EMSO
European Multidisciplinary Seafloor and Water-Column Observatory

Laura Beranzoli on behalf of the EMSO Consortium
**EMSO** is the European Research Infrastructure of *fixed seafloor and water column observatories* constituting a *distributed infrastructure* for long-term monitoring of marine environmental processes.

RI for Challenges such as:

- Global ocean warming and acidification
- Impact and sustainability of marine resource exploitation
- Real-time observations of earthquakes and tsunamis
EMSO Nodes (12 sites & 4 test sites)
Participating Countries in EMSO RI*

10 Countries, and their Representative Institutions:
- Italy (coordinator) (JRU in progress)
- France (IFREMER, CNRS, IPGP)
- United Kingdom (NERC-NOCS)
- Greece (HCMR)
- Spain (CSIC, PLOCAN)
- Ireland (IMI)
- Portugal (IPMA)
- Germany (KDM)
- Romania (GeoEcoMar)
- The Netherlands (NIOZ)

Expected:
- Norway (NRC)
- Turkey (TUBITAK)
- Sweden (UGOT)

Total implementation costs: 300 M€
Running costs: 20 M€/y

* becoming an Independent Legal Entity through ERIC process
Assembly of Members: highest level decision body composed of Representatives of these Countries
# Steps towards EMSO-ERIC

<table>
<thead>
<tr>
<th>Step</th>
<th>Status</th>
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</thead>
<tbody>
<tr>
<td>Italian Ministry Letter sent to the Funding Agencies</td>
<td>DONE</td>
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<tr>
<td>MoU Signature process</td>
<td>DONE</td>
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<tr>
<td>Interim Office establishment</td>
<td>DONE</td>
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<tr>
<td>ERIC Official Application submission</td>
<td>STEP 1 COMPLETED</td>
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<tr>
<td>ERIC Statutes underwent informal EC check</td>
<td>STEP 2 COMPLETED IN LATE 2014</td>
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<tr>
<td>ERIC Application Submission</td>
<td>EARLY 2015</td>
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<tr>
<td>ERIC APPROVAL</td>
<td>NEXT</td>
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## Timeline for Implementation

- **PHASE 1**
  - M1: Norwegian Margin, Iberian Margin
  - Arctic, Celtic/Porcupine, Azores Islands, Ligurian Sea, Western Ionian Sea, Hellenic Arc, PLOCAN, Marmara Sea, Black Sea

- **PHASE 2**

### 10 Signatory Countries:

- Italy, UK, Portugal, Romania, Greece, The Netherlands, Ireland, Germany, France, Spain

### Expected:

- Norway, Turkey, Sweden (postponed)
**EMSO** provides power, communications, sensors, and data infrastructure for continuous, high resolution, (near) real-time, interactive ocean observations.

**EMSO** consists of a truly multi- and interdisciplinary range of research areas including biology, geology, chemistry, physics, engineering, and computer science, from polar to tropical environments, down to the abyss.

The coordinated data **EMSO** generates, allow us to pose multivariate questions in space and time, rather than focusing on single data streams.
Key Scientific Objectives

Geosciences
- Seismicity
- Gas hydrate stability
- Seabed fluid flow
- Submarine landslides
- Submarine volcanism
- Geo-hazard early warning

Biogeochemistry
- Ocean acidification & Solubility pump
- Biological pump
- Hypoxia
- Deep-ocean biogeochemical fluxes
- Continental shelf pump

Physical Oceanography
- Ocean warming
- Deep-ocean circulation
- Benthic and water column interactions
- Marine forecasting

Marine Ecology
- Climate forcing of ecosystems
- Molecules to microbes
- Fisheries
- Marine noise
- Deep biosphere
- Chemosynthetic ecology
A “EMSO Generic Sensor Module” is envisioned to ensure increased coordination, integration and standardisation across sites and discipline.

H2020 funding being sought (E.G., Call INFRADEV-3)
+ Countries national funds

<table>
<thead>
<tr>
<th>Variable</th>
<th>Geosciences</th>
<th>Physical Oceanography</th>
<th>Biogeochemistry</th>
<th>Marine Ecology</th>
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</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Conductivity</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Pressure</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Dissolved O$_2$</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Turbidity</td>
<td>X</td>
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<tr>
<td>Ocean currents</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Passive acoustics</td>
<td>X</td>
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H2020 funding being sought for increased integration and implementation of Services
**EMSO** addresses several Horizon 2020 challenges
EMSO provides a wide range of services and products of great benefit to policy makers, scientists, SMEs, industry, academia and the general public:

- **Scientific information products:** climate change studies, biodiversity, marine geohazards and pollution
- **Industry information products:** energy, tourism, fishing, shipping, mining and exploration
- **Test Bed/SME innovation:** sensors, complex systems, cable technology, and robotics
- **E-Infrastructure technology and data management applications and systems**
- **Training Centre and Pole of Attraction for young scientists**
- **Educational products and services**
Partnership Agreement with RI SIOS - Svalbard Integrated Arctic Earth Observing System (www.sios-svalbard.org)

Cross collaborations with other RIs, such as: EURO-ARGO, EPOS, ICOS, EMBRC, LIFEWATCH and KM3NeT (H2020 ‘INFRA’ and ‘E-INFRA’ Calls submissions of proposals)

Participation in many EU projects (e.g., FixO₃, ENVRI, MARsite, SCIDIP-ES)

Links with other EU RI initiatives (e.g., EUROFLEETS-2, SeaDataNet, EMODnet)

