D10.10 NeXOS Second Bi-annual Report on Community Outreach Activities and Dissemination Tasks

Lead organisation for this deliverable
SECTION FRANÇAISE DE L'INSTITUT DES INGÉNIEURS ÉLECTRICIENS ET ÉLECTRONICIENS (IEEE)

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Deliverable 10.10 – NeXOS first Bi-annual Report on Community Outreach Activities and Dissemination Tasks

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Abstract

Deliverable 10.10 is the second of two NeXOS Bi-annual Report on Community Outreach Activities and Dissemination Tasks. This report summarizes activities conducted between Month M25 and Month 48 related to the outreach and dissemination tasks. The outreach task reaches out to a broad variety of stakeholder communities involved in NeXOS. It extends beyond the initial stakeholder network through use of the NeXOS website, social networks, distribution lists, and one-to-one communications where practical. The dissemination task organizes participation in conferences, seminars and other meetings, and coordinates publications in technical journals, trade magazines and online magazines.

1 Table of Contents

Table of Figures

List of Tables

1 Introduction

The NeXOS dissemination and outreach follows the strategic dissemination plan developed early in the project and delivered at month 3. The plan addresses activities across a diverse set of stakeholder communities within academia, government and industry to define and demonstrate the project developments. The strategy considers the cultural differences between research scientists and industry application specialists, large industry and small and medium enterprises etc. The plan draws on other work packages to maximize use of the technical and business developments of the project.

Effective acceptance of NeXOS outcomes requires a broad trust of the information available from the system that can be the basis for maritime management and operations decisions. Having sensors of reliable quality and enabling that the user community understands their capabilities is of great importance. Availability of the Project outcomes to the sensor, platform and user communities are an integrated effort of the NeXOS team coordinated through the Dissemination and Outreach activities.

2 Implementing the Dissemination and Outreach Strategy

Sectors addressed in the EC's Blue Growth communication using ocean observations and information include fishing, minerals, energy, blue technology, disaster forecasting and environmental sustainability.

Understanding the information needed by each sector in consensus maritime policies and management is one of the drivers of NeXOS. Through the research tasks as well as the NeXOS dissemination and outreach plan, intensive exchange between stakeholders across various user sectors is supported, ensuring requirements from all marine sectors are properly taken into account.

With the requirements defined and understood, the next major project activity is the system design and development. This includes both the individual sensors and the integration of the sensors and components into an end-to-end system. As development matures, outreach activities focus on potential user communities who have identified applications of the sensor and systems NeXOS products. The goal is to recognize potential early adopters and work with them. This is being done by leveraging NeXOS partner experience, through interactions with stakeholders during symposiums, workshops and international conferences, and via publications in web and peer reviewed journals.

The objective of the dissemination and outreach activity is to increase the visibility of project outcomes and facilitate the market uptake of the new sensors developed in the project. In addition to the outreach work with users during the development phase, dissemination is addressing a broader base, providing information on developments and innovation, consistent with IPR limitations. The activities need to address academic, industry and government interests.

From a strategic perspective, coordination with other projects makes an important contribution to the developments and outcomes of the NeXOS. Coordination with the three other projects funded under the Oceans of Tomorrow 2013.2 call, particularly in the dissemination and outreach activities, leverages areas of common interest and expands NeXOS outreach. Collaboration is taking place with a

broader range of European projects in areas of observations and information systems from a requirements and user uptake perspective.

Outreach extends beyond the initial stakeholder network through use of the NeXOS website, social networks such as LinkedIn, distribution lists, and one-to-one communications where practical. Targeted communities include industry groups, small and medium enterprises, oil and gas and other large industries, sensor producers and users of ocean information.

In addition, the project is working with standards organizations such as OGC and technology focused organizations such as IEEE for further outreach and communication.

Active collaboration with GEO/GEOSS is implemented as part of the plan, emphasizing opportunities for synergy with the 2012-2015 GEO Work Plan.

3 Community outreach task – Years 3 and 4

This task reaches out to a broad variety of stakeholder communities involved in NeXOS. The outreach extends beyond the initial stakeholder network through use of the NeXOS website, social network, distribution lists, and one-to-one communications where practical (either in person during conferences and meetings, or virtually via online communication tools). Communities targeted include industry groups, small and medium enterprises, oil and gas and other large industries, sensor producers and users of ocean information:

- IEEE Ocean Engineering Society (members and regional chapters)
- Developers and users of marine information systems (MyOcean, SeaDataNet) and current or upcoming European Research Infrastructure Consortia (ERIC) (such as EMSO, GROOM, ICOS)
- Specialized communities (e.g. ocean biodiversity, ocean chemistry, space observations, marine management, fisheries) through postings to specific mailing lists, use of resource syndication and social networking technologies
- EU Technology Platforms (ETPs) (eg. those related to earth observation, maritime transport (waterborne TP), fisheries, aquaculture (EATIP TP) etc.)
- The US NSF Ocean Research Coordination Network.

In addition, the project works with standards organizations such as OGC and technology focused organizations such as MTS for further outreach and communication.

