LIFE sedremed
ENHANCED BIOREMEDIATION
OF CONTAMINATED MARINE SEDIMENTS

LIFE20 ENV/IT/000572

LIFE SEDREMED

Bioremediation of contaminated sediments in coastal areas of ex-industrial sites

LIFE20 ENV/IT/000572

START DATE OF THE PROJECT: **1 October 2021**

DURATION OF THE PROJECT: **45 months**

DELIVERABLE D1.4

Final Communication, Dissemintaion & Exploitation Plan

DUE DATE OF DELIVERABLE: **01/2025**

ACTUAL SUBMISSION DATE: **03/2025**

BENEFICIARY LEADING THIS DELIVERABLE: **Nisida Environment**

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Executive Summary

This deliverable follows on Deliverable D1.3 that presented the intermediate LIFE SEDREMED Communication, Dissemination and Exploitation Plan. It provides an updated overview of the communication, dissemination and exploitation strategy of the project and the results obtained until now, in addition to the latest activities foreseen until the end of the project.

As a reminder the general objectives of LIFE SEDREMED Communication, Dissemination and Exploitation Plan are:

- set up innovative tools for the communication and engagement of various stakeholders (academic institutions, private and public companies, professionals, ministries and environmental agencies, environmental associations/NGOs, local residents etc.);
- disseminate efficiently project goals and results achieved;
- create synergies with other EU funded projects for collaborations and exchange of experiences;
- ensure the dissemination of project outcomes also after the end of the project.

The document provides an overview of the communication tools that have been created and used, the key messages of the project, the target audiences, the

outcomes of the dissemination event organized in Rome and Helsinki, the other events in which the partners participated, and the events foreseen for the upcoming months.

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Update on the exploitation strategy

NISIDA has designed an exploitation methodology to allow valorisation and replication/transfer of the project results. The strategy will be the core part of Deliverable (Del.) B4.2 (Replication and Transfer Plan) that can be summarized in the following steps:

1. Preliminary identification of the key exploitable results generated by technical actions of LIFE SEDREMED (B1-B3 and C1).
2. Assessment of the innovation and business potential of the exploitable results (including Life Cycle Analysis (LCA) and Life Cycle Costs (LCC) outputs).
3. Identification of the main applicable standards in the decontamination sector.
4. Analysis of selected Member States marine decontamination needs.
5. Implementation the IPR strategy developed.
6. Application of the prepared business plan.
7. Organization of targeted networking activities to reach stakeholders interested in LIFE SEDREMED result exploitation.
8. Identification of private and public funding schemes as pillars of a fundraising strategy that guarantee the future market deployment of the innovations developed during the project.

An important role in the exploitation strategy will be played by the Mediterranean Remediation Hub (MEDREHUB) since it will serve as physical space where conferences and meetings will be held at the end of the project and after the project ends to present project results to stakeholders potentially interested in exploiting LIFE SEDREMED innovations.

The exploitation strategy will evolve from a "inception phase" during the first half of the project to a "development phase" in year 3 and 4, ending with an "implementation phase" during the last 6 months of the project.

As the project arrives in its last months (end programmed for 30th June), both the inception and development phase have been completed. Hereafter an updated on the 8 steps listed before:

1-2) First results on lab-scale and mesocosm-scale showed low evidence for stimulated degradation of organic pollutants while fixation of heavy metals more significant. Several adaptations have been implemented to ensure better results during on-field testing, however several environmental conditions made the conclusions on remediation efficiency challenging. Additionally, the cost of installation for the on-site application were unpredictably high, due to these preliminary conclusions it was decided the technological combination is not yet ready to be introduced to the market.

3-4) The deliverable B4.1 (Stakeholder & Market Analysis) includes an in-depth analysis of the bioremediation market with a focus on the application for contaminated sediments. It sets the base for the Replication & Transfer Plan and includes preliminary analysis of applicable standards and Member States (MSs) decontamination needs with reference to IT, BE, FI and DE (representing the MSs involved in the LIFE SEDREMED partnership). This work will be completed in B4.2.

5-6) In view of the only partial results obtained by the demonstration at full-scale of the remediation methodology, the partnership has decided not to proceed with the preparation of IPR strategy and Business plan. In contrast, B4.2 will focus more on replication of the monitoring approach developed during the project and transfer of the technologies on other polluted matrixes such as harbor or riverine sediments.

7) In addition to the activities already described in D1.3, the project partners have undergone a sustained dissemination and networking activity during 2024 including: an international conference organized in Rome at Invitalia's headquarters (March 2024), a dissemination event dedicated to the Baltic Sea organized in Helsinki (June 2024), the participation with a dedicated talk at Remtech 2024 in Ferrara (IT) (September 2024), a workshop on the Blue Economy with key stakeholders in Naples (March 2025) and a visit to the Aquatech Fair in Amsterdam (March 2025).

8) The funding strategy for the after-life phase has started under the development of MEDREHUB funding strategy. The first public calls have been identified under the HORIZON program and INTERREG-MED. Key stakeholders from the maritime sector have been engaged in a first event held in Naples in March 2025 at Fabbrica Italiana dell'Innovazione. The complete funding strategy and events program will be published with the deliverable B5.1.

Update on Communication Channels and Dissemination tools

In LIFE SEDREMED, we use several channels to disseminate our research to the different target groups. Some channels are specific for communication with certain target groups, e.g. technical/scientific publications or technical dissemination events, and others suitable for communication with all specified target groups, e.g. the LIFE SEDREMED website or the X platform. Thereby, it is important to express project results in an accessible language, tailored to the different target groups.
Afterwards, more detailed information on each channel is presented in the following sub-chapters. The described use of the channels are suggestions and should be adjusted to any occurring changes during the project.

Website

The LIFE SEDREMED website is the central tool for communicating about the project progress and disseminating project results to stakeholders, the academic community, concerned citizens, and the wider non-expert audience. The languages of the website are both English and Italian. The partnership chose to traduce the website in Italian to maximize the accessibility to information for local Bagnoli's residents and Italian Institutions.

The following information are presented on the website:

- General project information including the project's objectives, activities, timeframe, and demonstration site information.
- Presentation of project partners and description of their activities.
- Update of the project progress.
- All documents, such as deliverables, brochures, articles in press or fact sheets are provided online and can be downloaded as pdf.
- Links to press releases, social media channels and networking activities.
- Information on meetings and events.
- Media section with access to project videos and photographs.
- Dedicated contact page with section for newsletter subscription.

The website will be regularly updated by NISIDA's team until the end of the project and beyond (at least until March 2027).

