EMSO

European Multidisciplinary Seafloor and Water-Column Observatory

Laura Beranzoli
on behalf of the EMSO Consortium

EMSO Research Infrastructure (RI)

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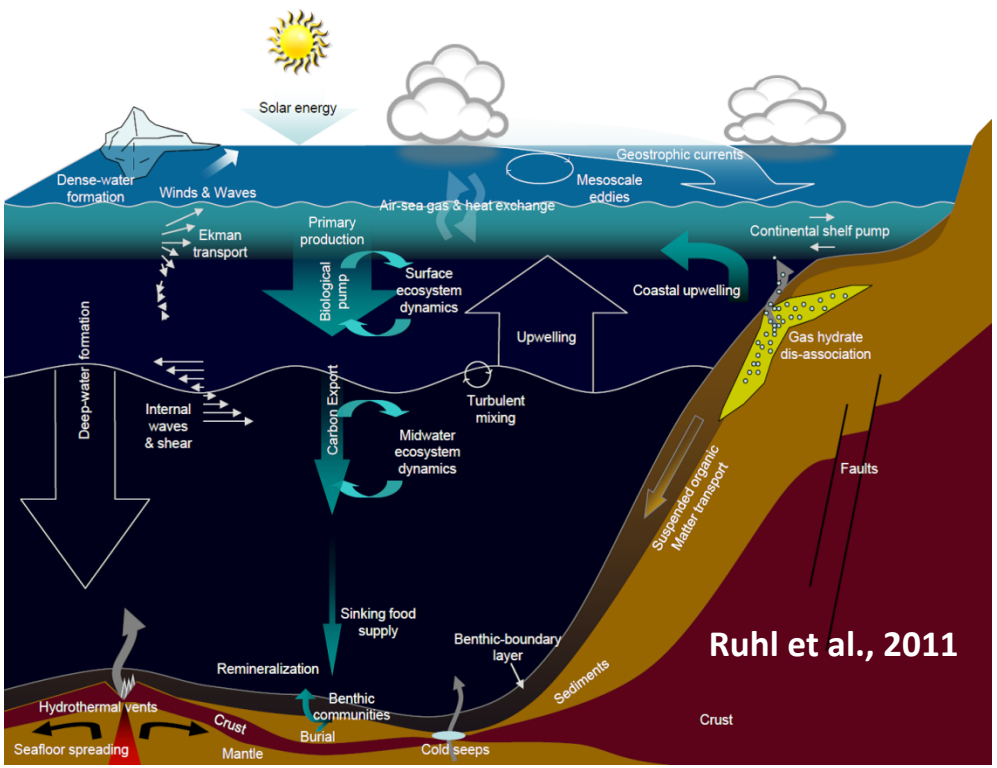
EMSO is the European Research Infrastructure of ***fixed seafloor and water column observatories*** constituting a **distributed infrastructure for long-term monitoring of marine environmental processes**



Ruhl et al., 2011

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)