This task also contributes to the inter-cooperation effort between the four projects funded under the OCEANS 2013.2 call through face-to-face meetings and e-collaboration tools.

In addition to presentations and posters, the outreach and dissemination team distributed NeXOS fact sheets for each of the events discussed below (see project fact sheet M36 and fact sheet M48).

3.1 Project Advisory and stakeholder Board

WP10 is co-leading the Project's Advisory and Stakeholders Board (ASB) with WP11. International members have been carefully selected for their roles in stakeholder communities, and invited to join the Board during the proposal stage. Further members have been invited as appropriate during the various phases of the project. The following members participated in ASB meetings: Clara Hulburt, Teledyne; Victor Turpin, UPMC; Philippe Courmontagne, IM2NP/ISEN.

The members provided advice on interface of sensors with platforms and brought a knowledge base of emerging technology and applications. As important, they reinforced lessons learned from their years of research and field experience.

3.2 Engaging the Ocean and Marine Engineering Community - IEEE Ocean Engineering Society (OES)

IEEE OES is an international professional society whose members cover the broad range of ocean disciplines from sensors and standards to systems and applications. This broad and international base provided an efficient and effective platform for NeXOS to engage the marine technology community. NeXOS has participated in the IEEE Ocean conferences held since the beginning of the project. Initially, the project team distributed NeXOS fact sheets and displayed NeXOS posters at the IEEE or one of our partner's booths. With the project maturing, we started submitting presentations and formal papers. Table 1 below summarizes the above activities.

Table 1 Community Outreach supported by the IEEE Ocean Engineering Society

#	IEEE Conferences	Date	Lead	Activity	Comments
1	15 MTS/IEEE Ocean Washington DC	16-22 October 2015	IEEE Pearlman	Exhibitor	Flyers in IEEE/ OES booth
2	16 MTS/IEEE Oceans Shanghai, China	2016	UPC Del Rio	Presentation	Time synchronization accuracy refinement for mobile shallow water acoustic sensor network Oriol Pallares and Joaquin del Rio , Pierre-Jean Bouvet
3	16 MTS/IEEE Ocean Monterey	20 – 23 September, 2016	IEEE Pearlman	Session organization/co-chair	Organize and co-chair Interoperability session

#	IEEE Conferences	Date	Lead	Activity	Comments
4	16 MTS/IEEE Ocean Monterey	20 –23 September, 2016	IEEE Pearlman	Presentation	"Oceans of tomorrow sensors interoperability for in-situ ocean monitoring", Jay Pearlman, Simon Jirka, Joaquin del Rio, Eric Delory, Sergio Martinez , Tom O'Reilly
5	16 MTS/IEEE Ocean Monterey	20 –23 September, 2016	UPC Del Rio	Presentation	Range-Only Underwater Target Localization: Path Characterization I. Masmitja, S. Gomariz, J. Del Rio, B. Kieft, T. O'Reilly
6	Oceans'17 MTS/IEEE Aberdeen, Scotsland	17-22 June 2017	PLOCAN Delory	Keynote	"Emerging solutions for in-situ observation systems" Eric Delory
7	Oceans'17 MTS/IEEE Aberdeen, Scotsland	17-22 June 2017	PLOCAN Delory	Presentation	"On Sensor and observation developments: Overview of innovations in European projects for in-situ earth observing systems – Marine Domain" Eric Delory
8	Oceans'17 MTS/IEEE Aberdeen, Scotsland	17-22 June 2017	PLOCAN Delory	Presentation	"New compact digital passive acoustic sensor device with embedded pre-processing" Eric Delory
9	Oceans'17 MTS/IEEE Aberdeen, Scotsland	17-22 June 2017	UNOL Ferdinand	Presentation	"Next generation fluorescence sensor with multiple excitation and emission wavelengths – NeXOS MatrixFlu-UV" Oliver Ferdinand
10	Oceans'17 MTS/IEEE Aberdeen, Scotsland	17-22 June 2017	IEEE Pearlman	Presentation	"Developing and evaluating a new generation of in-situ ocean observation systems" Jay Pearlman
11	Oceans'17 MTS/IEEE Aberdeen, Scotland	17-22 June 2017	IFREMER Delauney	Presentation	Biofouling protection results
12	Oceans'17 MTS/IEEE Aberdeen, Scotland	17-22 June 2017	IEEE Pearlman	Session organization Sensor and System Innovations for the Oceans of Tomorrow An Oceans of Tomorrow	Fact sheet; OoT meeting; stakeholder panel, video collection, interviews

#	IEEE Conferences	Date	Lead	Activity	Comments
				Workshop)	
13	Oceans'17 MTS/IEEE Aberdeen, Scotland	17-22 June 2017	IFREMER Delauney	Presentation	Biofouling engineering concepts and results
14	Oceans'17 MTS/IEEE Aberdeen, Scotland	17-22 June 2017	NIVA Golmen	Presentation	"Validation and demonstration of novel oceanographic sensors on selected measurement platforms in the NeXOS project" Lars Golmen
15	Oceans 17 MTS/IEEE Anchorage, Alaska, USA	Sept 19 - 22 2017	PLOCAN Delory, IEEE Pearlman	Exhibitor's booth	Fact sheets, posters, sensor models
16	Oceans 17 MTS/IEEE Anchorage, Alaska, USA	Sept 19 - 22 2017	IEEE Pearlman	Presentation	"NeXOS-Next generation cost-effective, compact, multifunctional Web enabled Ocean sensor systems" Eric Delory

3.3 Developers and users of marine observation systems

In the framework of this task, three project workshop activities are focused on sensor system users, sharing partners and users experiences. These include the Brest Sea Tech week, Oi 2016, (both part of Workshop 2), and a side event during the MTS/IEEE Ocean 2016 in Aberdeen (Workshop 3).

