



## FixO3 - Deliverable D5.3: Establishment of technology clusters

<b>Project</b>	312463 - Fixed Point Open Ocean Observatories Network
<b>Work Package number</b>	WP5
<b>Work Package title</b>	Innovation Through Industry
<b>Deliverable number</b>	D5.3
<b>Deliverable title</b>	Establishment of technology clusters
<b>Description</b>	Establishment of technology clusters: A number of technology clusters (e.g. ICT, sensors) that include industry & academic partners. The development of clusters of technology companies stimulates innovation. SLR will identify technology companies in different sectors, for example sensor developers, data transmission technologists and biofouling specialists and combine them in a cluster that encourages interaction to address specific technical problems encountered in the deployment of seafloor observatories.
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## Table of contents

I. Introduction.....	3
II. Background.....	3
III. Large marine industry clusters (the landscape) .....	4
IV. Investigation .....	5
V. Cluster Companies Identified .....	8
VI. Recommendations for further Commercialisation.....	10
ANNEX.....	11

## I. Introduction

Offshore Europe there is a history of long-term stations in physical oceanography, such as the Shetland to Faeroe transect, that monitor the interchange between the Atlantic and Arctic oceans, which may play a significant role in climate change, and monitor Mediterranean inflows and outflows. In marine biology, long term camera deployments (BATHYSNAP) in the NE Atlantic showed evidence of seasonal change in the abyss and that significant trends and events occur during a 10 year time series. In marine geology, the observation of volcanic and seismic events extends offshore monitoring networks, while the rift and subduction zones need decadal collection of data. This European Seafloor Observatory Network has been evolving over the last twenty years and a number of EU programmes have developed autonomous observatory capacity during that time. The European Commission's investment in scientific research has an impact on enterprise development and job creation in the marine sector.

One of the objectives of the FixO<sup>3</sup> WP5 is to promote interaction between the ocean observatory research community and the commercial sector in order to identify innovative products and services for commercialisation. These innovative products and services will give competitive advantage to European companies in the growing marine science and technology business, worth €1.35 billion in 2012 (Society of Maritime Industries, 2012).

This deliverable, D5.3, establishes a group of companies able to promote FixO<sup>3</sup> technologies to the commercialisation stage. This "cluster" will be used by the project for the next steps: IPR discussions and agreement, determination of innovative products and promotion of those products.

## II. Background

Deliverable D5.3 establishes a FixO<sup>3</sup> technology cluster (e.g. ICT, sensors) that includes industry & research partners. The cluster will act as knowledge transfer networks (KTNs) which will foster collaboration between businesses and researchers and the exchange of knowledge and expertise. The cluster will:

- **operate a Tenderwatch** for ocean zone environmental monitoring;
- organise **presentations by researchers and engineers** at industry events;
- organise **one to one meetings** between equipment and sensor manufacturers, and researchers to present current technologies, explore IPR sharing agreements and discuss commercialisation of prototype sensors.

The technology cluster will also be able to identify products and services that may be eligible for commercialisation grants funded by the enterprise agencies of member states. Furthermore, assist in achieving the objective of Task 5.3, the selection of at least 5 products to be promoted by FixO<sup>3</sup>. A deliverable due in month 26 will describe these products and/or services in more detail.

### III. Large marine industry clusters (the landscape)

Due to several contacts made during large exhibitions and the outcome of the EMSAC project, which was kindly open to the FixO<sup>3</sup> WP5 team by PôleMer Bretagne (Philippe Monbet), it has been possible to navigate the landscape of actions to stimulate economical activities locally, regionally and nationally on marine industrial R&D.

The regional, national and European cluster policies are ending with a large number of institutions. The marine sector is not referenced as such in the index of the dedicated observatory which registers more than 2000 regional clusters (<http://www.clusterobservatory.eu>). Even those recognised as 'Regional Research Driven Clusters' are numerous. One interesting initiative was taken by a group of marine clusters to overcome fragmentation: the EMSAC (European Marine Science Applications Consortium) project between 2010 and 2012. It used specific topics of advanced sensing and surveillance systems, improved operational management for resource extraction including renewable energy, better management of coastal ecosystems and protected areas etc., to evaluate the potential of collaboration between clusters of expertise. The basic list of clusters involved in the marine sector is added in the Annex of this report. EMSAC investigated the potential to create working relationships and regular interactions with selected European clusters having expertise relevant to the EMSAC objectives. The list is still large and some clusters are restricted to the shipping and ship building sectors.