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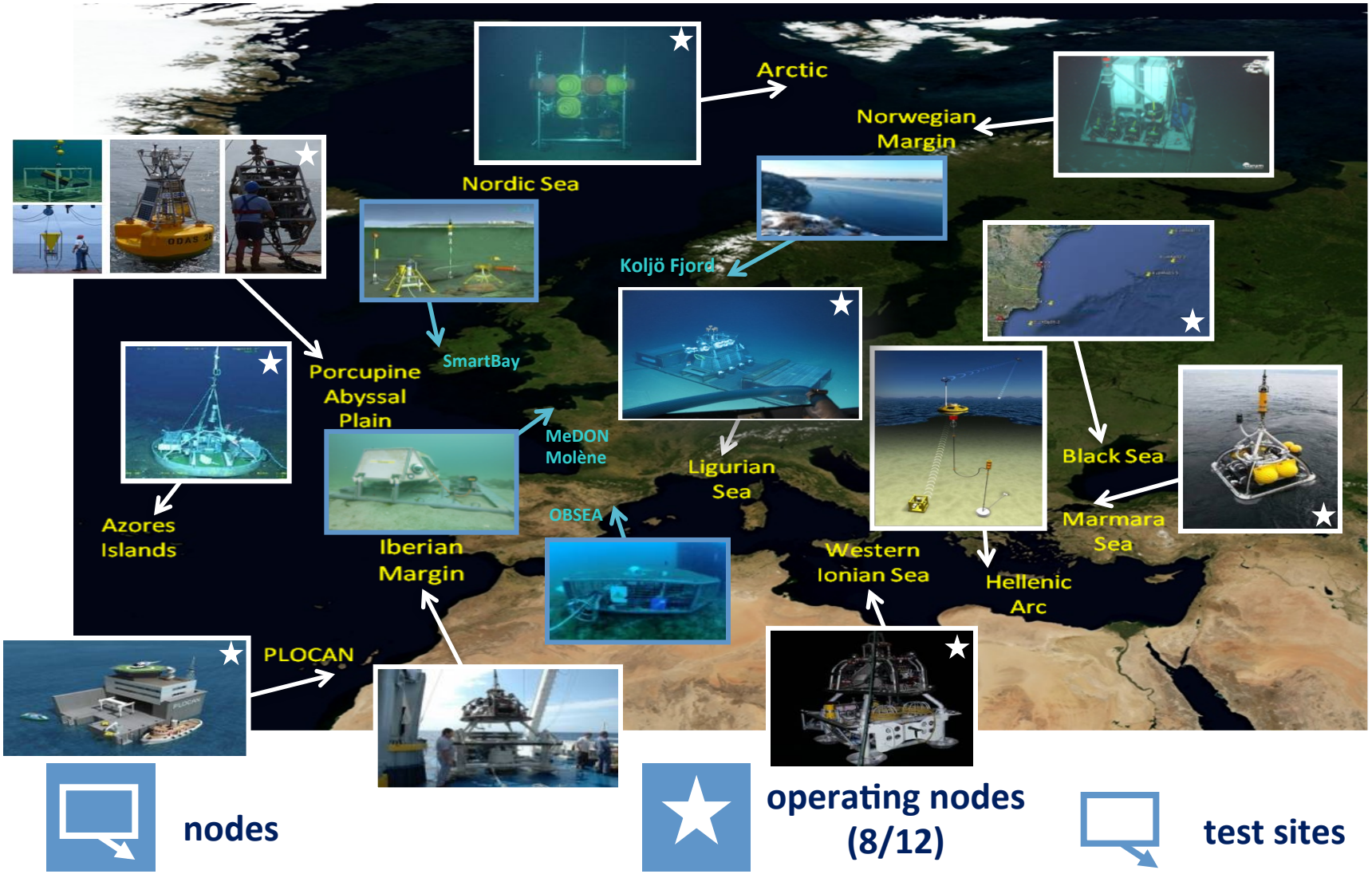

nodes

operating nodes (8/12)

test sites

Participating Countries in EMSO RI*

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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)

