



# ANNUAL REPORT 2017

OCEANIC PLATFORM OF  
THE CANARY ISLANDS



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## 1. INTRODUCTION

This 2017 annual report cannot ignore two important facts: the completion of the construction work on the Platform on its final location at the Test Site, for which it provides the essential basic services, and on the other hand, the culmination of the first decade that the Consortium set up to run this activity has been in operation. The agreement to set up the Consortium for the Design, Construction, Fitting Out and Management of the Oceanic Platform of the Canary Island, PLOCAN, was signed on the 10<sup>th</sup> of December 2007.

The signing of this document culminated a complex process of several years of defining a new, original infrastructure (ICTS) aimed specifically at effectively contributing to make (marine and maritime) science and technology of excellence a support for economic and employment growth, in a contradictory environment: that the conditions of the site (understanding the term in its broadest sense) offset a highly-complex National and Regional system of competences, along with the socio-economic reality of a fragmented society on poor, outermost islands.

These initial reference points are key elements to understanding and interpreting what has happened over the course of this first decade.

The ICTS PLOCAN proposal is no casual or spontaneous result that emerged in the context of the opportunity opened up by AGE (Spanish central administration); it was the result of the process started many years previously in Gran Canaria that had resulted in the creation of the Spanish Oceanographic Institute (IEO), the Fishing Technology Centre (CSIC-Cabildo of Gran Canaria), the Faculty of Sea Sciences (ULPGC-Ministries) and the Canary Island Institute of Marine Sciences (ICCM-Canary Island Government-Cabildo of Gran Canaria). This previous process made it possible to extend and complete the map of ICTS when a proposal was presented to the open process of the AGE. PLOCAN, in the Canary Islands, was the only proposal with the level of definition and maturity necessary to be considered feasible and join the other existing ICTS in the archipelago. Thus, everything that has happened should be appraised in light of this initial consideration and consequently see the importance of what has been achieved to date, which can be summarised in the critical elements that have been overcome or achieved.

In general, national ICTS, at the time of their initial consideration, had clear and specific examples to follow of very similar infrastructures in the country, enabling them to harness a lot of experience and rationale from previous needs. In the case of PLOCAN, at the time, the only things available were references to partial approaches of the elements comprised in its vision. This caused a certain amount of uncertainty arising from the lack of specific international models. The essential design of the PLOCAN infrastructure coincided with the central focus of a call for projects put out by the European Commission in the 7th FP in the specific section of Oceans of the Future, to start the conceptual development of what has come to be known as "Multi-Purpose Off-Shore Platforms" based on an international consensus that this would be the most efficient approach from a socio-economic and environmental point of view. PLOCAN presented a proposal, leading the TROPOS Consortium, of 20 partners from 9 countries, which was the best received and perfectly executed. The results obtained, in the context of needs for products and services that mankind was starting to demand increasingly of the seas and oceans, are an important contribution to this multi-purpose approach that is now one of the central strands of the process of world economic growth (Blue Growth) developed by the leading scientific-technological centres and companies



of the industry and international leaders. On top of consolidating this line of scientific, technical development, there is also the fact that projects were appearing on the international scene to build “very similar” infrastructures to the PLOCAN infrastructure.

The initial agreement of 2007 was amended in December 2012 to introduce a clarification of the purpose of the consortium, which “*establishes that an essential part of the design, construction, fitting out and management of the Platform is that the Consortium participate in R+D+I projects that make research and scientific and technological development of marine maritime sciences possible*”. In January 2016, the agreement was amended again, bringing the Consortium under the responsibility of the AGE. At the same time, management of the public domain maritime-terrestrial reserve declared by resolution of the Council of Ministers was delegated to MINECO to establish the test site, its initial components and the supplementary elements and accessories for bringing it into operation.

These modifications have turned out to be key to implementing the important projects that have made it possible to bring the Platform into operation faster and more efficiently than if they had waited for it to be finished to do so, which has been especially important, given the delays in the administrative and construction process, allowing for important results, such as:

- ◆ Consolidate one of the world's benchmark Oceanic Observatories, which drive the EMSO/ERIC, set up in October 2016 as the most significant European contribution to global oceanic observation needs.
- ◆ Having placed the PLOCAN Test Site among the top three in terms of the highest number and variety of technological experiments on matters that include prototypes for harnessing energy, vehicles and instruments, processes and procedures.
- ◆ Attract top-level international institutions and companies to the PLOCAN vehicle and instrument base for their operations to develop the latest technologies and consolidate their position as the world benchmark as a school for learning the technology for operating and maintaining new families of vehicles and their useful pay-loads.

Installing the Platform at its final location has culminated a highly complex technical and administrative process that has managed to make significant cost savings against the tender price, but it has taken longer than could have been envisaged, due to circumstances such as:

- ◆ The procedure of competitive dialogue concerning the project and building works, totally new at the time it was used, that allowed the consortium to include the experience of those presenting tenders and combine this with the needs posed, during which, ordinary procedural incidents occurred in public procurement and other arising from the original nature of the procedure.
- ◆ The enormous number and difficulty of the administrative arrangements of all kinds, including the time taken between completing the draft of the Project and the start of building work.
- ◆ The technical difficulty that made it necessary, among other technical incidents, to add additional floats to guarantee the transport to tow the floating structure between the two support positions on the seabed.



An initial appraisal of the impact of the drive to R+D+i carried out and promoted by PLOCAN can be made from the information on the 56 projects that have been led or in which the consortium has taken part over the years, in which, support has been provided for the activities of 625 partners from 437 public and private institutions (practically a 50-50 split) from 39 countries, as the consequence of a success rate of 30%, which has meant participating in carrying out and presenting 186 projects (with staffing levels established and set up for the design, construction and fitting out phase of the Platform), with a participation of €15,110,349.49 in competitive non-national funds, 66% of the total.

Other transcendental results, regarding international projection, include co-operation to technification and high-specialisation both as part of and beyond official academic programmes, helping to create and develop a socio-economic environment that encourages participation in blue growth, the efforts made to promote knowledge and information about the social environment and fostering scientific-technical vocations that can be found in this and previous reports, and they will not be given in detail here due to limited space, rather than because they are not important or of interest.

One can objectively say with a sound and proven base, that the PLOCAN initiative in the time that has transpired since its design has not only maintained its validity and interest, it has also been reinforced and with regard to the international environment, continues to reinforce and add the values of convenience and opportunity.

One can also say that the decisions initially taken by the administrations of the consortium regarding the design, strategy, planning and economic support, amongst others, were the ones that have allowed the PLOCAN initiative to be developed efficiently, with the indicated results, during the period of general crisis that has been seen in the country in recent years.

The reflections and decisions that have had to be taken in 2018, are the ones that must determine the future of the next decade, having demonstrated the validity, efficacy, timelines and favourable conditions of the global socio-economic environment in which PLOCAN engages in its marine maritime activities. Paying particular attention to the spending effort that will be possible for the administrations of the consortium, there are aspects that are not so evident, such as the regulatory framework and the management of human resources, which are key in knowledge-based activities. The growing complexity and difficulty of the management that public research consortia are subjected to are a long way from the national business and institutional environment, and even more so from the international environment, if that is possible, even though these are the players called upon to turn knowledge into economic growth and jobs.

Now is the time and the place to put on public record the effort and the vocation of the Consortium staff, who have made it possible to achieve the objectives set with their dedication over and above usual standards, and whose commitment ensures the future of PLOCAN.

## 2. FACILITIES

PLOCAN offers on-shore and off-shore facilities to promote long term observation and the sustainability of the oceans, providing a highly-efficient combination of services. PLOCAN can provide access and multi-disciplinary support with its shore facility and its access facilities to the sea. These facilities are on the north-east coast of the island of Gran Canaria, and the off-shore platform is on the test site at sea (dedicated reserve zone).

### MULTI-PURPOSE OFF-SHORE PLATFORM

The infrastructure, built on a caisson that rests on the sea floor, is comprised of the different levels, each one for a specific use:

**Helipad:** Situated over the bridge, capable of receiving helicopters of up to a maximum of 18m long and 6 tonnes. In 2017, the helipad legalisation procedures were carried out, along with emergency exercises (without landing).

**Bridge** (86 m<sup>2</sup>): Rising over the deck with 360° view. All the control and operational activities of the platform and the test site are managed from here.

**Building:** Divided into two parts, the laboratory floor and a rest and relaxation floor (297 m<sup>2</sup>), classrooms (39 m<sup>2</sup>), kitchen (64 m<sup>2</sup>), dining room (80 m<sup>2</sup>), lounge (37 m<sup>2</sup>), etc.

**Main deck:** This is a hangar (590 m<sup>2</sup>) and an open working area (546 m<sup>2</sup>) where there is an open test tank (6.0 x 7.8 m). It has a telescopic hoist to operate with containers. The test tank will facilitate sea trials and launching submarine vehicles and specific equipment into the sea.

**Service floor** (1,215 m<sup>2</sup>): This houses the installation rooms and energy management equipment.

During the first half of 2017, work was done to complete the building work, mainly on the installations, and on the 27th of March 2017, the official certificate was signed receiving the work and the mission of the platform started, along with training and defining operational and safety protocols that will enable the platform to be brought into service when the necessary personnel is hired and trained.

Signing the reception deed meant taking possession of the platform by the PLOCAN Consortium and, hence, the start of the phase to fit out the Platform and commission and maintain the facilities and equipment.



Figure 1. Off-shore platform

The main facilities of the platform are:

- ◆ Two floating pontoons measuring 3.0 x 6.7 m. on the south corner of the structure
- ◆ Gantry crane with a maximum load capacity of 2 tonnes
- ◆ Personnel transport (by crane) basket capable of carrying up to four standing passengers or 2 people plus a stretcher (maximum gross weight: 800kg)
- ◆ Telescopic hoist with a 17.70 m arm
- ◆ Waste water treatment plant: 2 grey water treatment plants (for re-cycling 3,500 l / d) and sewage water (around 94% reduction in BOD, 93% in SS and 80% in CDO)
- ◆ 3.11 m<sup>3</sup> tanks that take sea water from different depths and 2x16m<sup>3</sup> tanks, one with sea water that will be desalinated and transferred to the other where fresh water is stored
- ◆ Desalination system with capacity of 16 m<sup>3</sup> / d
- ◆ Fresh water tank
- ◆ Hand tools and other small equipment
- ◆ Two pallet trolleys with a maximum load capacity of 2.5 Tn

The equipment associated with the platform is as follows:

**SAILBOUY** Surface autonomous vehicle. Mod. Sailbuoy. Year: 2016. Serial number: 1605. Payload: CTD, dissolved oxygen, fluorometer, turbidimeter and hydrocarbons. Manufacturer: Offshore Sensing (Norway)

**ROV AND ACCESSORIES** Remotely-Operated Vehicle. Mod. Seabotix Vlbv - 950 (950 m). Serial number: EBR-1000-0614-066. Year: 2014. Payload: Bowtech HD b/w camera, Bowtech HD colour camera, Tritech Micron MK3 sonar, 2GL arm. Manufacturer: Teledyne Seabotix (USA)

**SLOCUM GLIDER** Submarine autonomous glider. Mod. Slocum G2. Year: 2014. Serial number: 492. Payload: GPCTD, dissolved oxygen, fluorometer and turbidimeter. Manufacturer: Teledyne Webb Research (USA)

**SEAEXPLORER GLIDER** Autonomous submarine glider. Mod. SeaExplorer. Serial number 031. Year. 2017. Payload: GPCTD, Dissolved oxygen, Fluorometer, turbidimeter and hydrocarbons. Manufacturer: ALSEAMAR (France).

**SLOCUM GLIDER** Autonomous submarine glider. Mod. SLOCUM G3. Serial number 676. Year. 2017. Payload: GPCTD, Dissolved oxygen, Fluorometer and turbidimeter. Manufacturer: Teledyne Webb Research (USA)

**LARS (LAUNCH AND RECOVERY SYSTEM)** Mod. LITE compact. Serial number: 18846. Year: 2015. Manufacturer: POMMEC (NETHERLANDS). Designed and built to use the least possible deck space, with IMCA Diving standards and their specific requisites. With the following overall dimensions: 2.5x2, 2x4.3 m. Maximum weight of 3.2 tonnes.

**WAVEGLIDER** Surface autonomous glider (ASV). Mod. Wave Glider SV2. Serial number: 3051. Manufacturer: Liquid Robotics (USA)

**DECOMPRESSION CHAMBER** Containerised hyperbaric chamber measuring 1.8 metres with air compressor and air bank included. Mod. IB - 180. Year: 2015. Manufacturer: IBERCO (Spain)

**MILI-Q WATER PURIFICATION SYSTEM** Type II and I + water production. Model: Elix for producing Type II water and Milli-Q Ventaja for producing Type 1 + water. Millipore, Merck

**FLUOROMETER** Takes measurements of fluorescence, absorbance and turbidity using the appropriate Application Module. It is fitted with a Chl a-Extracted-Acidification module for determining chlorophyll a in sea water samples and for calibrating chlorophyll sensors.

**LAMINAR FLOW CABINET** Reduces particle contamination in handling samples. Model: Class 100 Helios 72, ALS

**TITRATOR SYSTEM WITH 5 ML/20 ML EXCHANGE UNITS** To determine dissolved oxygen and alkalinity in sea water samples. Titrino 888, Metrohm

**FUME HOOD** This is a local ventilation device designed to limit exposure to dangerous or toxic fumes, vapours or dust.

Initially, it was decided to sign a full maintenance contract of all the facilities, for 6 months, in order to study how it worked, and thus assess the true needs practically. This contract including the preventative and corrective maintenance of the facilities pursuant to the maintenance files of the building log handed over by the contractor of the works, Plataforma Marítima UTE. This contract was signed with Acciona Industrial at a cost of €17,826.44 (not including IGIC).

At the end of the initial 6-month contract, the preventative and corrective maintenance of the Platform was put out to tender for a period of 2 years. The tender was published on 10/10/17 entitled L-CPS-PA-7-2017 and it was awarded in 3 lots:

Lot 1	Lot 2	Lot 3
Electrical installations Lighting Special installations Fire-fighting protection	Plumbing Water supply and treatment Sanitation and drainage Compressed air Vacuum production	Climate control and Ventilation

In the case of equipment like generators and cranes, the same criteria were followed as for the installations. A six-month maintenance contract was signed to see how they worked and assess the needs and then the maintenance of the generators and the diesel oil tanks was put out to tender (L-CPS-PA-8-2017).

As the main improvement of the platform equipment, it was decided to install a winch on the telescopic hoist, which would allow operations to be carried out faster and more safely. To such end, the "Purchase, assembly and installation of a winch for a heavy-duty, marine, telescopic hoist for the Canary Island Oceanic Platform" contract (L-CPS-PA-8-2017) was put out to tender.

To improve access to the platform, a transport basket for people was bought to transfer people without them having to use the ladder after disembarking on the pontoon. The basket can hold four people or one person and a stretcher, up to a maximum weight of 800 kg.



Figure 2. Transport basket

## TEST SITE

The test site encompasses the administrative marine-terrestrial zone of the north-east coast of Gran Canaria. It covers an area of approximately 23 Km<sup>2</sup>, reaching maximum depths of 600 metres. The reserve was approved by the Council of Ministers in March 2014. Its purpose is to drive Marine-maritime R+D+i and it is used to try out and monitor all kinds of scientific and technological activities in the marine environment, including marine energy devices, devices for observing meteorological and oceanographic parameters. It will have its own electricity and communications infrastructure to feed the power and data from the devices hosted on the test site back to land. The general purpose of the test site is to provide companies and research groups with the opportunity to demonstrate how the technologies that they develop work before marketing them.

The work to build and commission the marine-terrestrial electricity and communications infrastructure (REDSUB) to operate on the PLOCAN test site, is currently on-going. The work was adjudicated using an open process on the 26th of August 2016 to the Cobra Instalaciones y Servicios S.A. trading company by means of a public administrative contract at a fixed price, published in the Official State Gazette, number 146 on the 17<sup>th</sup> of June 2016.

The electricity infrastructure has been designed and sized to feed a maximum of 15MW into the grid. It is comprised of medium voltage underwater cables (marine electrical system), laid from the area of the PLOCAN reserve in the sea to a switching station located in the coastal area, where the transition is made from submarine cable to the terrestrial cable that will connect to the sub-station on shore to feed the power into the terrestrial distribution grid (terrestrial electricity system).

The photos below show the mooring operation of the cable-laying vessel for the installation, starting to lay the submarine cable to bring it on land and to run it to the switching station and the splicing operations on board the vessel.



Figure 3. PLOCAN test bed

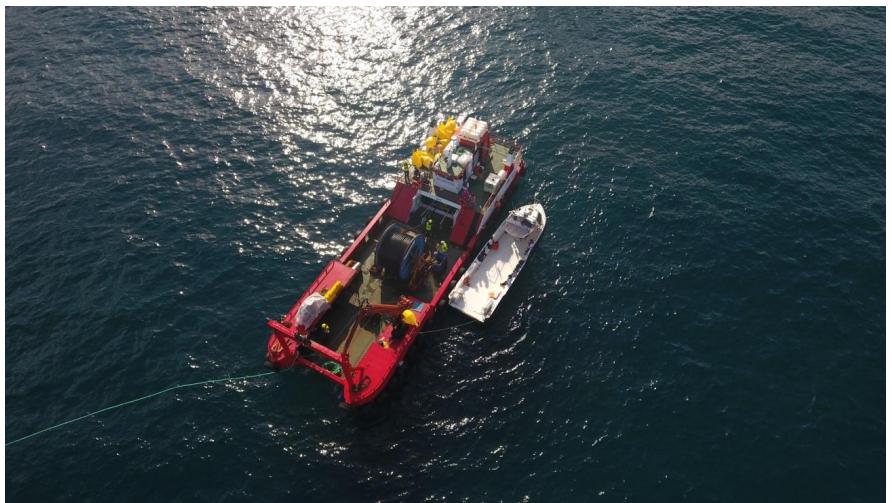


Figure 4. Mooring the cable-layer to start installation operations



Figure 5. Laying the splice



Figure 6. Connection



Figure 7. Start of the splicing operation

The nominal route of the IECOM electricity lines on the test site is shown in the photo below:

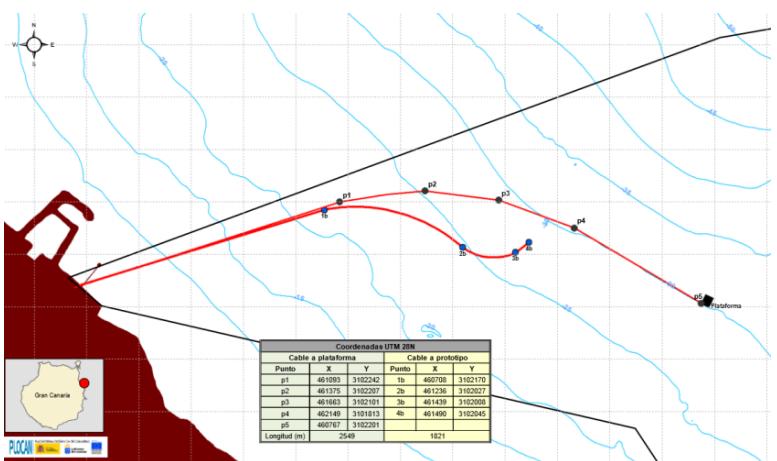


Figure 8. Route of the electricity lines

The work was done in 2017 for installing the terrestrial cables for the terrestrial electricity system, along with installing the switching station and the power transformer in the Jinámar power station.



Figure 10. Supply and installation of the power transformer in the Jinámar power station



Figure 9. Channelling for the marine-terrestrial electricity lines

The test site has the support of the on-shore offices, located in Taliarte, next to the Port of Taliarte, about 8km from the airport and 20km from the city of Las Palmas GC and the Ports of Las Palmas. This area has meeting rooms, workshops, operations control rooms, submarine vehicle workshops and calibration tanks for submarine vehicles, laboratories (wet and dry), classrooms, offices and multi-purpose rooms.

The facilities and equipment associated with the test site are as follows:

**FACILITIES IN THE PORT OF TALIARTE** The Port of Taliarte is the home port or base, with a capacity for 100m of frontage for berthing with water and electricity supply, a minimum depth of 4.5m and installations (2,000 m<sup>2</sup>). The port also has a slipway to provide access to the sea that facilitates the operations aimed at testing vehicles, two 40m storehouses, two 1000mm pipes for connecting sea-shore-sea and multiple communication and control systems.

**CONTAINERS OFF-SHORE AND ON-SHORE** Area of off-shore and on-shore 20 and 10-foot containers for storing and transporting equipment

**HF RADAR.** Radar for monitoring surface marine currents and wave action. Model: CODAR Seasonde

**SHIPPING RADAR** Maritime traffic surveillance at the test site. Model: 12 kW X-band radar

**TWO VESSELS** Operated by PLOCAN staff. VESSEL 1: PLOCAN 1 that can hold up to 12 people. Length 11.84m, Beam: 3.50m, Maximum speed: 45 knots. PLOCAN 2 can hold up to 5 people. Length 5.20m, beam: 2.18m, maximum speed: 40 knots

#### **CDTICMar EQUIPMENT**

- ◆ CIC – Integrated Shore-Sea Communications Centre: Shore-sea communications point between facilities: the test site, the off-shore platform and its shore station. This includes communications technologies like: satellite, WiMAX, TETRA and marine band.
- ◆ IPD – Data Processing Technology and Infrastructure: This is the place where information is processed. It has the resources to provide Cloud-based Computing services and virtual servers. The infrastructure has a NAGIOS alarm control system, 8 HP Proliant SL2500 servers, a storage area network (SAN) HP 3PAR StoreServ 7200 and two uninterrupted power feed source systems (UPS) HP R5000 INTL.
- ◆ IDF – Demonstrations and Support Skill-Building Infrastructure: Environment of dissemination and co-operation that acts as a space for organising events in the marine and maritime sector, a training centre, presentation of commercial products and services between business, universities, public institutions and suppliers and clients. It includes a 2x3 Samsung UD55C video wall, a Polycom RealPresence500 video conference system, 5 Dell Optiplex 9020 work stations, 5 Fujitsu Lifebook E754 HM86 lap-tops, 5 Samsung Galaxy Tabs 10.5 " tablets.

**DRONE** autonomous unmanned aerial vehicle (UAVs), remotely controlled with on-board sensors and GPS. Model: Phantom 4.

**SECURITY CAMERAS (3 UNITS)** The fixed Axis Mod Q6035E dome cameras (2013) are compact cameras with a domed housing. They are located directly and strategically on PLOCAN infrastructures for supervision of all the components installed on the test site.

**VAN VW COMBI TRENDLINE LONG 2.0 TDI 140HP** Support for logistics activities at the test site.

**AUXILIARY BUOYS (2UNITS)** Auxiliary buoy, with a 1.6m hull made from roto-moulded polythene filled with extruded polystyrene, ensuring floatation in the event of breakage. Its steel structure supports the mooring and the tower evenly, distributing loads on the upper surface of the hull.