3.3.1 10th Sea Tech Week, Brest, France, 2016

The 10th SeaTech Week, an international marine science and technology week with the Theme of "a connected Ocean", was held in Brest, France in October 2016. From October 10th-14th, 1,200 participants and more than 35 exhibitors attended this interdisciplinary week dedicated to marine science and technology. Colored by a "sea and digital" theme, Sea Tech Week has once again brought to light prospects and challenges of the blue economy.

Several NeXOS team members gave presentations, which addressed the emerging outcomes of the NeXOS project. These were aimed at improving the temporal and spatial coverage, resolution and quality of marine observations. This is being achieved through the development of cost-efficient innovative and interoperable in-situ sensors deployable from multiple platforms, as well as web services for a broad range of key domains and applications. The main objective is to present new, integrated sensors that can be implemented on a variety of

fixed and mobile platforms and have multiple functionalities including measurements of key parameters useful to a number of objectives, ranging from more precise monitoring and modelling of the marine environment to an improved assessment of fish stocks.

Table 2 below summarizes the presentations given at the SeaTech Week 2016 by members of the NeXOS team.

Table 2 NeXOS presentations at SeaTech Week 2016

Presentation title	Authors
Standard-based middleware for marine sensor networks	D. Toma et al
Standards for interoperable marine sensors: technologies and adoption.	T. O'Reilly et al
. Synchronization Experiences at Obsea-UPC. Sea Tech Week Brest 2016	- J del Rio. Et al

3.3.2 Oceanology International 2016, London, England

OI 2016 is the leading international event for Ocean related activities and it includes the presence of both Scientific and Business communities. During the three days of the OI2016, OoT projects, including NeXOS' partners had the opportunity to show the current progresses on sensor developments and transversal innovations.

Demonstrations took place each day at the tank of the Ocean of Tomorrow booth, showing the capabilities of the O1, A1 (Optical and acoustic sensors) and Sensor Web Enablement. It was a great opportunity to discuss with international stakeholders from research and business areas, with the objective to better understand their needs and shaping the marketability of our future products.
It was also an opportunity for workshops and round table among the Ocean of Tomorrow FP7 projects in order to collaborate to maximize impacts and implementation of each project's innovation.
In addition, in order to assess the added value of the NeXOS sensors, some case studies were developed where the NeXOS sensors benefits and the added value they bring can be identified and measured. Since relevant data (of technical and especially monetary nature) are extremely scarce, we participated in OI2016 to get a good look at what other technology is available on the market, what kind of future developments are to be expected in the field and rub shoulders with various industry experts exhibiting there, with the objective of retrieving said information.
This section describes the NeXOS demonstration planning and conduct, coordination of OoT events, participation in other events, and one-on-one discussion with stakeholders.

The main activities for the NeXOS team focused on the following items:

1) Present for the first time a demonstration of the Optical Matrixflu O1 and passive acoustic A1 sensors including the plug and play mechanisms developed during the project (full sensor web enablement and OGC-PUCK support), and receive feedback from the attendance – a 30 minute time slot was given for each demonstration, twice on Tuesday and twice on Thursday

2) Participate in a community meeting where all OoT projects presented key outcomes using a lightning format, also known as "Ignite". This format allows for 20 charts to be briefed in 5 minutes, with the charts advancing automatically. Each project also had a poster for the case where more detailed information was desired

3) Participate in a closed OoT meeting, to coordinate the interactions between the projects and the platform providers; and

4) Reach out to individual exhibitors, discussing technology and standards. The project was well represented at the above events.

Participation in OI 2016 is included in Workshop 2. For more detail consult deliverable D10.3 section 3.3.

3.3.3 Interfacing with stakeholders, MTS/IEEE Ocean 2016 Aberdeen

The Oceans 17 MCS/IEEE conference, held in Aberdeen Scotland, June 19 through 22, carried the theme of "A vision for sustaining our marine futures ". Fitting well with the theme, was an active participation from the NeXOS team, to include: the invited closing plenary presentation by Eric Delory, NeXOS coordinator; contributions to the technical program with focus on the new cost-effective sensor technologies (presentations/papers on passive acoustic sensors)– Eric Delory, optical sensors – Oliver Ferdinand, and sensor/platform system integration – Lars Golmen); a one-day workshop coordinated by the IEEE NeXOS team on Oceans of Tomorrow (OoT) sensors, followed by a panel of stakeholders. The NeXOS technical presentations, together with the stakeholder panel, form NeXOS workshop 3. A summary report of Workshop 3 is included in Deliverable D10.3.