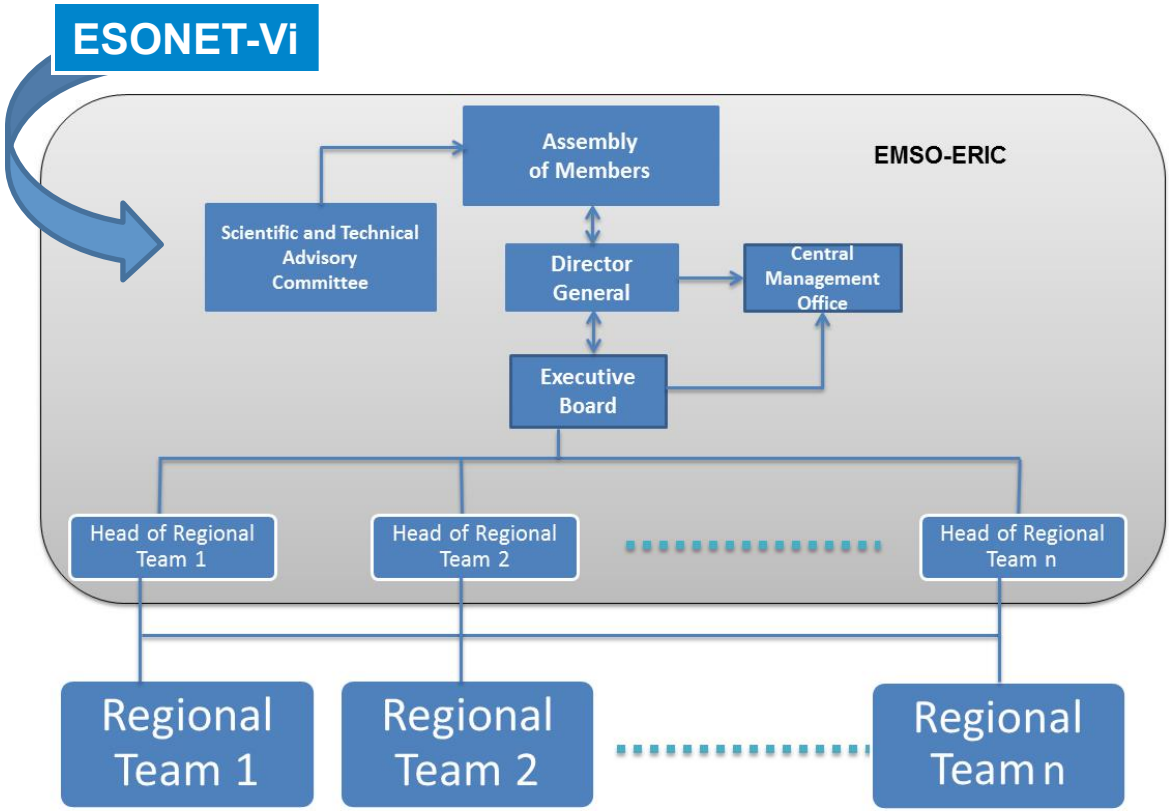
Expected:

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

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

* becoming an Independent Legal Entity through ERIC process

EMSO Governance



EMSO-ERIC will:

- Establish agreements with equipment/facility owners
- Coordinate and monitor construction quality control, coordinate users access (single access point)

Assembly of Members: highest level decision body composed of Representatives of these Countries

Steps towards EMSO-ERIC

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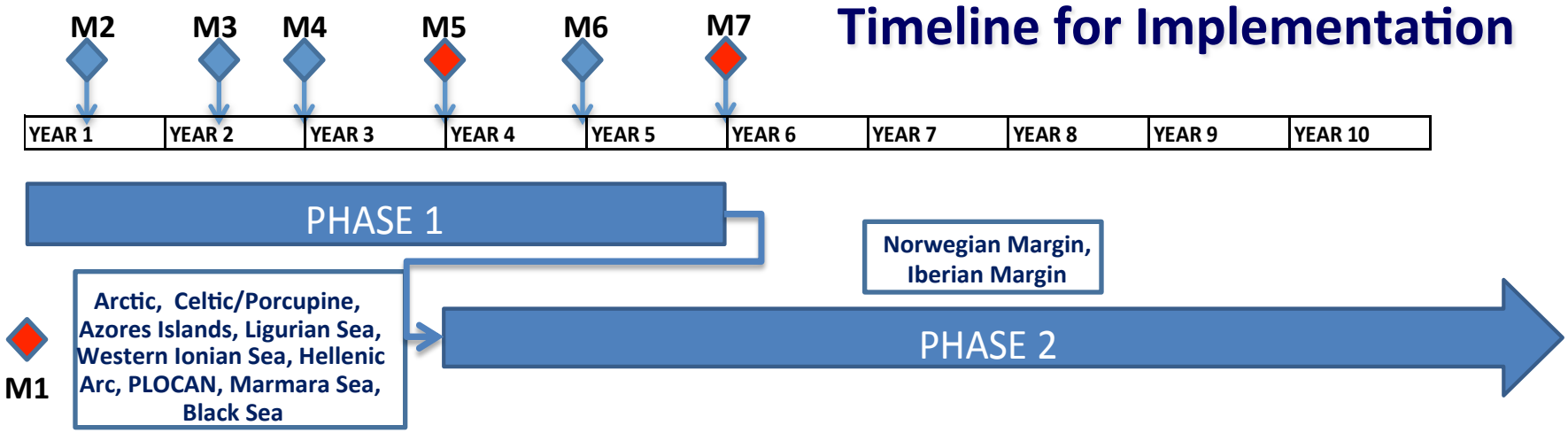
Italian Ministry Letter sent to the Funding Agencies	**DONE**
MoU Signature process	**DONE**
Interim Office establishment	**DONE**
ERIC Official Application submission	**STEP 1 COMPLETED**
ERIC Statutes underwent informal EC check	**STEP 2 COMPLETED IN LATE 2014**
ERIC Application Submission	**EARLY 2015**
ERIC APPROVAL M1	**NEXT**