A second project called REMCAP (Resource Efficient Maritime Capacity - <http://www.remcap.eu>) aims more particularly at generating information on the market potential in maritime resource efficiency and the opportunities this presents for winning business. Furthermore, REMCAP focuses on the innovation priorities that will enable access such business opportunities and on the understanding of current capabilities relevant to innovation, including research facilities, research projects and the potential for cluster activities to facilitate innovation. These experiences are valuable for FixO3 whose cluster may benefit from permanent business led and/or government and regional funded clusters.

One conclusion of EMSAC is to position the marine regional clusters according to the following scheme:

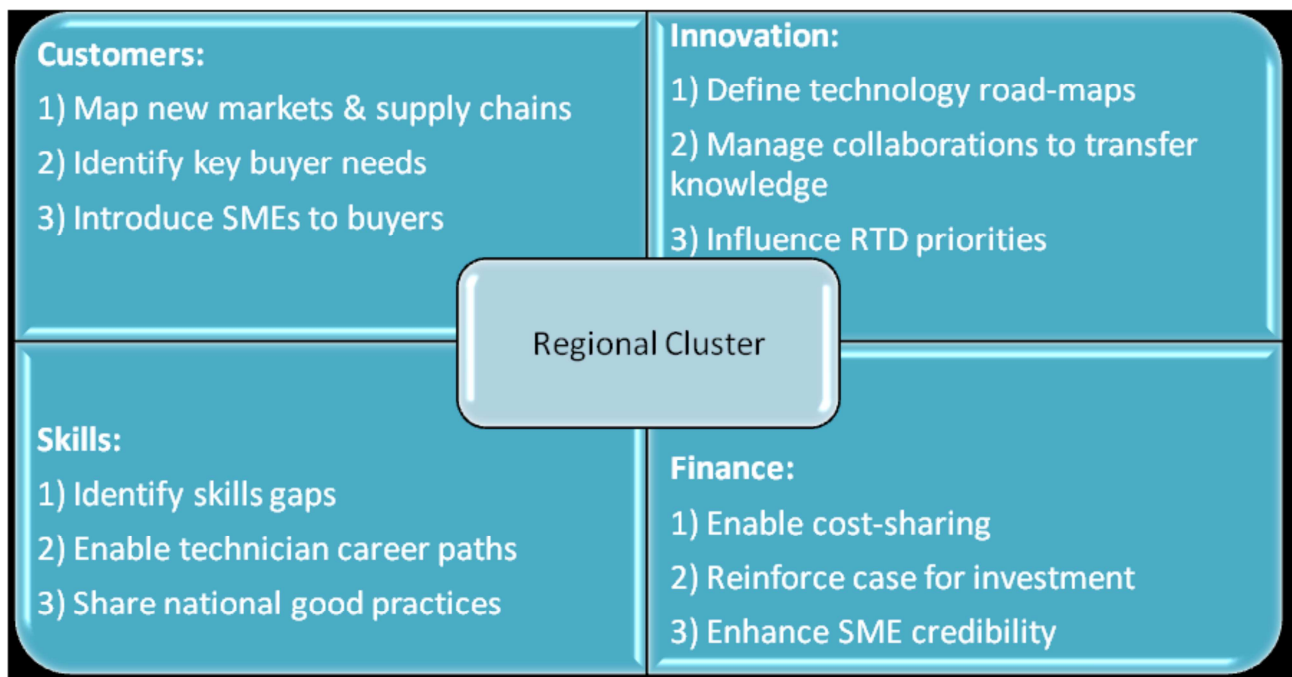


Figure 1. Role of Regional Cluster according to EMSAC

Building relationships with a selected group of marine clusters will be sufficient to start to define the FixO3 cluster. We will start working with clusters which are active in FixO3 field:

- Marine South East (United-Kingdom) - [www.marinesoutheast.co.uk/](http://www.marinesoutheast.co.uk/)
- Geoscience in Ireland (Ireland) - [www.geoscience.ie/](http://www.geoscience.ie/)
- Pôle Mer Bretagne Atlantique (France) - [www.pole-mer-bretagne-atlantique.com/](http://www.pole-mer-bretagne-atlantique.com/)
- Pôle Mer Méditerranée (France) - [www.polemermediterranee.com](http://www.polemermediterranee.com)
- Maritime Cluster of West Sweden (Sweden) - <http://maritimaklustret.se/> and Goteborg University Holding
- Oceano XXI (Portugal) - [www.oceano21.org/](http://www.oceano21.org/)

Others may join depending on the need of FixO3 own cluster.

#### IV. Investigation

Apart from stakeholder engagement at conferences and exhibitions, the WP5 team worked with FixO<sup>3</sup> partners, particularly WP2 and WP12 to understand what products and services were deployed on and delivered by the existing FixO<sup>3</sup> Observatories. WP2 collected all relevant technical information on hardware, software and middleware characteristic of each FixO<sup>3</sup> site. WP12 identified (i) pCO<sub>2</sub> measurement, (ii) pH measurement, (iii) passive acoustic data processing and (iv) stand alone platform for high data volume and precise time reference as products and services to be further developed.

A number of existing clusters of sensor, component and service companies relevant to the ocean observatory sector were identified in past or current EC projects. This includes:

Ongoing projects:

SmartOcean (<http://www.smartocean.org/>), Schema, NeXOS (<http://www.nexosproject.eu/>), COMMON SENSE (<http://www.commonsenseproject.eu/>) and SenseOcean (<http://www.senseocean.eu/>).

In NeXOS, a group of SME partner companies has been constituted called ASCS (Advancement of Small and Medium Enterprise Competitiveness) which is open to participation in the FixO<sup>3</sup> cluster. Their role is internal to NeXOS and can be explained as the “watch dog” of the project that continuously checks whether the innovations that are being developed make sense from a commercial/business perspective. The composition of the ASCS is built around the SME companies within the consortium (NKE, ACSA, TRIOS, SMID, Franatech). Whether or not innovations will be useful and can be implemented will only gradually become clear as the innovation work of WPs evolves from 2014 to 2016. ASCS was launched at the NeXOS meeting on 17th October 2014 in Brest.

A French national initiative called CAPTIVEN is funded by Agence Nationale pour la Recherche with the objective of promoting SMEs in the environmental instrumentation sector.

Previous projects:



ESONET Network of Excellence (2007-2011), prepared the way for a project like FixO<sup>3</sup> and constituted a working group called PESOS (Group of Providers of Equipment and Services for Observatory Systems - see <http://www.esonet-noe.org/Main-activities/Socio-economic-users>). Although very active, this “cluster” does not wish to become an independent and sustained legal entity.



One of the tools issued by ESONET NoE, with strong involvement by PESOS, is the Yellow Pages, which are now becoming updated in Task 2.3 of FixO3 - Open Ocean Observatory Yellow Pages (<http://www.esonetyellowpages.com/>).

## Esonet Yellow Pages [www.esonetyellowpages.com](http://www.esonetyellowpages.com)

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**Welcome to the Esonet Yellow Pages, a Tool for Interoperability and Standardization**

The ESONET Yellow Pages aim to organize the information concerning on-the-shelf products for the development and maintenance of Deep-Sea Observatories, which are provided by the private sector. This includes a range of equipments, from simple, isolated sensors or parts, to communication systems or even integrated Observatories.

ESONET Yellow Pages also aims to foster the feedback from the scientific community in what concerns the experience with a specific product, addressing reliability for long-term operations and the use in real deep sea or coastal conditions.

