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

PROJECT AS CASE STUDY

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From the Sea to Biotechnological applications

The mission of the Marine Biotechnology (BLUBIOTEC) Department is to explore marine biodiversity in order to sustainably exploit the chemical/functional diversity of marine organisms, heterotrophs and autotrophs, from microorganisms to invertebrates.

Biomedical biotechnology aims to discover, characterize and develop new marine-derived bioactive products for the pharmaceutical, nutraceutical and cosmeceutical industries.

Environmental biotechnology aims to isolate and characterize marine microalgae, bacteria and fungi, which are able to degrade organic pollutants and to absorb heavy metals.

Biomaterial biotechnology: to develop biopolymers such as biodegradable plastics from algal cell wall compounds.

Life Programme: European Union's funding instrument for the environment and climate action.

1.Environment: finances innovative actions in the field of the environment, such as water pollution control, waste treatment, **contaminated site restoration** and remedial action for land damaged by fire, erosion and desertification.

2.Climate: finances projects for climate change reduction and adaptation to climate change, as well as governance and climate information projects.

The projects must bring a benefit to the European Union, promote sustainable development and provide solutions to major environmental problems.

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LIFE sedremed

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INTRODUCTION

DURATION: Start: 01/10/2021 - End: 31/03/2025

PROJECT LOCATION: Bagnoli Bay, Naples, Italy

BUDGET INFO:

- **Total amount:** 2,591,866 Euro
- **% EC Co-funding:** 55%

Development of an innovative solution for the decontamination of polluted marine sites

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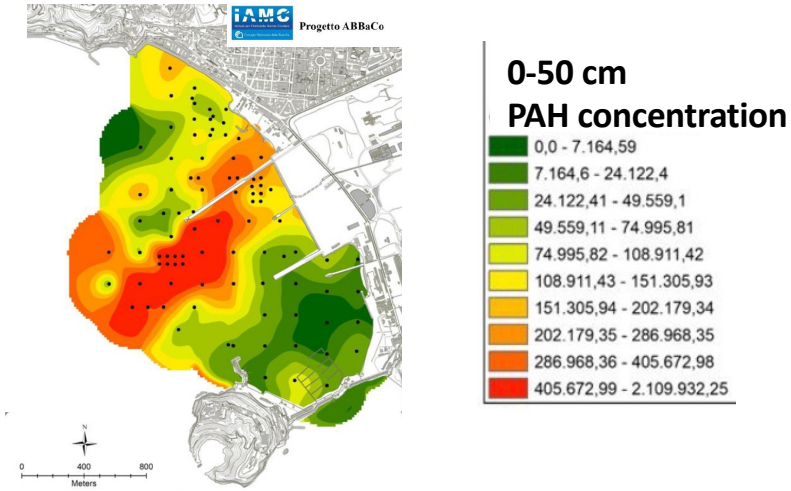