The website was put online on July 2022, and the URL is: https://life-sedremed.eu/

The website analytics were activated in February 2023 and the results in March 2025 are as follows:

- 596 unique users
- 00:02:04 average engagement time
- 2.675 views
- 7.091 event count

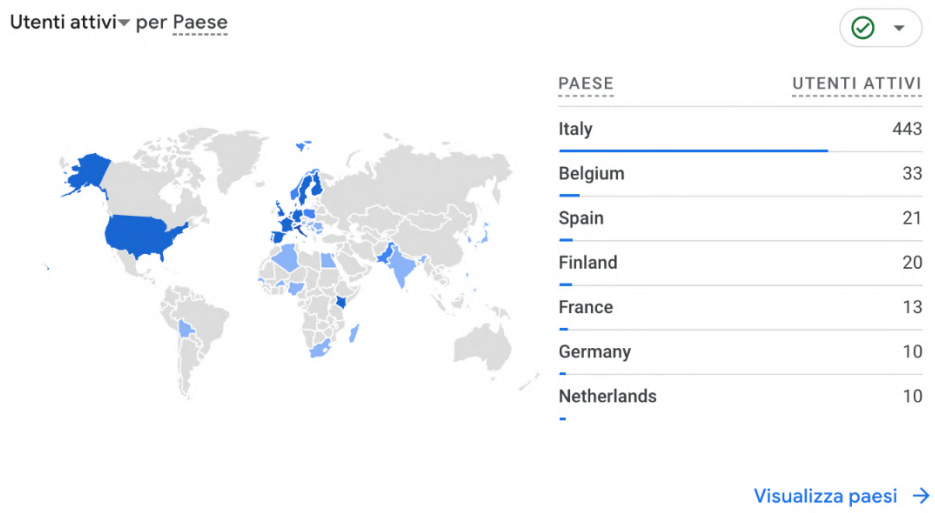

Figure 1: Geographical distribution of LIFE SEDREMED website users.

Compared to the intermediate CDEP an important increase has been registered in the unique users (+281), in total views (+1365), in the average engagement time (+13 seconds) and in the event count (+3591).

Newsletters

After the first two newsletters a third one was sent at the end of 2024 in order to provide a recap of all the activities implemented, ranging from the start of the on-field implementation of the technologies to the dissemination events in Rome and Helsinki, and ending with the publication of our animated video.

Newsletter #3 was successfully sent to 167 recipients, it counted 79 opening and 23 total clicks (up by 11 compared to the first two newsletters).

NEWSLETTER

December 2024

Looking back at 2024

Dear Partners, Colleagues, and Friends,

As 2024 comes to a close, we take a moment to reflect on an **inspiring year of collaboration**, innovation, and progress. Together, we have advanced sustainable solutions for sediment remediation, expanded partnerships, and shared knowledge across borders through impactful conferences and fieldwork.

From the launch of our experimentation in Naples to **international conferences in Helsinki and Rome**, we have demonstrated the power of collective action in addressing environmental challenges. None of this would have been possible without the commitment and expertise of colleagues and partners.

We're also excited to share **our new video** - which you can watch below. A short visual journey into how we tackle marine sediment pollution! Discover how we are testing microorganisms and electric currents to break down harmful pollutants, seeking an eco-friendly, cost-effective alternative solution.

We look forward to continuing this journey in 2025, building on our shared vision for cleaner and sustainable marine ecosystems.

With gratitude and best wishes for the new year,
The SEDREMED Team

Explaining how we tackle marine sediment pollution!

EKOGRID Oy Hosts Successful 3rd LIFE Sedremed Conference in Helsinki

On Tuesday, June 18, 2024, EKOGRID Oy hosted the 3rd LIFE Sedremed Conference in Helsinki, bringing together leading experts in marine sediment decontamination. This event aimed to advance the understanding and application of innovative in-situ solutions for the remediation of polluted marine sediments, and to learn from the challenges in the Baltic Sea. The conference, part of the LIFE Sedremed project co-funded by the European Union, provided a platform for sharing knowledge, discussing challenges, and exploring the latest technological advancements.

Read more

Naples University students visit Bagnoli

On 9 May 2024, a group of 15 students from the Master's Degree Course in Environmental and Territorial Engineering at the University of Naples Federico II participated in an educational visit to Bagnoli, Naples. The course is coordinated by Prof. Francesco Pirozzi of the Department of Civil, Construction and Environmental Engineering. The visit was organized as part of the reclamation of the Site of National

Figure 2-3: Newsletter #3 sent at the end of 2024.

Printed Material

The printed materials were produced at the end of 2022 and subsequently distributed to all partners. Italian partners received the brochure both in IT and EN while other EU partners received only the English version.

The produced printed materials included:

- Brochures with key information on the project
- 2 different roll-ups, one with detailed information and another one with more general information on the partnership
- 1 notice board that was installed in front of the Bagnoli site
- 1 scientific poster

All these printed materials have been detailed both in content and in numbers in the Intermediate CDEP.

As the project comes to an end NISIDA is preparing a new version of the printed materials that will be used for the last dissemination event and final conference to be held in Naples and to provide up to date material to all the involved stakeholders.

Figure 4-5: Printed material produced in the first half of the project.

Street Art

The container that has been used for the on-field implementation has been decorated with a street artwork to use it as a tool for stakeholder engagement and communication. To maximize stakeholder involvement and citizen's awareness about the project actions NISIDA organized a workshop in Villa Medusa, Bagnoli's community house. The workshop held together with the artist focused on the co-development with the community of the artistic representation to be realized on the container. The artist asked the participants to think about key words that came up to their minds when listening to the project presentation, the participants where then asked to illustrate some of these words. The artwork project was then composed of a combination of these drawings, allowing citizens to see their own thoughts represented on the project's container enhancing the community ownership of the project, below the pictures of the workshop and of the artwork.