10 Signatory Countries:

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

Expected:
Norway, Turkey, Sweden (postponed)

Timeline for Implementation



Key Scientific Research Objectives

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EMSO provides power, communications, sensors, and data infra- structure 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, **fr**om 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

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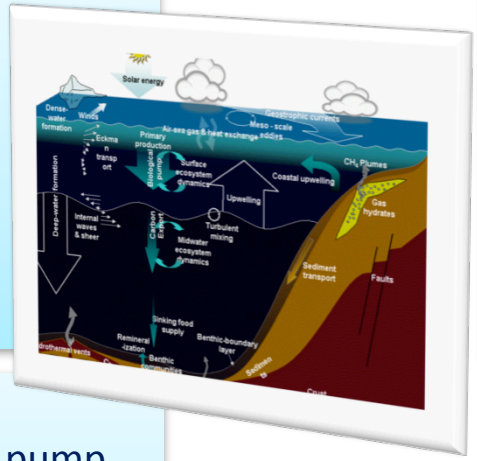
Geosciences

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



Physical Oceanography

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

Biogeochemistry

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

Marine Ecology

- Climate forcing of ecosystems
- Molecules to microbes
- Fisheries
- Marine noise
- Deep biosphere
- Chemosynthetic ecology

EMSO RI Common Design

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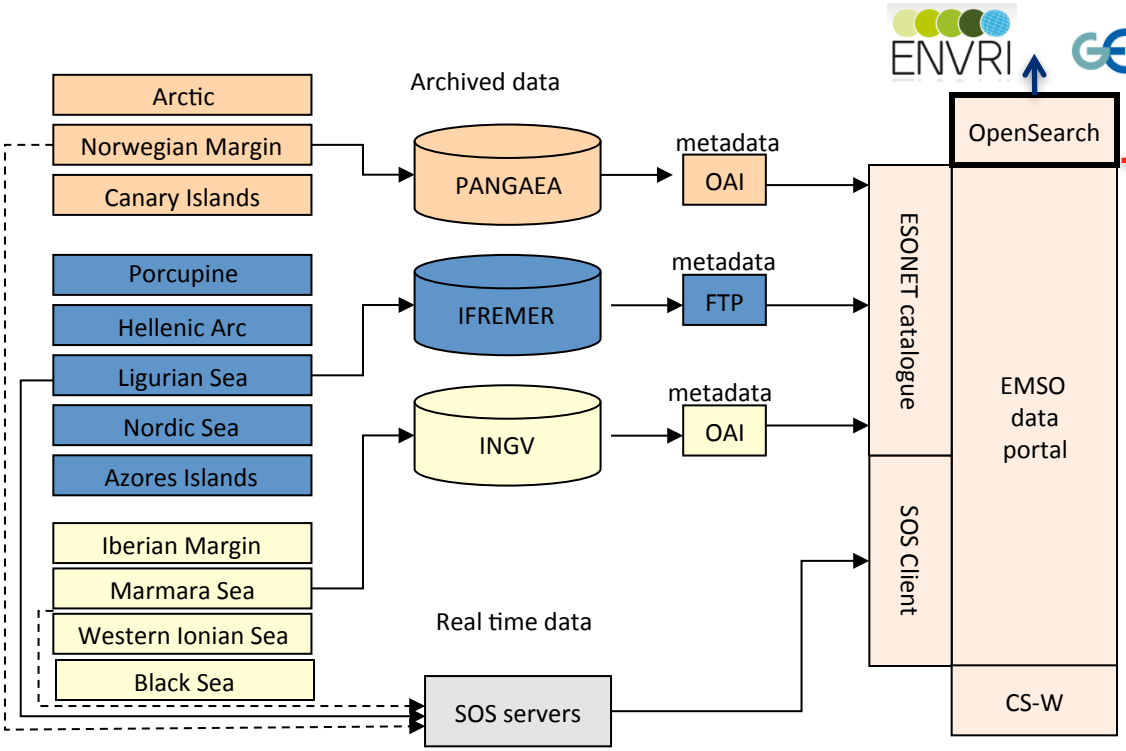
A ***"EMSO Generic Sensor Module"*** is envisioned to ensure increased coordination, integration and standardisation across sites and discipline

