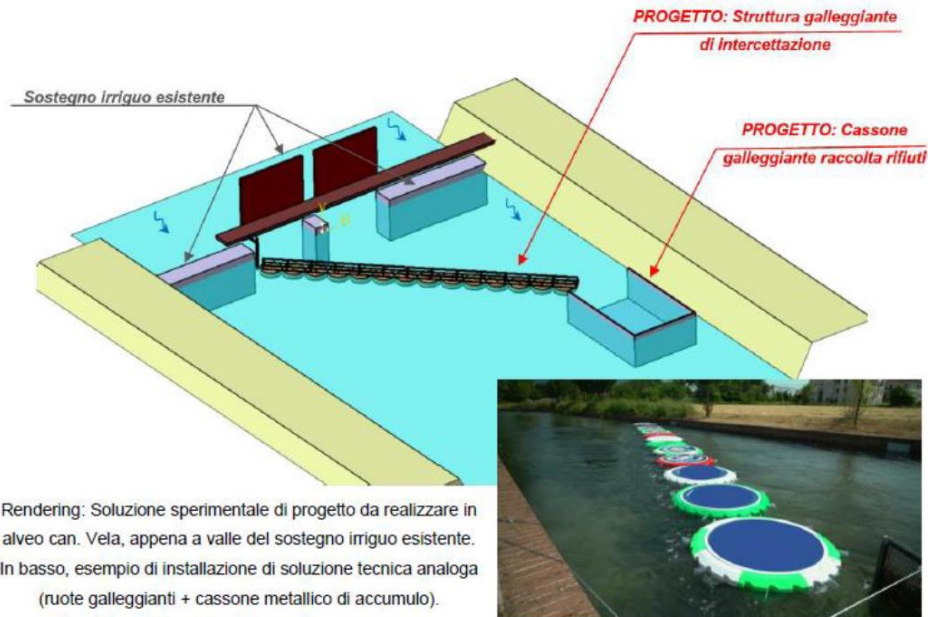


Figure 4: Example of the realization of the devices before the implementation.



Figure 5: Pilot site with devices in place.

3. Results and Summary

The Veneto Region, implementing and testing this new technological device, helped in supporting the collection of riverine litter, providing practical solutions that can be applied in future river agreements. Since “River agreement” can be considered a valuable instrument that can be spread not only in Italy but also over the Adriatic Region, this tool has been presented to Croatian partners at Project events in order to support the transfer of best practices.

In summary, the implementation of this project allowed to:

- a) monitor floating waste on the Vela Canal in order to quantify its size on an annual basis;
- b) determine the prevailing type of material by cameras and AI;
- c) intercept and collect plastics (and other riverine litter) without fixed works, ensuring compliance with the landscape context of high value (anytime the chosen side of the channel can be modified or the infrastructure can be moved to a different channel if needed);
- d) test the effectiveness of the combined monitoring solution - collection prepared, in order to refine and replicate the system in other sites affected by similar problems;
- e) raising community awareness of the problem of waste at river and sea by spreading documentation of the project within the framework of programmes already in place like Project School - Consortium of Remediation and National Week of the Remediation, or with seminars and guided tours.

4. ANNEXES

Decreto n. 42 dell' 8 maggio 2023