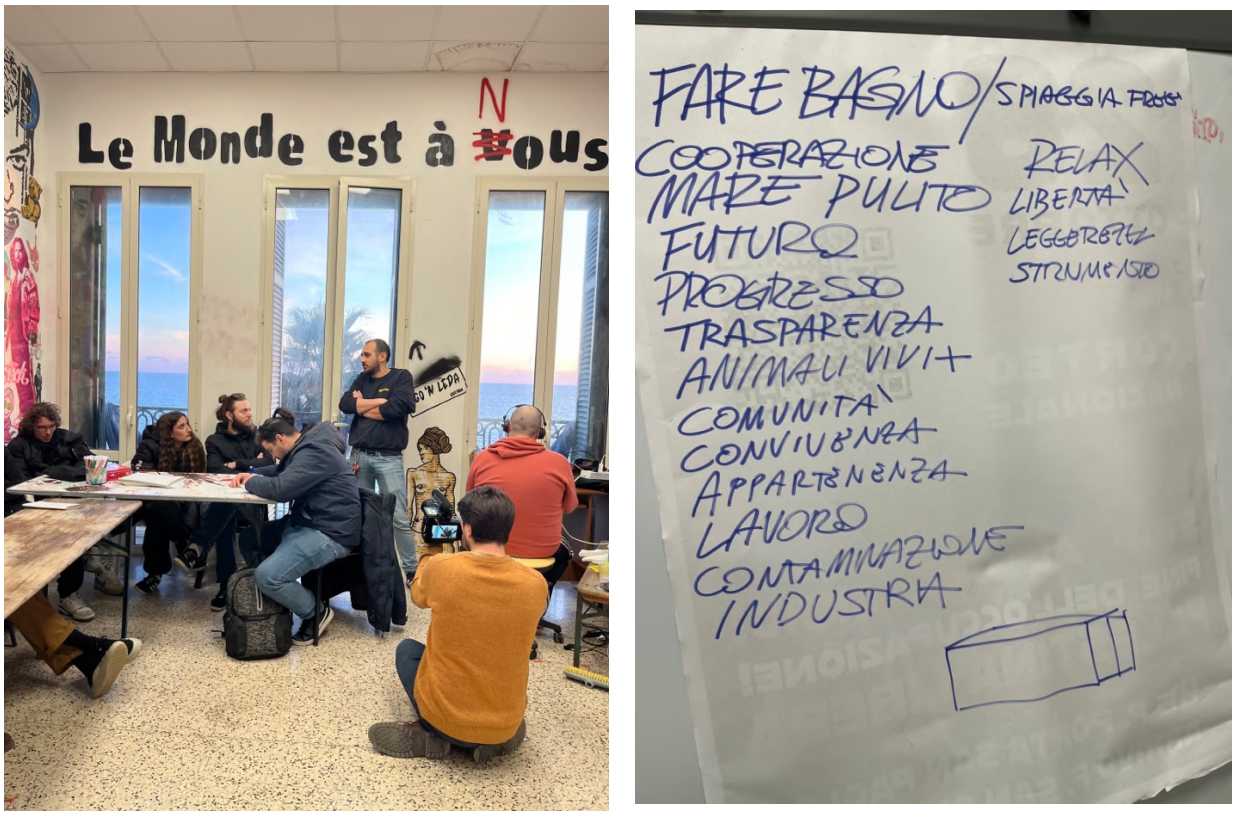

Figure 6-7: Community Workshop in Villa Medusa with local citizens.

Figure 8: The artwork almost completed on the LIFE SEDREMED container.

LIFE SEDREMED Micro Museum

NISIDA is planning to reuse the container and the artwork to create a micro museum of the project. The container will be used a short tunnel showcasing all the crucial steps and activities of the project, it will be composed both of explanatory panels and by some of the objects used during the project (the glass reservoirs for the mesocosms, the electrodes, the "socks" with the bio-fixed bacteria, the cables, the buoys etc.

After the project ends the container will be placed in a strategic point in the Bagnoli site in order to preserve the legacy of the project activities.

Press releases/news articles

Press releases as well as announcements about events have been produced for the main findings, with a focus on the relevance of benefits of the project.

Two press releases have been sent, including the first one announcing the start of the project (October 2022) and the second one focusing on the divulgation event held in Brussels (BE) in February 2023. Both press releases obtained a very good reach with several news articles in Italian media (both physical and digital).

In particular we would like to highlight again this extensive description of the project published on La Repubblica (one the main Italian newspapers): https://www.repubblica.it/green-and-blue/2023/06/08/news/inquinamento_mari_superbatteri_napoli-403560889/
A third press release was sent in January 2024 regarding the start of the on-field implementation of the technologies and details on the monitoring plan.

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COMUNICATO STAMPA N°3

Avvio della sperimentazione a Bagnoli

ENHANCED BIOREMEDIATION OF CONTAMINATED MARINE SEDIMENTS

Decontaminazione innovativa di sedimenti marini contaminati

LIFE20 ENV/IT/000572

"Avviata la sperimentazione per la bonifica innovativa dei sedimenti a Bagnoli"

Napoli, 25 gennaio 2024 - È stata **avviata la sperimentazione per la bonifica innovativa dei sedimenti contaminati** nel Sito di Interesse Nazionale (SIN) situato nell'area ex-industriale di Bagnoli. La Stazione Zoologica Anton Dohrn, ente coordinatore del progetto LIFE SEDREMED, insieme agli altri partner del progetto, dopo oltre un anno di studi preliminari e programmazione, ha **completato l'installazione delle tecnologie nell'area dedicata alla sperimentazione.**

Figure 9: Third press release announcing the start of the on-field implementation.

The press release had a good success rate with local media and obtained 3 important divulgations on national news platforms:

- https://www.fanpage.it/napoli/il-mare-di-bagnoli-bonificato-con-microrganismi-e-scosse-elettriche-cosi-lacqua-sara-balneabile/
- https://economiacircolare.com/bagnoli-tecniche-bonifiche-soil-washing/
- https://www.repubblica.it/economia/rapporti/energitalia/rigeneriamo-il-territorio/2024/02/08/news/biorisanamento_dei_sedimenti_marini_parte_la_sperimentazione_al_sin_di_bagnoli-422091241/

A final press release will be prepared and sent with the conclusions of the project and the announcement of the final conference and opening of the MEDREHUB.
Moreover, the project has been awarded as "LIFE project of the month" for January 2025 by the Italian Ministry of the Environment and Energy Security (https://www.mase.gov.it/pagina/progetto-life-sedremed).

Social media activities

The communication strategy of LIFE SEDREMED relies heavily on social media. Mainly Nisida Environment, but also the coordinator and other project partners have been communicating general project information, the project's progress, information and photos from activities, such as the dissemination events or internal meetings, the project's results, and all project publications via Facebook, X and LinkedIn.

Social networks are being used to advertise events and to spread news about the project. They are contributing to increase the visibility of LIFE SEDREMED among young people, students, but also local and European environmental remediation companies. All partners are contributing to that increasing the impact and the numbers of followers.