ex-industrial processing of steel, asbestos, cement, fertilizers and pesticides

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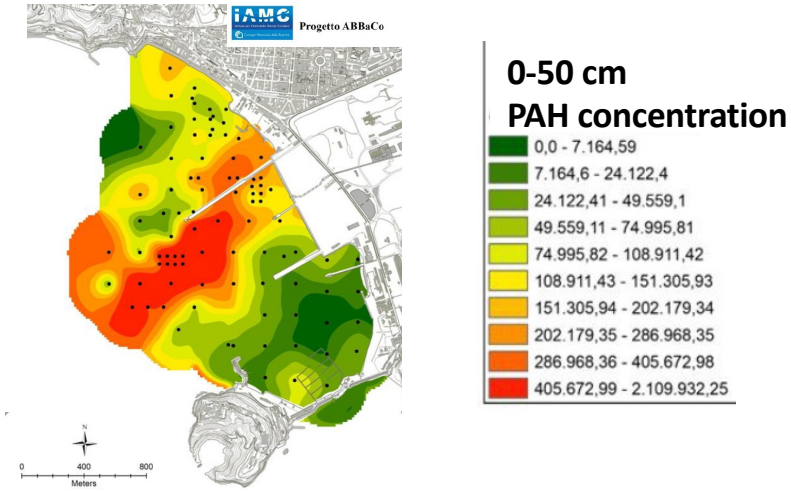
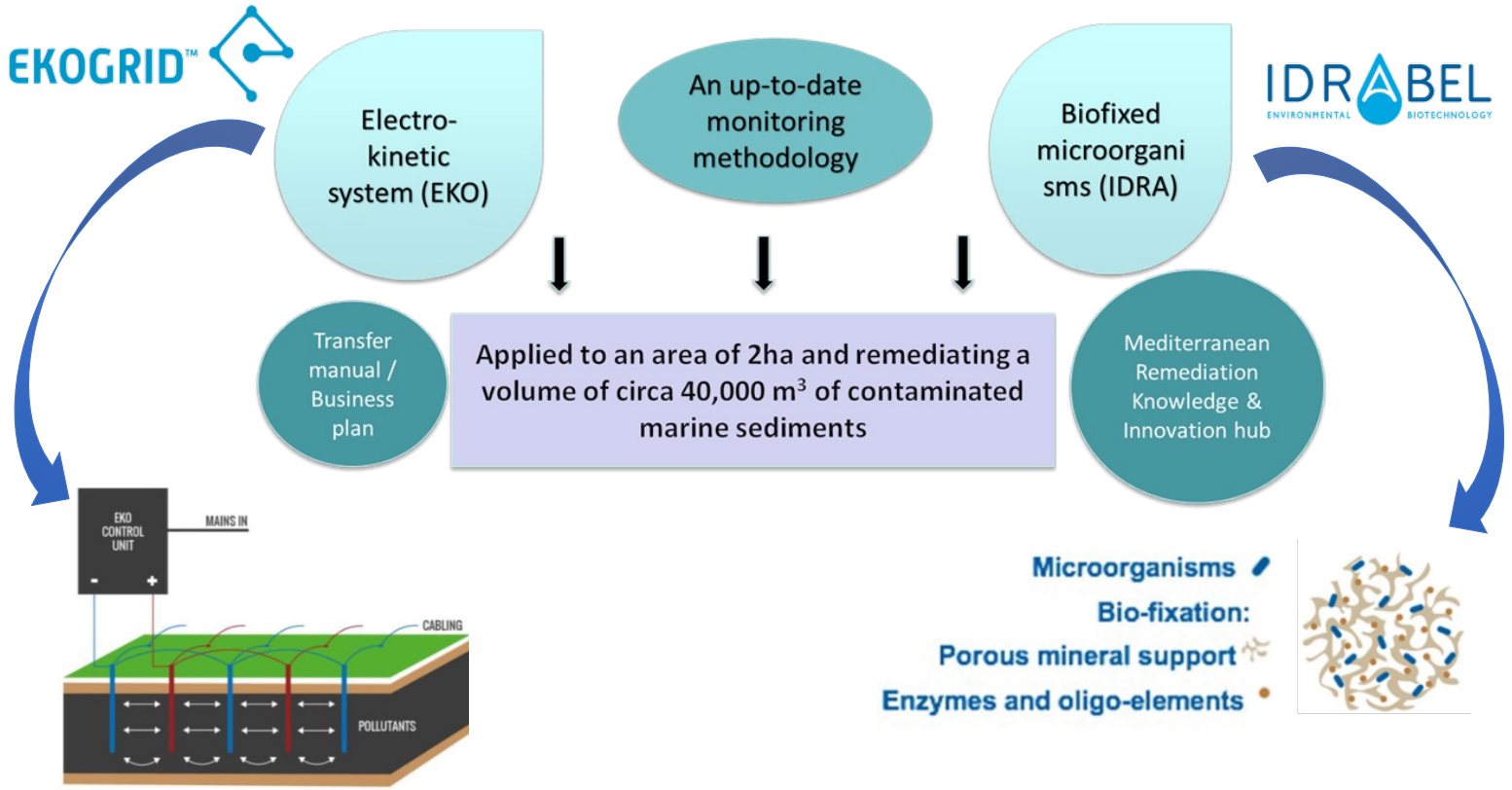


PROJECT'S PARTNERS:

Coordinator

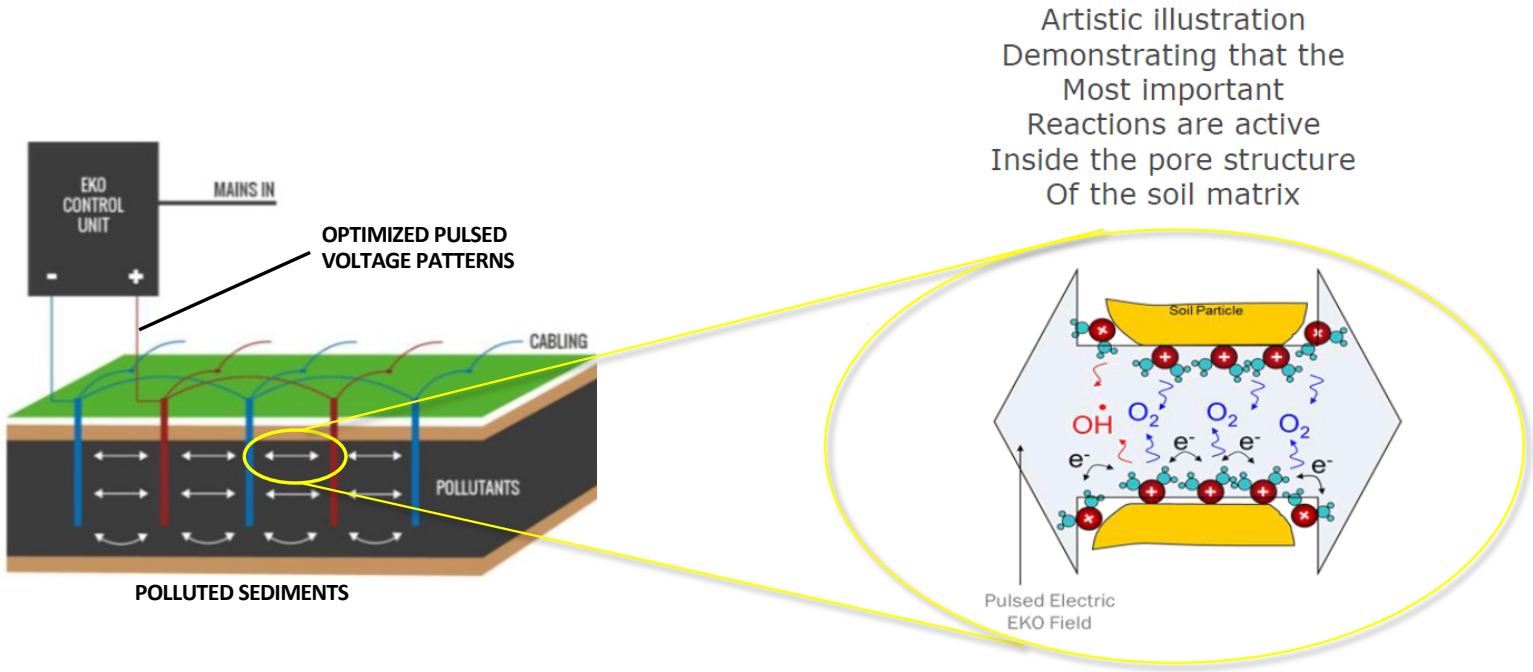
OBJECTIVES & SCOPE

Demonstrate the efficiency of an innovative in situ remediation methodology, adapting and combining 2 technologies, for the decontamination of **heavily polluted coastal sediments**.



EKOGRID™ TECHNOLOGY

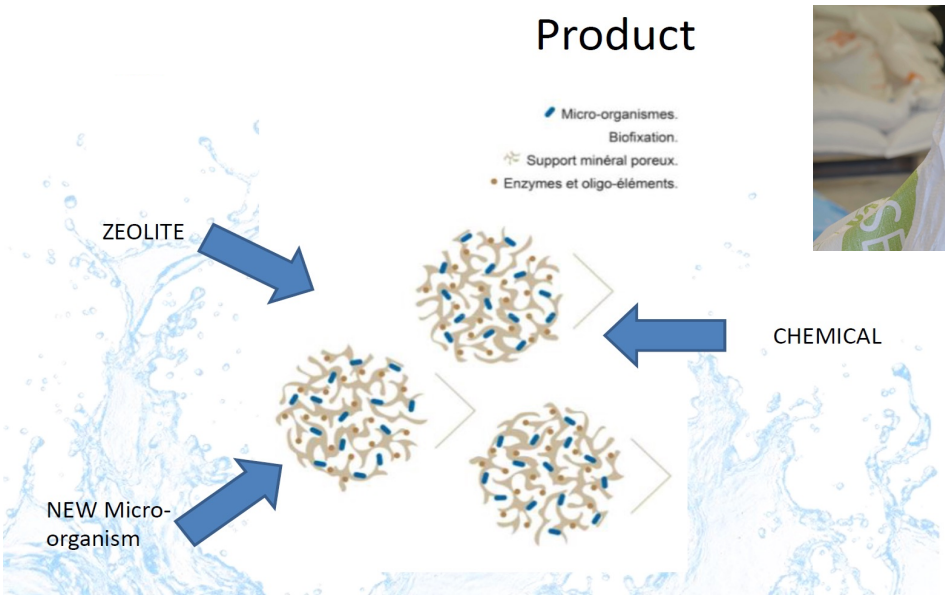
EKOGRID™ system improves natural processes and supports complementary remediation methods



- Electrochemical
- Electrokinetic
- Electro osmotic

TECHNOLOGY

Idrabel's technology is based on the innovative method of biofixation, which allows the immobilization of **microorganisms** on natural mineral supports



LIFE SEDREMED represents the first application of IDRABEL technology in the open sea