Work has continued in 2017 at the test site on a series of actions aimed at **observing physical-chemical marine parameters, both from boats and from fixed platforms**. The most important actions were as follows:

- **Two hydrographic campaigns from an oceanographic vessel.** These were conducted aboard the Ángeles Alvariño, oceanographic vessel belonging to the Spanish Oceanographic Institute (IEO,in Spanish), in April and September, measuring temperature, salinity, oxygen, chlorophyll, pH, turbidity, nutrients, heavy metals and hydrocarbons at 5 sample points.



Figure 11. Oceanographic vessel and a moment from the campaign

- **Real time monitoring of physical-chemical marine parameters using ODAS buoy.** In April 2017, the buoy moored in 2016 was removed for maintenance operations and to up-grade the sensors. The data from this buoy is received daily at the PLOCAN servers and it can be viewed on the web site at the following link: <http://siboy.plocan.eu/>

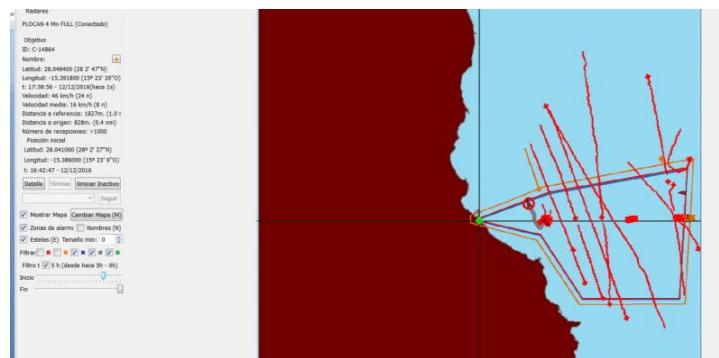


Figure 12. ODAS buoy and web portal

- **Installing a high-frequency radar for monitoring marine currents.** In November 2017, PLOCAN installed a system for monitoring marine currents on the North-East coast of Gran Canaria. The system is based on high-frequency radar technology using a CODAR SeaSonde model, marketed by Qualitas Instruments. The system is comprised of two antennae situated in the Port of Las Palmas on the Nelson Mandela Wharf and in Taliarte (Melenara) at the PLOCAN shore offices. The system operates on a frequency of 25 MHz and has a geographic cover of approximately 50 km with a spatial resolution of 500 m, offering data on surface marine currents (intensity and direction). As a by-product, it also offers data on wave action, albeit more limited and only in the geographic surroundings of the antennae.



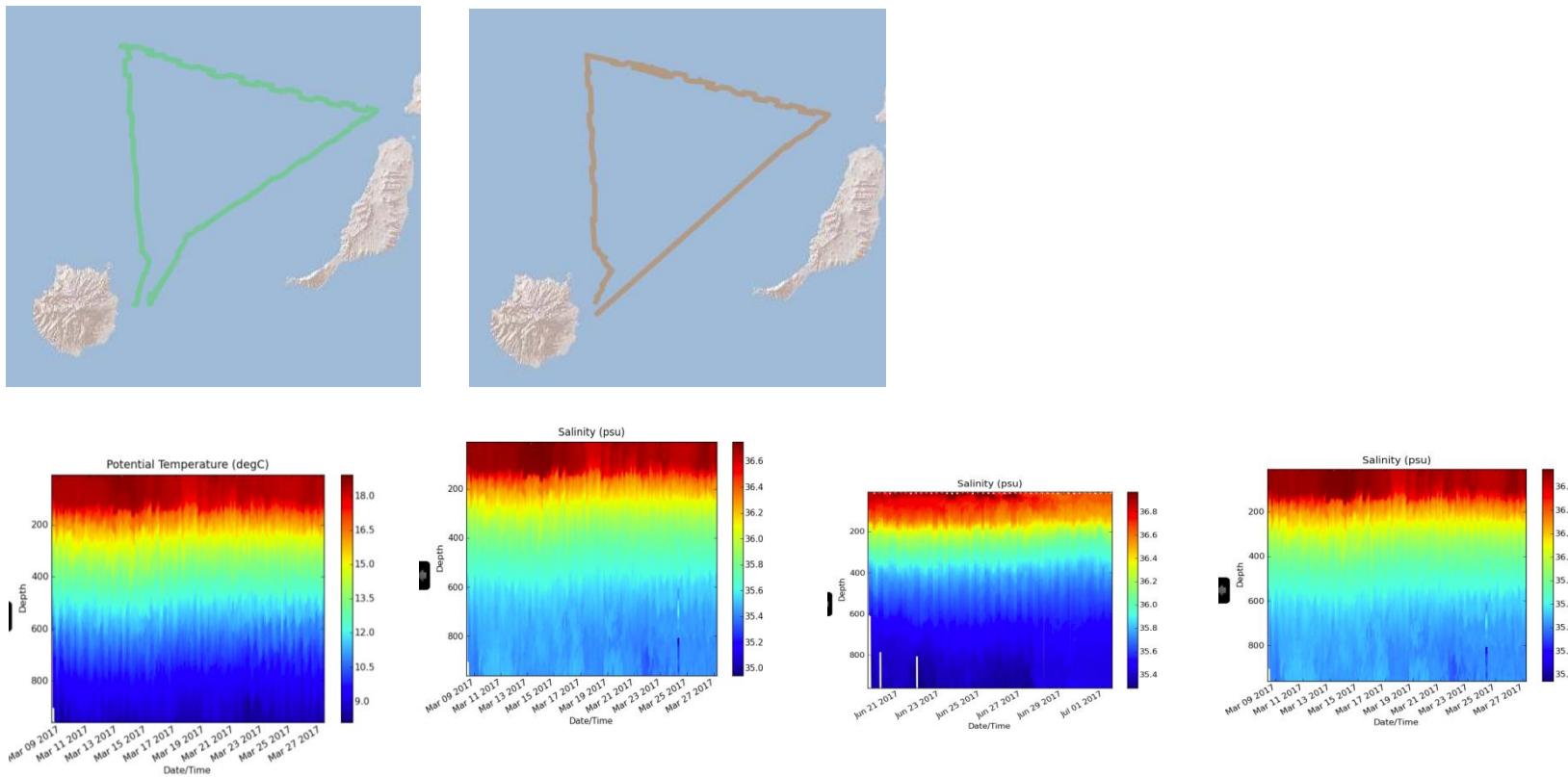
- Radar surveillance of shipping traffic in the test site area.** In 2017, the control software of the VIPICUL surveillance system installed in 2016, was up-dated. This was initially to monitor shipping traffic in the area of the test site. This is now available via the web site, making it easier to handle. The system is comprised of a radar antenna and data-processing software that allows the vessels sailing through the test site to be seen in real time. The radar antenna is located on shore in the offices of the EMALSA. PLOCAN has a co-operation agreement with this company covering scientific-technical activities and the use of their facilities.



- Developing an on-line geographic information system.** Work has continued this year on developing an on-line geographic information system (GIS) to show the test bank environmental information on the web site. The viewer under development currently includes the following information: bathymetry, biodiversity, geo-physics, marine planning (protected spaces, administrative limits, etc.), and wind resources.



- **Observing physical-chemical parameters with autonomous submarine vehicles (gliders).** Gliders are fitted with sensors capable of measuring the following parameters: temperature, salinity, oxygen, chlorophyll and turbidity. Two missions have been carried out in 2017 with the slocum glider. The first mission, ESTOC2017\_1, between the 8th and the 27th of March, and the second, ESTOC2017-2, between the 19<sup>th</sup> of June and the 7<sup>th</sup> of July. The results can be seen on the glider web portal developed by PLOCAN ([www.gliders.plocan.eu](http://www.gliders.plocan.eu)).



The **test site environmental surveillance programme for the REDSUB, ELICAN and WUNDERHEXICO programme** was carried out at the same time and in the same space in 2017

The aim of the **REDSUB project** is to install and operate a submarine electricity and communications network on the test site. The Basic Environmental Impact Statement (DBIE, in Spanish) issued in April 2013 by the Canary Island Government set out a detailed environmental surveillance plan in association with the work to install the cables. Work started on the installation in April 2017 and the environmental surveillance plan was rolled out. The responsibility for doing this lies with the company that has the concession to install the cables, COBRA, with PLOCAN playing a supervisory role in order to guarantee that it is implemented in accordance with the DBIE. The installation work is programmed for completion in the first quarter of 2018, depending on weather and sea conditions that could limit operations at sea.

Environmental surveillance activities conducted to date include the following:

- Measuring hydrodynamic conditions using an ADCP current metre
- Measuring turbidity in the water column
- Measuring submarine noise
- Marine mammal sightings
- Submarine archaeology prospecting

The final layout proposed for the two submarine cables is shown in the figure below, with the environmental surveillance plan coming into force in the geographic area of the two cables.

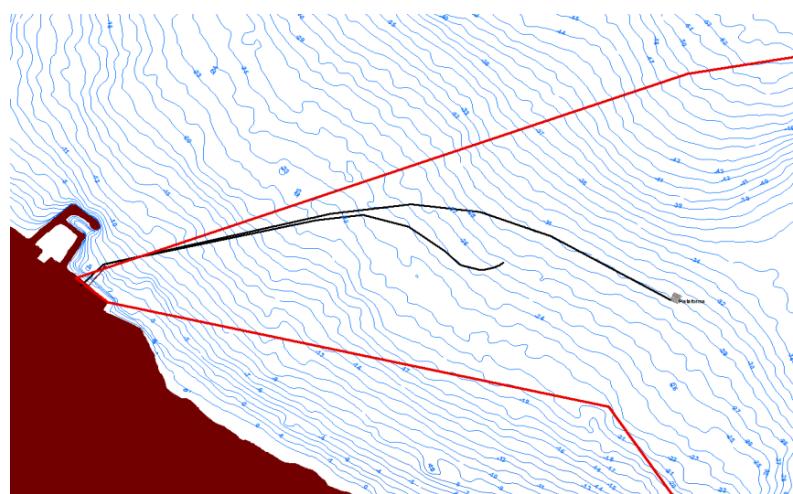


Figure 13. Layout of the cables

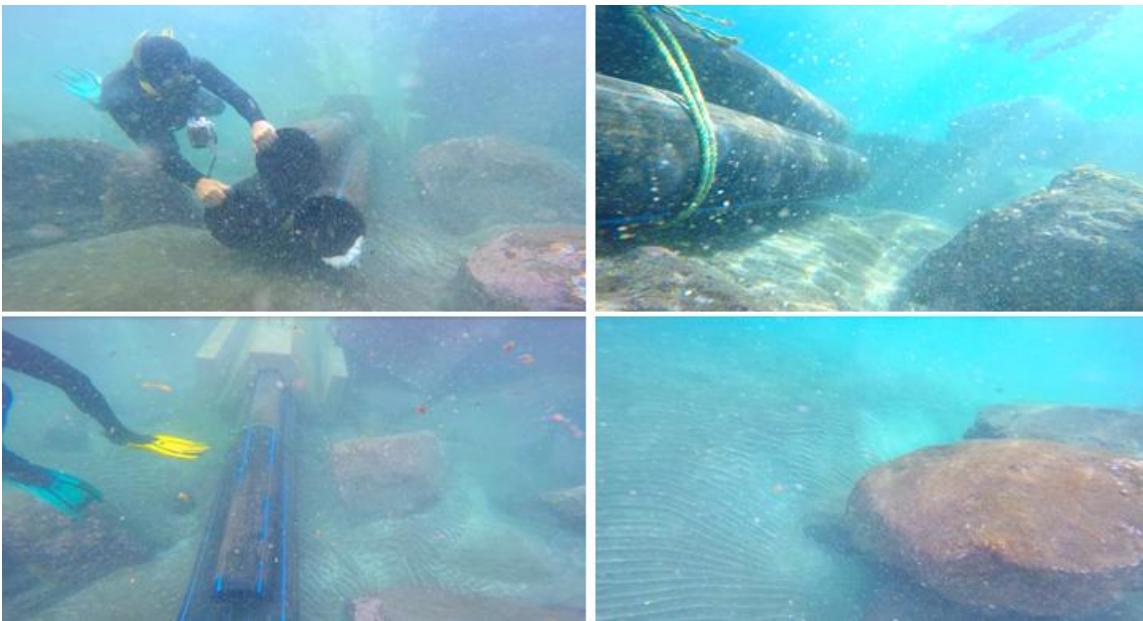


Figure 14. Channeling at the foot of the jetty for the two submarine cables to come ashore

The **hydrodynamics study** encompasses a study of the local marine currents. This has been done using a Sontek Argonaut XR acoustic Doppler current profiler (ADCP) installed in the position indicated in the following figures. This equipment records the Eulerian currents in the water column (velocity and direction), taking readings at different depths from the seabed to the surface.

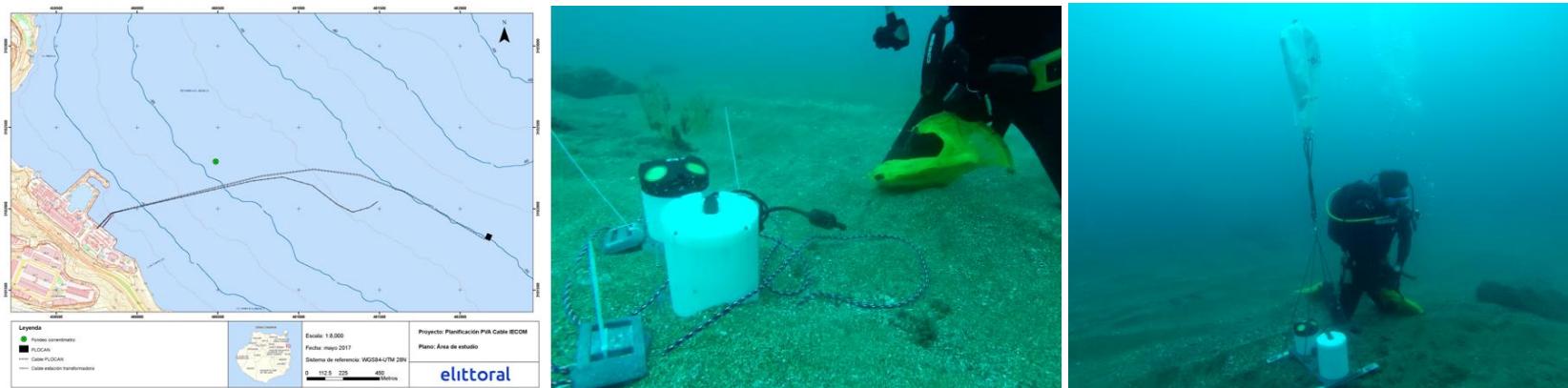


Figure 15. Location of the current profiler and photos of the installation

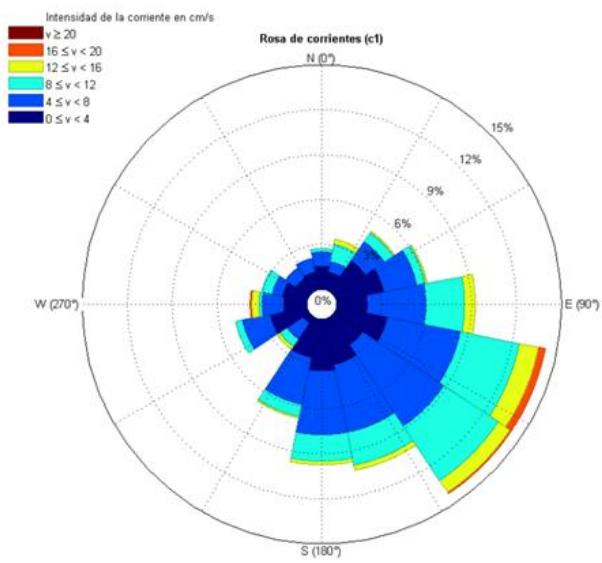


Figure 16. Current rose

Four measuring points were established around the cables for measuring turbidity. The turbidity results did not in general increase by more than 2 NTUs at any of the four points during the works. It is worth pointing out that there are no binding standards to regulate the acceptable limit of turbidity for natural surface waters. That is why Royal Decree 817/2015, 11th of September, was taken as a reference. This decree establishes the criteria for monitoring and assessing the state of surface waters and environmental quality standards. In this case, the good or upper/moderate limit for turbidity in frequently-renewed coastal Atlantic waters in areas affected by the presence of ports is 9 NTU. The results obtained are within this limit.

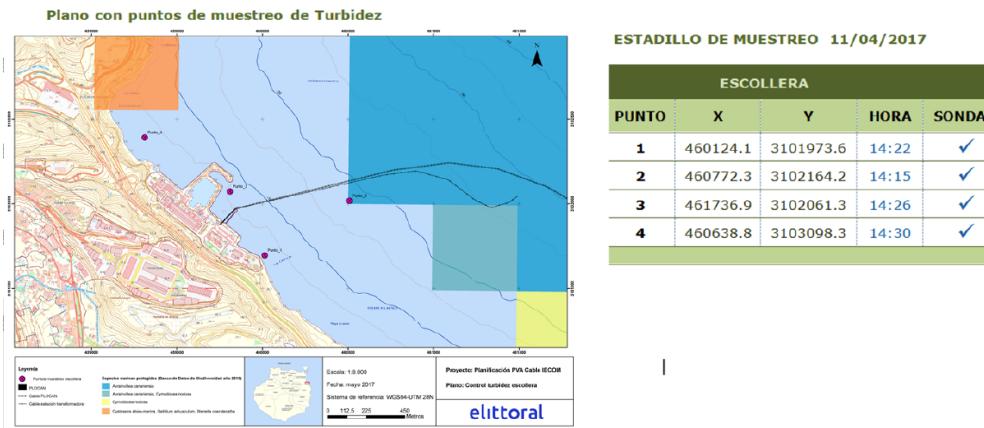
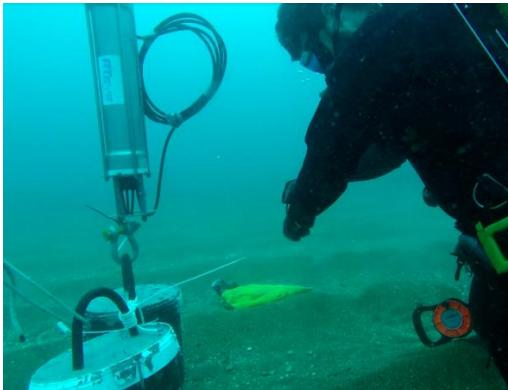
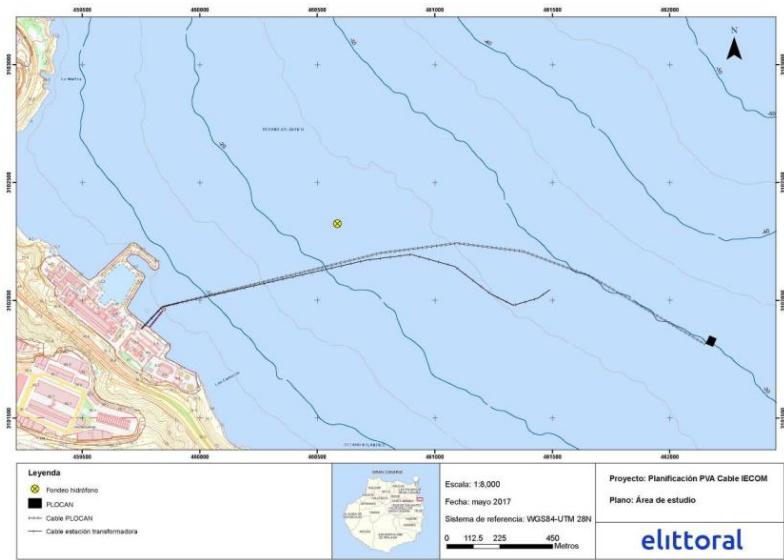


Figura 1. Plano de localización de los muestreos de turbidez en la escollera sedimento (puntos fucsia).

Figure 17. Sampling schedule for monitoring turbidity around the breakwater

The Environmental Surveillance Plan establishes that submarine noise will be measured before, during and after the installation works. The first measurements were taken in May 2017. A system comprising an EZ-SDA\_14 recorder and a RESON TC4032 installed 100 metres to the north of the cables, at a depth of approximately 23 m, was used for the study.



The results revealed that the noise level in the recordings remained within the range at levels within the limits.

**Marine mammal sightings** were made from aboard a vessel sailing previously-defined transects, shown in the following figure. The personnel in charge of this activity, along with the crew of the vessels, carry schedules with them in case they make any sightings during their voyages or manoeuvres. To date, no sightings have been made in the area, and no sightings are expected, given the proximity of the coast and the two submarine cables.

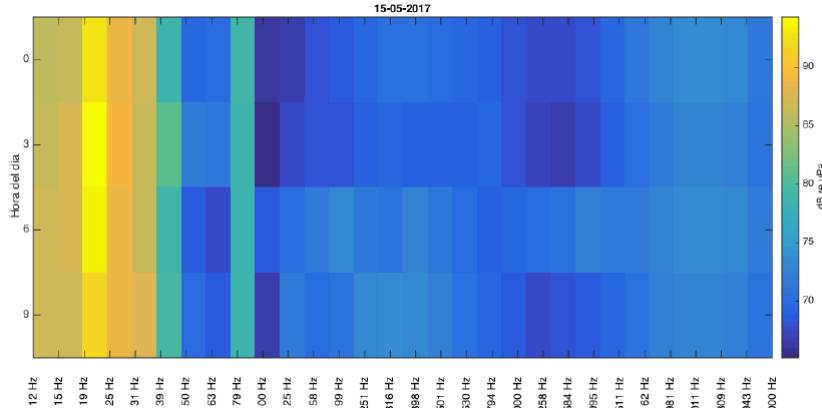


Figure 18. Noise levels by the hour in the 10 Hz band at 10 KHz for the 15<sup>th</sup> of May 2017

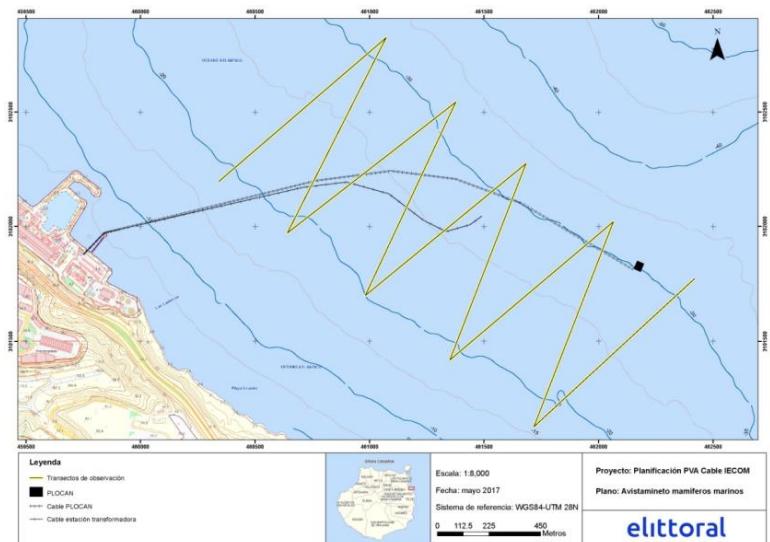


Figure 19. Marine mammal sighting plan

The submarine archaeological study is aimed at identifying possible archaeological remains in the area where the cables are being installed. This study was ongoing at the end of 2017.