A social media calendar has been developed to guide content production and is being implemented.
As of March 2025, the results of the social media activities are:
- 491 followers on LinkedIn (+60 since Intermediate CDEP)
- 154 followers on X (+ 20 since Intermediate CDEP)
- 92 followers on Facebook (+17 since Intermediate CDEP)

Concerning Facebook, we made the choice to publish news in Italian in order to dedicate this communication channel to local citizens. However, since the communication with the local community is a matter of concern (Bagnoli has been waiting for decontamination for the past 30 years with several projects that failed, and judiciary investigations involved) and, in view of the only partial results obtained by the on-field testing, the project partnership has chosen not to engage actively in local citizen Facebook groups. In order to clearly divulgate the outcomes of the results to the local population a specific event will be organized in May in Bagnoli in conjunction with the opening of the micro-museum.

Scientific publications

The main and relevant technical results from the project will published in high impact peer-reviewed journals and magazines to reach the scientific community and remediation industries. SZN and UNIVPM has a high track record of publications related with bioremediation, including recent papers about the Bagnoli Bay contamination published in a special issue on Marine Environmental Research. Articles will be tailored to relevant different targets (scientific research and remediation market), the project foresees the production of at least 2 scientific publications and 4 articles on magazines by the end of the project. Publications will continue in the after-life period of the project and include before 2028 another 2 publications and 6 articles on magazines.

Some already selected journals are:

- Critical reviews in biotechnology
- Marine Pollution Bulletin
- Environmental pollution
- Marine Environmental Research
- Science of The Total Environment
- New Biotechnology
- Environmental Science and Pollution Research
- Journal of Soils and Sediments

A review has already been published in March 2024 (Tedesco et al., A review, about oil pollution in the marine environment and the potential of the bioremediation market, *Marine Pollution Bulletin*, 2024. doi: 10.1016/j.marpolbul.2024.116157).

Bioremediation for the recovery of oil polluted marine environment, opportunities and challenges approaching the Blue Growth

Pietro Tedesco [1], Sergio Balzano [1], Daniela Coppola [1], Fortunato Palma Esposito [1], Donatella de Pascale [2], Renata Denaro [3]

Affiliations + expand

PMID: 38364643 DOI: 10.1016/j.marpolbul.2024.116157

Free article

Abstract

The Blue Growth strategy promises a sustainable use of marine resources for the benefit of the society. However, oil pollution in the marine environment is still a serious issue for human, animal, and environmental health; in addition, it deprives citizens of the potential economic and recreational advantages in the affected areas. Bioremediation, that is the use of bio-resources for the degradation of pollutants, is one of the focal themes on which the Blue Growth aims to. A repertoire of marine-derived bio-products, biomaterials, processes, and services useful for efficient, economic, low impact, treatments for the recovery of oil-polluted areas has been demonstrated in many years of research around the world. Nonetheless, although bioremediation technology is routinely applied in soil, this is not still standardized in the marine environment and the potential market is almost underexploited. This review provides a summary of opportunities for the exploiting and addition of value to research products already validated. Moreover, the review discusses challenges that limit bioremediation in marine environment and actions that can facilitate the conveying of valuable products/processes towards the market.

Keywords: Bioremediation; Blue Growth; Hydrocarbon-degrading microorganisms; Marine environment; Regulation.

Figure 10: Article produced during the project published on the Marine Pollution Bulletin journal.

Also, the academic magazine Animal Health has dedicated a full section to the LIFE SEDREMED project in July 2023.

COVER

L'ex sito industriale di Napoli-Bagnoli (figura 3)
In rosso e verde le due aree selezionate, una ad alto grado di inquinamento (H) e una a basso grado di inquinamento (L), per i primi test di installazione e monitoraggio della tecnologia

cui programmazione è ottimizzata per ogni sito. Ekogrid è una tecnologia avanzata di bonifica che migliora i processi naturali e supporta metodi di bonifica complementari, utilizzando fenomeni elettrochimici per generare radicali sulle superfici delle particelle dei sedimenti e fenomeni elettrocinetici ed elettro-osmotici per aumentare la disponibilità di contaminanti organici per il biorisanamento, la degradazione chimica o la rimozione meccanica. I prodotti e le tecnologie brevettate Ekogrid sono economici, semplici da installare e sicuri da usare sia per gli operatori che per l'ambiente. Attraverso un design specifico realizzato durante la fase di progettazione, il sistema massimizza il potenziale di bonifica delle matrici contaminate.

"Il progetto Life Sedremed rappresenta quindi la prima applicazione della tecnologia in mare aperto, permettendo così di verificarne l'efficacia anche in ambienti sottoposti a forti correnti"

Life Sedremd testerà per la prima volta la tecnologia combinata Ekogrid-Idrabel (figura 2) su sedimenti marini in mare aperto. L'installazione di Ekogrid mirerà a potenziare l'efficienza di degradazione degli inquinanti fornita dai microrganismi di Idrabel; pertanto, lo scambio costante di informazioni e il co-sviluppo dell'installazione sono fondamentali per ottenere risultati di decontaminazione soddisfacenti.

A oggi il progetto si trova in linea con la timeline stabilita. Idrabel ed Ekogrid hanno già sviluppato e messo a punto le condizioni sperimentali per l'implementazione del prototipo tecnologico, attualmente in fase di test su scala di laboratorio (in mesocosmo), mentre entro la fine di settembre

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Figure 11: Extract of the article dedicated to LIFE SEDREMED on the Animal Health magazine.

Dissemination events

The planning of dissemination activities is operated by NISIDA and executed in the locations where events are foreseen (BE, IT, FI). To maximise efficiency and avoid unnecessary travel all the listed dissemination events are planned in combination with the annual project meetings.

Below you will find an update of the original table, with the first three events already organized in Brussels in February 2023, Rome in March 2024 and Helsinki in June 2024.

Table 1: Planning of LIFE SEDREMED divulgation events

EU MS	LEAD	DATE	THEMATIC
BEL (Brussels)	IDRA	02/2023	Technological and policy solutions for the management of contaminated sediments in the EU – Expert Roundtable
IT (Rome)	INV	03/2024	Innovative approaches for the management of contaminated sediments – Bagnoli's case study.
FI (Helsinki)	EKO	06/2024	Innovative approaches for the management of contaminated sediments – Focus on the Baltic Sea
IT (Bagnoli)	SZN	05/2025	Innovative approaches for the management of contaminated sediments – Lessons learned and return of knowledge for the community

IT (Naples)	SZN	06/2025	Final Project Conference - Results and After-LIFE plan – MEDREHUB Opening

Internal events

The successful Brussels expert roundtable organized in February 2023 is described in the Intermediate CDEP and the community workshop for the development of the artwork has been presented in the previous section.