Future cooperation with European Centres of Excellence (e.g., CAGE-Centre for Arctic Gas Hydrate, Environment and Climate in Norway)

Cooperation and co-investment with industry (e.g., oil and gas, renewable energy, deep-sea mining, fisheries)
Global

Contacts and exchanges with sister research infrastructure initiatives:
- ONC - Ocean Networks Canada
- OOI - Ocean Observatories Initiative (USA)
- DONET - Dense Oceanfloor Network Syst. for Earthquakes & Tsunamis (Japan)
- IMOS - Integrated Marine Observing System (Australia)

Partnership Agreement with DONET

Collaboration with OOI is on-going within the EU-US research cooperation project, COOPEUS

Also, have teamed up with ONC, OOI, IMOS to propose an extended continuation of COOPEUS under H2020

ONC is joining EMSO as an Observer

The EMSO Coordinator nominated to the ONC International Science Advisory Board
EMSO business model

Based on the Business Model Canvas model (Ostwerwalder, Pigneur, 2012)
For the first 24 months we expect the EMSO-ERIC will substantially run in a cost/revenues equilibrium condition. From the 3\textsuperscript{rd} year, the break-even point will be reached.

Revenues:
- Full Members,
- Observers,
- Host country

Starting from the 2nd year:
- R&D grants

Starting from 3rd year:
- Services on the market
  - Technical consultancy services;
  - Monitoring services and data products
THANK YOU FOR YOUR ATTENTION

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**EMSO-Italy JRU-Joint Research Unit**

Leading National R&D Players Team Up to support EMSO

<table>
<thead>
<tr>
<th>Institution</th>
<th>Website</th>
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<tbody>
<tr>
<td>INGV - Italian National Institute of Geophysics and Volcanology</td>
<td><a href="http://www.ingv.it">www.ingv.it</a></td>
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<tr>
<td>CNR - National Research Council</td>
<td><a href="http://www.cnr.it">www.cnr.it</a></td>
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<tr>
<td>INFN - Italian National Institute of Nuclear Physics</td>
<td><a href="http://www.infn.it">www.infn.it</a></td>
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<tr>
<td>OGS - Italian National Institute of Oceanography and Experimental Geophysics</td>
<td><a href="http://www.ogs.trieste.it">www.ogs.trieste.it</a></td>
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<tr>
<td>SZN - The Stazione Zoologica “Anton Dohrn” of Naples</td>
<td><a href="http://www.szn.it">www.szn.it</a></td>
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<tr>
<td>ISPRA - Italian Higher Institute for the Protection and Environmental Research</td>
<td><a href="http://www.isprambiente.gov.it">www.isprambiente.gov.it</a></td>
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<tr>
<td>CONISMA - Italian National Consortium on Marine Sciences among 32 associated Universities</td>
<td><a href="http://www.conisma.it">www.conisma.it</a></td>
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<tr>
<td>History of European Underwater Observatory Initiatives (incomplete)</td>
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<td><strong>ABEL Feasibility Study (FP3, 1990-1993)</strong></td>
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<td><strong>DECIBEL Feasibility Study (FP3, 1990-1993)</strong></td>
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<td><strong>GEOSTAR (FP4, 1995-1998)</strong></td>
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<td><strong>GEOSTAR-2 (FP4, 1999-2001)</strong></td>
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<td><strong>ASSEM (FP5, 2002-2004)</strong></td>
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<td><strong>ESONET Concerted Action (FP5, 2002-2004)</strong></td>
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<td><strong>ORION-GEOSTAR-3 (FP5, 2002-2005)</strong></td>
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<td><strong>ESONIM (FP6, 2004-2007)</strong></td>
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<td><strong>EXOCET/D (FP6, 2004-2007)</strong></td>
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<td><strong>NEAREST (FP6, 2006-2010)</strong></td>
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<td><strong>KM3NeT Design Study (FP6, 2006-2010)</strong></td>
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<td><strong>ESONET-NoE (FP6, 2007-2011)</strong></td>
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<td><strong>EUROSITES (FP7, 2008-2011)</strong></td>
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<td><strong>HYPOX (FP7, 2009-2011)</strong></td>
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<td><strong>EUROARGO-PP (FP7, 2008-2011)</strong></td>
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<td><strong>KM3NeT-PP (FP7, 2008-2012)</strong></td>
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<td><strong>DS\textsubscript{3}F (FP7, 2009-2012)</strong></td>
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<td><strong>JERICO (FP7, 2011-2015)</strong></td>
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<td><strong>MARSITE (FP7, 2012-2015)</strong></td>
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<td><strong>FIXO\textsuperscript{3} (FP7, 2013-2017)</strong></td>
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Projects Providing a Fundamental Contribution to the EMSO RI Concept Development

ESONET Concerted Action (FP5): 2002-2004
European Seafloor Observatory NETwork
- Objectives: Site identification, technological issues

European Seafloor Observatories Implementation Model
- Objectives: case study on Porcupine Abyssal Plain site to investigate legal and financial aspects and develop a BP

ESONET-NoE (FP6): 2007-2011
European Seas Observatory NETwork - Network of Excellence
- Objectives: Integration of the scientific/technological “Observatory Science” Community

EMSO-Preparatory Phase (FP7): 2008-2012
- Objectives: development of the management structure: legal, governance and financial issues
Major aims of the Network of Excellence:

- Selection of “Key-sites”
- Integration of the scientific/technological “Observatory Science” Community

Activities performed:

- Networking
- Standardisation
- Technological development
- Dissemination and outreach
- Small R&D projects: Demonstration activities