

*Project IPA-HAZADR*  
*WP 4 – Act 4.3*

Monitoring planning for environmental emergencies  
at sea and along the coast in the Apulia Region: the  
case of an oil spill event

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## 1. Introduction

This document has been prepared in order to describe the intervention procedures of ARPA Puglia in case of an oil spill event at sea<sup>1</sup>.

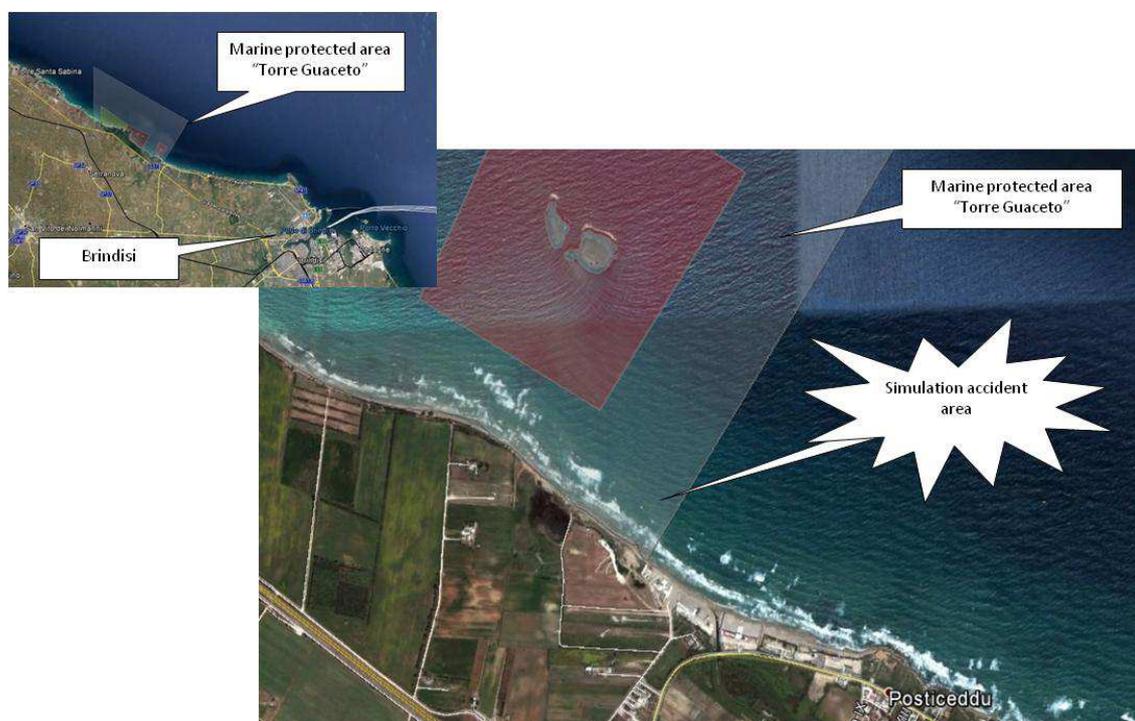
Furthermore the peculiar activities performed for the practical exercise in the Puglia Region, planned and located in “*Apani*” (a coastal area close to Brindisi town), have been described. The specific activities related to the practical exercise in the “*Apani*” location are in *italic* in the grey boxes.

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<sup>1</sup> Some of the information and some of the figure given in the text are taken from the document ISPRA, Quaderni – Ricerca Marina n. 6/2014 (Mannozi M., S. Di Muccio, Jordan P, Matiddi M., Sammarini V. and L. Alcaro. Modes of the hydrocarbon sampling at sea and along the coast).

## 2. Description of the scenario on the Apulia Region coast

The Civil Protection of Apulia Region reports to ARPA Puglia that an environmental emergency is occurring in the coastal area (Coordinates 40.6960 N, 17.8264 E) between the Natural Reserve of Torre Guaceto and the town of Brindisi (Figure 1). More precisely, a beach stranding of oil (Figure 2) has been observed in the locality called “*Apani*” (40.6960 N, 17.8264 E), caused by the massive spill of crude oil in the waters of the Southern Adriatic Sea. The oil spill was due to a large ship-type “Oil/Chemical tankers” accident, which occurred in the previous days.