Rome (March 2024):

The project partnership then organized a full-day international conference held at Invitalia's headquarters. The morning session focused on policy challenges and the ongoing efforts to harmonize remediation approaches across EU member states. After an introduction by the Mayor of Naples Gaetano Manfredi and the Head of Bagnoli project for Invitalia Enrico Fusco, discussions centered around policy developments necessary at the EU level, detailed by local institutions and experts. Prominent speakers such as Silvia Donato from the European Climate Infrastructure and Environment Executive Agency (CINEA) and Silvia Bartolini from the European Commission's Directorate General for Environment (DG ENV) provided insights into EU policies on marine sediment management. A roundtable featuring representatives from the Netherlands, Belgium, Sweden, and Italy showcased best practices and policy processes in their respective countries. The morning session also included an overview of market and replication opportunities in sediment management and introduced the Mediterranean Remediation Knowledge and Innovation Hub (MEDREHUB).

The afternoon session delved into technical challenges and available technological solutions for sediment remediation. This session presented the progress achieved by the LIFE SEDREMED project, including the final remediation plan for Bagnoli, innovative monitoring methodologies, and other related EU projects. Notable contributions came from Giulia Pérez Almodovar of the italian Ministry of Environment, who discussed opportunities within the LIFE Programme for coastal

projects. Song Jin from the University of Wyoming discussed the degradation of contaminated sediments using bioelectrochemical technologies, while Grazia Masciandaro from POLIBA showcased technologies developed under the LIFE GREENLIFE 4 SEAS project. A key highlight was the presentation on the environmental impact assessment of the Bagnoli area's reclamation project by Lorenzo Bertolè from ARCADIS. Additionally, Heinrich Eisenmann from Isodetect introduced the innovative monitoring plan developed by LIFE SEDREMED.

The event concluded with closing remarks from Donatella de Pascale, Director of the Ecosustainable Marine Biotechnology Department at the Zoological Station Anton Dohrn of Naples, emphasizing the importance of interdisciplinary research and international collaboration in addressing environmental challenges.
The event saw the participation of circa 50 people in the room with an additional 20 connections online. It enabled the project partnership to further engage with key policy and technical stakeholders in addition to bound ties with other related LIFE projects.

Figure 12: Introductory speech by the Mayor of Naples at the Rome International Conference.

Helsinki (June 2024):

The project partners then organized another divulgation event in Helsinki. In addition to the presentations from project partners speakers from key stakeholders in the Baltic Sea were invited. Ville Wahlberg, from the Baltic Sea Action Group (BSAG), delivered a compelling talk about the critical state of the Baltic Sea, highlighting the urgent need for innovative solutions to address climate change and eutrophication. Aura Nousiainen, from the Finnish Environment Institute (Syke) and AFRY, discussed the lack of specific legislation regarding sediment contamination in Finland and the implications for environmental management. Clara Neuschütz, from the Swedish Environmental Protection Agency, gave an overview of the environmental challenges facing Swedish aquatic systems and the measures being taken to address them. The importance of collaboration between various stakeholders, including national institutions, research centers, technology providers, and civil society, was highlighted as essential for successful sediment remediation. The dissemination event was attended both in person (15 participants) and online via the LinkedIn account with 10 people connected.

Figure 13: Address by BSAG at LIFE SEDREMED event in Helsinki.

Upcoming events:

The partners will organize two final divulgation events before the end of the project with the first one being dedicated to the local community and organized in Bagnoli and the second one being the Final Conference of the project together with the announcement of the MEDREHUB. Finally, NISIDA has applied to organize a side-event at the UN OCEAN Conference 2025 to be held in Nice (FR), the selection procedure is ongoing.

External events

Partners have been attending internationally relevant events as speaker (or poster presenter). In 2023 we participated to SedNet (Lisbon, PT), Acquaconsoil (Prague, CZ), Pollutech (Lyon, FR) and Ecomondo (Rimini, IT). Emanuela Buschi from SZN participated in Remtech Expo in Ferrara in September 2024, she presented the intermediate results of the project to several technical stakeholders in the framework of a half-day session dedicated to the ongoing remediation works in the Bagnoli site of national interest.

PROGRAMMA

REMTECH EXPO

AREA DI RILEVANTE INTERESSE NAZIONALE DI BAGNOLI COROGLIO: STATO DI ATTUAZIONE DEL PROGRAMMA DI RISANAMENTO AMBIENTALE E RIGENERAZIONE URBANA (PRARU)

Evento a cura di Confederazione Imprese Servizi Ambiente (Cisambiente) – Confindustria

Venerdì 20 Settembre ore 9.30-11.30
Sky Room – Pad.5

9.30 -9.40 Saluti Istituzionali
Silvia Paparella *General Manager RemTech Expo*
Gaetano Manfredi, *Commissario straordinario del Governo per la bonifica ambientale e rigenerazione urbana del sito di interesse nazionale Bagnoli-Coroglio, Sindaco di Napoli*
Rappresentanti di *INVITALIA, Rappresentante Confindustria Cisambiente*

9.40 -9.50 Aspetti Normativi del PRARU: focus sul Protocollo di Vigilanza Collaborativa con ANAC
Marco Lausi, *Invitalia*

9.50-10.00 Aspetti Comunicativi e strategici del PRARU
Diomede Falconio, *Sub Commissario del Commissario straordinario del Governo per la bonifica ambientale e rigenerazione urbana del sito di interesse nazionale Bagnoli-Coroglio*

10.00 - 10.10 Aspetti Economici del PRARU
Davide Del Cogliano, *Invitalia*

10.10 – 10.20 L'interazione con lo scenario internazionale: il progetto LIFE SedRemed
Emanuela Buschi, SZN

Figure 14: Program of the Remtech morning session dedicated to the Bagnoli site.

In March 2024 Raffaele Vaccaro from Nisida Environment presented the MEDREHUB at an important event on the Blue Economy held at Fabbrica dell'Innovazione in Naples. The event gathered key maritime and finance stakeholders, including Next Geosolutions, Cluster BIG - Blue Italian Growth, Grimaldi Group, Intesa Sanpaolo Innovation Center, FINCANTIERI, Salerno Container Terminal, CDP Venture Capital SGR, Maritime Ventures - Company Builder, and Federazione del Mare.

Figure 15: Raffaele Vaccaro presenting MEDREHUB at the Blue Economy event in Naples

Raffaele Vaccaro also visited in March Aquatech Amsterdam where he met with key Dutch stakeholders for the future participation and eventual financing of the MEDREHUB.

