



Application of the Environmental Assessment Matrix in Port Contexts: Practical Experiences, Sampling Activities, Key Takeaways and Critical Challenges

Port of Livorno

LORENZO MORRONI -ISPRA

3° Transfer Webinar «Environmental Impact Assessment: the TREASURE experience», 7 May 2026



TREASURE

Interreg
Euro-MED



Co-funded by
the European Union



- Core maritime hub on the Tyrrhenian coast:
- Strong performance in Ro-Ro, automotive logistics, and bulk cargo.
- Sustained growth in ferry connections and cruise
- Future Growth: **Darsena Europa Project**

Environmental Challenges

- **Dredging Strategy:** Identifying management options for polluted sediments using the Lines of Evidence (LOE) approach to balance port competitiveness with environmental quality.
- **Beneficial Re-use:** Promoting the recovery of sediments for land-based uses, despite a restrictive domestic regulatory framework that currently discourages recovery.
- **Advanced Treatment:** Scaling up mechanical, electrochemical, and biological treatments for contaminated sediments (inner port areas) from pilot phase to industrial production.

Port of Livorno



TREASURE

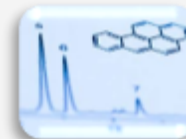
Interreg
Euro-MED



Co-funded by
the European Union



Lines of Evidence (LOEs)



**Chemical analyses
(LOE 1)**

**Bioassays
(LOE 5)**

**Benthic communities
(LOE 6)**



TREASURE

**Interreg
Euro-MED**



Co-funded by
the European Union





Activity 2.3

Actions	WHEN	ACTIVITES IN THE PORT OF LIVORNO
Definition of experimental design, sampling strategy (sampling stations) and data collection methods in each selected port.	Period 2-3 (Durres meeting)	
Sampling activities in each selected port and analytical analysis. 1st testing phase for LOEs	May-June 2025	<u>WP2 Sampling: 23 April 2025</u>
Update on state of activities and Sediqualssoft operative tutorial	Meeting 04 in Bar (June 2025)	
Data elaboration of LOEs, application of Environmental Impact evaluation and Hazard Management tool with selected LOEs on untreated samples and definition of risk index in each port area.	Beginning of period 4	<u>WP2 Data elaboration: June 2025</u>
Adjustment of the Environmental Impact evaluation and Hazard Management tool for the common application by partners	Period 4	
Application of Environmental Impact evaluation and Hazard Management tool during solutions testing , in coordination with WP3.	Period 4-5	<u>WP3 Sampling: 5 october 2025 / WP3 Data elaboration: April 2026</u>
Development and updating of the common data collection platform.	Period 3-5	



TREASURE

Interreg
Euro-MED



Co-funded by
the European Union

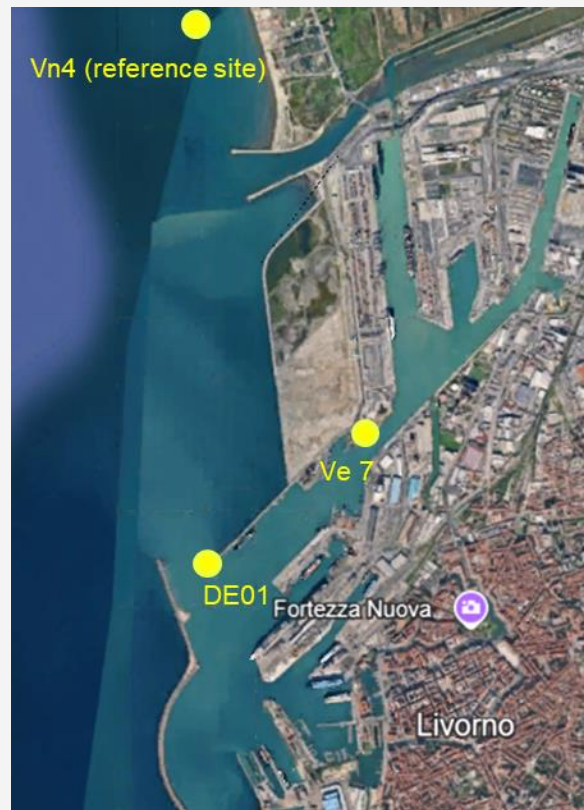




Sampling strategy of WP2

Three sampling stations were selected in different areas of the port, each characterized by a distinct level of anthropogenic impact, based on previous data (2021–2023).

