

**Interreg**  
Mediterranean



EUROPEAN UNION



**SHAREMED**

## SHAREMED

### First Capitalisation Workshop

*Designing the future system of observing systems to assess and address threats to the Mediterranean marine ecosystem  
- State-of-the-art, needs and future direction*

*Webinar: 14-15<sup>th</sup> December, 2020*



**Nives Kovač**

*Sensing toxicants in Marine waters makes Sense using biosensors – SMS*



*Sensing toxicants in **Marine** waters makes **Sense** using biosensors*

**Project name:** Sensing toxicants in Marine waters makes Sense using biosensors – SMS

**Project coordinator:** Prof. Giuseppe Palleschi, University of Rome

**Project duration:** Dec. 1st 2013 to Aug. 31st 2017 (45 months)

**Funding authority:** European Union Seventh Framework Programme (FP7-Collaborative Project) - OCEAN 2013.1 – Biosensors for real time monitoring of biohazard and man-made chemical contaminants in the marine environment

<http://www.project-sms.eu/>

No.	PARTICIPANT ORGANISATION NAME (ACRONYM)	Country
1	<b>UNIVERSITY OF ROME, TOR VERGATA (U2)</b> <i>Biosensor development</i>	Italy
2	<b>AGENZIA NAZIONALE PER LE NUOVE TECNOLOGIE, L'ENERGIA E LO SVILUPPO ECONOMICO SOSTENIBILE (ENEA)</b> <i>Reference procedures, validation</i>	Italy
3	<b>FUNDACI PRIVADA INSTITUTE CATALA DE NANOTECHNOLOGIA (ICN)</b> <i>Biosensor Development</i>	Spain
4	<b>ACROMED INVEST AB, (ACR)</b> <i>Connecting link between the research institutions and Systea and adapt research prototypes/procedures, sampling and fluidic systems to be manufactured by Systea.</i>	Sweden
5	<b>NATIONAL INSTITUTE OF BIOLOGY (NIB)</b> <i>Assembling the measurement device on a coastal buoy</i>	Slovenia
6	<b>PANEPISTIMO THESSALIAS (UNIVERSITY OF THESSALY) (UTH)</b> <i>Integrated monitoring system and data management</i>	Greece
7	<b>SYSTEMS TECHNOLOGY ADVANCE SPA (SYS)</b> <i>Prototype development for real time measurement of the selected pollutant</i>	Italy
8	<b>UNIVERSITY HASAN II MOHAMMADIA CASABLANCA (UH2MC)</b> <i>Electrochemical sensor development</i>	Morocco
9	<b>MICROBIA ENVIRONMENT SAS (SME)</b> <i>Sensor testing and sensitivity testing for toxic algae</i>	France
10	<b>ALIENOREU SPRL (ALI)</b> <i>Exploitation, training, demonstration and dissemination, Intellectual Property</i>	Belgium

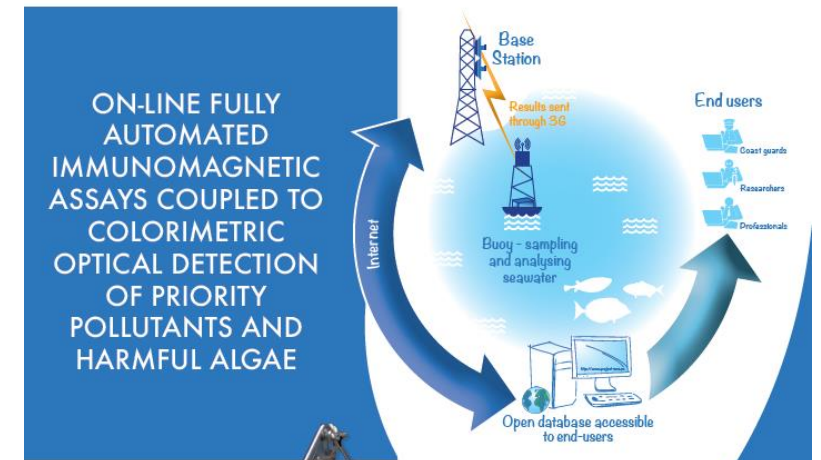
❑ What are the main environmental threats or risks that your project is addressing?