LIFE projects networking

Several direct contacts were made with different LIFE projects over the project.
To structure and manage the relationship a dedicated excel file has been created to map related LIFE, HORIZON and INTERREG projects.
Here is a list of the contacts made:

- LIFE REMEDIA Project – Meeting held with SZN at the end of October 2022.
- LIFE SEKRET and LIFE MAR PICCOLO – Joint online event in October 2022 together with the Italian Environment Ministry.
- LIFE GREEN SITE - Dr. Zanotto from the company 2A Group was contacted in view of our ongoing work for LCA and LCC, he shared information on the port authority of Venice for the project ECOREMED and shared the final report of the project.
- LIFE MARINAPLAN PLUS – The company Trevi Group was contacted in view of the organization of the expert roundtable, they answered that they have not gone forward with the development of the technology.
- LIFE SURE, LIFE NARMENA, LIFE BELINI – Participated in presence and with presentations to the expert roundtable organized in Brussels in February 2023.
- LIFE GREEN LIFE 4 SEAS – Participated in presence and with a dedicated presentation to the international conference held in Rome.

Layman report

A Layman's report will be published to present the project, objectives, actions, and results to non-specialist audiences, including political stakeholders. The versions of the report will be produced in English and Italian; the report will be provided both in printed and electronic versions, which will be freely accessible via the project webpage. This Layman's report will be useful for providing a summary of the project when it will have achieved its objectives.

In view of the 3 months extension obtained by the project the Layman Report will be provided by April 2025.

Project videos

Short videos have been used to illustrate the project approach and results.
In April 2023 a 4-minute video was broadcasted on RAI1 the main Italian public television channel. Other videos include interviews at Canale Energia, the description of the preparation phase in the lab of Idrabel in Belgium produced by the LIFE National Contact Point of Wallonia and a video produced by Invitalia showing the aerial view of the project's implementation site.

In November 2024 the LIFE SEDREMED animated video was published on the LIFE SEDREMED website and promoted through the project's social media channels and the end of the year newsletter.
Finally, the production of the short documentary is now its in final phase of post-production. The documentary will be premiered at the Final Conference in June 2025 in Naples.

Explained! Enhanced bioremediation of marine sediments

Figure 16: Animated video of LIFE SEDREMED published on the website.

Figure 17: Making of the short documentary of LIFE SEDREMED.

Site visits

The first site visit was organized on 9th May 2024, students from the Master's Degree Course in Environmental and Territorial Engineering at the University of Naples Federico II participated in an educational visit to Bagnoli. Among the various topics presented to the students, the LIFE SEDREMED project stood out as an innovative initiative aimed at decontaminating coastal sediments. The Master's Degree in Environmental and Territorial Engineering prepares students to design, manage and control environmental protection and restoration interventions, management of territorial and energy resources, and treatment of water and polluting emissions.
A second site visit will be planned following the divulgation event dedicated to the community in May 2025.

Figure 17: Site visit with Master student at the implementation site.

MEDREHUB and After-life Plan

The Mediterranean Remediation and Innovation Hub (MEDREHUB) is being set-up as the last implementation action of the project (B5). MEDREHUB, will be hosted initially at the Molosiglio offices of SZN with a potential plan of moving in the Bagnoli site, on SZN premises when completed. The funding strategy and the event program is being prepared and will be submitted by April 2025. This will enable the continuation of concrete dissemination and communication activities after the project ends and play a crucial role in the continuous involvement of civil society and industry, to integrate them actively as a crucial stakeholder in the ongoing remediation process of Coastal areas. The dissemination and communication program of MEDREHUB will be included in the After-Life Plan. Finally, the final conference will represent a key moment where project conclusions and environmental results will be presented to public authorities, private companies working on Bagnoli's site and other contaminated areas with the objective to integrate them in the funding and working activities of the MEDREHUB.

ANNEX 1 – Article on Animal Health Magazine

ANCHE I BATTERI AIUTANO A DECONTAMINARE IL MARE DA IDROCARBURI, DIOSSINE E METALLI PESANTI

La Stazione Zoologica "Anton Dohrn" di Napoli coordina il progetto Life Sedremed, finanziato dall'Unione europea, che combina microrganismi ed elettrocinetica per "biorimediare" i sedimenti marini impossibili e rischiosi da movimentare e rimuovere. Si lavora sul tratto costiero di Bagnoli-Coroglio, corrispondente all'ex area industriale

Donatella de Pascale
Director of the Ecosustainable Marine Biotechnology Department, Stazione Zoologica "Anton Dohrn", Napoli

Chiara Melchiorre
project manager Life Sedremed

"A oggi, la contaminazione dei sedimenti di Bagnoli è caratterizzata da alti livelli di inquinanti organici (tra cui idrocarburi alifatici, policlorobifenili e diossine) e metalli tossici (come arsenico, piombo, zinco, cadmio, rame e mercurio) i cui valori superano pericolosamente i limiti fissati dal Dm 56/09"

Il progetto Life Sedremed è un progetto finanziato dall'Unione europea per lo sviluppo di una soluzione innovativa per la decontaminazione di siti marini inquinati. In particolare il progetto intende testare la sua tecnologia in una delle aree identificate ad alto rischio di crisi ambientale in Italia, l'ex area industriale di Napoli-Bagnoli, la quale è stata inserita nell'elenco dei Siti di Interesse nazionale (Sin) già nella legge di bilancio 388/2000. Il sito industriale, ormai dismesso dagli anni '90, era caratterizzato dalla presenza di industrie siderurgiche (Italsider/Ilva), lavorazione dell'amianto (Eternit), produzione di fertilizzanti e cemento (Cementir).

LA CONTAMINAZIONE DEI SEDIMENTI

A oggi, la contaminazione dei sedimenti di Bagnoli è caratterizzata da alti livelli di inquinanti organici (tra cui idrocarburi alifatici, policlorobifenili e diossine) e metalli tossici (come arsenico,

piombo, zinco, cadmio, rame e mercurio) i cui valori superano pericolosamente i limiti fissati dal Dm 56/09. La caratterizzazione completa della contaminazione è contenuta in una relazione dell'Istituto superiore per la protezione e la ricerca ambientale (riferimento è BoI-Pr-CA-BA-relazione-02.04) e nel progetto Abbaco, concluso nel 2020. Tale iniziativa ("Sperimentazioni pilota finalizzate al restauro ambientale e balneabilità del Sin Bagnoli-Coroglio") finanziata dal Miur, mira alla bonifica e restauro ambientale dell'area e alla sua restituzione alla comunità.