3.4 EuroGOOS

EuroGOOS is an International Organization addressing the European-scale operational oceanography within the context of the Global Ocean Observing System of the Intergovernmental Oceanographic Commission of UNESCO (IOC GOOS). The EuroGOOS International Conference, organized by the Central Research Institute of Marine Engineering JSC will take place from 3rd October to 5th October 2017 at the Scandic Bergen City in Bergen, Norway. The conference will cover areas like Operational Oceanography Serving Sustainable Marine Development. Although the conference will take place a week after the end of the NeXOS project, a presentation was developed prior to the end of the project, and will be presented by Lars Golmen from Niva whose office is in Bergen.

3.5 Specialized Communities

NeXOS project team members participated in the conferences and workshops listed in Table 3 below.

Table 3 Specialized Community Workshops and Conferences

#	Conference	Location	Date	Presentation	Authors/ Participants
1	University Presentation	Toulon University	15 - 16 October 2015	"Dynamique de la matière organique naturelle et anthropique dans les eaux côtières de la Méditerranée : Approche par les techniques moléculaires et optiques."	Goutx, M. et al
2	Oceanology International	London, UK	15 – 17 March 2016	"NEXOS Project Recent Advances in In Situ Biogeochemical Instrumentation, Sensors, and Observatory" Poster	Goutx, M. et al
3	Oceanology International	London, UK	15 – 17 March 2016	"Preliminary work on NeXOS postdoc: glider-mounted optical sensor of dissolved organic matter"Flash presentation	Cyr F. et al
4	Oceanology International	London, UK	15 – 17 March 2016	Ocean of Tomorrow booth – demonstration of optical and acoustic sensors	Pearlman J. IEEE, Delory E. PLOCAN, Zielinski O. UNOL, Del Rio J. UPC
5	Oceanology International	London, UK	15 – 17 March 2016	Organized session of Flash presentations to OI attendees	Pearlman J.IEEE
6	Oceanology International	London, UK	15 – 17 March 2016	series of informal interviews with exhibitors at OI	Ecorys
7	Oceanology International	London, UK	15 – 17 March 2016	Flash presentations to OI attendees	Delory E. PLOCAN, Zielinski O. UNOL, Groux M. AMU, Del Rio J. UPC
8	Presentation at Jornades de	Vilanova i la Geltrú		"Nexos project and sensor to platform integration problems"	Del Rio,

#	Conference	Location	Date	Presentation	Authors/ Participants
	Recerca a la UP	(Barcelona), Spai n			Joaquin
9	7th FerryBox Workshop	Heraklion, Crete	April 7-8 2016	"Flow-through PSICAM - Detecting changes in phytoplankton based on autonomous hyperspectral absorption measurements"	Wollschläger, J. et al
10	French Ministry of Research	Paris, France	2016	"NeXOS sensors, passive acoustics innovations for ocean noise measurement," French Ministry of Research, Paris	Delory E.
11	7th EGO conference on autonomous ocean gliders and their applications	National Oceanography Centre, Southampton, UK	26–29 September 2016,	"Dynamics of dissolved organic matter in the NW Mediterranean from a new glider optical sensor"	Tedetti M
12	JERICO-Next Workshop	Gothenburg, Sweden	27 -29 September 2016	Performing measurements with the Hyperspectral Absorption Sensor (HyAbS)"	Wollschläger, J., Röttgers, R., Petersen, W
13	SAS2016 (IEEE Sensor Applications Symposium)	Catania, Italy	20 – 22 April 2016	NeXOS A1 Smart Hydrophone Integration into the Sensor Web Enablement Framework	Enoc Martínez, Daniel M. Toma, Enric Trullols, Joaquín del Rio, Diego Pinzani
14	The Geospatial Sensor Web COnference 2016	Muenster, Germany	29-31 August 2016	Applying OGC Sensor Web Enablement to Ocean Observing Systems	Daniel M. Toma, Joaquin del Rio, Enoc Martínez
15	21st IMEKO TC4 International Symposium	Budapest, Hungary	7-9 September 2016	Interoperable Data Management and Instrument Control Architecture for Ocean Observing Systems	Daniel M. Toma, Joaquin del Rio, Enoc Martínez, Eric Delory, Jay Pearlman, Christoph Waldman,