**Figure 1** General overview and excise area overview.

Following the Civil Protection report, the staff of the ARPA’s Provincial Department of Brindisi, with the operational support of the expert team of the ARPA’s Scientific Directorate, shall carry out an immediate inspection and collect samples at sea and along the beach to assess the degree of impact on the coast, the presence of critical / sensitive areas to environmental purposes, the main characteristics of the hydrocarbons and their distribution along the shore. These activities are needed in order to provide technical support for the decisions of the competent Authorities in the planning of emergency response.



**Figure 2** Example of a beach stranding of oil

During the activities of collection and storage of samples the operators are equipped with Personal Protective Equipment (PPE):

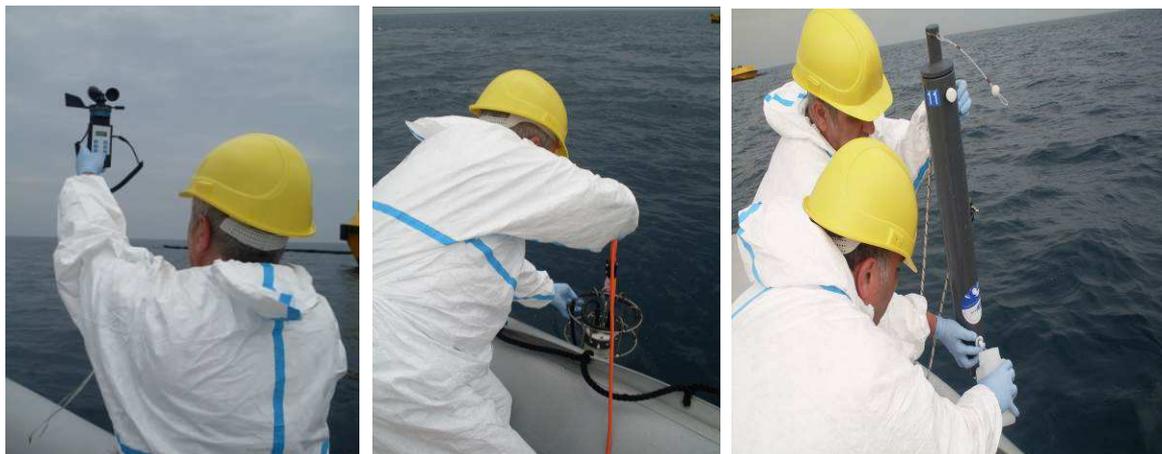
- Tyvek coverall type covering the entire body;
- Boots or safety shoes with toe and rubber sole antistatic, anti-slip, oil-resistant;
- Protective gloves to chemical hazards;
- Cover shoes to wear in sampling sites sprayed with oil.

### 3. ARPA Puglia procedures

#### 3.1 Spatial definition of the impacted area

The ARPA Puglia activities for the spatial definition and environmental characterization of the impacted area involve the observance of the following standard procedures:

- Identification of "geographical" area in which the pollution occurred, locating any critical and / or sensitive areas (waters identified for specific uses, including any protected areas, priority habitats, aquaculture and mussel plants, etc.);
- "Geo-morphological" classification of the area (bathymetry, seabed structure, morphology of the coast, etc.).
- Monitoring of meteorological parameters that can affect the distribution of any pollutants in the water (wind direction and intensity, waves, air temperature, relative humidity, etc.), using portable weather stations (Figure 3).
- Monitoring of the main hydrological parameters (direction and intensity of the surface currents, water temperature, salinity, pH, dissolved oxygen, concentration of chlorophyll "a", turbidity, redox potential, transparency), using the current meter, the multiparameter probe and the disk buckets (Figure 3).