L'IMPATTO SULL'AREA

L'area costiera in questione ospita numerose coltivazioni di mitili e attività di pesca, oltre all'attività balneare estiva, per cui il bioaccumulo di contaminanti può potenzialmente rappresentare una minaccia per la salute umana. Inoltre, la contaminazione si estende su tutta la costa di Bagnoli provocando un impatto negativo anche sullo sviluppo socio-economico della zona. Le soluzioni per la decontaminazione di sedimenti marini così inquinati, attualmente fanno riferimento unicamente al dragaggio dei sedimenti e successiva loro bonifica oppure scarico in vasche di raccolta a tenuta stagna (cassa di colmata). Data l'elevata estensione dell'area costiera di Bagnoli, questa strategia di bonifica risulta proibitiva dal punto di vista dei costi e ad alto rischio di disastro ambientale (il dragaggio dei sedimenti marini rimetterebbe in circolo grosse quantità di inquinanti attualmente stratificati nel sedimento).
Da queste considerazioni nasce l'idea di trovare e mettere in pratica una metodologia innovativa che miri a ridurre la concentrazione di contaminanti organici e la biodisponibilità di metalli tossici nei sedimenti, nonché contestualmente di sviluppare un nuovo approccio per diminuire i rischi ambientali e ridurre i costi dell'attività di dragaggio e del trattamento ex-situ di sedimenti contaminati.

COVER

I partner di Life Sedremed (figura 1)

"L'area costiera in questione ospita numerose coltivazioni di mitili e attività di pesca, oltre all'attività balneare estiva, per cui il bioaccumulo di contaminanti può potenzialmente rappresentare una minaccia per la salute umana. Inoltre, la contaminazione si estende su tutta la costa di Bagnoli provocando un impatto negativo anche sullo sviluppo socio-economico della zona"

LA PARTNERSHIP INTERNAZIONALE

Il progetto Life Sedremed si basa sull'implementazione di due tecnologie le quali sfruttano il biorisanamento e l'elettrocinetica per ottenere una decontaminazione dei sedimenti marini costieri *in situ*. Il partenariato di Life Sedremed è composto da un gruppo multidisciplinare e intersettoriale di sette partner provenienti da quattro paesi dell'Unione europea (figura 1).

Il coordinatore del progetto Life Sedremed è la Stazione Zoologica "Anton Dohrn" di Napoli (Szn), Istituto nazionale di biologia, ecologia e biotecnologie marine.

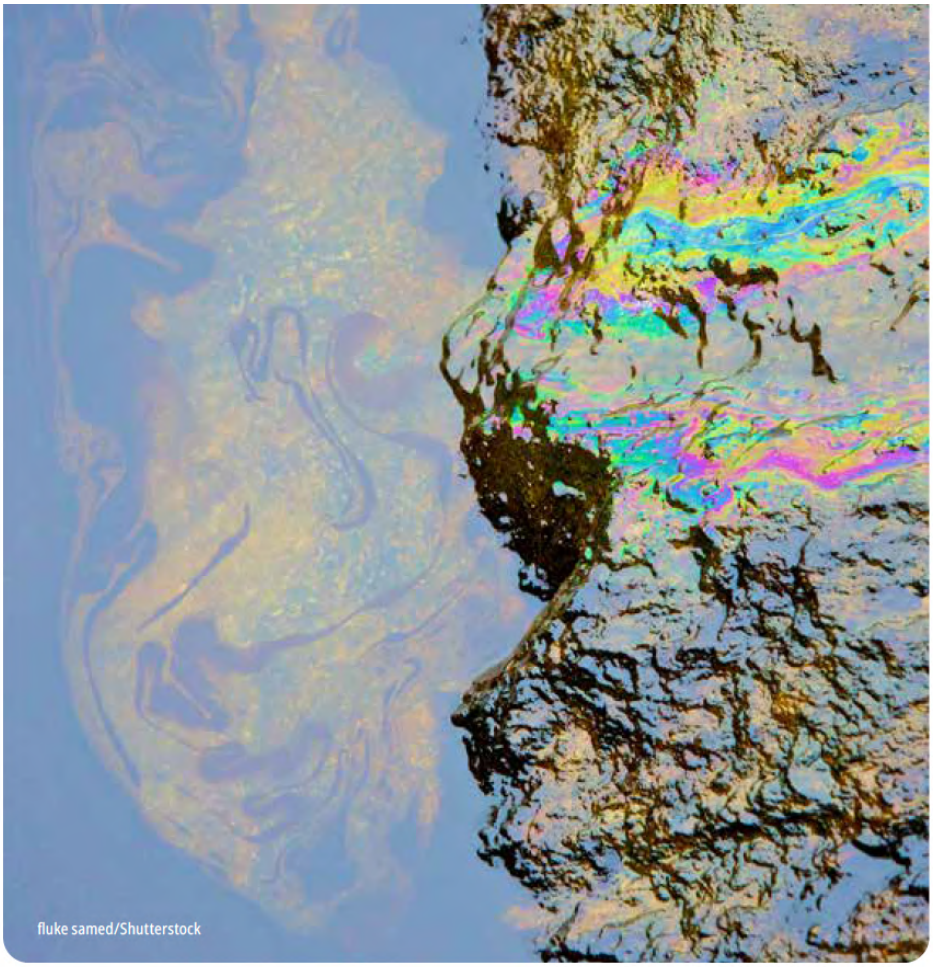
La Szn ha coordinato il già citato progetto Abbaco che ha caratterizzato la contaminazione dei sedimenti di Bagnoli e rappresenta la base scientifica per lo sviluppo di Life Sedremed.

In questo progetto, la Szn è responsabile di coordinare tutte le attività e il processo di campionamento dei sedimenti, fornendo risorse, imbarcazioni e laboratori, per l'implementazione delle azioni di biorisanamento e monitoraggio.

Invitalia è l'Agenzia nazionale per gli investimenti e lo sviluppo economico, controllata dal Ministero delle Imprese e del Made in Italy (Mimit). Invitalia mira a rilanciare la crescita economica dell'Italia, impegnandosi nel rilancio delle aree di crisi e opera principalmente nel Sud Italia. Inoltre, è stata nominata come agenzia esecutiva governativa per il Programma di riqualificazione ambientale e rigenerazione urbana di Bagnoli-Coroglio. L'obiettivo del piano è quello di valorizzare, attraverso azioni di decontaminazione e rigenerazione, le risorse geografiche, paesaggistiche, ambientali, sociali e culturali dell'area, con l'obiettivo di ripristinare la qualità della vita e il benessere dei cittadini. Per Life Sedremed, Invitalia è responsabile dell'azione di permitting & procurement e in generale dello sviluppo di sinergie tra i risultati del progetto e il piano di decontaminazione di tutta l'area marina.