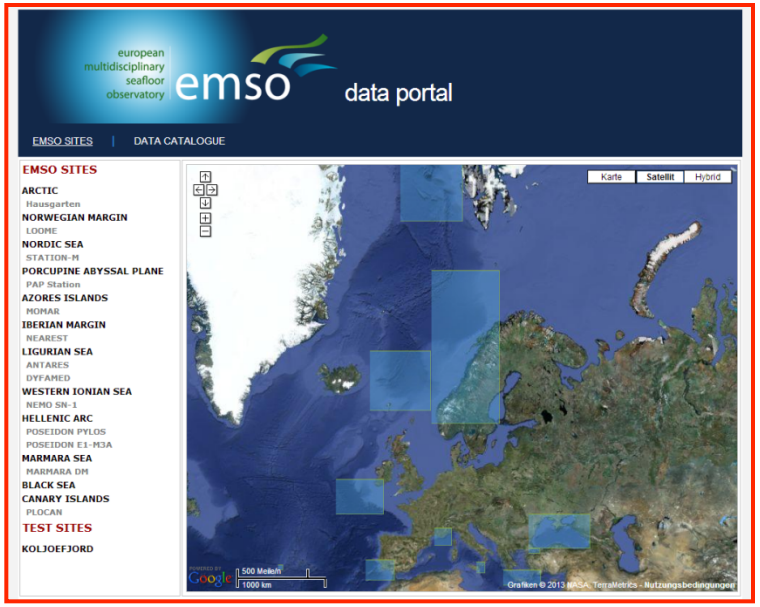
H2020 funding being sought (E.G., Call INFRADEV-3)
+ Countries national funds

Variable	Geosciences	Physical Oceanography	Biogeochemistry	Marine Ecology
Temperature	X	X	X	X
Conductivity	X	X	X	X
Pressure	X	X	X	X
Dissolved O_2	X	X	X	X
Turbidity	X	X	X	X
Ocean currents	X	X	X	X
Passive acoustics	X			X

EMSO Data Management



Distributed Data Architecture



EMSO Data Portal
Welcome Page
Overview of EMSO sites

H2020 funding being sought for increased integration and implementation of Services

Key Socio-Economic Impacts (1/2)

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EMSO addresses several Horizon 2020 challenges

Key Socio-Economic Impacts (2/2)

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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 geo-hazards 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**

Links to other Major Initiatives (1/2)

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Europe

- 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)

Links to other Major Initiatives (2/2)