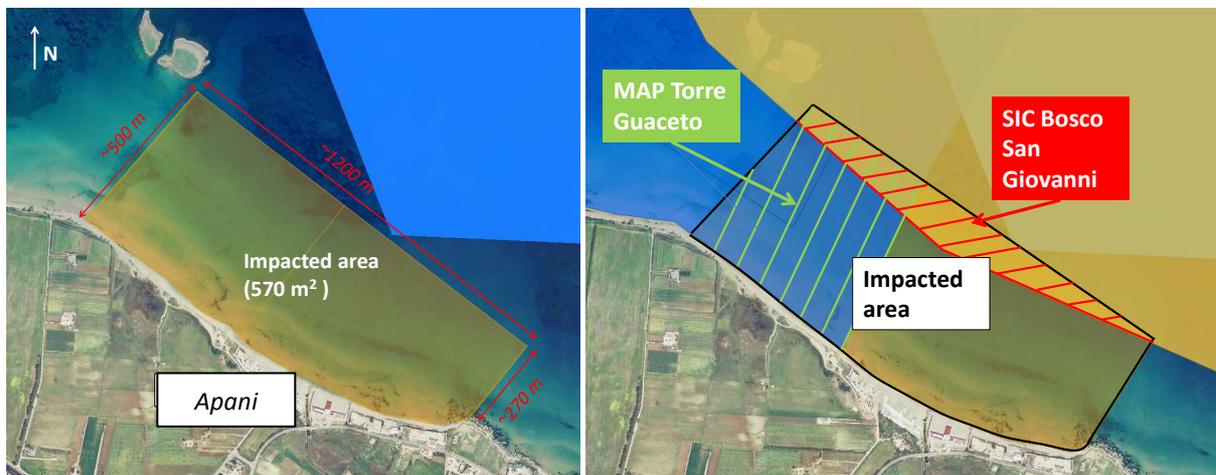


**Figure 3** Monitoring activities of meteorological and hydrological parameters.

In the case of “Apani” event, the characteristics of the impacted area are the following (Figure 4):

- Surface area: 570 m<sup>2</sup>
- Perimeter: 3850 m
- Offshore limit from the coast: the northern side ~500 m, the southern side ~270 m
- The major longitudinal axis is ~1200 m long
- Bathymetry: the whole area is between the 0 – 5 m depths
- The coast is mostly characterized by sandy beach (1200 m). The fraction of rocky shore is 104 m long.
- All the impacted marine area is characterized by a sandy seabed
- A small part of the “Torre Guaceto” Marine Protected Area (~210 m<sup>2</sup>) and a small part of the marine Site of Community Importance “Torre Guaceto – Macchia San Giovanni” (76 m<sup>2</sup>) fall within the impacted area (Figure 4).

The information on the main meteorological and hydrological parameters will be assessed on site the day of the exercise.



**Figure 4** Area impacted by the oil spill (left) and overlap among impacted area, the MPA of “Torre Guaceto” and the marine SIC “Bosco San Giovanni” (right).

### ***3.2 Monitoring activities at the sea***

The ARPA Puglia activities for the monitoring at sea are carried out according several standard procedures taking into account all matrices potentially affected by pollution with a site-specific sampling plan.

In particular, the "water" will be sampled using an appropriate scheme, taking into account the boundary conditions (extent of the influenced area, weather-marine, hydrology, etc..) and the characteristics of pollutants (chemical and physical properties, quantity, persistence, behavior in the water , etc.). For example, according to the density of the substance, it could be considered to sample at different levels of the water column, as well as in the prevailing direction of the current. A synoptic field sheet is available in order to take note of the environmental parameters (APPENDIX 1).

If necessary, the sediments will be sampled also, as the same, particularly those with a medium-fine granulometry, are considered traps for pollutants.