LA TECNOLOGIA IN SINTESI

I due partner Idrabel (Belgio) ed Ekogrid (Finlandia) sono rispettivamente responsabili dello sviluppo e la combinazione di due tecnologie per la decontaminazione dei sedimenti marini (figura 2). La prima, la tecnologia Idrabel, si basa sull'innovativo metodo della biofissazione, che consente di immobilizzare i microrganismi su supporti minerali naturali

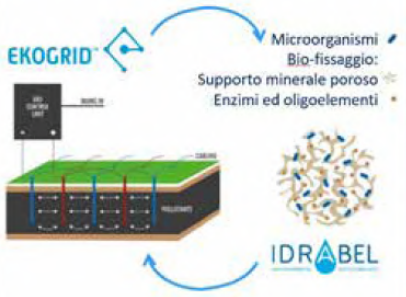

fluke samed/Shutterstock

consentendo una maggiore durata di vita dei microrganismi e quindi, una migliore efficienza di degradazione degli inquinanti. Inoltre, i supporti minerali utilizzati sono di origine naturale (carbonato di calcio di origine marina e zeoliti); questa caratteristica, oltre a consentire una maggiore efficienza di degradazione, fa sì che nei processi di decontaminazione non vengano utilizzati materiali sintetici.

Idrabel ha una vasta esperienza nell'applicazione della tecnologia nei sedimenti per la degradazione di inquinanti organici come gli idrocarburi e per la fissazione dei metalli pesanti, applicandola però in ambienti relativamente chiusi come porti, canali e laghi.

Il progetto Life Sedremed rappresenta, quindi la prima applicazione della tecnologia Idrabel in mare aperto, permettendo così di verificarne l'efficacia anche in ambienti sottoposti a forti correnti. Idrabel lavorerà a stretto contatto con Ekogrid per sviluppare una strategia sinergica di decontaminazione in-situ in cui l'elettrocinetica verrà utilizzata per potenziare le reazioni di biorimediazione.

Infatti, la soluzione Ekogrid Electrokinetic Remediation utilizza reazioni elettrocinetiche ed elettrochimiche per potenziare la biorimediazione e abbattere gli inquinanti organici nel suolo, nelle acque sotterranee e nei sedimenti. I modelli di tensione pulsata, essenziali per il corretto funzionamento di questo metodo, sono trasmessi dall'unità di controllo Ekogrid la



Schematizzazione delle tecnologie utilizzate (figura 2)

COVER

L'ex sito industriale di Napoli-Bagnoli (figura 3)
In rosso e verde le due aree selezionate, una ad alto grado di inquinamento (H) e una a basso grado di inquinamento (L), per i primi test di installazione e monitoraggio della tecnologia

cui programmazione è ottimizzata per ogni sito. Ekogrid è una tecnologia avanzata di bonifica che migliora i processi naturali e supporta metodi di bonifica complementari, utilizzando fenomeni elettrochimici per generare radicali sulle superfici delle particelle dei sedimenti e fenomeni elettrocinetici ed elettro-osmotici per aumentare la disponibilità di contaminanti organici per il biorisanamento, la degradazione chimica o la rimozione meccanica. I prodotti e le tecnologie brevettate Ekogrid sono economici, semplici da installare e sicuri da usare sia per gli operatori che per l'ambiente. Attraverso un design specifico realizzato durante la fase di progettazione, il sistema massimizza il potenziale di bonifica delle matrici contaminate.

"Il progetto Life Sedremed rappresenta quindi la prima applicazione della tecnologia in mare aperto, permettendo così di verificarne l'efficacia anche in ambienti sottoposti a forti correnti"

Life Sedremd testerà per la prima volta la tecnologia combinata Ekogrid-Idrabel (figura 2) su sedimenti marini in mare aperto. L'installazione di Ekogrid mirerà a potenziare l'efficienza di degradazione degli inquinanti fornita dai microrganismi di Idrabel; pertanto, lo scambio costante di informazioni e il co-sviluppo dell'installazione sono fondamentali per ottenere risultati di decontaminazione soddisfacenti.

A oggi il progetto si trova in linea con la timeline stabilita. Idrabel ed Ekogrid hanno già sviluppato e messo a punto le condizioni sperimentali per l'implementazione del prototipo tecnologico, attualmente in fase di test su scala di laboratorio (in mesocosmo), mentre entro la fine di settembre

Hector Pertuz/Shutterstock

inizierà la fase dei test sul campo (figura 3). In particolare, verrà installato nel sedimento un sistema elettrocinetico (tecnologia Ekogrid) insieme all'applicazione di microrganismi biofissati su supporti inerti (tecnologia Idrabel) per eseguire un biorisanamento avanzato dei sedimenti contaminati.

IL MONITORAGGIO

La soluzione sarà completata da una metodologia di monitoraggio innovativa, messa a punto dai partner Isodetect e Università Politecnica delle Marche, per studiare l'efficienza delle tecnologie di bonifica e l'impatto sulla biodiversità.
Isodtect GmbH è uno spin-off di due centri di ricerca tedeschi (Hmgu di Monaco e Ufz di Lipsia) che studia i processi di degradazione e le fonti di contaminazione nei siti inquinati. Con i continui sviluppi tecnologici nel settore delle bonifiche ambientali, Isodetect fornisce know-how analitico e scientifico per fornire prove, caratterizzare e quantificare la trasformazione naturale e stimolata degli inquinanti come parte integrante delle tecnologie di bonifica.
Nell'ambito del progetto Life Sedremed, Isodetect implementerà tecniche di analisi degli isotopi stabili specifici e di rilevamento dei metaboliti e di microcosmi in situ (BACTRAPS) per chiarire i processi biologici e geo-chimici. Mentre, l'Università Politecnica delle Marche ha una vasta esperienza nell'analisi dell'ecologia e della biodiversità delle comunità bentoniche, nella valutazione dell'impatto dei contaminanti a diversi livelli della catena alimentare marina e nello sviluppo di strategie e strumenti per la valutazione dell'impatto e il risanamento/ripristino degli ecosistemi.
In caso di successo, sia la metodologia di bonifica che quella di monitoraggio potrebbero essere integrate nel piano di decontaminazione di tutta l'aerea marina di Bagnoli. Il progetto prevede anche la creazione del Mediterranean Remediation Knowledge and Innovation hub (MedreHub), un centro di ricerca che sarà localizzato a Bagnoli e promuoverà ulteriori studi e progetti sulle tecnologie di biorisanamento ambientale.

Aziende/Istituzioni
Istituto superiore di sanità (Iss), Sistema nazionale per la protezione ambientale (Snpa), Marina militare italiana, Stazione Zoologica "Anton Dohrn"- Napoli, Istituto superiore per la protezione e la ricerca ambientale (Ispra), Invitalia, Università Politecnica delle Marche, Idrabel, Ekogrid, Isodtect GmbH