#	Conference	Location	Date	Presentation	Authors/ Participants
					Simon Jirka
16	21st IMEKO TC4 International Symposium	Budapest, Hungary	7-9 September 2016	Design obstacle detection system with the sonar MK3 by AUV Guanay II	C. Galarza, X. Grimau, I. Masmitja, J.Prat, Joaquín del Rio, S. Gomariz
17	21st IMEKO TC4 International Symposium	Budapest, Hungary	7-9 September 2016	Range-Only Underwater Target Localization: Error Characterization	I. Masmitja, O. Pallares, S. Gomariz, J. Del Rio, T. O'Reilly, B. Kief
18	Martech	BarcelonaSpain	26-28 October 2016	SWE Bridge: Software Interface for Plug & Work Instrument	Martinez et al
19	Ocean Outlook 2017	Bergen Norway	19-21 April 2017	biofouling	L. Delauney
20	The Geospatial Sensor Web COnference 2016	Muenster, Germany	29-31 August 2016	Applying OGC Sensor Web Enablement to Ocean Observing Systems	Simon Jitka Daniel M. Toma, Joaquin del Rio, Enoc Martínez
21	22nd IMEKO TC4 International Symposium	Iasi, Romania	14-15 September 2017	Accuracy and precision studies for range-only underwater target tracking in shallow waters	I. Masmitja, P. J. Bouvet, S. Gomariz, J. Aguzzi, J. del Rio
22	Congreso Español de Metrología	San Fernando Spain	06-08 June 2017	Caracterización de posicionamiento en el medio marino mediante métodos acústicos	Ivan Masmitja, Albert Garcia, Spartacus Gomariz, Joaquin Del Rio

3.6 EU technology Platform

The Outreach and Dissemination team focused the last year of the project working with the field integration teams primarily in Norway and the Canary islands. They interfaced with stakeholders in domains such as fisheries, energy, and environment monitoring, culminating in the workshop-3

stakeholder panel. These activities were conducted in lieu of working with the EU technology platforms.

3.7 US NSF Ocean RCN

A five year National Science Foundation-funded Research Coordination Network (RCN), the "OceanObs" RCN is currently in its fifth year. The RCN, through a series of working groups staffed by volunteer scientists, focuses on key issues in ocean observations, community outreach and education. The goal of the RCN is to foster a broad, multi-disciplinary dialogue, enabling more effective use of ocean observing systems to inform societal decisions. This is a very broad goal and, practically, it is necessary to identify specific areas on which to focus. The RCN has therefore defined a series of objectives to support the goal. These include:

- Motivate commitments to sustaining ocean and marine observing systems
- Stimulate inter-disciplinary cooperation for both observations and analyses
- Facilitate open exchange of ocean data
- Promote interoperability
- Improve the flow of critical ocean observation information to key stakeholders
- Stimulate capacity building and retention in ocean and marine observations community

Although innovative concepts in sensors, which are of particular interest to NeXOS, were originally addressed by the RCN, during the first bi-annual reporting period, the focus evolved to other areas of interest during the second bi-annual reporting period.

3.8 Interface with Standard Organizations

For information system elements of the NeXOS systems, standards developed under the Open Geospatial Consortium (OGC) have been adopted to support improved interoperability across platforms and between sensor systems. These include different parts of the system. The PUCK standard focuses on the sensor and allows for plug and play capabilities. This was described in paper "Standards-Based Plug & Work for Instruments in Ocean Observing Systems," by del Rio, et al. published in the IEEE Journal of Oceanic Engineering (July 2014).

The sensor web standards address the information flow from the sensor to the users. This was described in a paper by S. Jirka, et al on a sensor-web architecture for sharing oceanographic sensor data at the Conference on Sensor Systems for a Changing Ocean (2014 Brest, France).

This approach was furthe given at EGU (see Table 4 entry 11).

3.9 Inter-cooperation effort - OCEANS 2013 call

This task contributes to the inter-cooperation effort between the four projects funded under the OCEANS 2013.2 call through e-collaboration tools. The following activities were organized in support of the inter-cooperation effort during the last 2 years of the NeXOS project:

Oceanology International March 15 – 17, 2016, London, UK - OoT meetings were conducted (one was opened to the public, another was between the projects only); demonstrations were held in an OoT shared booth; a data working group was established. For more information, see Workshop 2 OI 16 discussion in deliverable D10.3, section 3.3.

MTS/IEEE Ocean 2017 September June 19 -22, 2017, Aberdeen, Scotland - a one-day workshop coordinated by the IEEE NeXOS team on Oceans of Tomorrow (OoT) sensors. For more information, see Workshop 3 discussion in deliverable D10.3, section 4.

Development of a joint policy brief - An agreed baseline of Policy-relevant syntheses of the Topic 2 project results are being included in the deliverable D.11.4 (due by month 48).

4 Dissemination activities

This task organizes participation in conferences, seminars and other meetings, and coordinates publications in technical journals, trade magazines and online. It includes the following sub tasks:

- Reaching out to the science and marine communities through presentations at international meetings, such as EGU, GEO-related FP7 meetings, AGU Ocean meetings and others upon request by the European Commission (2-3 meetings per year); additional participation in meetings of opportunity at regional events, engaging (mostly electronically, and locally where practical) with marine communities. Coordinate project development with GEO/GEOSS emphasizing opportunities for synergy with the current GEO Work Plan.
- Submission of articles to Trade magazines such as Marine Technology, Ship and Offshore, Sea Technology (2 per year starting in Year 2); Contribution of articles to Ocean-focused professional society newsletters such as IEEE Oceanic Engineering Society.
- Provision of articles in the web magazine, Earthzine, for broader dissemination to the general public (3 per year on ocean observation and related technology). Similar articles have been published for a number of projects (www.earthcube.org).