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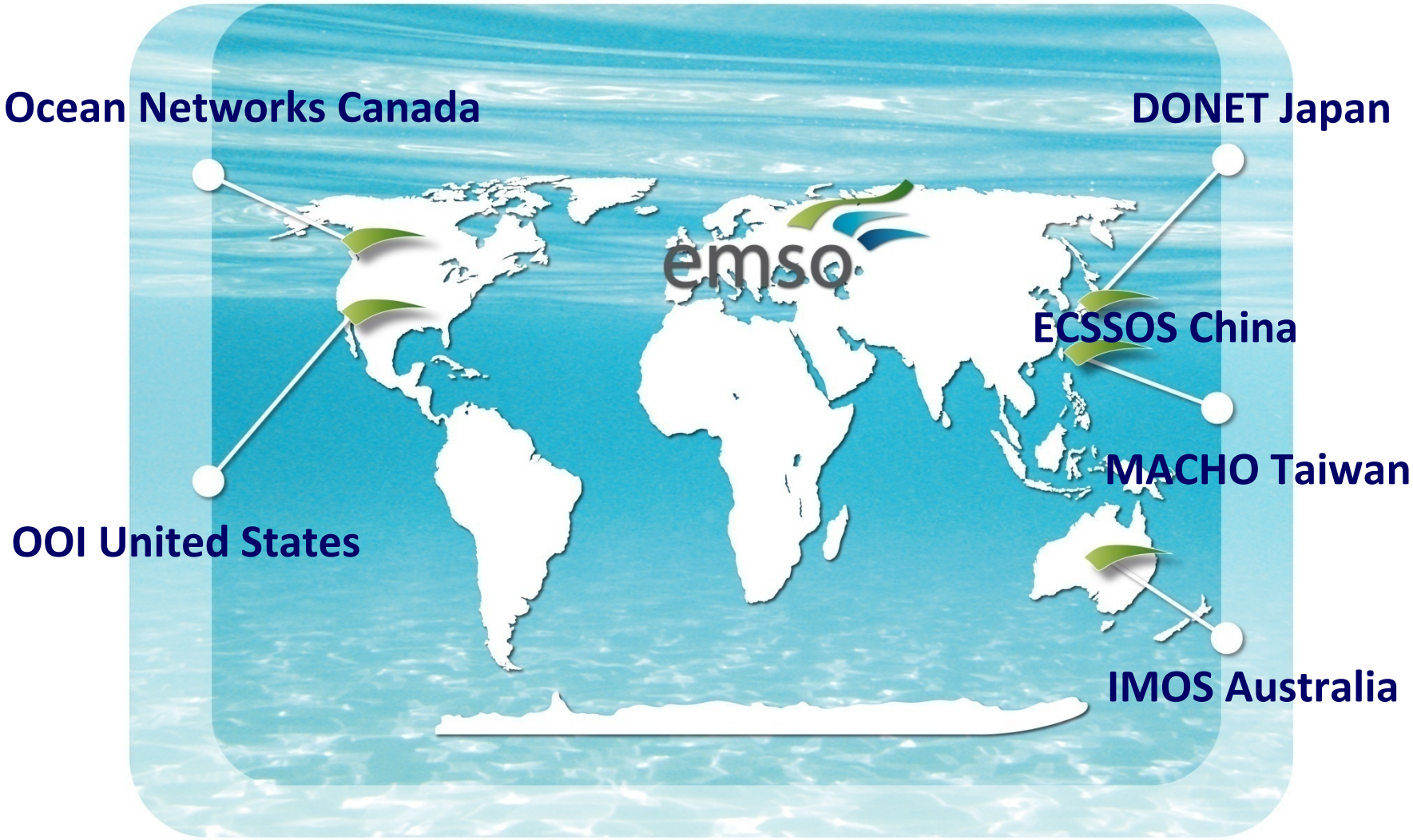
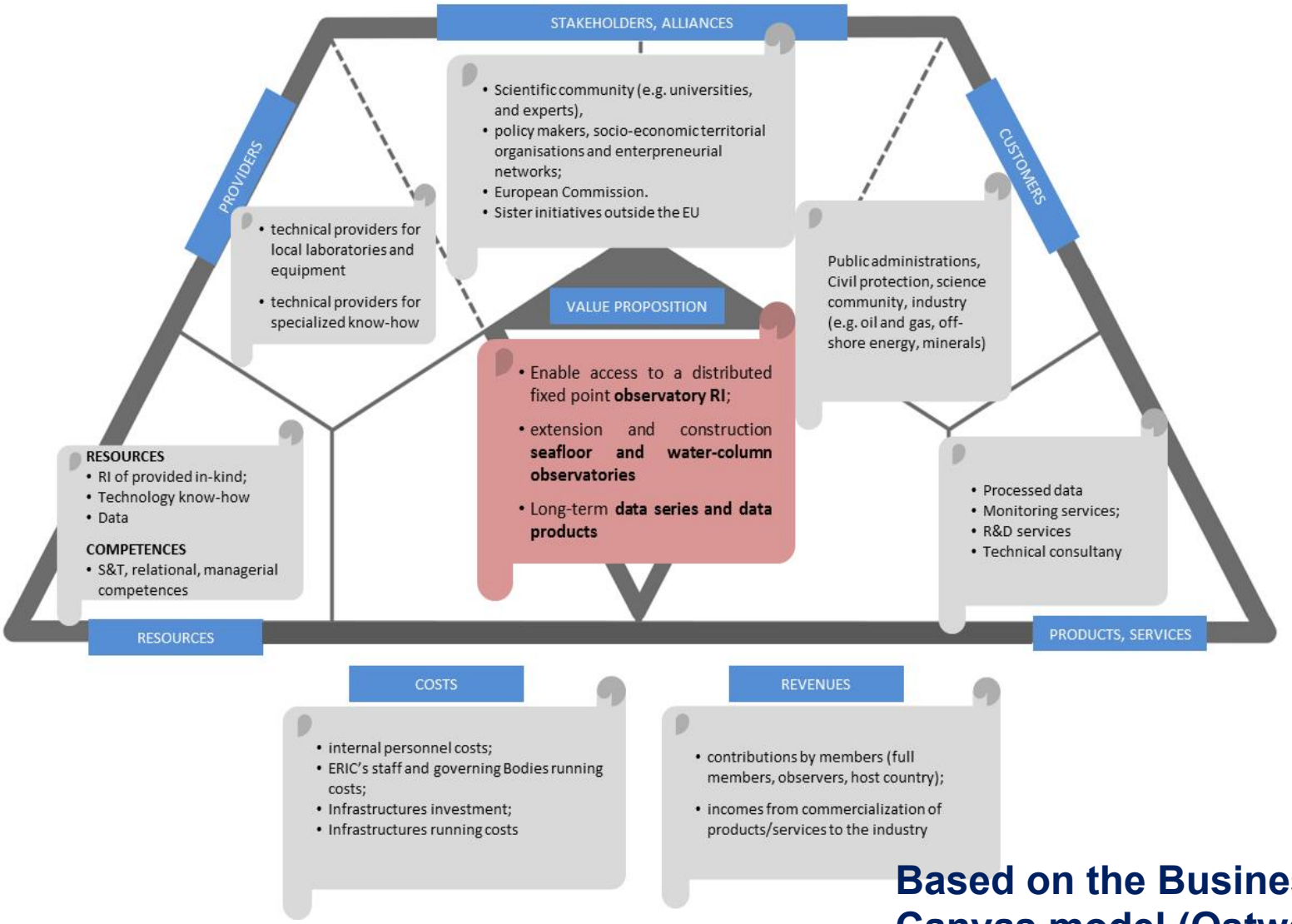
Global