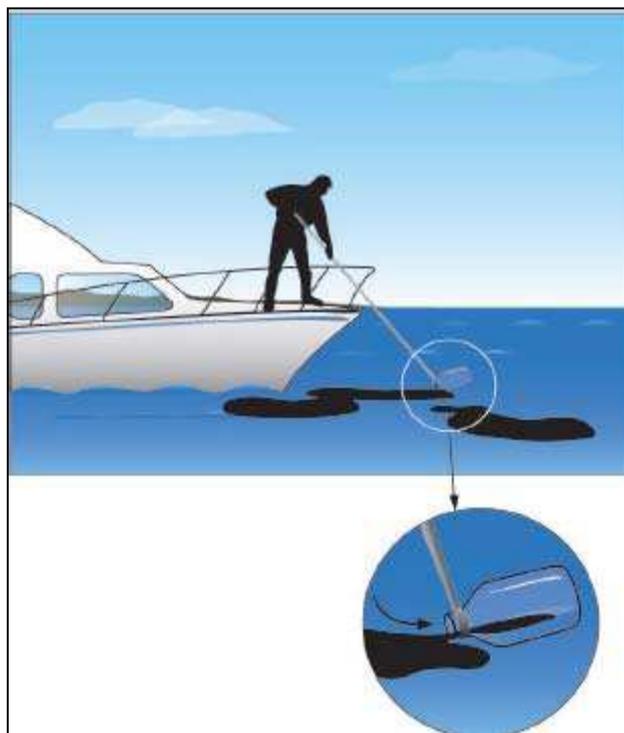
In addition, when there is a reasonable doubt that the pollutant may have reached critical and / or sensitive areas (waters identified for specific uses, including any protected areas, priority habitats, aquaculture plants/mussel farms, bathing areas, etc.), it will be necessary to sample the "biota" (mussels or other organism potentially subject to phenomena of bioaccumulation).

Regarding the waters, in the collected samples both the "basic" analytical parameters (eg. Suspended solids, total nitrogen, ammonia, nitrite, nitrate, total phosphorus, ortho phosphate phosphorus) will be determined and other parameters related to the specific type of pollution (the latter will be determined, if necessary, also in sediments and biota).

The measurement of chemical and physical parameters must be replicated at short time intervals (at least daily) in view of the fact that the oily substances, such as hydrocarbons, undergo transformation processes (weathering) that determine changes in characteristics or behavior and fate of these substances in the sea. The main characteristics to be measured are viscosity and density; tests to determine the dispersion tendency of the petroleum product are also performed with the same frequency.

The sampling procedure and the instruments to be used depend on the characteristics of the oil product (solid, liquid, sinking, floating, etc.) and the matrix to be sampled (water emulsions, solid product deposited on the seabed or on the coast, etc.):

- Sampling of conspicuous oil slicks (thickness > 1 mm) on the sea surface by the method of the bottle (Figure 5);



**Figure 5** Example of the method of the bottle (from ISPRA, 2014)

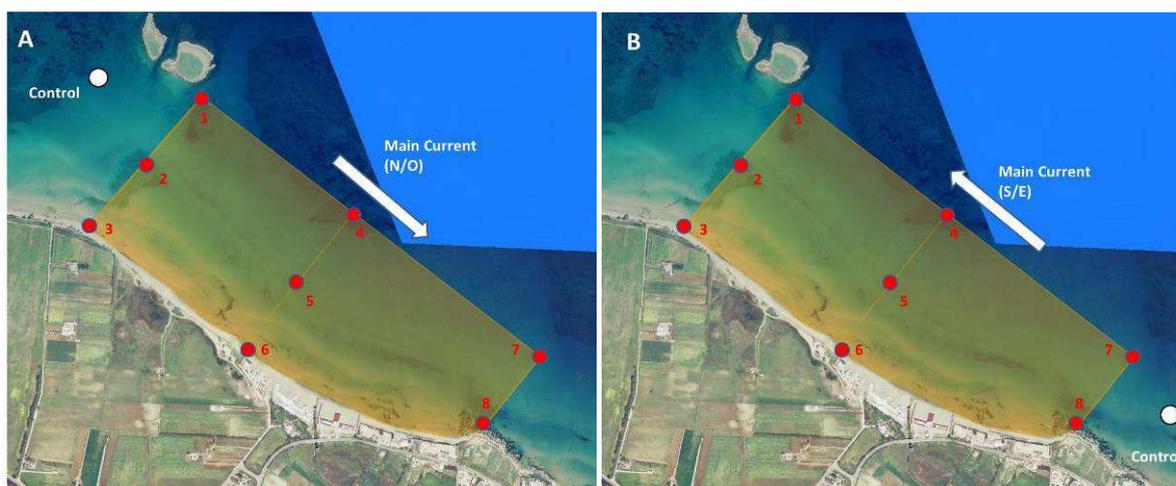
- Sampling tarry residues floating through screens, which may be mounted on the telescopic rods;
- Sampling of thin layers of hydrocarbons (<1 mm) and the iridescence on the surface of the sea by a Schomaker sampler, if available (Figure 6).