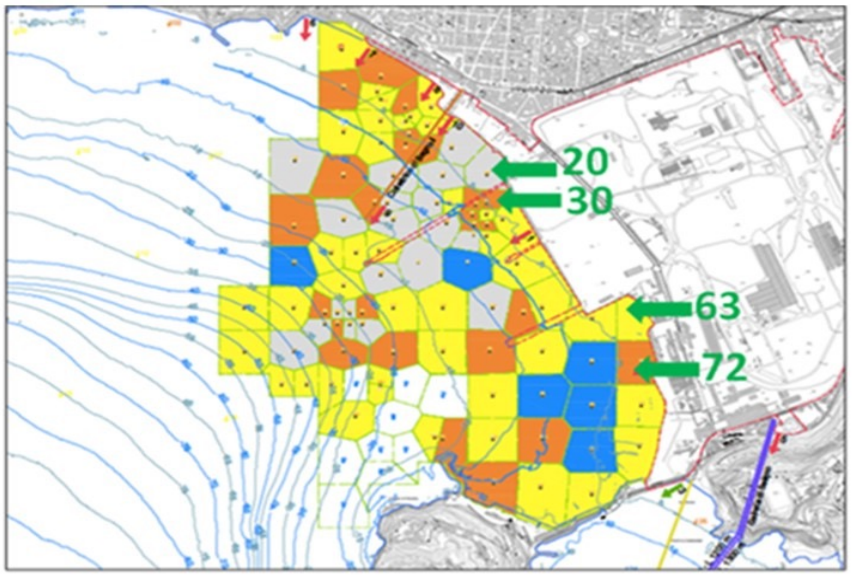
EXPECTED IMPACTS

General benefits: reduction of dangerous substances, improved water quality, reduced consumption of raw materials and energy, and reduced waste (by avoiding mechanical dredging interventions)

- Remediation ranges of 60-80% PAH; 70% for PCBs, and 60% for PCDDs.
- Immobilisation of metals enabling fixation rates of up to 80% for Cd, Cr, Ni, Pb, and 50% for As, Al, Cu, Fe, Hg, Zn.
- Reduction of cost per unit or process: Reduce costs of sediment remediation from 150€/m^3 (dredging and ex situ treatment) to 25€/m^3 (in situ remediation).

WORK PLAN: Sampling

Fig. 5: Selected areas for LIFE SEDREMED decontamination approach characterized by middle/high contaminants concentration . Area 63/72 (Città della Scienza/Circolo Ilva, Sediment Class: C-D) located closer to the coast and Area 20/30 (Sediment Class: D/E) located next to the North pier.



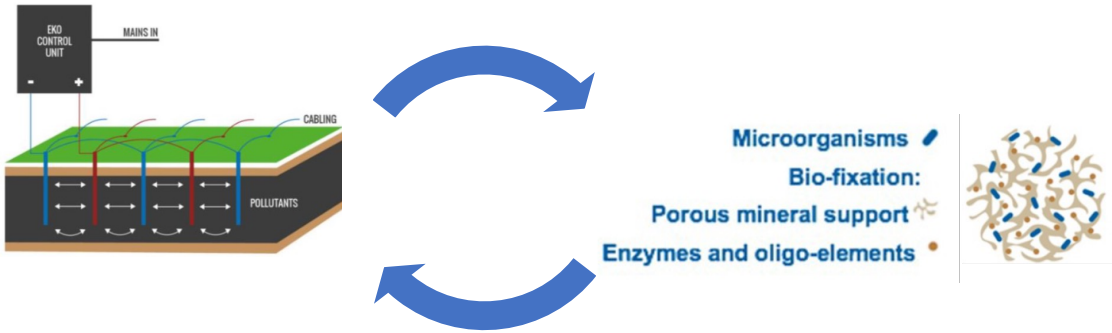
WORK PLAN: Sampling

- SZN host a sampling facility and infrastructure (IRM) which deals with the logistics of offshore operations, the sampling and measurement of environmental samples/parameters. IRM manages 2 two coastal boats (Vettoria and Hippocampus) equipped with oceanographic and sampling instruments and equipment.
- Deep sea technology has been hired to carry out the installation of the EKO system.

WORK PLAN: ex situ mesocosm

Prototype implementation will be set up in the ex situ mesocosm in order to calibrate the system

- **Perform lab scale test** on polluted sediments
- **Combine** the **IDRA and EKO technologies** in the **most effective way** in order to **increase the remediation capability**



CONTINUATION: MEDREHUB

Mediterranean Remediation knowledge and innovation hub (MEDREHUB)

The hub will work on 3 main research and innovation sectors:

- Environmental remediation technologies
- Biodiversity restoration methodologies
- Water and Wastewater treatment technologies

The MEDREHUB will have a crucial role in the active **involvement of citizens**, to integrate them actively as a **crucial stakeholder** in the ongoing remediation process in Bagnoli

CONCLUSIONS

- **For the first time, an in situ remediation methodology will be developed that combines two established technologies for pollution remediation in a new field of action (marine sediments)**
- **New approach to mitigate environmental risks and reduce the financial costs**
- **Application and reproduction of this innovative technology in other polluted sites**

Thank you for your attention !