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**ESONET YELLOW PAGES - [www.esonetyellowpages.com](http://www.esonetyellowpages.com)**

Figure 2. Front page of the Yellow Pages site to become Open Ocean Observatories Yellow Pages, a task of WP2

Many manufacturers are participating in the ESONET Yellow Pages but the invitation made in 2011 to participate in a cluster needs to be renewed. In FixO<sup>3</sup>, WP2 must take the necessary time to collect the feedback of the scientific community and review the opportunity to support or not the Yellow Pages products; the first deliverable is due in month 20 and will constitute an occasion to enlarge the cluster.

From the list of partners of these projects, a first subset of technology companies was identified to form the ocean observatory cluster together with FixO<sup>3</sup> industry and technology institute partners.

The selected companies will be invited to join the cluster and carry out the functions listed in section II above.

**Table 1. Conference & Exhibitions Attended 2013-2014**

<b>Title</b>	<b>Location</b>	<b>Date</b>	<b>Remarks</b>
SPE Offshore Europe Conference & Exhibition	Aberdeen	3 <sup>rd</sup> – 6 <sup>th</sup> September 2013	Showcases the innovation, solutions and tools required to operate in the offshore Oil & Gas Sector
UK-IMON International Workshop on New Monitoring Technologies	Southampton	10 <sup>th</sup> – 12 <sup>th</sup> September 2013	A workshop to identify those technologies that can increase the efficiency and reduce the cost of (UK) marine monitoring over the next 5–10 years.
SSCO 2014	Brest	October 2014	The next generation of underwater sensors
Oceanology International 2014	Excel London	March 2014	OilTech Investment Network
European Maritime Day Conference	Bremen Congress Center 28215 Bremen	May 2014	EMD face to face meetings with other maritime stakeholders
EGU	Vienna	May 2014	Relations to geological and operational oceanography stakeholders
7th EuroGOOS Conference	Lisbon	October 2014	Presentations on new products
SeaTechWeek	Brest	October 2014	
Sensor System for a Changing Ocean – SSCO IEEE conference	Brest	October 2014	New sensor systems presented by scientists and companies.

## V. Cluster Companies Identified

The following technology companies were identified as industry partners for the FIXO3 Technology Cluster. These companies fall within the Tier 4 supply chain category identified in D5.2. From this group five innovative products/services will be identified and presented to Tier 3 companies with a view to commercialisation.

Table 2. - FixO<sup>3</sup> Technology Cluster Companies

Company/Organisation	Product/Service	Location	Remarks
Nke Instrumentation	Measurement and communication systems for extreme depths	56700 Hennebont, France	
Pyro Science GmbH	High-precision optical oxygen sensors	52064 Aachen Germany	
Chelsea Technologies Group	Innovative multi-parameter sensors & systems for monitoring the physical, optical & biological oceanographic environment	Surrey KT8 2QZ, UK	
ACSA-ALCEN	Implementation of sensors on autonomous underwater vehicles - SeaExplorer glider	13590 Meyreuil FRANCE	
UNOL	Spectral- and imaging sensor systems for operational oceanography	D-26129 Oldenburg Germany	
TriOS	Development and manufacturing of optical sensors for measuring biological and chemical parameters	26180 Rastede Germany	
METAS	Instrumentation design and development from prototypes to finished products	NO-5106 OvreErvik Norway	Engineering for CMR Bergen
CTN	Prediction of physical quantities on acoustic signals in the underwater environment, communications	30320 FuenteÁlamo (Murcia), Spain	
SMID Technology	Underwater acoustic devices.	S. Stefano Magra (SP) - Italy	
FRANATECH	Underwater gas detection	21339 Lüneburg Germany	
ALVIM Srl	Biofouling prevention	Italy	supported in NeXOS by CNR-ISMAR and Ifremer
LEiTaT	Design, development and deployment of electronic devices and wireless sensor and actuator networks	08225 Terrassa (Barcelona), Spain	
DropSens	Development of electrochemical sensors	33428 Llanera (Asturias) Spain	
IDRONAUT	CTD multiparameter probes	20861 Brugherio (MB) Italy	Schema partner
SnellOptics	Development of state-of-the art	08221 Terrassa	