**Figure 6** Schomaker sampler (from ISPRA, 2014)

*In the case of “Apani” exercise, inside the impacted area, 8 sampling stations are located in order to analyze the various matrices potentially affected by pollution in accordance with a site-specific sampling plan that takes account of the findings in the previous step.*

*A control station will be located in order to compare an unimpacted area with the impacted one. Depending on the main water surface currents, this control station will be located in an area not influenced by the pollution event (Figure 7 A-B).*



**Figure 7** Location of the 8 sampling stations. The position of the control station (white spot) is conceived as free of the pollution influence.

*Along the water column will be analyzed the basic analytical parameters at different depth (surface, intermediate and bottom) depending on the total depth of the station:*

- *One (surface) for the inner station (3, 6, 8)*
- *Two (surface and bottom) for the middle stations (2, 5)*
- *Three (surface, intermediate and bottom) for the outer stations (1, 4, 7)*

*Moreover at each station, the specific sampling for hydrocarbons will be performed.*

*Since portions of critical areas are included in the impacted area, “biota” samples will be taken at the stations 1, 2, 3, 4, 7.*

*Samples of bottom sediment at the outer stations (1, 4, 7) will be taken.*

Following the acquisition of the cognitive data and those from the initial monitoring, you can try to predict whether, when and in what way any pollutants will be distributed (eg. it will remain on the surface, it will sink, it will follow preferential directions, etc.). In this case, it may be important the support of the hydraulic modeling, if available. Following the prediction made you will be able to modulate the next phase of monitoring.

### ***3.3 Monitoring activities at the shore***

ARPA Puglia shall carry out the sampling at the outer fringe of the coast - beach affected by the oil stranding, both at different points within the same, so to consider the size and limits of the area influenced by the spill. The collection of oil residues deposited on the sandy coast provides the use of binders (spatulas or spoons), preferably Teflon or PET made, or even stainless steel (Figure 8). Particular attention should be paid to avoid contamination of the sample with sediment, sand or other types of marine debris.



clusters tarry represent preferential points of sampling, as in the semi-solid outer crust, the oil product will be well preserved and less influenced by the weathering effects.



**Figure 10** Beached marine debris and vegetation (from ISPRA, 2014)

For the sampling on rocky shore, oil residues deposited on the surface will be picked. The tarry residues are particularly difficult to remove, so it is suggested to use disposable tools, designed for other purposes but equally effective, such as wooden pallets depressor.

The collected samples are transferred into wide mouth containers and stored at 4° C protected from light.

*In the case of “Apani” exercise, inside the impacted area 3 sampling stations are located, 2 on the sandy shore (stations 1 and 2) and 1 on the rocky shore (station 3) (Figure 11). For the sandy beach stations, surface and subsurface samples will be taken, furthermore an excavation up to the level of outcrop water will be performed. Tar Balls and beached marine debris, if observed, will be sampled. For the station 3, samples on the rocky shore will be picked.*



**Figure 11** Location of the sampling stations on the shore of the impacted area