- 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

International Dimension

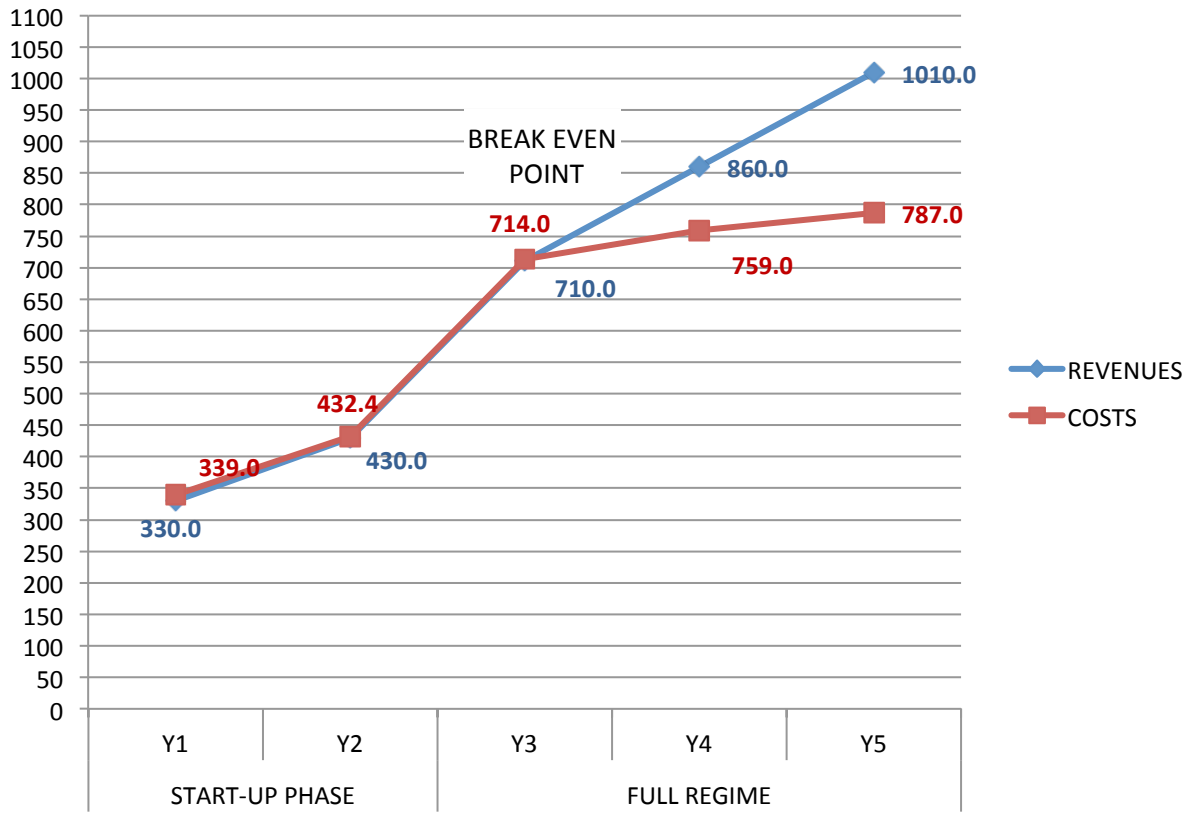


EMSO business model



Based on the Business Model Canvas model (Ostwerwalder, Pigneur, 2012)

EMSO business model



For the first 24 months we expect the EMSO-ERIC will substantially run in a cost/revenues equilibrium condition.
From the 3rd 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

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THANK YOU FOR YOUR ATTENTION

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EMSO-Italy JRU-Joint Research Unit

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Leading National R&D Players Team Up to support EMSO

- INGV - Italian National Institute of Geophysics and Volcanology (www.ingv.it)
- CNR - National Research Council (www.cnr.it)
- INFN - Italian National Institute of Nuclear Physics (www.infn.it)
- OGS - Italian National Institute of Oceanography and Experimental Geophysics (www.ogs.trieste.it)
- SZN - The Stazione Zoologica "Anton Dohrn" of Naples (www.szn.it)
- ISPRA - Italian Higher Institute for the Protection and Environmental Research (www.isprambiente.gov.it)
- ENEA - Italian National Agency for New Technologies, Energy and Sustainable Economic Development (www.enea.it)
- CONISMA - Italian National Consortium on Marine Sciences among 32 associated Universities (www.conisma.it)

History of European Underwater Observatory Initiatives (incomplete)

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ABEL Feasibility Study (FP3, 1990-1993)	DECIBEL Feasibility Study (FP3, 1990-1993)
GEOSTAR (FP4, 1995-1998)	GEOSTAR-2 (FP4, 1999-2001)
ASSEM (FP5, 2002-2004)	ESONET Concerted Action (FP5, 2002-2004)
ORION-GEOSTAR-3 (FP5, 2002-2005)	ESONIM (FP6, 2004-2007)
EXOCET/D (FP6, 2004-2007)	NEAREST (FP6, 2006-2010)
KM3NeT Design Study (FP6, 2006-2010)	ESONET-NoE (FP6, 2007-2011)
EUROSITES (FP7, 2008-2011)	HYPOX (FP7, 2009-2011)
EUROARGO-PP (FP7, 2008-2011)	KM3NeT-PP (FP7, 2008-2012)
EMSO-PP (FP7, 2008-2012)	DS_3F (FP7, 2009-2012)
JERICO (FP7, 2011-2015)	MARSITE (FP7, 2012-2015)
$FIXO^3$ (FP7, 2013-2017)	

Projects Providing a Fundamental Contribution to the EMSO RI Concept Development

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- **ESONET Concerted Action (FP5): 2002-2004**

  European Seafloor Observatory NETwork

  → Objectives: Site identification, technological issues

- **ESONIM (FP6): 2004-2007**

  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 Obervatory 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

FP6 ESONET-NoE
European Seas Observatory NETwork -NoE

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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