Company/Organisation	Product/Service	Location	Remarks
	optical equipment	Spain	
SubCtech	Subsea power solutions - such as Li-Ion batteries, pCO <sub>2</sub> analyzers and vessel systems - to monitor environmental issues.	Wellseedamm 3, 24145 Kiel Germany	
Contros	Underwater sensor systems to detect hydrocarbons (e.g. methane), CO <sub>2</sub> , dissolved oxygen, Total Alkalinity, pH	24148 Kiel, Germany	
Texcel Technology	Telemetry and data transmission, design and manufacture	Kent, UK	FixO3 partner
SensorLab	pH sensors and high stability spectrophotometric led light sources	Canary Islands, Spain	
In-Vivo	environment studies	Brittany, France	services
ENVIRON	environment studies	UK	services
CREOCEAN	environment studies	La Rochelle, France	services
Fugro	Engineering of monitoring	Several subsidiaries, Netherlands, UK, Norway, France,...	partner of MIDAS
Aanderaa	Full range of sensors and instruments in oceanography. Specific pCO <sub>2</sub> sensor product tested in FixO3.	Norway	Supported by University of Goteborg in FixO3
Neotek	Underwater acoustic instrumentation, oceanographic measurement	56 850 Caudan, FRANCE	CAPTIVEN initiative
Fluidion	Sampling and instrumentation : optical analyzer for assaying some physicochemical parameters, pH, free and total chlorine, phosphates, nitrates, etc.	<b>94019 Créteil, France</b>	CAPTIVEN initiative
Geps Techno	marine renewable energy for instrumented buoys	44600 Saint Nazaire, France	CAPTIVEN initiative
HOCER	chemical analyzers	29200 Brest, France	
OSEAN	electronic systems for instrumentation	83220, Le Pradet, France	

A subset of companies on the End Users list in D5.1, which are Tier 3 companies, will be invited to specific targeted events organised by the FixO<sup>3</sup> Technology Cluster where innovative products and services will be presented in order to identify partners who will commercialise them. Where commercialisation grants are available from national enterprise authorities the relevant FixO<sup>3</sup> Technology Cluster companies will be encouraged and assisted to apply.

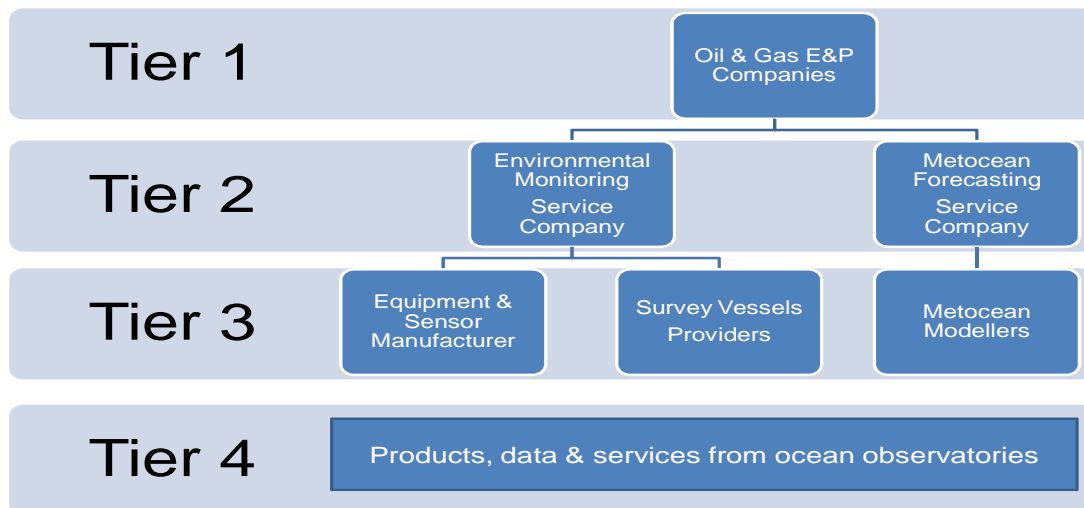


Figure 3. Supply Chain Diagram for Oil and Gas Exploration & Production. Note that only one example of Tier one is presented here. Other Tier one to address are: Fisheries, Defence, Marine Renewable Energy, Mineral Resources exploitation. They result in common market in most cases at Tier 4 level.