Figure 20. Photos of the implementation of the archaeological report



The environmental information provided by PLOCAN was used for the environmental impact study as part of the ELICAN Project described in the projects section.

## OBSERVATORY

The mission of the PLOCAN multi-disciplinary observatory is to contribute to monitoring and modelling coastal, regional and global phenomena and eco-systems on increasing geographic scales, from shallow waters to major oceanic depths and monitor the environmental impacts and mitigation for all the scientific and technical experiments, such as testing instrumentation, operations in deep waters and the training activities of the platform. Finally, one of the objectives is to offer a large but constantly controlled area for testing deep observations systems, offering benchmarking, calibration and instrument validation services.

The equipment associated with the observatory is as follows:

- ◆ ACOUSTIC DOPPLER CURRENT PROFILING SENSOR Acoustic Doppler Current Profiler. Monitoring currents and waves. Model: RDI 600 kHz
- ◆ HYDROPHONES WITH SUBMARINE ACOUSTIC RECORDING SYSTEM Monitoring and recording marine sound waves in-situ. Model: RESON TC-4032
- ◆ PH MEASURING SENSOR Measuring pH in samples with low salinity.
- ◆ SEDIMENT TRAP (2 units) These are used in the study of vertical particle flows during a given time, by collecting these particles in individual flasks for analysis afterwards
- ◆ PHYTOPLANKTON SAMPLER This autonomously collects samples over defined periods of time for the analysis of trace metals, phytoplankton and/or suspended particles in the water column.
- ◆ MULTI-PARAMETER PROBES, CONDUCTIVITY, TEMPERATURE, CTD FOR OCCEANOGRAPHY. Equipment for profiling and recording data. Equipped with pressure, temperature, pH, dissolved oxygen, conductivity, chlorophyll and sound velocity sensors. It is used mainly in oceanographic campaigns and for validation in the laboratory.
- ◆ SP100-SM MARINE HIGH-PRECISION SPECTRO-PHOTOMETRIC pH SENSOR. For measuring pH autonomously in sea water. It is moored at pressures similar to laboratory pressure.
- ◆ OCCEANOGRAPHIC BUOYS For in-situ monitoring of meteorological and oceanographic parameters. The main oceanographic parameters measured: temperature, conductivity, pH, dissolved oxygen, turbidity, chlorophylls. The main meteorological parameters measured: Temperature, wind, pressure and solar radiation.
- ◆ PH METRO LAB 913 Measures pH in samples with low salinity.
- ◆ PORTABLE TURBIDIMETER 2100Q. It is used to measure turbidity in sea water samples and for calibrating turbidity sensors. Model 2100Q, HACH
- ◆ AQUAPRO 400 KHZ PROFILERS (2 UNITS) For monitoring currents and waves. Model: 400 kHz

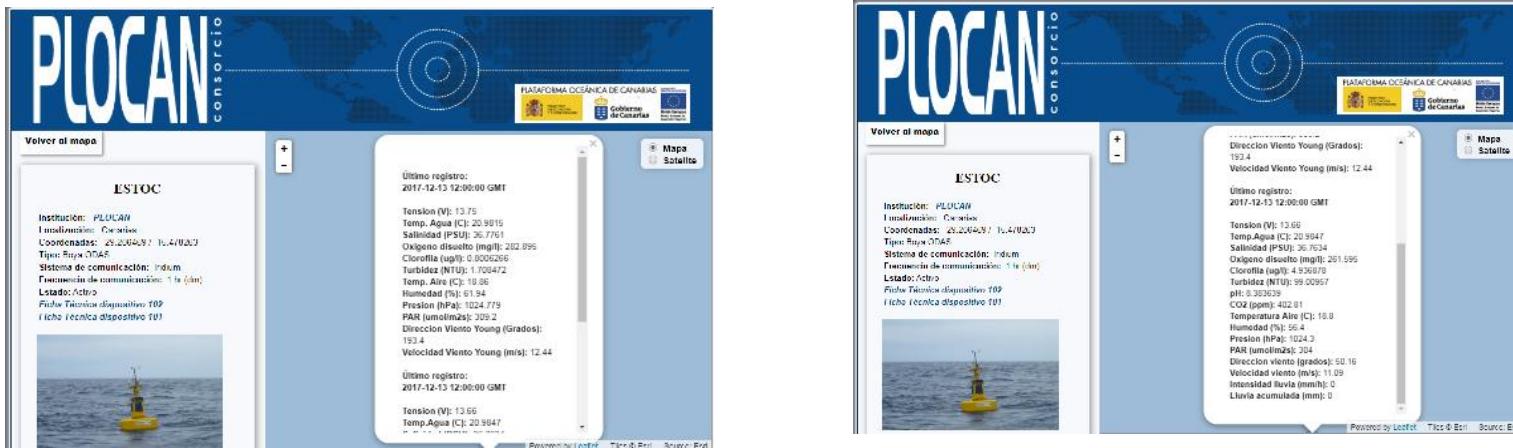
- ◆ HYDROPHONE TC4032 hydrophone with submarine data recording system (3 units). For monitoring and recording marine sound waves in-situ. Model: RESON TC-4032
- ◆ SUBMERSIBLE ACOUSTIC DAQ Acoustic data acquisition system to use on board that measures acoustic data in marine structures when using a remotely-operated vehicle (ROV)
- ◆ CONDUCTIVITY AND TEMPERATURE SENSORS For measuring temperature and conductivity in samples to then estimate salinity values.
- ◆ MONOPOINT DOPPLER CURRENT METER For monitoring currents and waves. Model: RDI 600 kHz.

Pursuant to the 2017 scheduled annual planning for the **ESTOC time series station**, PLOCAN carried out two buoy exchanges and moored them on the sea bed from the oceanographic vessel Ángeles Alvariño that belongs to the IEO fleet. It also conducted maintenance operations on the station in April and September. During this year, two projects were implemented that had been approved for funding as part of the Trans-National Access of the FixO<sub>3</sub> project. This project finished on the 31st of August, although more than one user wanted to keep the components in the September campaign.

The buoy includes meteorological and oceanographic sensors to take measurements at the sea surface. There are also oceanographic sensors on the bottom, at a depth of 100m (e.g. microcat and fluorometer) and a frame or protector at 150m with an array of sensors including a FixO<sub>3</sub> TNA one and another NEXOS one. Furthermore, the mooring includes 4 larvae traps for larvae located at 4 different depths (600m, 800m, 1200m and 3580m) from the other FixO<sub>3</sub> TNA project and a sediment trap at 1600m as part of the AtlantOS project.

<i>Several variables measured and their modes in the ESTOC buoy and mooring</i>		
<u>Hydrodynamics</u>		<u>Continual Mode</u>
ADCP, Current meter		Currents
NOAA drift buoy		Sub-surface currents
<u>Meteorology</u>		<u>Continual Mode</u>
Surface buoy	Air pressure, air temperature, relative humidity, precipitation, wind intensity and direction, PAR (parameters arrive in real time)	
<u>Oceanography</u>		<u>Continual Mode</u>
Surface buoy	Pressure, temperature, salinity, oxygen, CO <sub>2</sub> , pH, turbidity, chlorophyll (parameters arrive in real time)	
Mooring between 100 and 150m	Pressure, temperature, salinity, oxygen, nitrate, pH, turbidity, chlorophyll	
<u>Oceanography</u>		<u>Discreet Mode</u>
CTD sampling/Rose (at least twice per campaign)	CTD: pressure, temperature and salinity continuously throughout the water column. Rose: 24 depths down to 3500m. Sea water samples are taken as basic measurements for oxygen, 2 CO <sub>2</sub> parameters (ULPGC), nutrients, chlorophyll, pigments and salinity. In general, the analyses are conducted in laboratories on-shore. Exceptionally, other measurements such as micro-plastics.	
<u>Others</u>		<u>Continual Mode</u>
Hydrophone at 150m	Submarine noise	
Larvae traps with different substrates	Analysis of material found (e.g. different species)	
Sediment trap	Analysis of material found (e.g. sedimented particles)	

Data acquisition continued from April, with the data from the buoy arriving in real time and those from the water column later, once the mooring is collected.



2017 saw the start of using the PLOCAN drone during the on-board campaigns to record the deployment and recovery manoeuvres of the ESTOC buoy/mooring.



Figure 21. Photo of the oceanographic campaign on the test bed

### 3. SERVICES

#### HOSTING

This service encompasses the hosting of equipment, devices and marine technologies for the activities of trials, experiments or other resources of the users in any of the ICTS facilities and especially on the test site. The hosting services involve regulated rights and conditions for using the facilities and also associated services like transport, installation, maintenance, monitoring, de-installation, permits, accommodation, insurance and others. The cost of using vehicles, equipment, facilities and technical support is equivalent to adding 25% of the indirect costs to the direct costs (approved by the Executive Board in May/2013).

Financed by the Ocean Art-Up Project and co-ordinated by Geomar, 40 researchers from this institution, which in turn, is part of the University of Las Palmas de Gran Canaria, and Bigelow Laboratory for Ocean Sciences carried out their Kosmos GC2017 experiment with the support of PLOCAN. The Project sought to analyse the feasibility, effectiveness, associated risks and the possible side effects of using artificial oceanic up-wellings to fertilise oceanic productivity and on improving the transfer of energy to higher trophic levels, to potentially increase fish production. The experiment was also part of practical sessions for students of the Masters in Biological Oceanography (BIOC) of the Christian-Albrechts-Universität of Kiel. The Kosmos GC2017 experiment was conducted between August and October in the waters of the Taliarte dock, with the installation of 8 8000-litre mesocosms on the floating concrete pontoon of the dock.

As part of hosting the experiments carried out in previous years, the GEOMAR research group led by Ulf Riebesell, this group published the following in 2017:

- Dissolved organic matter dynamics during an oligotrophic ocean acidification experiment using large-scale mesocosms. Zark, Maren; Broda, Nadine; Riebesell, Ulf; Dittmar, Thorsten (2017)
- Influence of Ocean Acidification and Deep-Water Upwelling on Oligotrophic Plankton Communities in the Subtropical North Atlantic: Insights from an in situ Mesocosm Study. Jan Taucher, Lennart T. Bach, Tim Boxhammer, Alice Nauendorf, The Gran Canaria KOSMOS Consortium, Eric P. Achterberg, María Algueró-Muñiz, Javier Arístegui, Jan Czerny, Mario Esposito, Wanchun Guan, Mathias Haunost, Henriette G. Horn, Andrea Ludwig, Jana Meyer, Carsten Spisla, Michael Sswat, Paul Stange and Ulf Riebesell. *Front. Mar. Sci.*, 04 April 2017.
- Ocean Acidification Experiments in Large-Scale Mesocosms Reveal Similar Dynamics of Dissolved Organic Matter Production and Biotransformation. Maren Zark, Nadine K. Broda, Thomas Hornick, Hans-Peter Grossart, Ulf Riebesell and Thorsten Dittmar. *Front. Mar. Sci.*, 05 September 2017.



Figure 22. Kosmos experiment on the Taliarte dock in 2017



## DATA SUPPLY

The data obtained from ICTS resources in the area of the integrated observatory (coastal, oceanic and extended) are available to users freely and free of charge. Furthermore, PLOCAN's observational capacities supply a series of data and information from its facilities.

## OPERATIONS

This service uses the operational resources and capacities of PLOCAN to make the multi-purpose off-shore platform and outstanding vehicles available to users under regulated conditions. This may involve associated services regarding the installation, operation, maintenance, transport, insurance, de-installation and others. In May 2013, the Executive Board approved the daily cost for using the glider, with a minimum access of 3 weeks including insurance, operation (launch, piloting and recovery), data processing and the technical support necessary for operating it. For the other vehicles, equipment, facilities and technical support, it is the equivalent of adding 25% of the indirect costs to the direct costs (approved by the Executive Board in May/2013).

## 4. ACCESS

DESCRIPTION OF ACCESS	FACILITY	ENTITY	KIND OF ACCESS
Seasonal mission with glider to ESTOC (Deep node of the PLOCAN observatory)	Observatory	PLOCAN	Open
As part of the European NeXOS project, trial in a real operational scenario of the acoustic (A1) and optical (O1) sensors fitted to a mobile platform such as the Waveglider SV2 for assessing the NeXOS system	Multi-purpose Off-shore Platform	NeXOS Consortium	Open
As part of the European NeXOS project, trial in a real operational scenario of the acoustic (A1) and optical (O1) sensors fitted to a mobile platform like the PROVOR float, for assessing the NeXOS system	Multi-purpose Off-shore Platform	NeXOS Consortium	Open
As part of the European NeXOS project, Trail in a real operational scenario of the acoustic (A1) and optical (O1) sensors fitted on a mobile platform like the Waveglider SV2 to assess the NeXOS system	Multi-purpose Off-shore Platform	NeXOS Consortium	Open
Mooring two prototypes of the ANTEIA buoy on the test site	Test Site	Zunibal	Open

## 5. ORGANISATIONAL STRUCTURE (GOVERNING BODIES AND COMMITTEES)



The **Strategic Council** is the top body of government and administration of the Consortium, comprised of the chair person, a deputy chair and the members. The chair and deputy chair rotate successively every two years between MINECO and the Government of the Autonomous Region of the Canary Islands (CAC). The members represent MINECO and the CAC. The secretary, appointed by the Board itself, attends meetings, as does the director of the infrastructure.

The competences of the Strategic Council include establishing the guidelines and the general framework in which the project must be drawn up, set the rules, guidelines and general criteria for the Consortium to act and operate, approve the form of management that must govern compliance of its aims and to approve, at the proposal of the Executive Board, the Consortium's annual budget, annual accounts and the settlement of the previous budget. The chair of the Strategic Council acts as the highest representative of the Consortium.

Figure 23. Organisational structure of the PLOCAN consortium

The composition of the Strategic Council at the close of 2017 was as follows:

Chairperson

Juan María Vázquez Rojas, Secretary General of Science and Innovation of MINECO

Deputy Chairperson

Manuel Miranda Medina, Director General of the ACIISI

Members

José Ignacio Doncel Morales, Deputy Director General of Major Scientific-Technical Facilities

Marina Pilar Villegas Gracia, Director of the State Research Agency (AEI)

José Ramón Urquijo Goitia, Deputy Chair of Organisation and Institutional Relations of the CSIC



Eduardo Balguerías Guerra, Director of the Spanish Oceanography Institute

Adrián Mendoza Grimón, Deputy Minister of Industry, Energy and Trade of the Canary Island Government

Javier Armas González, Deputy Minister of Finance and Planning

Alexandra Betancort Reyes, Deputy Minister of the President's Office

The **Executive Board** is a governing body set up to monitor and carry out the Consortium's activities, made up of four representatives of the CAC, at least one of whom must be a member of the Strategic Council, and four representatives of MINECO, at least one of whom must also be a member of the Strategic Council. The chair and deputy chair of the committee will rotate with the same frequency as the Strategic Council, bearing in mind that the chair of both bodies may not be held by the same institution at the same time.

The Executive Board is the body responsible for putting the Consortium's proposed annual Budget to the Strategic Council for approval, along with the annual accounts and the settlement of the previous budget and a proposed annual plan of action, projects and the scientific programme to be carried out in the infrastructure. Below is a list of the latest composition of the Executive Board in 2017.

Chairperson

Manuel Miranda Medina, Director General of the ACIISI

Deputy Chair

José Ignacio Doncel Morales, Deputy Director General of Major Scientific-Technical Facilities

Members

Ángela Fernández Curto, Department of Major Scientific-Technical Facilities

Ana Aricha Yanguas, Head Area, Department of Major Scientific-Technical Facilities

María Jesús Marcos Crespo, Head of Area, Department of Major Scientific-Technical Facilities

Carlos Gustavo Díaz Perera, Director General of Planning and Budget

Ciro Gutiérrez Ascanio, Director General of Universities

Antonio López Gulás. Head of co-ordination and relations of Research, Innovation and Information Society of the ACIISI

The **Socio-economic Activities Advisory Committee** (CASE) is an advisory body to the Consortium. Its purpose is to advise on the PLOCAN's scientific and technological activities, programmes and plans and to propose future actions that could focus the work of the Consortium to contribute to the sustainable socio-economic development of oceanic activities.

The CASE is made up of a group of people of recognised prestige in the socio-economic fields relating to the purposes and activities of the Consortium. The functions of the CASE include drawing up an advisory report every four years on the opportunities, prospects and future capabilities of the centre. The report is presented to the Strategic Council to help them in the strategic orientation of the centre.



The composition of the CASE at the end of 2017 was as follows:

Chairperson:

Rafael Robaina Romero. Chancellor of the ULPGC (University of Las Palmas de Gran Canaria).

Members:

Rafael Rodríguez Valero. Director General of the Merchant Navy

José Luis González Serrano. Director General of Fisheries Planning

Vicente Marrero Domínguez. Chairperson of the Canary Island Maritime Cluster

Miguel Montesdeoca Hernández. Chairperson of the Canary Island Engineering Cluster

Blas Trujillo Oramas. Chairperson of the Canary Island Economic and Social Committee

Antonio Sánchez Godínez. Rear Admiral engineer, director of naval construction of the Ministry of Defence

Secretary:

Arturo González Romero. Director General of the INNOVAMAR Foundation

The **Scientific and Technical Advisory Committee** (COCI) is the other advisory body to the Consortium. Its purpose is to advise on PLOCAN's scientific and technological activities, programmes and plans and propose future actions that could improve the quality and scope of its work.

The COCI is made up of people of recognised prestige in fields related to the purposes and activities of the Consortium. Its members were appointed by the Strategic Council, at the proposal of the institutions that comprise the Consortium. The functions of the COCI include drawing up an advisory report every four years on the opportunities, prospects and future capacities of the centre, which is presented to the Strategic Council to help them in the strategic orientation of the centre.

The composition of the COCI at the end of 2017 was as follows:

Chairperson:

Prof. Gerold Wefer. Professor of the University of Bremen.

Members:

Dr Enrique Álvarez Fanjul, Head of the Area of Knowledge of the Physical Environment of the State Ports Authority

Dr María Soledad Izquierdo López, Professor at the University of Las Palmas de Gran Canaria.

Dr Alicia Lavín Montero, Researcher from the Santander Oceanographic Centre (IEO).

Prof. Chris Barnes, Professor of the University of Victoria (Canada).

## 6. PEOPLE IN PLOCAN

At the end of 2017, the PLOCAN team comprised forty-six people. Thirty-one of these were staff, ten were hired on R+D+i contracts and five belonged to the training and internship plan. The schematic below shows the internal organisational structure of the Consortium, with three different areas that the Consortium staff are divided into.

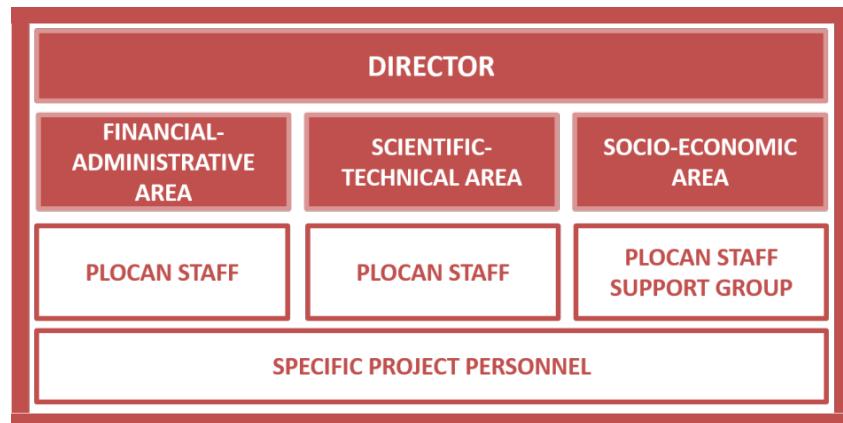


Figure 25. Areas of the PLOCAN Consortium



Figure 24. PLOCAN staff with authorities during the visit of the King and Queen of Spain

Furthermore, as shown in the figure above, the organisation has a support group in the socio-economic area. This group is made up of staff from the former Canary Island Institute of Marine Sciences that the Canary Island Government has assigned temporarily to PLOCAN as support during these early stages of creating the infrastructure in an environment that over the years, has made it impossible to hire the staff envisaged at the rate that was initially planned in the project.

The schematic below shows the age distribution of the PLOCAN staff (staff, projects and training/internships) at the end of 2017. Most of the staff falls into the thirty-five to thirty-nine age range.