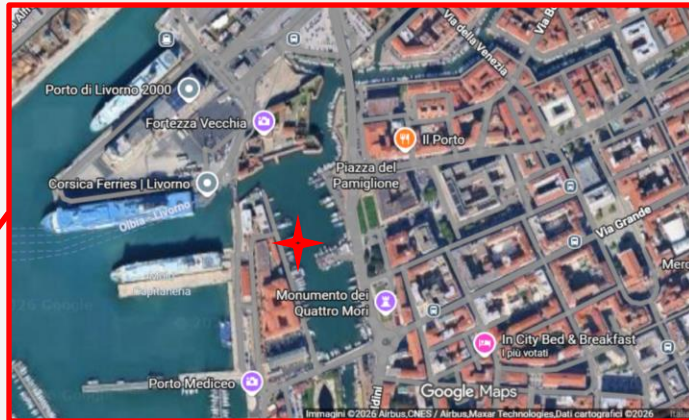
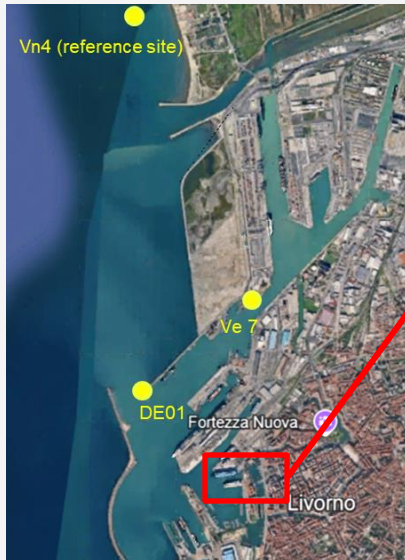
1. **Vn4**: located in the upper northern area, far from the port, and used as a reference site
2. **DE01**: close to the end of breakwater
3. **VE07** located in the inner part of the port, close to the CDF outlet



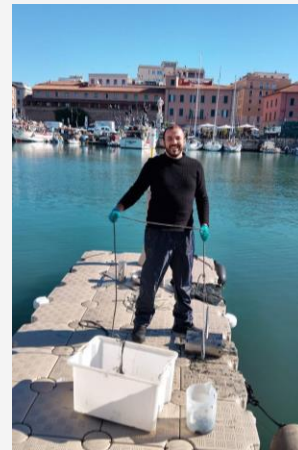


Testing activities in coordination with WP3

Sites characterized in WP2



New sample has high organics and metals contamination and fine granulometry (clay > 60%)
→ best sample possible for treatment experiments





Analyses

Chemical analyses (LOE 1)

- Grain size
- Trace elements
- PAHs
- PCBs
- Organotin compounds
- Organochlorine pesticides

Bioassays (LOE 5)

- *Bioluminescence inhibition bioassay with Aliivibrio fischeri*
- Inhibition of algal growth *Phaeodactylum tricornutum*
- Embriotoxicity with sea urchin *Paracentrotus lividus*

Benthic communities (LOE 6)

Analysis of presence/abundance of macroinvertebrate in soft bottoms, using AMBI or m-AMBI index



TREASURE

Interreg
Euro-MED



Co-funded by
the European Union





Sediqua software® WP2 Results

Chemical analyses (LOE 1)

ISPRA

SEDIQUALSOFT®

Home

Account

Template file

Elaboration LOEs

Results LOEs

Station

LOE1 Chemical Characterization of sediments

LOE2 Chemical Characterization of water column

LOE5 Toxicological Bioassays

LOE6 Benthic Communities

WOE

TUTORIAL

Tutorial

Chemical Characterization of Sediments Results LOE1

Show 10 entries

Copy CSV Excel PDF Print

Search:

Details	Sample code	L1 (D.Lgs. 173/16)	L2 (D.Lgs. 173/16)	SQA (D.Lgs. 172/2015)	PEL	TEL	ERM	ERL	Col A (D.Lgs. 152/06)	Col B (D.Lgs. 152/06)	ISQG Low ANZECC	ISQG High ANZECC
Q	DE01	MODERATE	ABSENT	MODERATE	ABSENT	MAJOR	ABSENT	MODERATE	ABSENT	ABSENT	ABSENT	ABSENT
Q	Ve7	SEVERE	MODERATE	MAJOR	SLIGHT	SEVERE	SLIGHT	MAJOR	SLIGHT	ABSENT	SLIGHT	ABSENT
Q	Vn4	SLIGHT	ABSENT	SLIGHT	NEGLECTIBLE	MODERATE	ABSENT	MODERATE	ABSENT	ABSENT	ABSENT	ABSENT

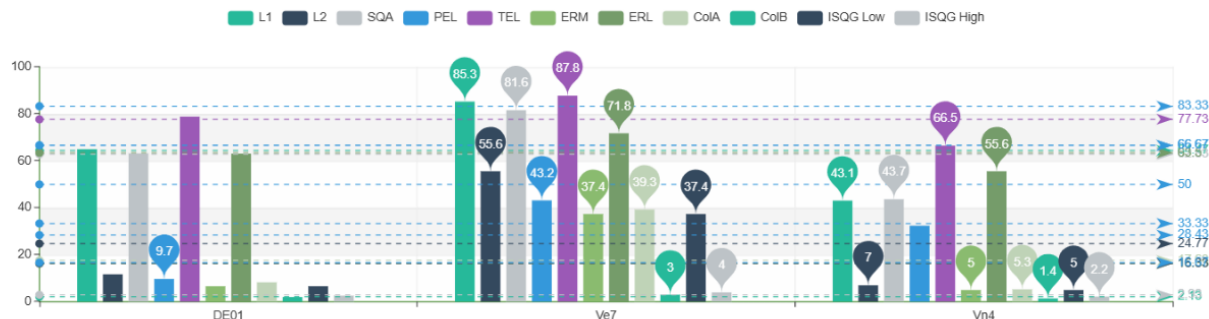
Showing 1 to 3 of 3 entries

Previous 1 Next

Bar Graph

LOE1

HQ norm



TREASURE

Interreg
Euro-MED



Co-funded by
the European Union

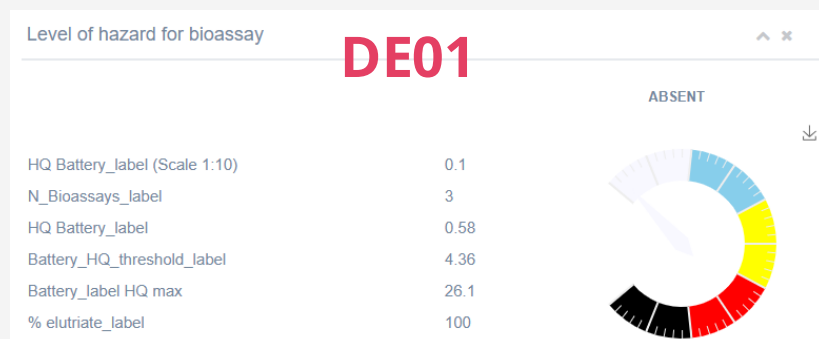
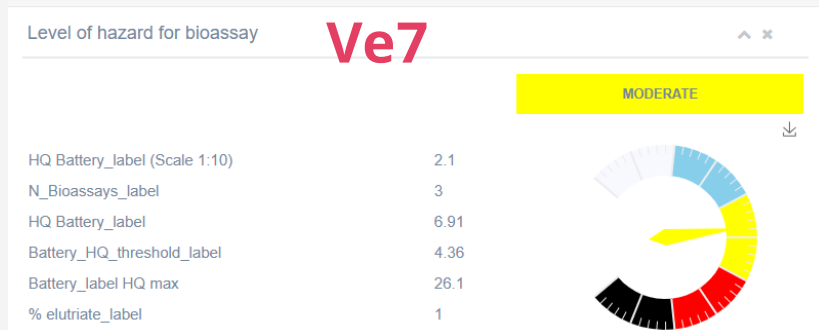
ISPRA
Istituto Superiore per la Protezione
e la Ricerca Ambientale