SMS aims:

- to deliver an automated networked system that will enable real-time in-situ monitoring of marine water chemical and ecological status in coastal areas by the detection of contaminants (algal toxins and their associated algal species, hazardous compounds (flame retardant: pentabromodiphenyl ether, sulphonamides)

 Sensing toxicants in  
**Marine** waters makes  
Sense using biosensors

Monitoring seawater chemical  
and ecological status in real time  
and in-situ



Our instrumental prototypes



❑ What kind of contribution to the above listed threats/risks does your project provide?

- scientific knowledge (information on single analytes)
- new (and observation) real-time monitoring through in situ sampling and analysis
- proposed biosensors can contribute to a more controlled and higher quality coastal environment

SMS project result have been published in several publications:



[http://www.project-sms.eu/page/publicationsmedia\\_p120/](http://www.project-sms.eu/page/publicationsmedia_p120/)

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**SCIENTIFIC PUBLICATIONS**

**Simple On-Plastic/Paper Inkjet Printed Solid-State Ag/AgCl Pseudoreference Electrode** - Everson Thiago Santos Gerônimo da Silva , Sandrine Miserere , Lauro Tatsuo Kubota , Arben Merkoç, *Analytical Chemistry*, 2014, 86 (21), pp 10531-10534

**Annexin V/quantum dot probes for multimodal apoptosis monitoring in living cells: improving bioanalysis using electrochemistry** - Helena Montón , Claudio Parolo , Antonio Aranda-Ramos , Arben Merkoç , Carme Nogués, *Nanoscale*, 2015, 7, 4097-4104

**Graphene Quantum Dots-based Photoluminescent Sensor: A Multifunctional Composite for Pesticide Detection** - Erhan Zor , Eden Morales-Narváez , Alejandro Zamora-Gálvez , Haluk Bingöl , Mustafa Ersoz , Arben Merkoç, *ACS Appl. Mater. Interfaces*, 2015, 7 (36), pp 20272-20279

**On-the-Spot Immobilization of Quantum Dots, Graphene Oxide, and Proteins via Hydrophobic** - Alfredo M. Griegnaquillo , Eden Morales-Narváez , Charlene Regina Santos Matos , Sara Longobardi , Paola Gardina , Arben Merkoç, *Advanced Functional Materials*, 2015, 25 (38), pp 6084-6092

**Molecularly Imprinted Polymer-Decorated Magnetite Nanoparticles for Selective Sulfonamide Detection** - Alejandro Zamora-Gálvez , Abdellatif Ait-Lahcen , Luiza A. Mercante , Eden Morales-Narváez , Aziz Amine , Arben Merkoç, *Anal. Chem.*, 2016, 88 (7), pp 3578-3584