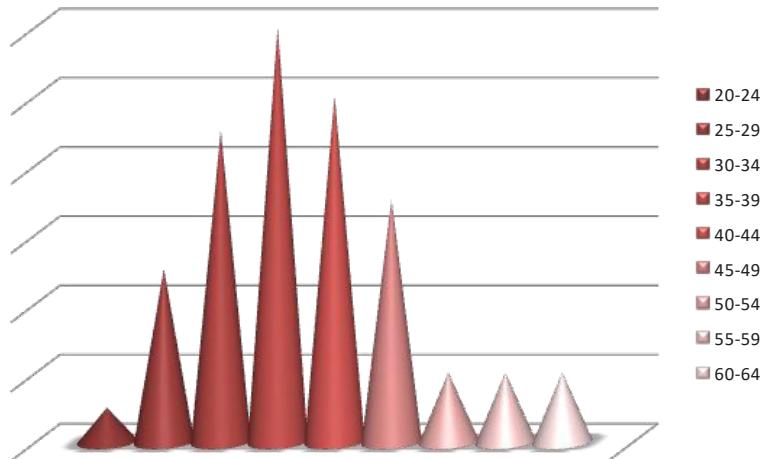


Figure 26. Age distribution of the PLOCAN staff

**35-39 AVERAGE AGE**

**58% MEN Y 42% WOMEN**

**30 ON THE STAFF**

**11 ON PROJECTS**

**5 IN TRAINING**

Figure 27. People at PLOCAN

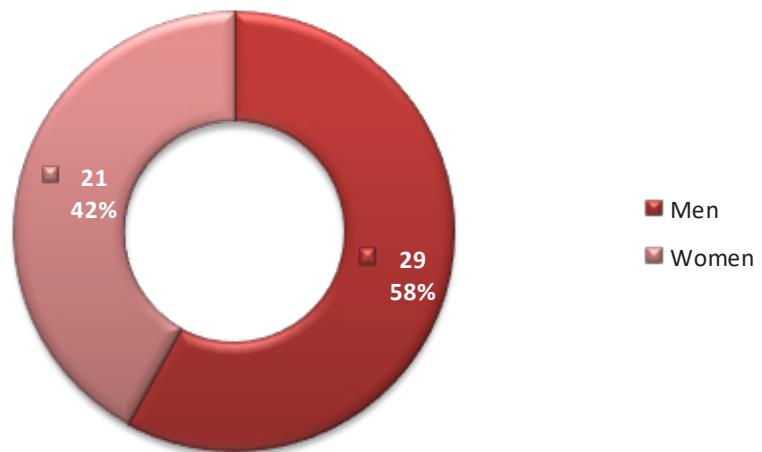


Figure 28. Gender distribution of the PLOCAN staff

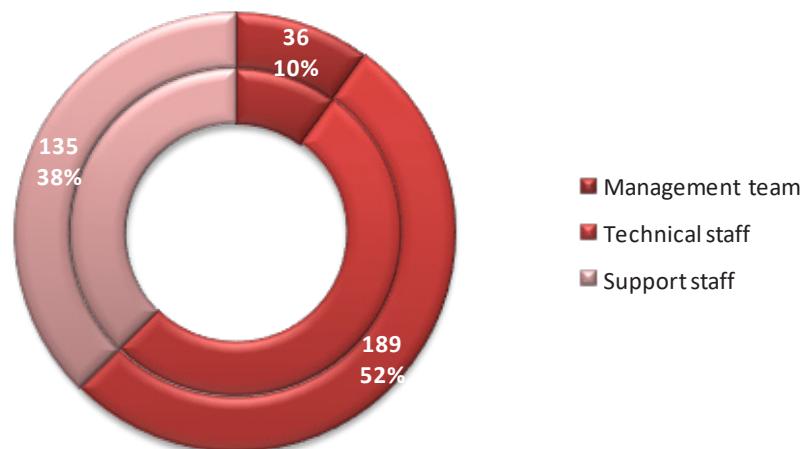


Figure 29. Person/month units at the different levels of the staff organisation

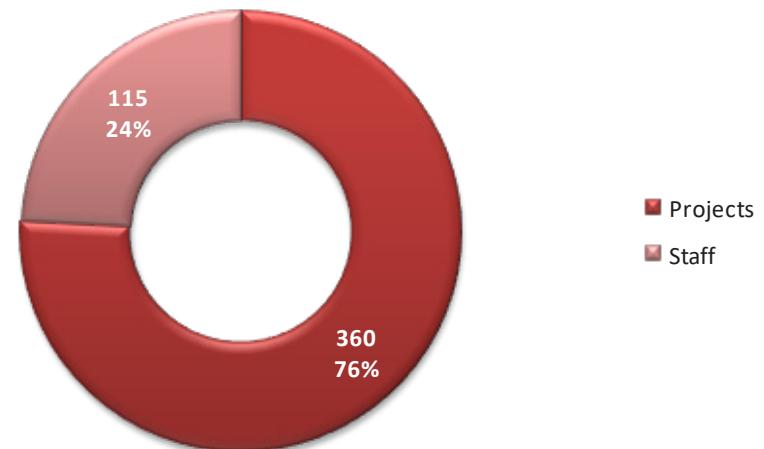


Figure 30. Persons/month units of staff organisation and implementing projects

The graphs below show the proportion between persons/month at the end of 2017 at the different levels of the organisation (full-time staff) and the proportion difference between persons/month units of staff implementing projects and the Consortium staff. Internship and bursary contracts are not included.

## 7. JOBS AT PLOCAN

9 calls for candidates were made in 2017, offering 13 employment contracts, and all the vacancies were covered. All the contracts were published on the PLOCAN web site and on the Canary Island Employment Service web site. Candidates presented their applications over the app enabled for the purpose that included all the necessary information for the selection committee to appraise their candidacies.

The graphs below analyse the proportion of men and women that sent their applications to the process, along with the gender of the candidates that were hired to cover the vacancies offered.

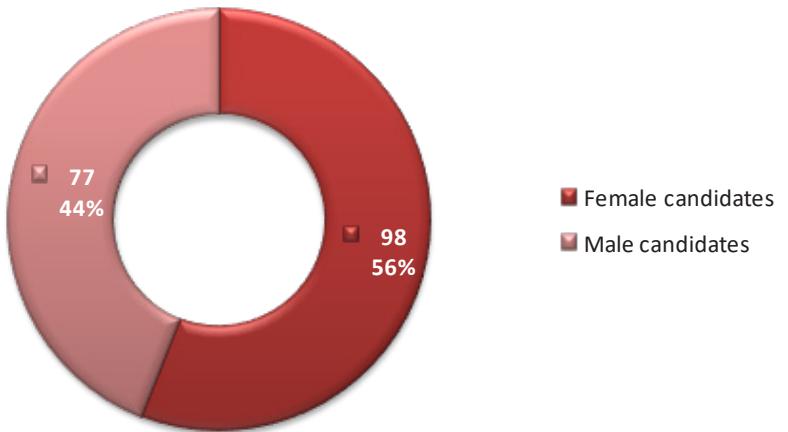


Figure 31. Proportion of men and women that presented their applications

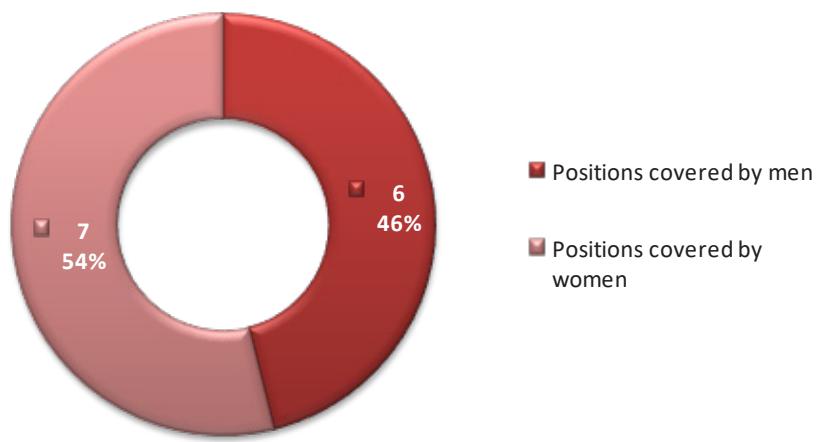


Figure 32. Proportion of men and women who covered the vacancies

## 8. PROJECTS IMPLEMENTED OR UNDER IMPLEMENTATION

Over the course of 2017, PLOCAN has managed a total of 34 projects, driving the constant presentation of new projects and maintaining and extending an extensive network of partners of multiple nationalities.

Proyectos clasificados por tipo de proyecto

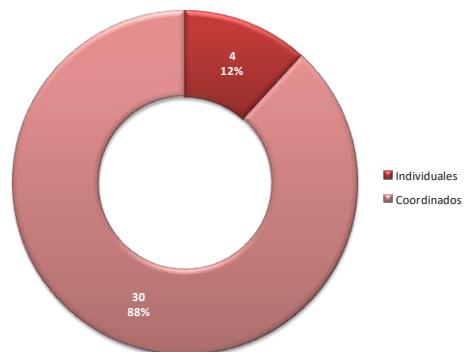


Figure 35. Classification by kind of project

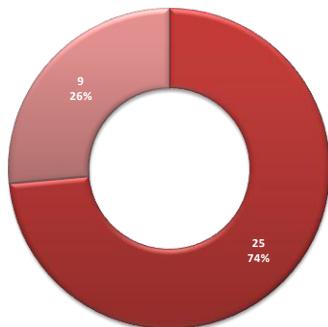


Figure 34. Projects by funding origin

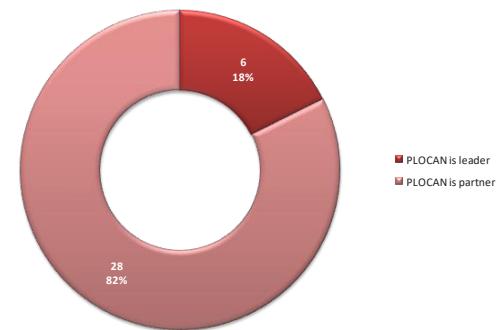


Figure 33. PLOCAN's role in projects

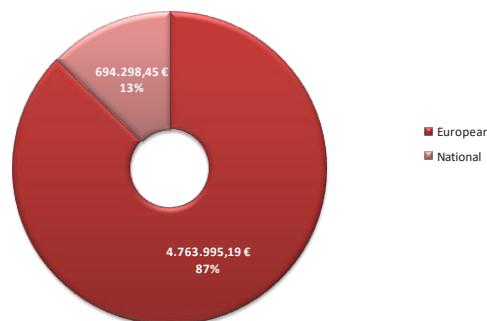


Figure 36. PLOCAN funding from projects

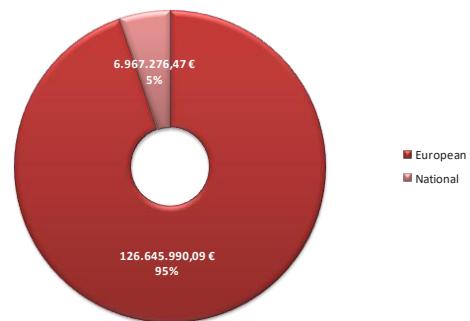


Figure 37. Total project funding

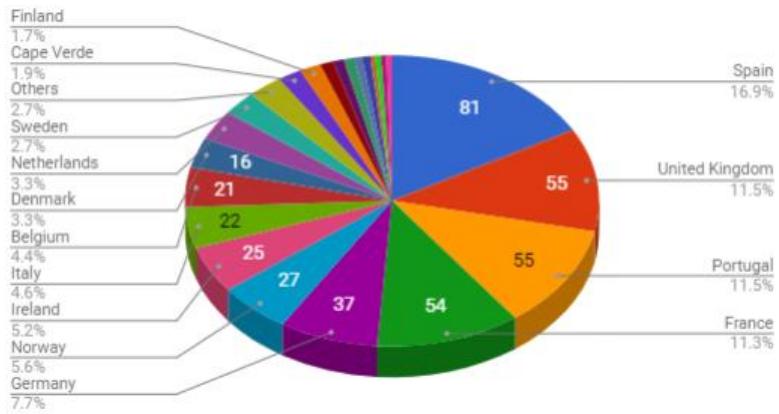


Figure 41. Partners of projects in which PLOCAN has participated by countries

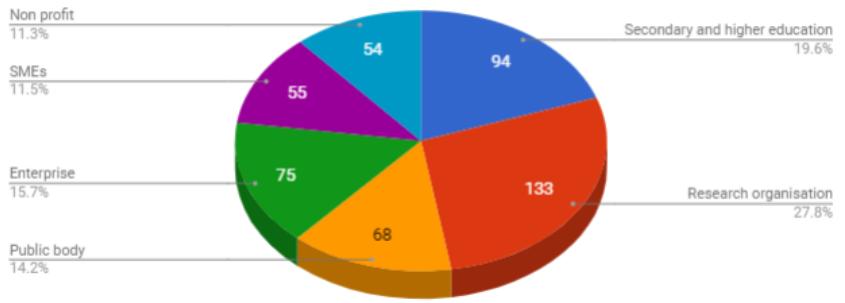


Figure 40. Partners of projects in which PLOCAN has participated by kind of organisation

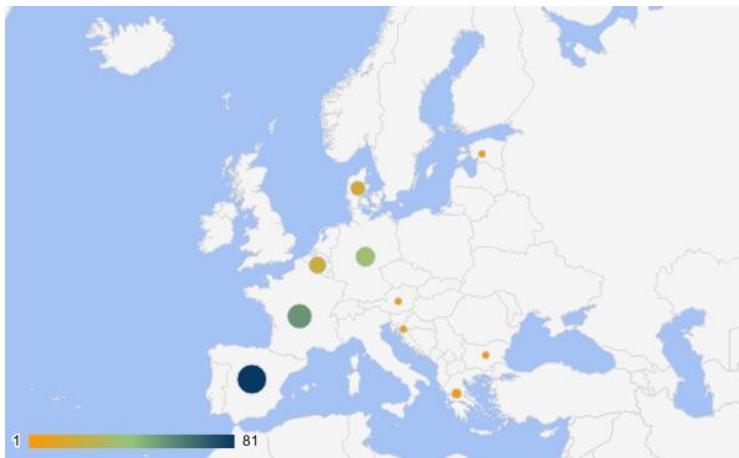


Figure 39. European distribution of project partners



Figure 38. World-wide distribution of project partners

## AORAC-SA

### Atlantic Ocean Research Alliance Support Action

Origin of funding: H2020-BG-2014-1 / BG-14-2014

Participation: Partner

Starting and ending date: 01/03/2015-29/02/2020

Total project funding: 3.447.000,00 €

Funding for PLOCAN: 247.000,00 €

Percentage of external funding: 79,36 %

The Atlantic Ocean Research Alliance Coordination and Support Action (AORAC-SA) is designed to provide scientific, technical and logistical support to the European Commission in developing and implementing trans-Atlantic Marine Research Cooperation between the European Union, the United States of America and Canada. The Coordination and Support Action (CSA) is carried out within the framework of the Atlantic Ocean Research Alliance as outlined in the Galway Statement on Atlantic Ocean Cooperation (May 2013). Recognising the evolving nature of the Atlantic Ocean Research Alliance, the hallmark of this proposal is that it is flexible, responsive, inclusive, efficient, innovative, value-adding and supportive.

To support the Commission in negotiations with the USA and Canada on trans-Atlantic Ocean Research Cooperation, the AORAC-SA support and governance structure comprises a Secretariat and Management Team, guided by a high-level Operational Board, representative of the major European Marine Research Programming and Funding Organisations as well as those of the USA and Canada. This structure is further able to draw on significant marine research expertise and experience through its partner organizations. The CSA, reporting to the Commission representatives of the Atlantic Ocean Research Alliance, will be responsible for the organisation of expert and stakeholder meetings, workshops and conferences required by the Atlantic Ocean Research Alliance and related to identified research priorities (e.g. marine ecosystem-approach, observing systems, marine biotechnology, aquaculture, ocean literacy, seabed and benthic habitat mapping), support actions (e.g. shared access to infrastructure, dissemination and knowledge transfer, establishment of a knowledge sharing platform) and other initiatives as they arise, taking into account related Horizon 2020 supported trans-Atlantic projects (e.g. BG1, BG8 and BG13) and on-going national and EU collaborative projects (e.g. FP7).

The AORA-CSA Project places PLOCAN in the position of a reference institution in the international context in matters of managing and co-ordinating R+D+i on the strategy of management policies for marine observation, for future actions and projects. PLOCAN leads WP5 concerning Ocean Observations to identify potential co-operation synergies for future actions and projects. At the same time, clear co-operation opportunities have been identified with Brazil, South Africa, Argentina and Morocco in the field of gliders (*capacity building and engagement*), which would be on top of existing ones with the USA. Co-operation synergies have also been

established with The Maritime Alliance in the context of world-wide international Marine Maritime Clusters. PLOCAN will play a significant role in co-ordinating with African countries.

A glider mission was carried out in May, from Ireland to the Canary Islands with the Silbo glider, as part of the international Challenger One programme. This action is carried out with EU-USA co-operation.

In June, as part of the international Educational Passages programme, educational boats were launched from Gran Canaria, with the participation of the Belgian VLIZ institution. This action was carried out with EU-CAN-USA co-operation.

The dissemination file on the project was drawn up:



PLOCAN took part in signing the Belém Agreement between the European Union, Brazil and South Africa that took place in Lisbon on the 13th of July at the "A new era of blue Enlightenment" conference. This treaty will allow for better co-ordination among the countries involved. The leaders of the different project work packages held a project meeting in parallel to the event.

On the 20th and 21st of November, PLOCAN took part in the "2nd High-level dialogue between Industry, Science and Government on Atlantic Interactions" – AIR Centre- International Atlantic Research Centre" with over 200 representatives of seven countries in Florianópolis (Brazil), which concluded with what is known as the Florianópolis Agreement, marking a step forwards in co-operation between the signatories to create a multilateral organisation in the Azores to conduct research into climate change, energy systems, space sciences and data in the Atlantic Ocean.

The project has been disseminated as follows:

- International Cargo Handling Co-ordination Association (ICHCA) conference held in Las Palmas de Gran Canaria in October
- International Workshop on Marine & Atmospheric Sciences in Western Africa held in Cape Verde in November
- Launch meeting of the iFado Project held in Lisbon in November
- General Assembly of the Atlantos Project held in Las Palmas de Gran Canaria in November

# ATLANTOS

## Optimizing and Enhancing the Integrated Atlantic Ocean Observing System

Origin of funding: H2020-BG-2014-2 / BG-08-2014: Developing in-situ Atlantic Ocean Observations for a better management and sustainable exploitation of the maritime resources

Participation: Partner

Starting and ending date: 01/04/2015-30/06/2019

Total project funding: 20.652.921,00 €

Funding for PLOCAN: 502.231,25 €

Percentage of external funding: 100 %

The overarching objective of AtlantOS is to achieve a transition from a loosely-coordinated set of existing ocean observing activities to a sustainable, efficient, and fit-for-purpose Integrated Atlantic Ocean Observing System (IAOOS), by defining requirements and systems design, improving the readiness of observing networks and data systems, and engaging stakeholders around the Atlantic; and leaving a legacy and strengthened contribution to the Global Ocean Observing System (GOOS) and the Global Earth Observation System of Systems (GEOSS). AtlantOS will fill existing in-situ observing system gaps and will ensure that data are readily accessible and usable. AtlantOS will demonstrate the utility of integrating in-situ and Earth observing satellite based observations towards informing a wide range of sectors using the Copernicus Marine Monitoring Services and the European Marine Observation and Data Network and connect them with similar activities around the Atlantic.

AtlantOS will support activities to share, integrate and standardize in-situ observations, reduce the cost by network optimization and deployment of new technologies, and increase the competitiveness of European industries, and particularly of the small and medium enterprises of the marine sector. AtlantOS will promote innovation, documentation and exploitation of innovative observing systems. All AtlantOS work packages will strengthen the trans-Atlantic collaboration, through close interaction with partner institutions from Canada, United States, and the South Atlantic region. AtlantOS will develop a results-oriented dialogue with key stakeholders communities to enable a meaningful exchange between the products and services that IAOOS can deliver and the demands and needs of the stakeholder communities. Finally, AtlantOS will establish a structured dialogue with funding bodies, including the European Commission, USA, Canada and other countries to ensure sustainability and adequate growth of IAOOS.

As part of the project, and more specifically, WP2, two publications have been presented, one on Marine Chemistry and the other on Biogeosciences. As part of WP2, a sediment trap was moored at a depth of 1600m at the ESTOC station in April.

An observation mission was carried out in February, with MARUM, SENSORLAB and GEOMAR, using the Wave Glider SV3 in the area of Cape Verde. The Wave Glider was deployed from the R/V MERIAN during the MSM61 oceanographic campaign, led by GEOMAR.



Figure 42. Photo of the oceanographic vessel moored at the dock

The study included the deployment and operation of a range of different observation equipment and autonomous platforms such as multi-parameter moorings on the seabed, surface gliders (Wave Glider, models SV2 and SV3) and profilers (Slocum G2-1000), all fitted with specific sensors for taking samples and data in-situ, to cover the scientific-technical needs of the mission and the project itself. The participation and contribution of PLOCAN in the MSM61 mission focused on deploying and operating an autonomous surface vehicle Wave Glider SV3 in co-operation with MBARI and MARUM, which was set up specifically in the months prior to the mission with an array of physical and bio-geo-chemical sensors, including a current meter based on Doppler acoustic technology (ADCP) and a pH meter based on latest-generation spectro-photometry, the latter

The purpose of the campaign was to study the physical and bio-geo-chemical characterisation of the outstanding ecosystem comprised by the Senghor sea-mount situated to the north of the Cape Verde archipelago, and to assess the operational capacity and response of new autonomous oceanic observation technologies in real operational scenarios. With a duration of ten days, the campaign was conducted in the waters of Macaronesia between Cape Verde and the Canary Islands, starting in Mindelo and finalising in the port of La Luz and Las Palmas, with the participation of the German institutions GEOMAR (Helmholtz Centre for Ocean Research), MARUM (Centre for Marine Environmental Sciences), Thünen Institute, the American MBARI (Monterey Bay Aquarium Research Institute), the University of Aveiro in Portugal, INDP (Instituto Nacional de Desenvolvimento das Pescas) of Cape Verde, the international OCDE organisation (Organisation for Economic Cooperation and Development) through their department of Innovation and Spatial and Oceanic Policy, with

offices in France, and the Canary Island Oceanic Platform (PLOCAN).

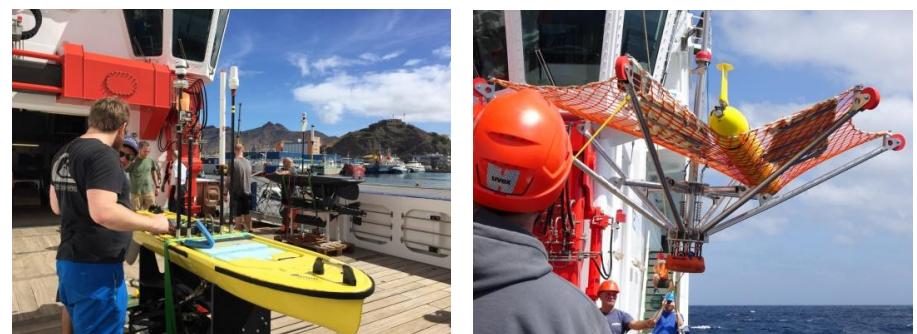


Figure 43. Photos of the oceanographic campaign

associated to a GPCTD-DO module for measuring temperature, conductivity, pressure and dissolved oxygen in sea water. Part of the development and integration of this multi-parameter module was carried out as part of the AEI-Gliders technology project, co-ordinated by the Canary Island Maritime Cluster, with the intervention of PLOCAN and MARUM along with the SensorLab and Liquid Robotics companies.

During the specific activities conducted as part of the project, the pH, dissolved oxygen and ADCP and fluorometer were lost as the cable they were attached to on the submerged unit of the vehicle was torn off, probably due to the high level of friction between the unit and the vehicle because of the large amount of encrusted fouling.

The ESTOC 2017\_I glider mission took place between the 8th and the 27th of March with the P202 glider, completed normally. During the first six months, the process of acquiring three new glider units was completed. The new equipment offers significant value added for PLOCAN, as it provides the ESTOC station with the possibility of increasing its bio-geo-chemical parameter observations both quantitatively and qualitatively. The dissemination sessions on the new equipment were carried out during this period. These sessions were given by staff from multinational McLane through its subsidiary Grafinta. Work was also prepared for presenting it at OCEANS'17 IEEE in Aberdeen in June 2017.



Figure 45. Course given by McLane in the PLOCAN facilities



Figure 44. PLOCAN technicians at Ocean Business 2017

As part of the Project, the members attended Ocean Business 2017.