4.1 Presentations and Active International Interfaces at Meetings

Active collaboration with GEO/GEOSS is through opportunities for synergy with the 2012-2015 GEO Work Plan follow-on. A major strategic area is the Blue Planet, the GEO Ocean Initiative. NeXOS presentations were given at the GEO Summit in Geneva, Switzerland in January 2014 and subsequent GEO plenary meetings. Discussions with stakeholders highlighted sensor innovations and opportunities for environmental monitoring. At the EC-supported GEO European Projects Workshop, NeXOS organized sessions on ocean and marine observations that included NeXOS, GOOS and Oceans of Tomorrow Projects. Attendees were program managers from GEO, the European Commission, project coordinators from a wide range of disciplines that have potential use of NeXOS sensors.

At the policy level, NeXOS contributed to the GEO Plenaries with posters and meetings of the GEO Blue Planet Initiative. These and other such activities addressed GEOSS-GOOS and GES for marine systems in the technical and policy context. NeXOS also had discussions with a manager at the Directorate-General for Maritime Affairs and Fisheries (DG MARE) with respect the potential of NeXOS sensors to support maritime policies in area of fisheries. In these discussions, the impact of the NeXOS sensors on the priorities for Good Environmental Status and the missions of DG MARE were reviewed. The outcomes of the discussion are that the directions of NeXOS were appreciated and there is interest in continuing to monitor developments as the sensor systems mature.

The feedback from all of the above discussions has been fed into the NeXOS design and implementation planningIn addition to the presentations discussed in section 5 above, the NeXOS outreach and dissemination team was active in the following meetings listed in Table 4 below.

Table 4 Presentations at International conference

#	Type	Leader	Title	Date & Place	Audience	Scope
1	GEO	IEEE	GEO XI Plenary	9 – 12 November 2015, Mexico City	GEO Plenary attendees (decision makers)	IEEE Booth; NEXOS flyer and poster
2	International conference	IEEE	AGU	December 2015, San Francisco	Scientific community	Flyers and ocean science business meeting
3	Session co-organization	IEEE	AGU Ocean Science meeting 2016	February 21-26, 2016 New Orleans, Louisiana, USA	Scientific community	Session organization and presentation Session “Evolving Biologically-Enabled Ocean Observing Systems: Integrating Biological Observations with Physicochemical Measurements for Informed Ecosystem-Based Decision Making”
4	Poster	AMU	AGU Ocean Science 2016	February 21-26, 2016, New Orleans, Louisiana, USA	Scientific community	Goutx M. et al ”Physical-Biogeochemical Interactions in NW Mediterranean, using the Glider "Sea Explorer" fitted with a Newly Developed Fluorescence Sensor, the " MiniFluo-UV", Poster
5	Presentation	UPC	AGU Ocean Science 2016	February 21-26, 2016, New Orleans, Louisiana, USA	Scientific community	J. del Rio et al NeXOS contributions to end-to-end data flow and access to marine sensor systems
6	Presentation	IEEE	EGU	17 – 22 April	Scientific	Jay Pearlman et al

#	Type	Leader	Title	Date & Place	Audience	Scope
				2016, Vienna Austria	community	"Multifunctional Web Enabled Ocean Sensor Systems for the Monitoring of a Changing Ocean"
7	Workshop	IEEE, HZG	GEO European Project Workshop 10	31 May - 2 June, 2016 Berlin, Germany	GEO European Commission and project Coordinators	Oceans of Tomorrow presentation
8	International conference	PLOCAN	AGU	December 2016, San Francisco	Scientific community	Flyers and ocean science business meeting
9	International conference	UPC	ASLO	February 27 – March 1, 2017, Honolulu, HI	Scientific community, primarily hydrology	Presentation and discussion – J. del Rio et al NeXOS contributions to end-to-end data flow and access to marine sensor systems
10	International conference	IEEE	ASLO	February 27 – March 1, 2017, Honolulu, HI	Scientific community, primarily hydrology	Presentation and discussion - Nexos contributions to end-to-end data flow in marine sensor systems. Jay Pearlman, Joaquin del Rio, Daniel Toma, Enoc Martinez, Simon Jirka
11	Presentation	IEEE	EGU	March 2017, Vienna, Austria	Scientific community	NeXOS, developing and evaluating a new generation of in-situ ocean observation systems Eric Delory, Joaquin del Rio, Lars Golmen, Nils Roar Hareide, Jay Pearlman, Jean-Francois Rolin, Christoph Waldmann, and Oliver Zielinski . Geophysical Research Abstracts Vol. 19, EGU2017-11686-1, 2017 EGU General Assembly 2017
12	Presentation	IEEE	EGU	March 2017, Vienna, Austria	Scientific community	SWE-based Observation Data Delivery from the Instrument to the User - Sensor Web Technology in the NeXOS Project Simon Jirka, Joaquin del Rio,

#	Type	Leader	Title	Date & Place	Audience	Scope
						Daniel Toma, Enoc Martinez, Eric Delory, Jay Pearlman, Matthes Rieke, and Christoph Stasch Geophysical Research Abstracts Vol. 19, EGU2017-11686-1, 2017 EGU General Assembly 2017.