## VI. Recommendations for further Commercialisation

The momentum generated by the establishment of the FixO<sup>3</sup> Technology Cluster will be maintained by hosting at least one annual event such as the 'Innovation Zone' and 'Meet the Investor' Workshop at Oceanology International. For the duration of FixO<sup>3</sup>, up to August 2017, SLR and Ifremer will be responsible for organising the annual 'Meet the Investor' Workshop at Ocean Business in Southampton in April 2015 and 2017 and a major event dealing with FixO<sup>3</sup> innovation at Oceanology International in March 2016. These events will be used to match Tier 3 company needs for products and services with TRL7 equipment, sensors and software being used on FixO<sup>3</sup> observatories.

The FixO<sup>3</sup> Technology Cluster is now defined. The corresponding mailing list will be used for next steps of WP5: tender watch, industry events, one-to-one meetings, IPR agreement and innovative products selection. It will also play a role in the renewed Yellow Pages in WP2.

## ANNEX

Table of active clusters in Europe dedicating part or all their activity to Marine sector.

Name	Country	Region	Foundation Year
German Marine Cluster	Belgium	North-West	
Marine Cluster Bulgaria	Bulgaria	East	2007
Maritime Development Centre of Europe	Denmark	East	
Dutch Marine Network	Denmark	West	
Maritime Cluster Finland	Finland	South-West	
Association of Finnish Maritime Industries	Finland	South-West	
Cluster Maritime Français	France	Centre	2006
Pole Mer Bretagne	France	North-West	2005
pole mer PACA	France	South-East	2005
Pole Qualitropic	France	Reunion Island	2005
Pole Trimatec	France	South	2005
French Marine Protected Areas Agency	France	North-West	
Maritimes Cluster Schleswig- Holstein	Germany	North	2005
Center of Maritime Technologies	Germany	North	1965
Marine Institute	Ireland	West	1991
Italian Maritime Federation	Italy	Centre	1994
Distretto Ligure delle Technologie Marine	Italy	North-West	2001
Naval and nautical technological district	Italy	FriuliVeneziaGiulia	2009
DLTM	Italy	Northwest	2009
Integrated Marine science, studies and business centre / Baltic valley	Lithuania	West	2007
Luxembourg Maritime Cluster	Luxembourg	South	
Marsec XL	Malta	North-East	2007
Oslo Maritime Network	Norway	South-East	
Fondation Franco-Norvegienne	Norway	South-East	1988
Polish Maritime Cluster	Poland		
Centre of Marine and Environmental Research	Portugal	Centre	2002
OCEANO XXI Cluster for sea knowledge	Portugal	North-East	
Asociación Cluster del Naval Gallego	Spain	North-East	
Cluster MaritimoEspanol	Spain	Centre	2007
Asturmar	Spain	North	2008
Basque Maritime Forum	Spain	North	1993
ADIMDE – Agrupacion de IndustriasMaritimasde Euskadi	Spain	Northeast	
Idimar (Balearic Islands Marine Cluster)	Spain	Southwest	
Cluster Naval y del Mar	Spain	southeast	2007
Swedish Maritime Forum	Sweden	South-West	2007
Mare Novum,	Sweden	South-West	
Water management authority for	Sweden	South west	

Western Sea			
Maritime Development Centre for Europe	Sweden / Denmark	<a href="http://www.maritimecenter.dk/">http://www.maritimecenter.dk /</a>	
Cowes Maritime Cluster	UK	IOW	2003
Marine South East	UK	South-East	2005
Plymouth Marine Science Partnership	UK	South-East	1999
SensorsKnowledge Transfer Network	UK	South-West	2008
Maritime London	UK	South east	
Mugla Yacht Building Cluster	Turkey	South west	
Maritime Allianz Ostseeregion	Germany	Northwest	
Mersey Maritime	UK	South east	
Norwegian Centre of Expertise-Maritime	Norway	-	
Maritime Cluster in Mecklenburg-Vorpommern	Germany		
Haven Gateway Public/Private Partnership	UK		
Maritimt Forum	Norway		
Ship&Boatbuilding	Croatia		