The project general assembly was held at the PLOCAN facilities between the 20th and 25th of November with the attendance of approximately 200 participants.



Figure 46. Delegates at the project general assembly

## BIODIVERSA3

### BiodivERsA3: consolidating the European Research Area on biodiversity and ecosystem services

Origin of funding: H2020-SC5-2014-one-stage / SC5-09-2014: Consolidating the European Research Area on biodiversity and ecosystem services

Participation: Partner

Starting and ending date: 01/02/2015-31/01/2020

Total project funding: 11.999.980,50 €

Funding for PLOCAN: 132.069,96 €

Percentage of external funding: 34,49 %

**The loss of biodiversity and degradation of ecosystems jeopardize the sustainable provision of ecosystem services and are major scientific and societal challenges. Addressing this challenge and providing scientific support to stakeholders and policy makers requires a coherent interdisciplinary research framework, with coordinated strategies and programmes at the national, regional and international levels, which are the relevant scales for many biodiversity issues.**

By networking 32 funding agencies from 18 countries, BiodivERsA3 aims to strengthen the ERA on biodiversity. Building on the previous experiences of the projects BiodivERsA1&2 and NetBiome, BiodivERsA3 will promote and support coordinated pan-European research on biodiversity and ecosystem services. It will strengthen research and research programmes coordination with the ultimate aim to provide policy makers and other stakeholders with adequate knowledge, tools and practical solutions to address biodiversity and ecosystem degradation.

The objectives are to:

- Enhance the capacity of the network to coordinate research programmes on biodiversity and ecosystem services more completely in Europe (including overseas territories) and to increase the international dimension of BiodivERsA activities.
- Develop a strategic, multi-annual vision of the network's priorities, based on ambitious mapping and foresight activities developed in collaboration with key initiatives in the field.
- Design and implement a co-funded call and other joint calls to better integrate research on biodiversity and ecosystem services across Europe.
- Develop a range of other joint activities, in particular alignment of national research programmes for biodiversity and ecosystem services, and activities for promoting mobility and equal opportunities for researchers and reinforcing data sharing.
- Promote effective science-policy and science-society (including sciencebusiness) dialogue during the whole research process

PLOCAN was present at the workshop on alignment and the third general assembly that took place in Stockholm at the end of January, and at the fourth general assembly that was held on the 8th and 9th of June in Punta Delgada (Azores).The project data base was up-dated during the first six months and contains information on 11,802 projects, 17,880 experts, 45 funding agencies and 1,112 programmes.



The first call for projects distributed €34m and 3000 researchers took part. The extension working group reviewed the proposals that were not finally funded in order to identify the main reasons for this. Two questionnaires were sent out to researchers and funding agencies. The objective is to exchange best practises between funding agencies and provide support for candidates to contact other countries. Another objective is to lever important international events to organise information days on them to make contact meeting points for researchers interested in the call for projects.

## CATAPULTA

### PLOCAN as catalyst of innovative marine projects

Origin of funding: Programa Estatal de Fomento de la I+D+i Orientada a los Retos de la Sociedad / Acciones de Dinamización "Europa Redes y Gestores"

Participation: Only partner

Starting and ending date: 01/01/2015-31/12/2017

Total project funding: 143.000,00 €

Funding for PLOCAN: 143.000,00 €

Percentage of external funding: 100 %

**The main endpoint of the CATAPULTA project is to deploy PLOCAN's potential to win and consolidate international financing to attract marine and maritime R+D+i to Spain and ensure its consolidation here. From a strategic standpoint, this will be aimed at:**

- Enhancing the capacity-building and management of the number of proposed projects, for both ICTS users and for the PLOCAN infrastructures in the new European Union Framework Programme Horizon 2020 and other international programmes (COSME, Interreg, Eurostars, etc.)
- Fine tuning and bringing specifications in line with international standards and best practises, to improve the quality of the PLOCAN's Integral R+D+i Project Management System, from conception to rationale.

CATAPULTA will run for 3 years with an estimated starting date of 1st January and finishing on 31st of December 2017. In order to attain the main objective, the project is structured in accordance with the following specific objectives:

1. Develop the area of attracting resources and preparing proposals for international projects for ICTSPLOCAN users
2. Create and roll out a continuous training programme in the European Union's Horizon 2020 Framework Programme and accredit new personnel on an international level in project management
3. Reinforce and optimise the PLOCAN Integral Project Portfolio Management System.

The expected result of these actions is that PLOCAN sees at least a 70% increase in the number of proposals presented to the H202 programme against its participation in the FP7 programme, over the course of the 3 years of the project, both in projects to be hosted by the PLOCAN infrastructure and those aimed at fostering European participation among infrastructure users and that all this translates into at least a 95% increase in proposal approvals.

As part of Catapulta, a public consultation was made on the Strategic Research and Innovation Agenda-SRIA aimed at organisations, with a total of 55 valid responses from organisations devoted to research. The implementation plan for 2017-2019 was drawn up in the first quarter.

During the first half of the year, project experts wrote several reports and presentations on new lines of funding for the European H2020 Framework Programme. The area of resource capture and preparation of international projects worked hard throughout the year, drafting a total of 17 proposals that were presented and 5 approved. The also undertook the negotiation procedures for the approved proposals. During the life of the project, over 100 calls for projects for international, national and regional funding have been analysed to generate new opportunities for POCAN. More specifically, the topics 2018-2020 of the H2020 programme were analysed. At the same time, the project attended several networking events and conferences.



Figure 47. Meeting with Sintef Ocean

Along with these latter two institutions and Astican, a conference was held to identify new lines of co-operation. These activities drove the development and consolidation of the area of resource capture and preparation of proposals for international projects.

The main actions implemented in 2017 in this project are aimed at reinforcing PLOCAN's position on the international stage, attracting resources and fostering the participation of the infrastructure in international consortiums. Capturing resources and projects helps to attract qualified personnel. The project has also co-operated in fine-tuning the integral project management system.

The project was completed at the end of the year.

# COLUMBUS

## Monitoring, Managing and Transferring Marine and Maritime Knowledge for Sustainable Blue Growth

Origin of funding: H2020-BG-2014-1 / BG-11-2014: Monitoring, dissemination and uptake of marine and maritime research

Participation: Partner

Starting and ending date: 01/03/2015-28/02/2018

Total project funding: 3.997.488,00 €

Funding for PLOCAN: 49.000,00 €

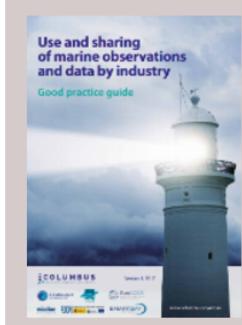
Percentage of external funding: 100 %

We are standing at the dawn of a century that will be largely affected by how we as a society are able to manage our oceans and their resources. Marine and Maritime Research has a critical role to play in developing our understanding of the seas and advance technology so that we can develop their economic potential in a sustainable manner.

The COLUMBUS project intends to capitalise on the EC's significant research by ensuring accessibility and uptake of research Knowledge Outputs by end-users (policy, industry, science and wider society). COLUMBUS will ensure measurable value creation from research investments contributing to sustainable Blue Growth within the timeframe of the project. Adopting proven methodologies and building on significant past work, COLUMBUS will first identify end-user needs and priorities. It will then set about identifying and collecting "Knowledge Outputs" from past and current EC projects. Rigorous analysis will take place to identify specific applications and end-users. Transfer will be achieved and measured through tailor-made knowledge transfer. All knowledge collected will be made accessible the pre-existing Marine Knowledge Gate.

As part of the project a "Guide of best practises for using and exchanging data from marine observation by the industry" was drawn up.

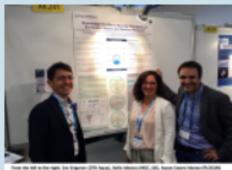
The main purposes of this guide of best practises consist of raising awareness about the issues that prevent the industry from participating in marine observatories and associated initiatives to exchange data, foster an informed discussion among gatherers/suppliers of public data, managers of data portals and users/suppliers from the private sector and formulate possible solutions to overcome some of the barriers that would, in the end, imply a greater use and provision of marine data to and from the industry.



**Monitoring and Observation Node Guidelines Publication** have been prepared by Seascape, VLIZ, EuroGOOS, Marine South East, PLOCAN & SmartBay Ireland in order to encourage marine data sharing and re-use by industry members. They provide an analysis of both barriers and bottlenecks limiting marine data sharing and re-use by industry members, and set some recommendations. The guidelines can be downloaded [here](#), and will be presented and discussed further within one of the European Maritime Day's workshop.

and politics.

The project was disseminated at EGU2017 held in April.



#### COLUMBUS at the European Geosciences Union (EGU) General Assembly, Vienna (AUSTRIA)

COLUMBUS participates with DTU Aqua, NOC, PLOCAN from April 23rd to 28th. DTU Aqua, NOC, PLOCAN were among the thousands of worldwide scientists who joined EGU, the largest European Geoscience Conference. They took this opportunity to promote COLUMBUS. Ivo Grigorov (DTU Aqua) gave a talk on how Knowledge Transfer can help researchers achieve measurable impact. Sofia Alexiou (NOC) presented with a poster the COLUMBUS methodology for effective knowledge transfer.

from left to right: Ivo Grigorov (DTU Aqua), Sofia Alexiou (NOC, UK), Ayoze Castro Alonso (PLOCAN)

During the second half of the year, the main actions carried out by PLOCAN in the Columbus Project focused on co-ordinating and implementing the Brokerage Event "Knowledge Transfer and Innovation in Maritime Sensing Technologies" that was held on the 23rd of November during the Atlantos Project general assembly. The purpose of this action was to explain the main developments and a prototype of marine sensors developed by small and medium-sized enterprises in European research projects to the international scientific community. PLOCAN led the organisation of this event with the support of EMODnet and EuroGOOS.

PLOCAN has helped in the preparation of this guide, along with project partners Seascape Consultants, VLIZ (Flanders Marine Institute), EuroGOOS (European Global Oceanic Observation System), Marine South East and SmartBay Ireland.

The fifth project partners meeting was held in Lisbon in March. During the meeting, partners were informed of the contents of the assessment report for the first 18 months of the project and the comments made by the EC, highlighting just how ambitious the work plan was and requesting that the project focus first and foremost on the transfer of knowledge to industry



Figure 48. Delegates to the fifth partners meeting

The event was considered a success in terms of both participants and delegates. On one hand, companies were given the chance to show off their latest developments and products to their main user communities. Delegates, mainly research centres and heads of operational oceanography in Europe, got the chance to meet companies and discuss scientific-technical aspects tackled in research projects.

The sixth project partners meeting was held in Brussels in early November.

**COLUMBUS**  
Brokerage Event

Knowledge Transfer in  
Maritime Sensing Technologies

**PROGRAMME**

TIME	TITLE	SPEAKER	EC PROJECT
11:15 – 11:20	Opening: AtlantOS WP6 Knowledge transfer in new sensors & Instrumentation	Jay Pearlman, WP6 Co-leader	ATLANTOS
11:20 – 11:25	Introduction to COLUMBUS and Ocean of Tomorrow Sensor Clustering	Oonagh McMeel, COLUMBUS Observation and Monitoring Competence Node	COLUMBUS
11:25 – 11:30	Knowledge Transfer and Innovation in Optical Sensors	Harald Rohr, TRIOS Ltd	NexOS
11:30 – 11:35	Knowledge transfer and Innovation: Nutrient Electrochemical Sensor and EAF Sensor	Yves Déiges, Managing Director of NKE Instrumentation	NexOS, SenseOCEAN
11:35 – 11:40	Knowledge transfer and Innovation: new interoperable pH sensor	Hervé Precheur, CEO of SensorsLab SL	NexOS
11:40 – 11:45	Knowledge transfer and Innovation: Compact Autonomous Sensor for Toxic Algal Species	Carmen Lasa, R&D Director of Microbia Environment	SMS
11:45 – 11:50	Knowledge transfer and Innovation: Low cost scalable sensor arrays for large scale hydrodynamics measurement	Natalia Rejas, AQUATERA Ltd	LAKHSMI
11:50 – 11:55	Knowledge transfer and Innovation: A novel MicroPlastics Sensor	Sergio Ramírez, Senior Researcher in Smart System Area, LETIAT	COMMONSENSE
11:55 – 12:00	Knowledge transfer and Innovation: The COST02 Controller	Corinne Troussard, International Sales Manager - RTsys	EMSODEV
12:00 – 12:05	Knowledge transfer and Innovation: Marine Sensors Interoperability	Christian Autermann, Manager in 52 North	NexOS Bridges
12:05 – 13:00	Expert Panel on Sensor Systems Knowledge & Technology Transfer from Research to Market	Moderator: Jay Pearlman Gemma Gomila - Perspectives from major research, observation and data infrastructures in Europe Matt Mowlem (National Oceanographic Centre Southampton, UK), Erik Buck (European Global Ocean Observing System) and Jan-Bart Calewaert (European Marine Observation and Data Network) - Panel discussion with representatives from participating SMEs	



Figure 49. Brokerage event of the Columbus project

## DESAL+

### Macaronesian Platform for advancing R&D excellence in water desalination and in knowledge of the link between desalinated water and energy

Origin of funding: Territorial Co-operation Programme INTERREG V A Spain-Portugal (MAC 2014-2020)

Participation: Partner

Starting and ending date: 01/01/2017-31/12/2019

Total project funding: 1.863.192,34€

Funding for PLOCAN: 208.250,00 €

Percentage of external funding: 85 %

**Despite possessing an array of desalination plants whose size and variety is unique in the world, there is no cohesive group of researchers within the Co-operation Area that responds to the needs of the Sector. It is necessary to support R&D&I in desalination (for domestic supply and agricultural use), to examine the interface between water and energy and to allocate resources in a co-ordinated manner to resolve challenges and for innovative and demonstrative projects related to water desalination technology and the applied use of renewable energy, in accordance with the RIS3 priorities and EU-Blue Growth. DESAL+ proposes to:**

- Create a combined research platform in the Co-operation Space.
- Modernise, rationalise, strengthen and raise awareness of desalination infrastructure related to R&D&I.
- Develop innovative solutions and demonstrative projects.
- Increase training for researchers and joint participation in European projects as well as international collaboration.

The final ruling was handed down in January, after adapting the initial proposal presented in response to the 30% reduction in the overall project budget. This adaptation led to reducing the number of marine areas off the coast of Gran Canaria to characterise. One of the two areas chosen was eliminated, opting for the one situated in the north because of its greater potential for wave power.

The first meeting of partners was held on the 27th of March at the offices of the Canary Island Institute of Technology and, on the 28th of March, the delegates visited the Bocabarranco desalination plant in the municipal district of Gáldar.

In June, the project published a summary in the B3M newsletter.



Figure 50. Delegates to the project kick-off meeting

The project was presented at the conference on Interreg MAC projects held in the offices of the Ministry of Foreign Affairs of Cape Verde, in Praia in July as part of the HEXAGONE strategy project co-ordinated by the Programme Joint Secretariat.



Figure 51. Presentation of Interreg MAC projects in Cape Verde

The project was presented and disseminated in October at the International Water and Energy Fair of the Canary Islands, Canagua&energía, in October, where PLOCAN had a stand to disseminate the infrastructure and the projects that it implements in the fields of energy and water.

Consumables for laboratories were bought in the second half of 2017 in order to fine tune a range of different techniques for measuring pesticides and hydrocarbons in sea water. These techniques will be used during the characterisation of the northern zone planned in the project.

B3M N°12

**DESAL+**  
Plataforma Macaronésica para el incremento de la excelencia en materia de I+D en desalación de agua y en el conocimiento del nexo agua desalada-energía

**DESAL+**  
Plataforma Macaronésica para o incremento da exceléncia em matéria de I+D na dessalinização da água e no conhecimento do nexo água dessalinizada-energia  
B.Pefate (Instituto Tecnológico de Canarias - ITIC), J.González (Plataforma Oceánica de Canarias - PLOCAN)

Figure 52. Image of the article published in B3M

## MULTI-PURPOSE DRONE

### Feasibility study for the design of a multi-purpose drone

Origin of funding: Asociaciones Empresariales Innovadoras

Participation: Partner

Starting and ending date: 20/06/2017-31/03/2018

Total project funding: 51.787,00 €

Funding for PLOCAN: 5.810,00 €

Percentage of external funding: 70 %

The project consists of conducting a feasibility study on the technical possibilities offered by flying drones to undertake tasks in different areas of application, and to conduct a study of the current market to act as a decision-making framework for future projects. There is currently an enormous range of drone models on the market, with their different strengths and technical capabilities. The purpose of the study is to provide a decision-making tree of models depending on the requirements of the project. Drones are currently used in tasks of surveillance, monitoring, reconnaissance and detection as they can be deployed quickly. On the other hand, as they are unmanned, there is no risk to the physical integrity of whoever is flying them, unlike other aircraft like helicopters or airplanes. These tasks are generally carried out using high resolution, infra-red or heat-sensitive cameras, but recently, other kind of instruments have been fitted to acquire data from sensors, such as temperature sensors, or to detect different gases. The large supply of unmanned vehicles on the market poses problems when buying one for a given use. The objectives of the project are as follows:

- To conduct a broad market study of the models of drones currently on the market, bearing in mind their different technical specifications. – Establish a decision-making framework to allow the potential buyer to select the drone model that is the best fit with any set of needs. The technical challenges are: - To compile information on existing models of drones. – Study the instrumentation fitted, or which can be fitted to drones.
- Formalisation of the decision-making framework for drone models.
- Conduct a pilot test based on the decision-making framework. The study is part of strategy strand 3: Promotion and Implementation of R+D+I projects, in the thematic area of: Sub-aquatics and Robotics.

The project is aligned with the European Commission's Blue Growth Communication of Support for sustainable growth in the marine and maritime sectors of the EU that acknowledges the importance of seas and oceans as driving forces of the European economy because of their great potential for innovation and growth, throughout the territory, with the Canary Island Smart Specialisation Strategy (RIS3), which envisages the blue economy as one of the region's priorities for the period 2014- 2020 due to the strengths of this sector of activity and the socio-economic and environmental conditions of the Canary Islands to promote the associated activities in the territory and in other EU Atlantic regions. This project has received funding from the Ministry of Economy, Industry and Competitiveness (MINECO) within the program to support Innovative Business Associations (AEI) to contribute to improve the competitiveness of Spanish industry.

Project activities did not commence in 2017.

# ECOMARPOT

## Technology transfer and eco-innovation for the marine and environmental management of port areas in Macaronesia

Origin of funding: Territorial Co-operation Programme INTERREG V A Spain-Portugal (MAC 2014-2020)

Participation: Partner

Starting and ending date: 01/01/2017-31/12/2019

Total project funding: 1.156.606,1 €

Funding for PLOCAN: 252.063,79 €

Percentage of external funding: 85 %

The objective of the ECOMARPOT project is to promote marine and maritime R&D and innovation in European and African Macaronesia by creating an operational network of environmental and marine observation of water and air quality in ports (eco-ports in Macaronesia). This will be achieved via the development and use of the latest in sustainable technology, the creation of useful products and tools for its users, and through the co-operation and appropriate and efficient technology transfer between the public and private sectors in the field of marine and maritime science and technology, promoting business opportunities within the context of Blue Growth.

To this end, ECOMARPOT will include innovative technological developments through new measurement instruments, services and tools for environmental management and impact assessment, making it possible to validate results, products and services in terms of their social and management value.



Figure 53. Photo of the weather station in Mindelo

Maintenance was carried out on the measuring devices in Cape Verde in February. One of the weather stations of Mindelo and another on the oceanographic buoy on Laginha beach. During these early months, conversations were started with partners to define new locations for stations to measure meteo-oceanographic parameters.

The Canary Island partners in the project met at the PLOCAN offices on the 3rd of May to make first contact and to review the general issues regarding a co-ordinated implementation of the project in all regions.



Figure 55. Meeting of Canary Island project partners

The graphic brand of the project was created in the first months, along with the web site and a range of dissemination material to promote it.

ecomar PORT

TRANSFERENCIA TECNOLÓGICA Y ECO-INNOVACIÓN PARA LA GESTIÓN AMBIENTAL Y MARINA EN ZONAS PORTUARIAS DE LA MACARONESIA

ÚLTIMAS NOTICIAS

Figure 54. Ecomarport project web site

The project was presented at the conference on Interreg-MAC projects held in Cape Verde as part of the Hexagone project.



Figure 56. Meeting of partners at the project presentation in Cape Verde

# ELICAN

## Self-Installing Telescopic Substructure for Low-Cost Craneless Installation of Complete Offshore Wind Turbines. Deep Offshore 5MW Prototype

Origin of funding: H2020-LCE-2015-2 / LCE-03-2015: Demonstration of renewable electricity and heating/cooling technologies

Participation: Partner

Starting and ending date: 01/01/2016-31/12/2018

Total project funding: 11.181.986,88 €

Funding for PLOCAN: 50.000.000 €

Percentage of external funding: 65 %

In ELICAN, a strong team of complementary European companies with worldwide leading presence in the Wind Energy industry join forces to provide the market with a disruptive high-capacity and cost-reducing integrated substructure system for deep offshore wind energy. The technology is exceptionally fitted to meet the technical and logistical challenges of the sector as it moves into deeper locations with larger turbines, while allowing for drastic cost reduction. This project will design, build, certify and fully demonstrate in operative environment a deep water substructure prototype supporting Adwen's 5MW offshore wind turbine, to be installed in the Southeast coast of Las Palmas (Canary Islands). It will become the first bottom-fixed offshore wind turbine in all of Southern Europe and the first one worldwide to be installed with no need of heavy-lift vessels. The revolutionary substructure consists in an integrated self-installing precast concrete telescopic tower and foundation that will allow for cranefree offshore installation of the complete substructure and wind turbine, thus overcoming the constraints imposed by the dependence on heavy-lift vessels. It will allow for a full inshore preassembly of the complete system, which is key to generate a highly industrialized low-cost manufacturing process with fast production rates and optimized risk control. The main benefits to be provided by this ground-breaking technology are:

- Significant cost reduction (>35%) compared with current solutions.
- Direct scalability in terms of turbine size, water depth, infrastructure and installation means.
- Complete independence of heavy-lift vessels.
- Excellently suited for fast industrialized construction.
- Robust and durable concrete substructure for reduced OPEX costs and improved asset integrity.
- Suitable for most soil conditions, including rocky seabeds.
- Enhanced environmental friendliness regarding both impact on sea life and carbon footprint.

The purpose of this project, led by tech company ESTEYCO, is to install a prototype off-shore wind generator on the test site. The prototype will rest on the seabed at a depth of 28 m and will have a tower rising up 80 metres above sea-level. ESTEYCO conducted an environmental impact study of the project with the environmental information provided by PLOCAN. The result of the environmental assessment is that the project has an insignificant impact. The environmental document proposes a detailed plan of environmental surveillance that will be rolled out after the prototype is installed. The technical project and the environmental impact study were presented to the Ministry of Industry, Energy and Tourism (MINETUR) for their authorisation, and to the Ministry of Agriculture, Food and the Environment (MAGRAMA) for environmental approval. The environmental ruling was published in the Official State Gazette of the 10th of August 2017: Ruling of

the 26th of July 2017, of the Secretary of State for the Environment, formulating an environmental impact report on the MLRT Off-shore Wind Tower Prototype project. The environmental report concluded that this project was not expected to cause any significant adverse impacts.