4.2 Publications in professional journals

Publications arey the peer review process measures the work against community standards and the state of the art. Over the last 2 years, a number of papers have been published, addressing both the acoustic and optical sensors and transverse technologies. In addition to individual papers, a special issue of the Journal of Oceanic Engineering has been released in 2015/2016.

The following papers have been published in professional peer-reviewed journals (see Table 5), and in Trade journals (see Table 6).

Table 5 Papers published in professional journals

#	Authors	Title	Journal & doi
1	Pearlman, J., Garello, R., Delory, E., Castro, A., del Rio, J., Toma, D., Rolin, J.-F., Waldmann, C., Zielinski, O. Sensors and Actuators B	(2014) Requirements and approaches for a more cost-efficient assessment of ocean waters and ecosystems, and fisheries management.	2014 Oceans - St. John's, St. John's, NL, pp. 1-9. doi: 10.1109/OCEANS.2014.7003144
2	Reggiani, E.R., King, A.L., Norli, M., Jaccard, P., Sørensen, K., Bellerby, R.G.J.	(2016) FerryBox-assisted monitoring of mixed layer pH in the Norwegian Coastal Current.	(1) Journal of Marine Systems, 162, pp. 29-36. doi: 10.1016/j.jmarsys.2016.03.017
3	Wollschläger, J., Voß, D., Zielinski,	(2016) In situ observations of biological and environmental parameters by means of	IEEE J. Ocean. Eng. 41, 753–762. doi: 10.1109/JOE.2016.2557466

#	Authors	Title	Journal & doi
	O., Petersen, W.	optics-Development of next-generation ocean sensors with special focus on an integrating cavity approach."	
4	Cyr, F., Tedetti, M., Besson, F., Beguery, L., Doglioli, A., Petrenko, A. and Goutx, M.	(2017) A New Glider-Compatible Optical Sensor for Dissolved Organic Matter Measurements: Test Case from the NW Mediterranean Sea. Front.	Mar. Sci. 4:89. doi: 10.3389/fmars.2017.00089
5	Mascarenhas, V. J., Voß, D., Wollschläger, J., Zielinski, O.	(2017) Bio-optical variability, absorption budget, and hyperspectral light availability in Sognefjord and Trondheimsfjord, Norway.	Journal of Geophysical Research: Oceans. doi: 10.1002/2016JC012610
6	Ferdinand, O., Friedrichs, A., Miranda, M.L., Voß, D., Zielinski, O.	(Submitted) Next generation fluorescence sensor with multiple excitation and emission - NeXOS matrixFlu-UV.	OCEANS'17 MTS/IEEE
7	Oriol Pallares, Pierre-Jean Bouvet, and Joaquin del Rio,	TS-MUWSN: Time Synchronization for Mobile Underwater Sensor Networks	IEEE JOURNAL OF OCEANIC ENGINEERING, october 2016, VOL. 41, number 4, pags 763-775

Table 6 Publications in Trade Journals

Authors	Title	Journal & doi
Pearlman, J., Zielinski, O	(2017) A new generation of optical systems for ocean monitoring.	(2) Sea Technology 2, pp. 30-33.

4.3 Publications in Web magazines

Seven articles about NeXOS have been published since August 2015, and another 4 will be released shortly. A list of the published articles is provided below.

Table 7 Articles about NeXOS in Earthzine

#	Title	Date	Author
1	Ocean Sensing Comes of Age: European Consortium Advances Interoperability in Marine Science	Published on Monday, 24 August 2015 14:37	Lori Keesey
2	PLOCAN's Glider School Explores a New Approach to Underwater Observations	Published on Friday, 23 October 2015 17:06	Elise Mulder Osenga
3	Following the C: A Quick Introduction to Tracking Ocean Carbon	Published on Friday, 20 May 2016 11:56	Elise Mulder Osenga
4	NeXOS Project Takes Aquatic Sensors to Next Level;	Published on Thursday, 31 August 2017 15:56	Kelley Christensen
5	Listening to the Ocean with NeXOS Passive Acoustic Smart Sensors	Published on Thursday, 31 August 2017 18:52	Jenny Woodman
6	Monitoring the Ocean in Color with MatrixFlu	Published on Thursday, 31 August 2017 20:58	Jeff Kart
7	All the Light We Cannot See: Deploying Optical Sensors to Study the Ocean	Published on Thursday, 31 August 2017 19:43	Kelley Christensen

5 Conclusion

During the first bi-annual period, the Dissemination and Outreach activities for NeXOS were defined through the Demonstration and Outreach Strategy and then implemented according to the Dissemination and Outreach Plan. The dissemination plan was followed in defining specific activities of the NeXOS team working with their communities and the broader technology and users communities. For the last two years, there were two imperatives: (1) continue engaging the technical community, engineers, manufacturers and standards organizations to maintain alignment with technology evolution, and (2) maintaining contact with the stakeholders to ensure that they are familiar with the new sensor products.

The first item included collaboration and face-to-face meetings with the other 2013 Oceans of Tomorrow projects. Interactions with GEO and the European Infrastructure projects provided both inputs to the project and opportunities for outreach. Examples include the GEO Plenaries at the Policy level and the GEO European Project Workshops at the technical level. with both OoT involvement and a stakeholder panel. There was a dedicated NeXOS workshop (Workshop 3) during the reporting period. The tables in this report along with the associated descriptions provide detailed information on the dissemination and outreach interactions.