Sediqua software® WP2 Results

Bioassays (LOE 5)





Sediqua!soft® WP2 Results

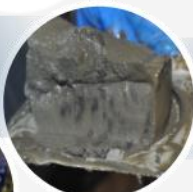
Benthic communities (LOE 6)



WP2: Environmental Integrated Quality index



Chemical analyses



Sediments

LOE 1

Ecotoxicological tests

LOE 5

- LOEs
- ☒ LOE 1: Chemical Characterization of Sediments
 - ☐ LOE 2: Chemical Characterization of Water
 - ☐ LOE 5: Toxicological Bioassays
 - ☐ LOE 6: Benthic Communities

Select Normative (LOE1)

L2 (D.Lgs. 173/16)

Select Normative (LOE2)

SQA freshwater

Select Ecological Index (LOE6)

AMBI

WQE

Analyses of benthic communities

LOE 6

ABSENT



MODERATE



ABSENT



Vn4 (reference site)



Class

ABSENT

SLIGHT

MODERATE

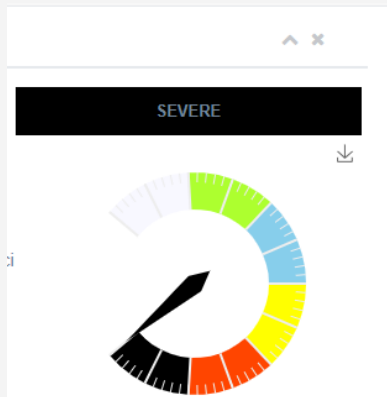
MAJOR

SEVERE

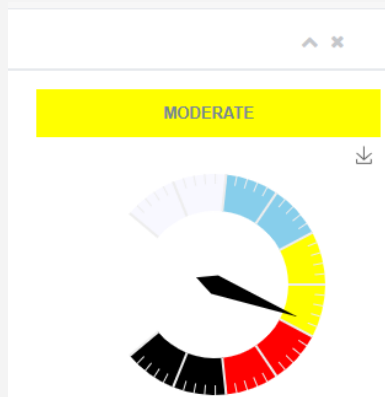


Sediqua!soft® WP3 Results

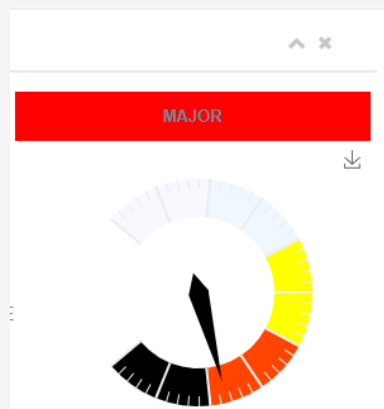
Chemical analyses (LOE 1)



Bioassays (LOE 5)



WOE Integration



Contribute % LOE

LOE1	<div><div></div></div>	59.2%
LOE5	<div><div></div></div>	40.8%



TREASURE

Interreg
Euro-MED



Co-funded by
the European Union





Main outcomes and how they can drive decision making

- No evidence of contamination outside the port area or at the northern entrance (WP2)
- Moderate contamination detected inside the port → relevant for routine dredging management (WP2)
- Significantly higher contamination (metals and PAHs) in the inner old dock area (Darsena Vecchia)
- This area used for pilot tests on contaminated sediment treatment to reduce pollution levels (WP3)

Importance of integrating ecotoxicological and chemical data for management decisions (port operations, ecosystems, public health)



TREASURE

Interreg
Euro-MED



Co-funded by
the European Union





THANK YOU FOR THE ATTENTION!

Lorenzo Morroni – lorenzo.morroni@isprambiente.it



0039 3281895 821



TREASURE

Interreg
Euro-MED



Co-funded by
the European Union