## EMSODEV

### EMSO implementation and operation: Development of instrument module

Origin of funding: H2020-INFRADEV-1-2015-1 / INFRADEV-3-2015: Individual implementation and operation of ESFRI projects

Participation: Partner

Starting and ending date: 01/09/2015-31/08/2018

Total project funding: 4.470.474,00 €

Funding for PLOCAN: 40.000,00 €

Percentage of external funding: 100 %

The EMSODEV (European Multidisciplinary Seafloor and water-column Observatory DEVelopment) general objective is to catalyse the full implementation and operation of the EMSO distributed Research Infrastructure (RI), through the development, testing and deployment of an EMSO Generic Instrument Module (EGIM). This module will ensure accurate, consistent, comparable, regional scale, long-term measurements of ocean parameters, which are key to addressing urgent societal and scientific challenges such as climate change, ocean ecosystem disturbance, and marine hazards. This will result in the increased interoperability of EMSO nodes thanks to the harmonized collection of ocean essential variable time series.

In addition, EGIM will also greatly help optimize the investments and operational efficiency of the EMSO research infrastructure thus improving RI effectiveness and its attractiveness for member states and users, including for industry.



PLOCAN's main function in the project is to implement a trial of the EGIM module at the ESTOC time series station. During the first six months, work was done on acquiring the equipment necessary for deploying the module such as the VDC 400 power source, which reached the platform in July.

Figure 57. Power source module on the plattform

# ENTROPI

## Enabling Technologies and Roadmaps for Offshore Platform Innovation

Origin of funding: EASME/EMFF/2016/1.2.1.3 / Blue Technology: Transfer of innovative solutions to sea basin economies

Participation: Partner

Starting and ending date: 01/04/2017-31/03/201

Total project funding: 595.112,00 €

Funding for PLOCAN: 112.136,00 €

Percentage of external funding: 80 %

The ENTROPI project will target investment to address critical challenges along the value chain supporting multi-use platforms. Such platforms have already been identified as a Key Enabling Technology (KET) and three FP7 projects (TROPOS, H2OCEAN and MERMAID) have explored preliminary platform concepts and feasibility.

Capabilities to build and operate such platforms will enable expansion of aquaculture capacity and renewable energy capacity, to address two important Blue Growth priorities, and in addition to bring concrete progression of the Energy Union It may also become a platform for development of offshore infrastructure for seabed mining and maritime security, two further Blue Growth sectors. ENTROPI will achieve this by:

- Identifying and building an investment plan for critical capabilities along the value chain enabling multi-use platforms;
- Targeting involvement of SMEs in this value chain innovation;
- Focusing initial deployment potential on the Atlantic sea-basin which has strong industries in sectors that could benefit from multi-use facilities;
- Aligning the investment plan with regional and national investment priorities and specialization (RIS3) topics and funding resources.

In the first half of the year, the partners worked in co-operation on deliverable D2.1 (*Review of conceptual and existing multi-use offshore platform projects and key value chain opportunities*) that was completed in September. PLOCAN attended four partner meetings by tele-conferencing during the year. The kick-off meeting of the project was held on the 18<sup>th</sup> of May on European Maritime Day in Poole. A meeting of the partners was held on the 2nd of November at the offices of the Ocean Forum in Lisbon, but the PLOCAN participants attended by video-conference as they could not do so physically.

In the second half of the year, work was done on contributions to D3.1. (*Report on prototype deployment systems, use-cases, business models and technical requirements*).

# ENVRI PLUS

## Environmental Research Infrastructures Providing Shared Solutions for Science and Society

Origin of funding: H2020-INFRADEV-1-2014-1 / INFRADEV-4-2014-2015: Implementation and operation of cross-cutting services and solutions for clusters of ESFRI and other relevant research infrastructure initiatives

Participation: Partner

Starting and ending date: 01/05/2015-30/04/2019

Total project funding: 14.683.533,75 €

Funding for PLOCAN: 81.000,00 €

Percentage of external funding: 100 %

**ENVRIPLUS** is a cluster of research infrastructures (RIs) for Environmental and Earth System sciences, built around ESFRI roadmap and associating leading e-infrastructures and Integrating Activities together with technical specialist partners. ENVRIPLUS is driven by 3 overarching goals:

- favoring cross-fertilization between infrastructures
- implementing innovative concepts and devices across RIs
- facilitating research and innovation in the field of environment to an increasing number of users outside the RIs.

ENVRIPLUS organizes its activities along a main strategic plan where sharing multi-disciplinary expertise will be most effective. It aims to improve Earth observation monitoring systems and strategies, including actions towards harmonization and innovation, to generate common solutions to many shared information technology and data related challenges, to harmonize policies for access and provide strategies for knowledge transfer amongst RIs.

ENVRIPLUS develops guidelines to enhance trans-disciplinary use of data and data-products supported by applied use-cases involving RIs from different domains. ENVRIPLUS coordinates actions to improve communication and cooperation, addressing Environmental RIs at all levels, from management to endusers, implementing RI-staff exchange programs, generating material for RI personnel, and proposing common strategic developments and actions for enhancing services to users and evaluating the socio-economic impacts. ENVRIPLUS is expected to facilitate the structuration and improve quality of services offered both within single RIs and at pan-RI level. It promotes efficient and multi-disciplinary research offering new opportunities to users, new tools to RI managers and new communication strategies for environmental RI communities. The produced solutions, services and other project results are made available to all environmental RI initiatives, thus contributing to the development of a consistent European RI ecosystem.

PLOCAN's objective in the project is to take part in drawing up and implementing a demonstrator of inter-operable, low-cost sensor arrays, in co-operation with other entities (CNR, Ifremer, etc.). In May, PLOCAN took part in a project meeting held in Grenoble, France. In November, PLOCAN took part in the envriweek held in Malaga with the production of the report on the technological innovation session.



LANDSCAPE – ESFRI/ENVRI Landscape setting event

Tuesday 07<sup>th</sup> of November 2017 – Malaga Town Hall, Spain

Panel on Research Infrastructure (RI) Innovation (10h45 – 12h15)

Moderator : Laura Beranzoli (INGV – RI: EMSO ERIC)  
Rapporteur : Eric Delory (PLOCAN – RI: EMSO ERIC & Fix03)

Panelists :  
Jacques Roy (CNRS – RI: ANAEE)  
Valérie Thouret (CNRS – RI: IAGOS)  
Glenn Nolan (EUROGOOS)

## FixO3

### *Fixed point open ocean observatory network*

Origin of funding: FP7-INFRASTRUCTURES-2012-1

Participation: Partner

Starting and ending date: 01/09/2013-31/08/2017

Total project funding: 6.999.999,37 €

Funding for PLOCAN: 613.282,61 €

Percentage of external funding: 67,48 %

The fixed point observatory network (FixO 3) seeks to integrate European fixed point open ocean observatories and enhance access for the community in general to these key facilities. This will provide multi-disciplinary observations in all parts of the oceans from the air-sea interface to the deep ocean bed. Co-ordinated by the National Oceanography Centre, United Kingdom, FixO 3 will be based on the significant advances achieved by the EuroSITES, ESONET and CARBOOCEAN FP 7 programmes. With a budget of €8.4m over 4 years (from September 2013), the initiative has 29 partners from the areas of academe, research institutions and SMEs. Moreover, 14 international experts from a wide range of disciplines make up the Advisory Committee.

The programme will be achieved by means of:

1. Co-ordination activities to integrate and harmonise the current technological, procedural and electronic infrastructure processes. Strong ties will be fostered with a broad community from academe, industry, politics and the general public via dissemination, an exchange of know-how and training activities.
2. Support actions to offer a) access to observatory facilities for those who do not currently have such access and b) free access to data and product services.
3. Joint research activities to innovate and improve the current capacity for multi-disciplinary in-situ observation of the ocean. Open ocean observation is currently a priority for European marine and maritime activities, as reflected in the recent declaration made by the EurOCEAN 2010 Conference, and internationally from the declaration of the OceanObs09 Conference. The programme proposals will provide important data on environmental products and services to tackle the Framework Directive on Marine Strategy and to provide support for the E.U. Integral Maritime Policy. The FixO 3 network will provide free access to top-quality in-situ fixed point data. It will provide an integral framework of open ocean facilities in the Atlantic Ocean from the Arctic to the Antarctic and throughout the Mediterranean, allowing for an integral, regional and multi-disciplinary approach to understand natural and man-made changes in the ocean.

Work continued in 2017 on monitoring the TNA projects from the calls for projects launched, ensuring that these started and advancing them the funds approved for their implementation. The campaign conducted from the oceanographic vessel Ángeles Alvariño included the components from the approved TNA projects, mooring the OPUS UV-E optical nitrate sensors at a depth of 150 metres, along with larvae traps for the University of Aveiro. Work continued on managing the data

from the ESTOC buoy and mooring with some incidents, such as the breakage of the mooring until the 14<sup>th</sup> of April. A deliverable was also completed, deliverable 2.10 of WP2 on the inter-operability of sensors, led by PLOCAN.



Figure 58. Photo of the final general assembly of FIXO3

The final project general assembly took place in Vilanova i la Geltrú (Poly-technical University of Catalonia) from the 27th to the 29th of June 2017. On the 27th of June, PLOCAN organised a Science and Technology Day, as the leader of WP9 on Trans-National Access (TNA). The leaders of the TNA projects had all been invited to this event to make a presentation on the TNA Project implemented or under implementation. Representatives from 15 of the projects agreed to participate and presented their results.

A contribution was made to deliverable D12.6 in June. The project finalised on the 31<sup>st</sup> of August.

# iFADO

## *Innovation in the Framework of the Atlantic Deep Ocean*

Origin of funding: FP7-INFRASTRUCTURES-2012-1

Participation: Partner

Starting and ending date: 01/11/2017-31/10/2021

Total project funding: 2.724.476,25€

Funding for PLOCAN: 293.456,25 €

Percentage of external funding: 75 %

The aim of the iFADO project is to create marine services on a regional and sub-regional scale, using European Union waters as a case study. Filling the existing technical gaps, iFADO will use the implementation of the Framework Directive on Marine Strategy. (FDMS) to demonstrate the application of innovative products.

The project will combine traditional surveillance with profitable, cutting-edge technologies: remote sensing, numeric modelling and emerging observation platforms such as gliders and oceanic buoys.



Figure 59. Delegates at the kick-off meeting held in November

PLOCAN took part in the project kick-off meeting for iFADO, held on the 14th and 15th of November in the conference centre of the Higher Technical Institute of the University of Lisbon, the entity leading the project. iFADO involves twenty partners of different kinds, some public, other private, from Portugal, Ireland, United Kingdom, Spain and France. PLOCAN co-ordinates WP5 devoted to emerging technologies for oceanic monitoring. At the meeting, partners presented their institutions in order to enhance their knowledge of the others and to establish synergies for implementing the project and activities were planned in the different work packages, determining the responsibilities for the different tasks to be carried out.

# LEANWIND

## Logistic efficiencies and naval architecture for wind installations with novel developments

Origin of funding: The Ocean of Tomorrow 2013 / FP7- OCEAN-2013 / OCEAN.2013-4 Innovative transport and deployment systems for the offshore wind energy sector

Participation: Partner

Starting and ending date: 01/12/2013-30/11/2017

Total project funding: 9.986.231 €

Funding for PLOCAN: 203.930 €

Percentage of external funding: 75,88 %

The main objective of LEANWIND is to reduce costs over the whole life cycle and supply chain of offshore wind farms and to develop state-of-the-art tools and technologies. The marine wind energy industry in inshore shallow water sites still has to become economically competitive with conventional energy sources while new sites are planned further off-shore or in deeper waters, giving rise to new challenges. The off-shore wind power industry has still to apply lean principles in the logistics operations of wind farms and in all stages of its life cycle, as the LEANWIND Project proposes. Lean principles were originally developed by Toyota to optimise the processes of the manufacturing industry. These optimisation and efficiency principles have subsequently been adopted by many other industries to eliminate wasteful stages and to make processes more responsive. These principles will be applied to each of the critical stages of the project: logistics processes, land-based transport links, temporary storage and port facilities, vessels, cranes and lifting machinery, safety and operations and maintenance. The LEANWIND approach will ensure the elimination of unnecessarily complex or wasteful stages of the development process, which makes the transition between stages faster, enhances quality and hence optimises time and costs to enable the industry to reduce the gap between current expenditure and the economic aspirations of the industry.

The European Leanwind Project, whose main purpose was to reduce the costs of off-shore wind farms located in deep waters and make them more competitive with fossil-fuel electricity generation, was completed in November. Leanwind comprised 10 different work packages, from technical management, new vessels, integrated logistics or economic and assessment, among others. PLOCAN, together with the Centre for Numeric Applications in Engineering (CEANI) of the University of Las Palmas de Gran Canaria (ULPGC), focused its activity on the work package devoted to operational and maintenance strategies (WP4), apart from leading the work package on trial and validation of tools and technologies (WP7). LEANWIND has successfully provided a broad range of new solutions that enhance existing practises and set new standards for helping the industry to achieve its objectives with regard to its LCOE and maintaining the cost reductions as the industry evolves.



 **Driving Cost Reductions**  
Figure 6o. Front page of the final publication of the project results

## MARCET

**Macaronesian Network for Cross-border Knowledge and Technology Transfer to protect, supervise and monitor cetaceans in the marine environment, and to explore and exploit the related tourism in a sustainable way**

Origin of funding: Programa de Cooperación Territorial INTERREG V A España-Portugal (MAC 2014-2020) / Cooperación TRANSFRONTERIZA

Participation: Partner

Starting and ending date: 08/11/2016-07/11/2019

Total project funding: 1.030.914,13 €

Funding for PLOCAN: 264.990,32€

Percentage of external funding: 85 %

The MARCET project transfers and disseminates cutting-edge science and technology in order to promote growth and sustainable development of tourism directly and indirectly related to Whale Watching, through the creation of new eco-innovative products and services. In particular, centres specialised in the monitoring and tracking of cetacean health and in operational oceanography will be brought together from across the region in order to integrate, harmonise and optimise knowledge, infrastructures and best practices in the region.



Figure 61. Project kick-off meeting

The project kick-off meeting was held in March in the Elder Science and Technology Museum in Las Palmas de Gran Canaria. The meeting, which marked the start of project tasks, was opened by the Vice Chancellor of Research, Innovation and Transfer from the University of Las Palmas de Gran Canaria (ULPGC), José Pablo Suárez Rivero, and was attended by representatives of entities from the Azores, Madeira, Senegal, Cape Verde and the Canary Islands, including the University of La Laguna, PLOCAN, the Marine Sciences Technology Centre (CETECIMA), Gran Canaria Blue and Loro Parque, from the Canary Islands; the Whale Museum and the Oceanic Observatory, from Madeira; the Regional Directorate for Sea Affairs, from the Azores; the Regional Conservation Society and the Interstate School of Medicine and Sciences, from Senegal; and the Association of Biologists and the Association of Environmental Conservation and Sustainable Development Bios CV, from Cape Verde. PLOCAN was interviewed on Spanish National Radio to disseminate the project.

The project was presented in July at the conference on Interreg-MAC projects held in the offices of the Ministry of Foreign Affairs of Cape Verde in the city of Praia. An informative article was published in the same month in B3M (Macaronesian marine-maritime newsletter).

As part of the project, and in co-ordination with the Atlantos Project, a mission was carried out with Sailbuoy to monitor a series of meteorological and bio-chemical variables along almost nine hundred nautical miles between the island of Gran Canaria and Sao Vicente in Cape Verde.



Figure 62. Mission with Sailbuoy

The First Conference on Transfer of Knowledge and Technologies of the MARCET Project was held in November, in two different parts. A first part dealing with dissemination that was held in the Elder Museum, and another aimed at technical and veterinarian staff co-operating in stranding networks in Macaronesia, which took place in the School of Veterinary Medicine of the University of Las Palmas de Gran Canaria.

In December, technicians from the project took part in the MSM68-2 oceanographic campaign of the research vessel Maria S. Merian

for 11 days, setting out from the port of Emden, Germany, for Mindelo, island of São Vicente, Cape Verde. The purpose of the project in this campaign was to create new working synergies aboard with the other researchers from GEOMAR and from the Max Planck Institute, and to take the opportunity to engage in whale-watching activities throughout the area selected for investigation during the voyage.



Figure 63. Whale watching tasks during the MARCET campaign



Figure 64. Presentation of the project in Mindelo

Although weather conditions were not ideal, the main objective was met, thanks to using an oceanic vessel for opportunistic observation of cetaceans and sea birds. Photo-identity was successfully used to recognise four different species of cetaceans and six sea birds and closer bonds were forged with the other participants in the campaign. The trip finished with the organisation of an international conference to open the Ocean Science Centre de Mindelo, where the objectives and main results of the MARCET project were presented.

The project was presented in December at the opening of the Mindelo Marine Science Centre (OSCM) that hosted the International Seminar on Atmospheric and Marine Sciences, bringing together over one hundred delegates from Europe, Africa, the United States and Canada working in atmospheric and oceanic scientific-technical disciplines.

## MARINERG-i

### Marine renewable energy research infrastructure

Origin of funding H2020-INFRADEV-2016-2017 / Topic: INFRADEV-02-2016: Preparatory Phase and support to early phase of ESFRI projects / Deadline Id: H2020-INFRADEV-2016-2

Participation: Partner

Starting and ending date: 08/11/2016-07/11/2019

Total project funding: 1.999.798,75€

Funding for PLOCAN: 282.500,00€

Percentage of external funding: 100 %

The objective of MARINERG-i is to become the leading internationally distributed infrastructure in the Marine Renewable Energy (MRE) sector. Its integrated nature and co-ordinated approach will accelerate the research development and deployment of offshore wind, wave, tidal and combined energy technologies and help maintain Europe as a global leader in this industry. In addition MARINERG-i will strengthen European, scientific and engineering excellence and expertise as its combined facilities represent an indispensable tool to foster innovation across a large variety of MRE technologies and systems and through all key stages of technology development (TRLs 1-9).

The purpose of this INFRADEV proposal is to undertake development work which will ensure MARINERG-i is effectively positioned to attain the criteria

necessary for being successful in a future ESFRI roadmap application. MARINERG-i made an application to the 2016 roadmap and was identified as an emerging RI of EU significance. Since making the bid to the ESFRI 2016 roadmap, the consortium has continued to evolve and collaborate, culminating in the submission of a proposal for a second MaRINET project (MaRINET2) under Horizon 2020 [Infra-IA].

This proposal takes on board the comments and recommendations provided in feedback from the ESFRI 2016 reviewers and has also analysed and updated the positioning of the MARINERG-i concept based on the current status of the sector. In this context it is proposed to:

- Broaden the number of member states involved.
- Create a design study and scientific plan.
- Develop a business plan including governance, legal, financial and strategic issues.
- Secure further national support from partners.
- Create and agree an implementation plan that will bring the proposal to the roadmap.

The consortium consists of partners from Ireland, UK, France, Spain, Portugal, Denmark, Sweden, Norway, Netherlands, Germany, Belgium and Italy all of whom will become national nodes.

The project kick-off meeting was held in March in Brussels, with the presence of experts representing the European Union with responsibilities for research and development of renewable, offshore energies and from key sectors of industry for whom the integrating activity of Marinerg-i will play a critical role in the process of developing technologies from the initial concept to reaching the market. During the official launch, the importance of marinerg-i was highlighted as a crucial first step to make the combined vision of the facility partner a reality. Its aim is to form an independent legal entity that is adopted in the 2020 Road Map for the European Strategy Forum on Research Infrastructures (ESFRI).

The project was launched in the context of transition that is occurring in the world towards more sustainable energy and the renewal offshore energies (offshore wind, wave and tide) that have the potential to make a significant contribution.



Figure 65. Kick-off meeting held in Brussels

PLOCAN is the only Spanish participant in Marinerg-i and it will represent the Spanish node in the future infrastructure. During the implementation of the project, it is the leader of work package 7 responsible for establishing dissemination, interaction and commitment to both direct users and clients on the one hand, as other kinds of key partners to harness Marinerg-i to define a business plan that shows value added for each one. PLOCAN is participating specifically in a total of 25 tasks from 7 work packages, leading 5 tasks and 8 deliverables.

The “Legal Structures Workshop meeting – Evaluation of Possible Legal Structures for Marinerg-i” workshop was held in May in London, with the participation of PLOCAN.

Deliverable D7.1 – “Initial Marinerg-I Mission, Vision and Value Statement” and D7.2 – “Common understanding of the Value Proposition” were drawn up at the end of June. Work also started on drawing up deliverable D7.3 “Stakeholder mapping”.

In November, Marinerg-i took part in the International WaTERS forum in PLOCAN. This workshop was devoted to wave power research centres, and it focused on the exchange of know-how within trans-national research programmes, such as this one.

Work was done in 2017 on deliverable D7.1 “Initial Marinerg-i Mission, Vision and Values Statement”, on D7.2. “Common understanding of the Value Proposition”, on D7.3 and D7.4. PLOCAN also participated in reviewing and discussing several deliverables of WP5 concerning legal issues and in drawing up a draft agreement to include the different national test sites and test tanks interested in forming part of the future MARINERG-i ERIC.

The project has been disseminated in the following forums:

- On the 30th and 31st of October, at the “International Waters” workshop held in the PLOCAN offices, organised by the EMEC in co-operation with PLOCAN. The purpose of the event was to bring together international test sites to establish terms and conditions for a common track to marketing offshore energy.
- On the 23rd of November, MARINERG-i was presented nationally at the annual event of the APPA Marina Association in Madrid, in order to disseminate the mission and vision of the project to different national stakeholders.



Figure 66. The project at “International Waters”



Figure 67. The project at the APPA Marina meeting

## MARINET2

### Marine Renewable Infrastructure Network for Enhancing Technologies 2

Origin of funding: H2020-INFRAIA-2016-2017 / Topic: INFRAIA-01-2016-2017: Integrating Activities for Advanced Communities / Deadline Id: H2020-INFRAIA-2016-1

Participation: Partner

Starting and ending date: 01/01/2017-30/06/2021

Total project funding: 10.592.285,25€

Funding for PLOCAN: 85.500,00€

Percentage of external funding: 100%

Integrating activities planned under MARINET 2 build upon the achievements of the advanced community created in MARINET FP7. MARINET 2 will ensure the continued integration and enhancement of all leading European research infrastructure and facilities specialising in research, development and testing of offshore renewable energy systems including electrical sub systems and grid integration through a range of TRLs (1-7). MARINET FP7 proved the added value of uniting these facilities, and substantially improving their capability as a community of practice to deliver consistent testing services ensuring, quantifiable, stepwise innovation and progress in the development of devices and key components, and identifying critical areas for further technical investigation and enhancement. Whilst activities proposed under MARINET 2 will follow the same formula, balancing networking/joint research/and transnational access, the consortium and scope of work is expanded to include xx partners in xx countries with xx facilities. The e-infrastructure programme fills a strategic gap. Taking stock of existing capacities for data management/sharing; it addresses user requirements and demonstrates the operation of a new system based on standards and tools adapted from the SeaDataNet infrastructure.