**Graphene-based Janus micromotors for the dynamic removal of pollutants** - Jahir Orozco , Luiza A.

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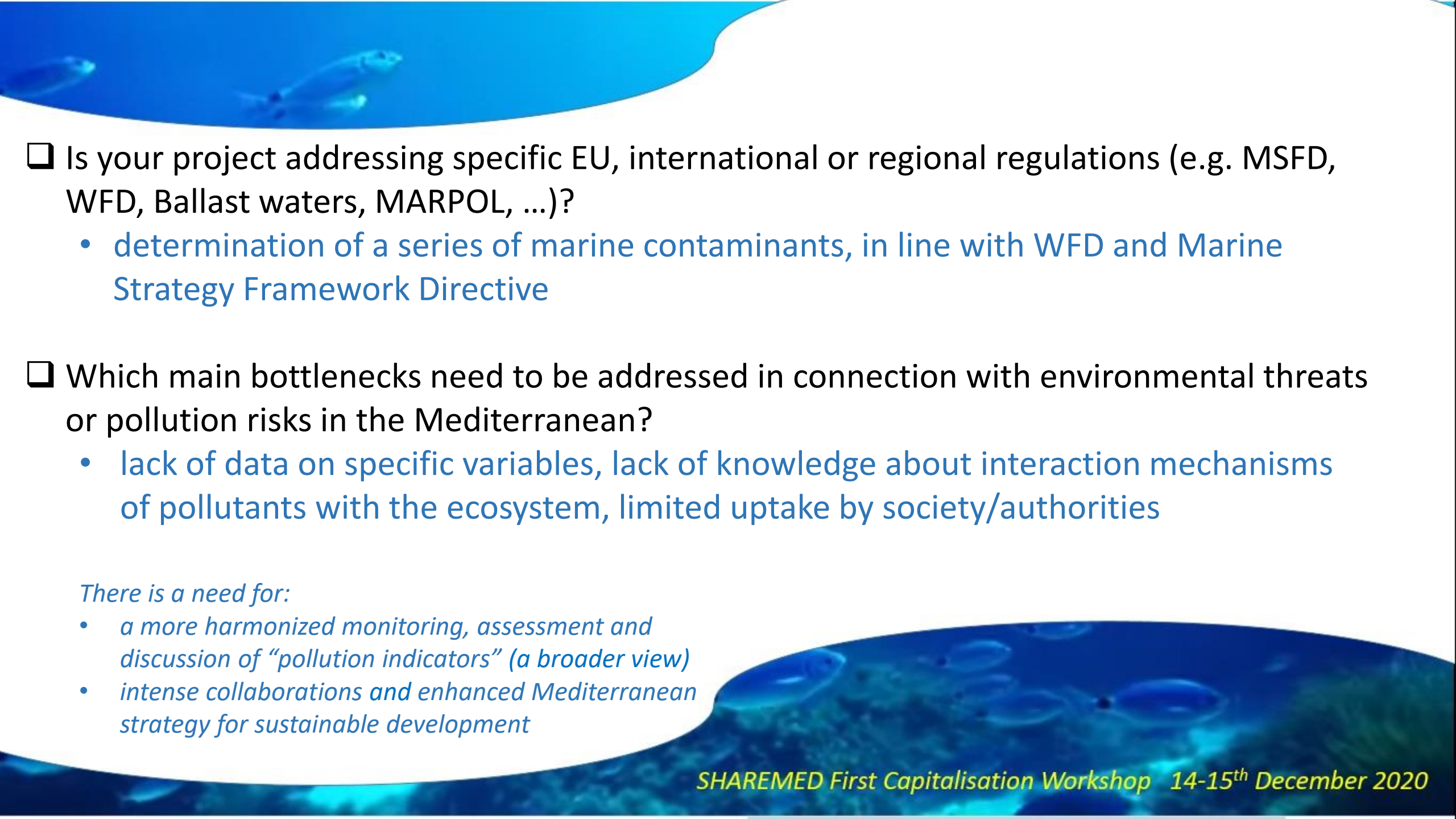


❑ What kind of information/data is your project able to provide?

- data on selected analytes and experiences of their analytical determination (biosensor technology)
- access to the facilities and ideas necessary to sustain the research activity and the technological necessary to deliver sensor-based products to the market
- training and demonstrations activities

■ What are the main gaps/needs from a scientific and technological point of view?

- optimization of sampling systems, sensors and box instruments is needed

- 
- ❑ Is your project addressing specific EU, international or regional regulations (e.g. MSFD, WFD, Ballast waters, MARPOL, ...)?
    - determination of a series of marine contaminants, in line with WFD and Marine Strategy Framework Directive
  
  - ❑ Which main bottlenecks need to be addressed in connection with environmental threats or pollution risks in the Mediterranean?
    - lack of data on specific variables, lack of knowledge about interaction mechanisms of pollutants with the ecosystem, limited uptake by society/authorities

*There is a need for:*

- *a more harmonized monitoring, assessment and discussion of “pollution indicators” (a broader view)*
- *intense collaborations and enhanced Mediterranean strategy for sustainable development*



❑ How did your project contribute to solve such bottlenecks?

- bring together a multi-sectorial team of experts interacting with (end-user's and also marine water stakeholders)
- choice of less explored pollutants (targeted substances in SMS project) in the sea



## ❑ Which governance frameworks are needed to address such challenges more extensively?

*Those who will enhance better communication and dissemination of available results/information (on local, national, transboundary and global level) and promote the integrated approaches to achieve global environmental benefits and implementation of policy, legal, and institutional reforms and activities contributing to the protection and restoration of marine and coastal ecosystems and to their sustainable use and maintenance of ecosystem services.*

## ❑ Main take home messages from your project and suggestions for future project trajectories and/or integration with other research programs

The SMS results (data, practical experiences) relate to:

- sensor construction and functioning (sensitivity, detection limit, sensor robustness ...),
- assembling and testing proves in real environments,
- collecting, processing and communicating data about seawater quality



important information for increase the potential of biosensors for marine application

There is a need to upgrade the project activities that will led to better early warning system and improvement of seawater management.