As the sensors matured, there were further opportunities for working with stakeholders, Because NeXOS includes both the development of innovative sensors and the integration of the sensors into platforms, the dissemination and outreach strategy became increasingly focused on system demonstrations and field test, working closely with the integration and demonstration teams. Primary field activities were captured on video, and extracts found their way into the project video (see NeXOSproject.eu video link https://ieeetv.ieee.org/ieeetv-specials/nexos-observations-supporting-ocean-sustainability .

To conclude the NeXOS project, a booth was reserved at the MTS/IEEE Ocean 17 conference in Anchorage Alaska, in late September. There, we were able to display 2 of the sensors (the A1 and O1), as well as displaying the current NeXOS seascape (see Figure 1), distributing Fact sheets for the acoustic, optical, and EAF sensors, and play the NeXOS video. Many of the attendees to the conference indicated interest in the new products, and discussed the potential transition from research and development to manufacturing.

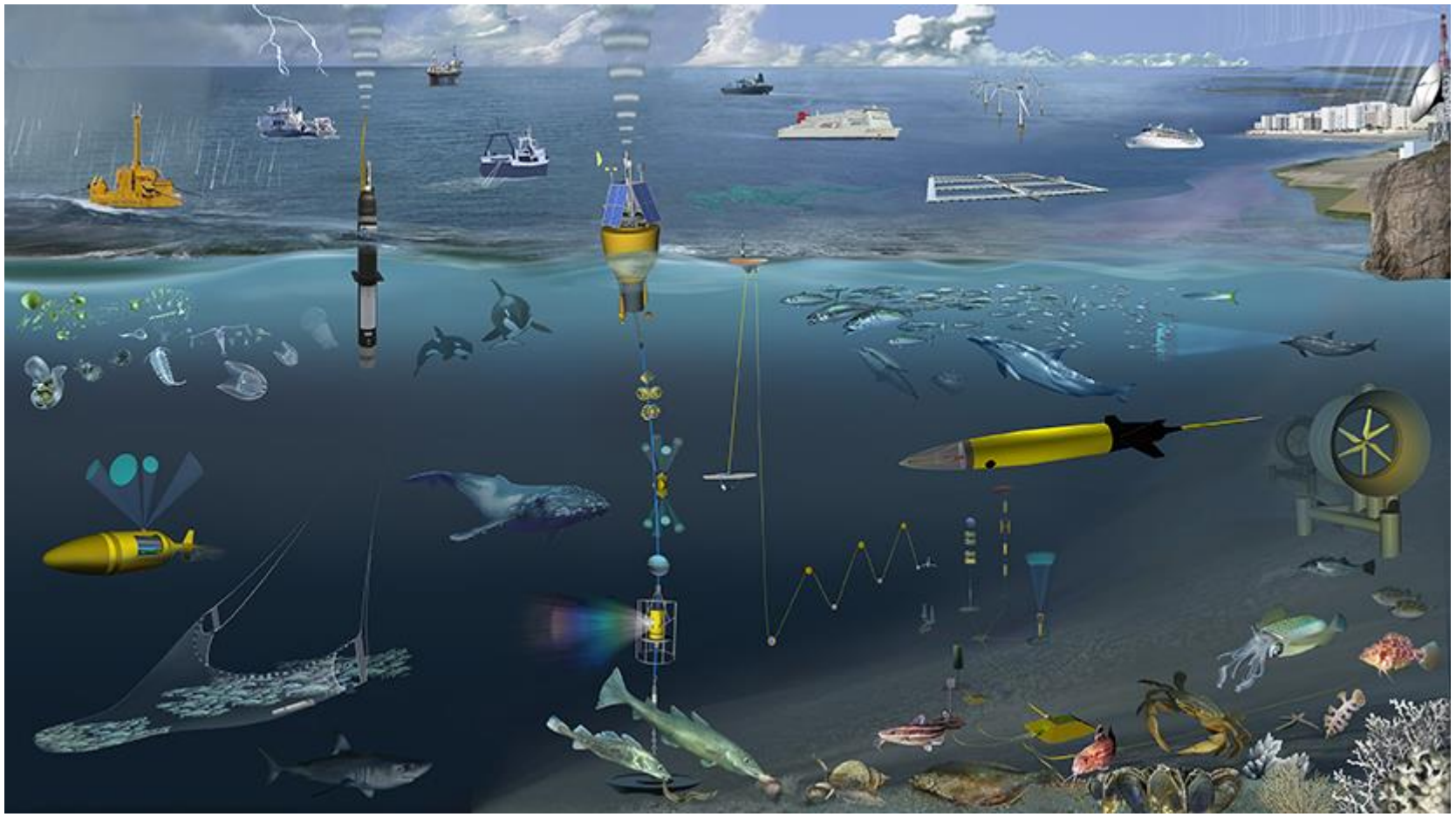

Figure 1 NeXOS seascape at end of project