The European Commission and member states recognise offshore renewable energy as an important source of clean energy that can: generate economic growth and employment; increase energy security; and boost competitiveness and technological innovation. The realisation of this potential depends on the accelerated development, deployment and grid integration of reliable, efficient technologies for harvesting offshore renewable energy, which in turn requires robust and exhaustive testing in dedicated facilities operated by practitioners with specialised expertise. MARINET 2 provides this ecosystem, and is pre-eminently suited to fostering the next generation of offshore renewable energy devices.

Taking part in the MARINET 2 project provides PLOCAN with an extensive network of contacts and channels of communication for interacting with interested parties from the industry, research, investment and politics. Furthermore, the project actions can be used to develop a community of scientific infrastructures with which PLOCAN will be able to co-operate in future projects and, consequently, will contribute to the progress of the region. The launch of calls for projects for Trans-National Access (TNA) by this project opens the door to certain European technological and scientific funding, provided that high level proposals are presented for carrying out the trials in the area of offshore renewable energies. The inclusion of the PLOCAN Test Site among the sites offered for TNA, and provided that work is done on dissemination to attract clients, will help to optimise its use.

# MARPOCS

## *Multinational Response and Preparedness to Oil and Chemical Spills*

Origin of funding: Call for Proposals 2015 - Prevention and Preparedness Projects in Civil Protection and Marine

Participation: Partner

Starting and ending date: 01/01/2016-31/12/2017

Total project funding: 648.595,00€

Funding for PLOCAN: 42.530,07 €

Percentage of external funding: 75 %

The need for regional cooperation in the NE Atlantic to face marine pollution has been previously demonstrated by historic accidents in Spanish, Moroccan, French and Portuguese coasts. The Lisbon Agreement, recently ratified (2014) by the mentioned countries and EU, envisions the cooperation in case of pollution incidents. Transnational strategies to face marine pollution with hazardous and noxious substances (HNS) and especially with oil spills have been under development in different regions in the context of international agreements and EU RTD projects. However, the Atlantic sub-region involving Morocco, Madeira and Canary Islands has not been similarly prepared in an integrated fashion. Furthermore, recent oil and gas prospecting and drilling activities are increasing the awareness of potential environmental threats in this area. Although spill accidents with HNS are not as frequent as oil spills, their impacts, the variety of products and increasing volume transported justify the development of regional and cross border capacities to respond to both spill types. This is particularly relevant in the studied area, which is environmentally sensitive and socio-economically dependent upon marine resources and marine-based tourism.

Built on previous EU efforts, and in compliance with parallel international protocols (e.g. OPRC-HNS), strategies and current EU RTD initiatives, MARPOCS promotes a common operational framework supported with state-of-the-art model-based decision support tools and exercises for oil and HNS spills, adapted to the region and supported by cross border cooperation, implementation and training of local, regional and national authorities. This strategy will strengthen the capacity for mutual assistance and multinational preparedness and response to accidental pollution episodes in this crossborder sub-region, as planned in the Lisbon Agreement.

The project fosters transnational co-operation with special attention on the region of Macaronesia that Canaries belongs to. At the same time, it places PLOCAN in the spotlight of the international response to spills and prepares it to take a leading role in facing situations such as the sinking of the Russian fishing vessel Oleg Naydenov to the south east of the island of Gran Canaria or after the incident with the Armas ferry at the Nelson Mandela Dock. The project provides a tool to predict the behaviour of spills that could be useful for all local institutions involved in the response to these events.

The third co-ordination meeting of the project in Casablanca, Morocco, was held in March, with the participation of PLOCAN as a project partner. The meeting took place in the facilities of the Institut National de Recherche Halieutique (INRH) of Casablanca. It was attended by representatives of the project partners: IST (Portugal) [project co-ordinator], Action Modulers (Portugal), Cedre (France), Ardit (Portugal), Plocan (Spain), ULPGC (Spain) and INRH (Morocco). Several

institutions that form part of the consortium advisory committee were also at the meeting: Coast Guards, Cetmar, DGPM (Direção-Geral de Política do Mar), DGAM (Direcção-Geral da Autoridade Marítima) and AMSSA (African Maritime Safety and Security Agency).

The meeting agenda focused on reviewing each of the project work packages and organising the tasks to be undertaken in the coming months. There was also a working session with end users in Morocco and a training day on the MARPOCS platform with users.



Figure 68. Delegates to the MARPOCS meeting held in Casablanca

by the European Commission.

The meeting was attended by representatives of the institutions involved in the project: Higher Technical Institute - IST (Portugal) [project co-ordinator], Action Modulers (Portugal), Centre of Documentation, Research and Experimentation on Accidental Water Pollution - CEDRE (France), Agência Regional para o Desenvolvimento da Investigação, Tecnologia e Inovação - ARDITI (Portugal), Canary Island Oceanic Platform - PLOCAN (Spain), University of Las Palmas de Gran Canaria - ULPGC (Spain) and the Institut National de Recherche Halieutique - INRH (Morocco). The second day was also attended by members of the Madeira Port Authority (APRAM) and the Portuguese Navy.

In 2017, on the one hand mapping and oceanographic information on the area of the Canary Islands was compiled to validate the models created by other partners (coast line, bathymetry, sea levels, salinities, water temperatures, currents, drifters, etc). On the other hand, the sensitivity indexes of the whole coast of the archipelago were compiled and adapted to be entered on the Marpocts platform too.

In July, PLOCAN took part in the fourth meeting of the project organised by the Regional Agency for Developing Research, Technology of Portugal (ARDITI) as a project co-ordination meeting for the research into the Preparation and Multinational Response to Chemical and Hydrocarbon Spills (MARPOCS) ECHO/SUB/2015/713854/PREP08 from the DG-ECHO 2015 call for projects and funded



Figure 69. Delegates to the MARPOCS meeting held in Madeira

The meeting agenda focused on reviewing each of the working packages of the project and on preparing the local exercises that will take place in Madeira, Morocco and Canaries next October, November and December respectively. PLOCAN, co-ordinator of data acquisition, presented the results of the work done to date for the region of the Canary Islands in co-ordination with the University of Las Palmas de Gran Canaria.



Figure 70. Final MARPOCS meeting at PLOCAN

oceanographic measurements of the area of the Canary Islands, which are essential for calibrating and adjusting forecasting models in the area. They have also provided and adapted information for vulnerability maps, which are necessary for assessing the areas of risk that could be caused by spills of hydrocarbons and other substances.

PLOCAN was the venue of the final project meeting on Preparing a Multinational Response to Chemical and Hydrocarbon Spills (MARPOCS) in the Atlantic sub-region encompassed by Morocco, Madeira and the Canary Islands. The meeting was attended by the Higher Technical Institute - IST (Portugal), which leads the project, Action Modulders (Portugal, now part of the Bentley Systems group), Centre of Documentation, Research and Experimentation on Accidental Water Pollution - CEDRE (France), the Regional Agency for Developing Research and Technology of Portugal (ARDITI), the Canary Island Oceanic Platform, the University of Las Palmas de Gran Canaria with the attendance of the Foundation Scientific Technological Park and the Institut National de Recherche Halieutique - INRH (Morocco). PLOCAN and the University of Las Palmas de Gran Canaria have provided basic information and meteo-oceanographic measurements of the area of the Canary Islands, which are essential for calibrating and adjusting forecasting models in the area. They have also provided and adapted information for vulnerability maps, which are necessary for assessing the areas of risk that could be caused by spills of hydrocarbons and other substances.

## NEXOS

**Next generation, cost-effective, compact, multifunctional web enabled ocean sensor systems empowering marine, maritime and fisheries management**

Origin of funding: The Ocean of Tomorrow 2013 / FP7- OCEAN-2013 / OCEAN.2013-2 Innovative multifunctional sensors for in-situ monitoring of marine environment and related maritime activities

Participation: Leader

Starting and ending date: 01/10/2013-30/09/2017

Total Project funding: 5.906.479 €

Funding for PLOCAN: 500.324 €

Percentage of external funding: 82,31 %

According to those responsible for marine research in Europe in the Ostend Declaration of 2010, support for the development of a truly integrated and sustainably funded European oceanographic observation system is a major challenge. This can be achieved with the long term measurement of key parameters but it is hindered by the cost and the lack of reliability of oceanographic sensors in general. The NeXOS Project aims to improve the time and space cover, the resolution and the quality of marine observations by developing cheap, innovative and inter-operable in-situ sensors that can be deployed from multiple platforms and web services for key domains and applications. This will be achieved by developing new, low-cost, compact, integrated sensors, with multiple functions, including the measurement of key parameters that are useful for a series of objectives, from more accurate marine monitoring and modelling to better evaluation of fisheries. Seven new, compact, efficient sensors will be developed, based on optic and acoustic technologies, aimed at most of the descriptors identified by the Framework Directive on Marine Strategy aimed at attaining a good ecological state. Two of the new sensors will contribute specifically to the Common Fisheries Policy with the pertinent variables for an eco-systemic approach to fisheries.

All the new sensors will meet the need for multi-platform integration, inter-operability of data and sensors with quality guarantees and the reliability requisites. All of these will be specified for each new sensor system. All the new sensors will be calibrated, integrated in several types of platform, scientifically validated and demonstrated. Finally, one of the main objectives of NeXOS is to improve the competitiveness of European SMEs in the marine sensor market. With this purpose, the specifications and requisites of the sensors will be evaluated in an early stage of the project for market penetration

PLOCAN has carried out its job of project co-ordinator and also the role of leader of WP6 and party responsible for a series of activities concerning the integration, validation and demonstration of sensors. The project had complex scientific-technological objectives and was able to develop 8 new sensors, 4 of which are commercially available, 2 inter-operability technologies and an innovative anti-fouling system, among others.

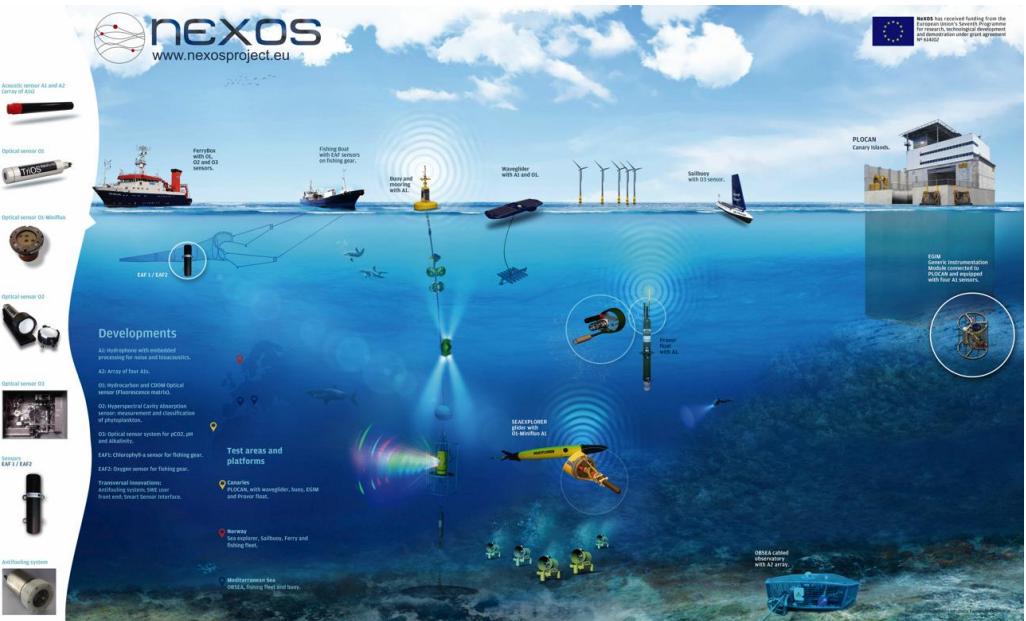


Ilustración 72. Infografía del proyecto NEXOS

In November, the PLOCAN offices in Taliarte hosted the final project meeting, where the Minister of Economy, Industry, Trade and Knowledge of the Canary Island Government, Pedro Ortega, said that this initiative “has a lot to offer our islands” and stated that there was a need to convert the Canary Islands into “a national and international benchmark for marine maritime research, innovation and technology”. Pedro Ortega, accompanied by the chancellor of the University of Las Palmas de Gran Canaria, Rafael Robaina, and the director of PLOCAN, opened the final project meeting by emphasising that “blue growth is one of the priorities set by the Canary Island Smart Specialisation Strategy”.



Figure 71. Authorities at the final project meeting



Figure 73. Delegates to the final project meeting



Figure 74. NEXOS at IEEE OCEANS

At the international IEEE OCEANS conference held in Anchorage (Alaska), PLOCAN presented the new sensors developed by the European NeXOS technology project to develop new marine observation sensors to create a truly integrated, sustainable European oceanographic observation system ("Next generation, cost-effective, compact, multifunctional web enabled Ocean Sensor Systems Empowering Marine, Maritime and Fisheries Management").

The event saw the presentation of the final results of the project, co-ordinated by PLOCAN and which finished on the 30th of September. This project has developed a set of low-cost, multi-functional, innovative, compact sensors that can be integrated into both mobile and fixed ocean observation platforms, and developed services for the Global Ocean Observation System (GOOS), the European

Framework Directive on the marine strategy that establishes descriptors of Good Ecological State (GES) of European marine waters and the Common Fisheries Policy (CFP).

The IEEE OCEANS event, which is held each year in the United States, and every other year in Europe and Asia, usually attracts over two thousand delegates and over one hundred exhibiting institutions to its American version. The motto of the event was "How to protect the fragility of inhospitable environments with the joint application of modern technology and traditional know-how", so the organisation tried to reflect this in the plenary lectures and the technical sessions.



Figure 75. NEXOS stand at IEEE Oceans

## OCEANERA-NET

### Coordination of national research activities of member states and associated states in the field of ocean energy

Origin of funding: ERA-NET Call 2013 / FP7- ERANET-2013-RTD / ENERGY.2013.10.1.3 Supporting the coordination of national research activities of Member States and Associated States in the field of OCEAN energy (ERA-NET)

Participation: Partner

Starting and ending date: 01/12/2013-30/11/2017

Total Project funding: 2.205.037,57 €

Funding for PLOCAN: 125.034,61 €

Percentage of external funding: 89,65 %

The vast European coastline houses enormous potential for ocean energy to be exploited as a source of renewable electricity, contributing to the objectives for 2020 and beyond. The ocean is a complex working environment, relatively little is known about it and it is widely used by other sectors, such as fishing, transport and leisure. However, the price of generating ocean energy is high, estimated by DG MARE, for 380 GW. Several member states and regions are currently funding ocean energy research, demonstration, technology and innovation (R+D+T+i). There is a common objective to generate know-how of the marine environment and to accelerate the development of this emerging sector. But these research efforts are not co-ordinated. For this reason, member states are proposing the ocean energy ERA-NET as described in this document. The ERA-NET will provide a framework for joint, trans-national activities and will co-operate with the EERA Ocean Energy Joint Programme and other important European projects and the industry stakeholders.

This wide-reaching ERA-NET brings together 16 partners from nine states with the intention of obtaining the benefits of a co-ordinated funding of research. The member states have different levels of commitment to the ocean energy sector, and it is important that the ERA-NET actions reflect this fact. The objective is to improve the quality, scope and fragmentation of research with better networks, tackling common barriers and improving co-ordination. The proposal establishes the implementation of the project from the creation of networks and sharing of know-how, to the launch of at least one joint, trans-national call for projects. This way, the partners will develop a shared vision of the sector, an action plan to deliver and a toolbox for administration. The result will be less fragmentation in funding research, the development and greater dissemination of best practices and support for marketing the ocean energy sector.

OCEANERA-NET places PLOCAN and the Canary Islands as an institution interested in off-shore renewables in the archipelago, even providing funds to finance proposals of interest for the Canary Islands in the field of off-shore renewables.

A joint activity of the project was held in the PLOCAN facilities on the 4th and 5<sup>th</sup> of July. There was also a meeting of the Steering Group on the 6<sup>th</sup> of July. The workshop was entitled "Ocean Energy: Turning Lessons into Constructive Actions", which attracted over 40 people from industry, funding agencies and other interested parties. The event was considered a success as those attending considered that both the funding agencies and the SMEs were there and they could freely discuss issues concerning the needs of the sector.



Figure 76. Evento de OCEANERA-NET en PLOCAN



Figure 77. Delegates at the event held in PLOCAN

PLOCAN took part in the "Stage gate metric development" organised by OCEANERA-NET in co-operation with the University of Edinburgh and Wave Energy Scotland in Edinburgh on the 29<sup>th</sup> of November. The matter dealt with was metrics for measuring success in the off-shore energy sector. The metrics developed were presented and there were discussions about their validity, suitability and integration. This was one of the activities of the annual event organised by SUPERGEN UK.

In WP3, led by PLOCAN, deliverable 3.5 "Proposal for a sustainable ocean energy network beyond the FP7 project" was completed.

# ODA

## Onboard Data Analyzer

Origin of funding: AEI-010600-2017-171

Participation: Partner

Starting and ending date: 20/06/2017-31/03/2018

Total Project funding: 69.389,00 €

Funding for PLOCAN: 7.043,00 €

Percentage of external funding: 70 %

We propose a technical-economic feasibility study for the future development of a tool (software+hardware), called ODA (Onboard Data Analyser) that can analyse the data packages that reach a vessel, in order to extract the flat or pure data arriving to send it to the different systems or applications that require it. If the flat data include malware, this will remain in ODA, preventing it from passing into the rest of the on-board network and it will emulate a state as if the vessel has been infected in order to stop new attacks being sent. The complexity, criticality and peculiarities of on-board systems makes it necessary to conduct an in-depth study that will allow us to determine the feasibility of ODA by establishing the following specifications for its development: scope, technical, financial and human resources necessary, development times. The possibilities of the ODA project being viable are very high, but do require an exhaustive technical and financial feasibility analysis to develop it afterwards. This is a totally innovative project aligned with the Connected Industry 4.0 strategy focused on cyber-security and integrating OT/IT systems in the maritime sector.

There is currently no ODA tool on the market and, should it be feasible, it represents a major technological challenge in the areas of communications and data processing and hybridisation between the physical and digital worlds. ODA is aligned with the European Commission's Blue Growth Communication offering support for sustainable growth in the marine-maritime sectors of the EU that acknowledges the importance of the seas and oceans as driving forces of the European economy because of the enormous potential they have for innovation and growth, and throughout the region, with the Canary Island Smart Specialisation Strategy (RIS3), which envisages the blue economy as one of the priorities for the region for the period 2014-2020 due to the strengths of this sector of activity and the socio-economic and environmental conditions of the Canary Islands to promote sea-related activities in this and other regions of the EU Atlantic, such as the elaboration of this proposal. This project has received funding from the Ministry of Economy, Industry and Competitiveness (MINECO) within the program to support Innovative Business Associations (AEI) to contribute to improve the competitiveness of Spanish industry.

PLOCAN's participation in this kind of public-private, tech-based business consortiums is highly beneficial as it places, not on PLOCAN as an institution, but also the Canary Islands and Spain, as benchmarks in the Blue Growth strategy, from the perspective of one of the most innovative sectors; marine sciences and technologies devoted to



Figure 78. Project co-ordination meeting

ocean observation, fostering the technological development and business fabric at a local level. In December, a co-ordination meeting of the partners was held in the offices of CMC.

## ORPHEO

### Coordination of national research activities of member states and associated states in the field of ocean energy

Origin of funding: Plan Estatal de Investigación Científica y Técnica y de Innovación 2013-2016 / Programa Estatal de I+D+i Orientada a los Retos de la Sociedad / Convocatoria: Retos-Colaboración 2016

Participation: Partner

Starting and ending date: 01/07/2016-31/12/2018

Total Project funding: 359.789,87 €

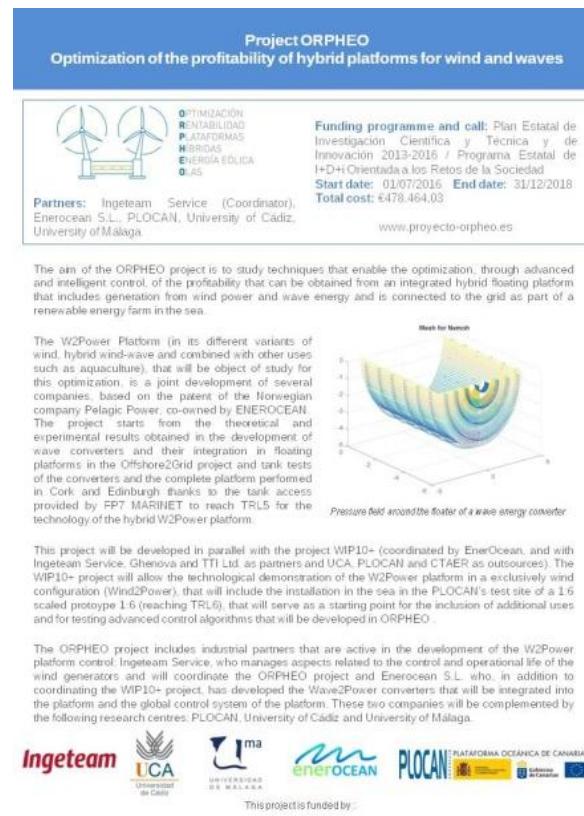
Funding for PLOCAN: 62.513,20€

Percentage of external funding: 100 %

The aim of the ORPHEO project is to study techniques that enable the optimization, through advanced and intelligent control, of the profitability that can be obtained from an integrated hybrid floating platform that includes generation from wind power and wave energy and is connected to the grid as part of a renewable energy farm in the sea. The W2Power Platform (in its different variants of wind, hybrid wind-wave and combined with other uses such as aquaculture), that will be object of study for this optimization, is a joint development of several companies, based on the patent of the Norwegian company Pelagic Power, shared by ENEROCEAN. The project starts from them theoretical and experimental results obtained in the development of wave converters and their integration in floating platforms in the Offshore2Grid project and tank tests of the converters and the complete platform performed in Cork and Edinburgh thanks to the tank access provided by FP7 MARINET to reach TRL5 for the technology of the hybrid W2Power platform.

ORPHEO will be developed in parallel with the international project WIP10+ (coordinated by EnerOcean, and with TTI Ltd (UK), Ingeteam Service and Ghenova as partners and CTAER, UCA and PLOCAN as outsources), in which the wind variant (without inclusion of waveconverters) will be tested and that has recently been selected by the ERANET COFUND DEMOWIND Consortium to demonstrate a scale prototype at PLOCAN's test site in the Canary Islands. WIP10+ will allow the technological demonstration of the W2Power platform in a exclusively wind configuration (Wind2Power), that will include the installation in the sea of a floating platform at a 1:6 scale in Gran Canaria (reaching TRL6), that will serve as a starting point for the inclusion of additional uses and for testing advanced control algorithms that will be developed in ORPHEO. The ORPHEO project includes industrial partners that are active in the development of the W2Power platform control: INGETEAM SERVICE SA, who manages aspects related to the control and operational life of the wind generators and will coordinate the ORPHEO project and ENEROCEAN SL who, in addition to coordinating the WIP10+ project, has developed the Wave2Power converters that will be integrated into the platform and the global control system of the platform. These two companies will be complemented by the following research centers: PLOCAN, University of Cadiz and University of Málaga. The ORPHEO Project is funded by the Spanish Ministry of Economy, Industry and Competitiveness in the scope of the Research, Development and Innovation program focused on the Society Challenges in the framework of the Scientific, Technical and Innovation Plan 2013-2016, section 1: "Research Challenges", R+D+I Projects, Call 2013.

Task 3.1 concerning the study of existing models for predicting wave action in the short term was completed in the first half of 2017, and work started on rolling out these models with real data. In the second half of 2017, work has continued with the application of the statistical techniques selected to the data from the PLOCAN test site with the help of the advisory services of an external consultant.



**Project ORPHEO**  
Optimization of the profitability of hybrid platforms for wind and waves

**Partners:** Ingeteam Service (Coordinator), EnerOcean S.L., PLOCAN, University of Cádiz, University of Málaga

**OPTIMIZACIÓN RENTABILIDAD PLATAFORMAS HÍBRIDAS ENERGÍA EÓLICA OAS**

**Funding programme and call:** Plan Estatal de Investigación Científica y Técnica y de Innovación 2013-2016 / Programa Estatal de I+D+i Orientada a los Retos de la Sociedad  
**Start date:** 01/07/2016 **End date:** 31/12/2018 **Total cost:** €478.464,03 [www.proyecto-orpheo.es](http://www.proyecto-orpheo.es)

The aim of the ORPHEO project is to study techniques that enable the optimization, through advanced and intelligent control, of the profitability that can be obtained from an integrated hybrid floating platform that includes generation from wind power and wave energy and is connected to the grid as part of a renewable energy farm in the sea.

The W2Power Platform (in its different varieties of wind/hybrid wind-wave and combined with other uses such as aquaculture) will be object of study for this optimization, is a joint development of several companies based on the patent of the Norwegian company Pelagic Power co-owned by ENEROCÉAN. The project starts from the theoretical and experimental results obtained in the development of wave converters and their integration in floating platforms in the Offshore2Grid project and tank tests of the converters and the complete platform performed in Cork and Edinburgh thanks to the tank access provided by FP7 MARINNET to reach TRL5 for the technology of the hybrid W2Power platform.

This project will be developed in parallel with the project WIP10+ (coordinated by EnerOcean, and with Ingeteam Service, Genous and TTI Ltd as partners and UCA, PLOCAN and CTAER as outsources). The WIP10+ project will allow the technological demonstration of the W2Power platform in a exclusively wind configuration (Wind2Power) that will include the installation in the sea in the PLOCAN's test site of a 1.6 scaled prototype 1.6 (reaching TRL6) that will serve as a starting point for the inclusion of additional uses and for testing advanced control algorithms that will be developed in ORPHEO.

The ORPHEO project includes industrial partners that are active in the development of the W2Power platform control. Ingeteam Service, who manages aspects related to the control and operational life of the wind generators, and will coordinate the ORPHEO project and EnerOcean S.L., who, in addition to coordinating the WIP10+ project, has developed the Wave2Power converters that will be integrated into the platform and the global control system of the platform. These two companies will be complemented by the following research centres: PLOCAN, University of Cádiz and University of Málaga.

**Ingeteam**  **UCA**  **enerOCEAN**  **PLOCAN**   
This project is funded by:  
  

Figure 79. Project information sheet

PLOCAN has drawn up an information sheet on the project that was presented at the conference organised by APPA Marina at CEHIPAR in March.

On the other hand, an inertial sensor was bought to measure acceleration to be installed on the WIP10+ platform.

Two prototype buoys were installed on the test site in December to measure wave action based on GPS. These are the property of a Spanish company ZUNIBAL. This prototype buoy, called ANTEIA, measures height, period and direction of the waves based on GPS measurements. In April 2017, ZUNIBAL and PLOCAN signed a co-operation agreement to install two prototypes of this buoy on the test site with a view to testing how it works and to compare the results with a reference wave buoy belonging to State Ports. The two prototypes were installed on the test site in December 2017 and immediately brought into operation. The data measured by the two buoys can be seen on the web portal developed by ZUNIBAL and the data for the selected periods can be downloaded.



Figure 80. Prototypes designed by ZUNIBAL



Figure 81. Web portal developed by ZUNIBAL

# RIS3NET

## Interregional Co-operation for the Intelligent Growth of the MAC Regions

Origin of funding: Programa de Cooperación Territorial INTERREG V A España-Portugal (MAC 2014-2020) / Cooperación TRANSNACIONAL

Participation: Partner

Starting and ending date: 01/11/2016-31/12/2018

Total Project funding: 537.997,53 €

Funding for PLOCAN: 162.775 €

Percentage of external funding: 85 %

**RIS3\_Net will develop a strategy for institutional co-operation and a system of common governance, aimed at those institutions responsible for the planning, execution and follow-up of the intelligent specialisation strategies in the MAC regions, taking into consideration its possible extension to other countries. RIS3\_Net will enable:**

- An increase in common knowledge of the RIS3 strategies of the participating regions.
- The sharing of needs, difficulties and challenges affecting the MAC regions, related to the revision, execution and follow-up of intelligent specialisation strategies.
- The creation of a governance that will permit a common work framework to be established.
- The exchange of knowledge and best practices with regards to R&D and innovation policies and information systems for the follow-up and evaluation of the strategy.
- The development of pilot actions in the form of “Proofs of Concept”.



Figure 82. Delegates to the project kick-off meeting

The RIS3Net Project kick-off meeting held at the beginning of May in the offices of the ITC brought together representatives of the entities that form part of the consortium, from the archipelagos of the Canary Islands, Madeira and the Azores. The meeting was opened by the head of the ACIISI Area of R+D+i, Antonio López, who highlighted the importance of the project to reinforce research, technological development and innovation, to enhance the competitiveness of SMEs, promote adaptation to climate change; conserve and protect the environment and promote resource efficiency and improve institutional capability and efficiency of public administrations. An informative article about the project was published in edition nº 12 of the B3M newsletter. An article analysing the participation of the groups from Macaronesia in the calls for territorial co-

operation Interreg-MAC was published in edition nº 13, in the area of blue growth, also in the framework of the project.



Ilustración 84. Artículo del proyecto en el B3M



Figure 83. Article about MAC calls for projects in B3M

The dissemination area also drew up a sheet about the project:



On the other hand, during these six months, three pilot projects have been started as part of the RIS3\_Net. In the case of the Canary Islands, PLOCAN is leading the "Blue Growth" pilot project, aimed at the marine maritime area. With a view to sharing a common methodology with all partners, a teleconference meeting was held, in which PLOCAN presented the objectives and the time line of the actions that comprise this pilot project. The main actions rolled out by PLOCAN during the second half of 2017 were as follows:

In the block "Study of the characterisation of the R+D+i systems of Madeira, Azores and Canaries in the marine-maritime area":

- Statistical analysis of the participation of Macaronesian entities in projects relating to the blue economy funded in Interreg calls for projects
- Identification of pro-active players in Macaronesian R+D+i in blue economy (files by entity with identification of projects and participation in calls for R+D+i grants and subsidies)
- Statistical analysis of participation of Canary Island entities in projects on the blue economy funded in European calls for projects (basically, FP7 and Horizon 2020)
- Bibliographic repository (articles, studies, reports, official communications, etc.) on Blue Economy, Blue Growth, Outermost Regions (OR) and Smart Specialisation Strategies (RIS3)

In the block "Search for and contact with potential partners to drive R+D+i into blue growth, with special interest in OR and third countries":

- Comparative study on Outermost Regions (OR) of the European Union and the inclusion of the Blue Economy in their respective RIS3
- Analysis of regional bodies of the Caribbean [Associations of Caribbean States (ACS), Caribbean Community (CARICOM) and Organisation of Eastern Caribbean States (OECS)], including a file for each country with general information and geographic location
- Analysis of the composition and organisational structure of the Economic Community of West African States (ECOWAS)
- Analysis of other regional bodies of the Central Atlantic, such as Overseas Countries and Territories (PTU) and the Association of Overseas Countries and Territories of the EU (OCTA).
- Geographic maps of the main regional groups of the Central Atlantic (Macaronesia, Caribbean and West Africa)

Another important milestone of this period in the "Blue Growth" pilot project was holding the first meeting of the Blue Economy Group (BEG), driven by PLOCAN, ACIISI and the ITC.

# ROVINO

## Low cost educational robotics with Arduino technology

Origin of funding: Call of support for the promotion of the culture of scientific, technological and innovation 2016

Participation: Leader

Starting and ending date: 01/01/2017-30/09/2017

Total Project funding: 22.000,00 €

Funding for PLOCAN: 22.000,00 €

Percentage of external funding: 38 %

**The main objective of this proposal is the integration of an educational project in the classrooms, based on the construction of a Remotely Operated Vehicle, from low-cost tools, considering open-source hardware and software, having selected Arduino as an open-source hardware platform and Scratch as an open-source software implementation.**

In addition to the main objective, it has been considered that robotics should be present in the education of any student, due to its didactic and practical nature, regardless the school/high school and the development that teachers make of this theme. Therefore, this proposal includes a demonstration workshop dedicated to robotics and programming which is also extrapolated to an exhibition in museum of science/technology. It will provide students a set of tools to build underwater robots, in line with the "Maker" philosophy and working realistically, creating dynamic activities that complement the teaching work and stimulate interest in science, technology and innovation. As an additional element of innovation, the proposal includes a training program for teachers in the Scratch programming language. This proposal is set as an excellent opportunity to disseminate to citizens in general and more specifically to students, the extensive and exciting field of professional development that through innovative technologies applied to the knowledge and the sustainable use of the ocean, can be found and developed in Spain.

Finally, the project context is also used to actively disseminate the results of the UNDERWORLD project, related to underwater radiocommunications, in the framework of the Scientific, Technic and Innovation Plan 2013-2016, section 1: "Research Challenges".



Figure 86. Delegates to the kick-off meeting



Figure 85. Project kick-off meeting

The PLOCAN shore offices, in Taliarte (Telde), hosted the kick-off meeting of the ROVINO Project: Low-Cost Submarine Robotics with Arduino Technology, which is part of the EDUROV Educational Submarine Robotics initiative of the Canary Island Oceanic Platform, with the co-operation of the Spanish Foundation for Science and Technology (FECyT) – Ministry of Economy, Industry and Competitiveness, La Caixa Charity Work Foundation, the Cabildo of Gran Canaria and the Canary Island Research, Innovation and Information Society Agency (ACIISI), attracting the participation of 55 schools.

The conference was opened by the director of PLOCAN, co-ordinator of the ROVINO project. The meeting closed with a debate on integrating ROVINO in the teaching projects of the Canary Island Ministry of Education, as a nationally-representative example. 17 teachers from 15 schools encompassing Primary, Secondary education, 6th form and Vocational Training, representing the 55 schools that took part in the project, intervened in the debate. From Gran Canaria, Atlantic School Garoé, the Heidelberg College, Norte school, Sagrado Corazón from Tafira, Amurga High School, Francisco Hernández Monzón High School, Guía High School, José Arencibia Gil High School, Politécnico High School, Schamann High School, Tamaraceite High School and Valsequillo High School; representatives from Tenerife were Ichasagua High School; from Fuerteventura; S. Diego de Alcalá High School; from El Hierro, Garoé High School. Before the workshop was rolled out in the schools, a manual was drafted for the Ministries of Education to ensure that submarine robotics workshop fitted into the teaching projects. The implementation phase started afterwards with the distribution of the kits to the selected schools to build the ROVs. A total of 106 kits were sent to 62 schools. A pilot scheme was also rolled out to train trainers in Primary Education aimed at Scratch with two training sessions in April and May for a total of 32 teachers. The demonstration event was held in the week of the 22<sup>nd</sup> of May.

Finally, an exhibition was organised of the contents of the project in the Elder Museum of Science and Technology in Las Palmas de Gran Canaria for four weeks in August.

The project came to an end in September.



Figure 87. Exhibition in the Elder Museum

# SE@PORTS

## Sustainable Energy at Sea Ports

Origin of funding: OCEANERA-NET Joint Call 2016 /Topic 5: Demonstration and validation of technological developments in a test or real sea environment  
Project ID: PLOCAN-2017-010021

Participation: Partner

Starting and ending date: 16/01/2017-15/01/2019

Total Project funding: 68.737,25 €

Funding for PLOCAN: 68.737,25 €

Percentage of external funding: 100 %

In Wave Energy - Technology Brief (June 2014), the International Renewable Energy Agency stated that synergies with other offshore industries would be advantageous to the wave energy industry. The report concludes that opportunities should be found to create more dedicated infrastructures – including ports – to support the installation, operation and maintenance of wave energy converters (WEC). Additionally, the progressive growth of the sea ports' activity brings many challenges, namely the increase of the energy consumption and pollution. The implementation of WECs in sea ports, allows preparing these important infrastructures for the future throughout sustainable and environmentally friendly developments. Seaports breakwaters are designed to withstand wave action and promote the dissipation of wave energy at the entrance of the seaport, creating sheltered conditions for port activities. The high potential of these structures for the integration of WECs, due to their high exposure to ocean waves, triggered the SE@PORTS project. This project intends to demonstrate this approach is a win-win solution for both breakwaters and WEC solutions in a large extent. WECs current applications onshore are either based on the oscillating water column (Pico Island-PT and MutrikuSP, approaching TRL8) or on the overtopping principle (SSG at TRL3/4). These proof-of-concept prototypes, installed in real environments for validation purposes, still lack an integrated, multipurpose-driven assessment aimed at maximizing its technology efficiency, power production, long-term reliability and minimizing visual impacts or the overall construction.

The integration of high potential, overtopping concepts (TRL3) in breakwaters of large ports will be studied by means of numerical (WP3) and physical (WP4) modelling. In order to improve the system overall performance, hybrid systems combining overtopping with other working principles to harness wave energy will be analysed to explore the potential of this original approach. Potentiality of WEC's application in seaports will be economically evaluated (WP5). To realize SE@PORTS ambition, it is necessary to characterize the casestudy sites (WP2): (i) the offshore wave conditions, (ii) wave conditions at the toe of the breakwater, (iii) wave energy in front of the WEC. As case studies sites, the Port of Leixões (Porto, Portugal) and Port of Las Palmas (Gran Canaria, Spain) are suggested. Several concepts will be numerically studied in order to: (i) study its hydrodynamic behaviour, (ii) define the best design for the foundations, (iii) combine different approaches of harnessing wave energy, (iv) define which PTO suits better the power generation, (v) establish control strategies to be applied, (vi) explore the integration of storage systems and, finally, (vii) measure both the effectiveness and efficiency, taking into account Lean Principles by apply Lean Design-forXcellence (LDFx) tool. Then, the most promising concept will be physically studied in both sites at different scales. Dissemination (WP6) will be organised around Research activities. The outcome of these activities will be published in peer-reviewed journals and presented at international conferences. At the beginning of the project the TRL will be 3 and in the end of the project we expect to reach the TRL 4-5 with the full set of laboratory tests of the reduced-scale models.

In 2017, the Las Palmas Port Authority send data on the La Esfinge Dock to PLOCAN to plan the project activities. At the end of June, the project Executive Board met. A PLOCAN representative took part in the Green Energy Ports Conference held in Vigo in June.



Figure 88. Delegates to the second partners' meeting held in PLOCAN

The project held its second partners' meeting in early July. The partners presented the progress they had made in each of the work packages and decisions were taken about next steps. Furthermore, there was a visit to the facilities of the port of La Luz y de Las Palmas, where they had the opportunity to discover the characteristics of the Nelson Mandela Dock in detail, which will be used as a case study in the project.

Work continued in the second half of 2017 on the deliverables of WP2 dealing with the characteristics of the ports of Las Palmas and Leixoes. At the same time, the University of Las Palmas de Gran Canaria was commissioned to write a technical report, now complete, dealing with the maritime climate of the area of interest, aimed at calculating the energy period of the waves that will improve estimations of energy potential of the waves.

## SMARTBLUE

### Red de clusters marino-marítimos regionales para la competitividad PYME de la economía azul

Origin of funding: INTERREG V A España-Portugal (MAC 2014-2020) / Cooperación TRANSFRONTERIZA:

Participation: Partner

Starting and ending date: 01/11/2016-31/10/2019

Total Project funding: 847.523,23 €

Funding for PLOCAN: 170.024,51 €

Percentage of external funding: 85 %

Within the sphere of blue economy there are endless development opportunities in established maritime subsectors such as fisheries, maritime transport and ports, and in emerging sectors such as maritime tourism (recreation and cruises), aquaculture, and marine biotechnology, as reflected in the European Strategy for Blue Growth. In this regard, the SMART BLUE ATLANTIC project will develop activities to promote networks and services to support innovation and internationalisation focused on the concept of regional maritime clusters and aimed at SMEs in blue economy within the MAC co-operation area. This will result in an increase in the critical mass and capacity that will produce economies of scale in networks dominated by small businesses working together to innovate and access other markets, obtaining better results than would be obtained from acting individually.



Figure 89. SmartBlue Project kick-off meeting

The SmartBlue Project consortium held its first meeting in the offices of PLOCAN in Taliarte. The opening of the project meeting was chaired by the director of the Canary Island Research, Innovation and Information Society Agency of the Canary Island Government, Manuel Miranda, and was also attended by the director of PLOCAN, Octavio Llinás, and the chairman of the Marine Sciences Technology Centre (CETECIMA), José Luis Guersi. The project participants include associates like SmartBay Ireland (Irish company that manages the marine renewable energy test site in Galway Bay), The Regional Directorate of Marine Affairs of the Azores Government and ENAPOR from Cape Verde.

As part of project dissemination, an informative article on the project was published in issue number 12 of B3M and an information sheet was drawn up:





Figure 93. Opening of the SmartBlue transfer conference

In 2017, PLOCAN played an active part in all the other project activities, clustering and internationalisation.

The day was opened by the Deputy Minister of Industry, Energy and Trade of the Canary Island Government, Adrián Mendoza Grimón, and two parts were programmed, a first one in which the Centre for Industrial Technological Development CDTI, The Canary Island Research, Innovation and Information Society ACIISI and financial institutions reported on the different lines of funding for R+D+i, and the other one in which a range of different innovative companies of the blue economy in activities such as bio-technology, water treatment, coastal engineering and sensors, presented their success stories in innovative projects. The information day is part of the project's innovation activity that is aimed at raising awareness, advisory actions, competitive intelligence actions and technological services that foster innovation and smart specialisation in maritime companies, and it was organised by the Canary Island Oceanic Platform (PLOCAN), in the Marine Sciences Technology Centre (CETECIMA) and the Canary Island Maritime Cluster.



Figure 92. Conference programme

# SWARMS

## *Smart and Networking UnderWAter Robots in Cooperation Meshes*

Origin of funding: ECSEL-2014-1 / ECSEL-01-2014: ECSEL Key Applications and Essential Technologies (RIA) y Programa Estatal de I+D+i Orientada a los Retos de la Sociedad / Acciones de Programación Conjunta Internacional 2014. Although included in the same card, Swarms national and Swarms international are considered independent projects attending to fund origin. Participation: Partner

Starting and ending date: 01/07/2015-30/06/2018

Total Project funding: 6.406.818,64 € + 5.675.266,54 €

Funding for PLOCAN: 231.156,25 € + 232.080,00 €

Percentage of external funding: 65,13 %

Nowadays, the major part of offshore operations is done by divers in dangerous missions. Since their number is limited, the dependency on their work represents a real threat to the offshore industry. The extended use of unmanned underwater vehicles (AUVs/ROVs) could solve this problem but since they are usually tailor-made for a specific task and difficult to operate their deployment is very expensive. The overall goal of the SWARMS project is to expand the use of AUVs/ROVs and facilitate the creation, planning and execution of maritime and offshore operations. This will reduce the operational cost and increase the safety of tasks assigned to divers.

The SWARMS project aims to make AUVs/ROVs accessible to more users by:

- Enabling AUVs/ROVs to work in a cooperative mesh thus opening up new applications and ensuring re-usability as no specialized vehicles are needed but heterogeneous standard vehicles can combine their capabilities,
- Increasing the autonomy of AUVs and improving the usability of ROVs The approach is to design and develop an integrated platform (a set of Software/Hardware components), incorporated into the current generation of underwater vehicles in order to improve autonomy, cooperation, robustness, cost-effectiveness, and reliability of the offshore operations.

SWARMS' achievements will be demonstrated in two field tests in different scenarios:

- Inspection, maintenance and repair of offshore infrastructure
- Pollution monitoring
- Offshore construction operations

SWARMS is an industry-led project: big technology companies will collaborate with SMEs specialized in the subsea, robotics and communication sectors and universities and research institutions to ensure that the newest innovations in subsea robotics will arrive fast to market. As voice of the customer, two end-users are also part of the consortium.

The project partners met in Livorno, Italy on the 16th and 17th of March to hold the fourth plenary session of the consortium. After holding the first project trials last September in the port of Taliarte in the PLOCAN facilities, this second meeting, which was accompanied by preliminary integration trials, helped to define the tests that will take place in July in Romania, which will be the second major milestone of the project. PLOCAN has played a leading role in this meeting, offering its experience as a demonstration centre.



Figure 94. Meeting of partners in Italy

anniversary. Its main objective is to show off the latest advances in the sector in a permanent exhibition area and a full and varied programme of lectures, seminars, commercial presentations and technical demonstration

PLOCAN took part in the project representation at the 5th edition of the international Ocean Business trade fair on offshore technologies held from the 4th to the 6th of April at the headquarters of the United Kingdom National Oceanographic Centre (NOC) in the city of Southampton.

A record attendance by visitors, five thousand, and exhibitors, four hundred, representing science-tech-based companies and institutions working on the development, marketing and use of instrumentation and systems for oceanic observation, allowed this event to reach its tenth

sessions over three days. Delegates also got a first-hand view of the latest technical advances in oceanic observation systems, and also to identify new synergies and ways of future international co-operation with companies and institutions.

In July, the project partners organised the first project demonstration, with the participation of PLOCAN as a partner, in Mangalia, Romania between the 3<sup>rd</sup> and the 11<sup>th</sup> of July. In Mangalia, the different partners shared the resources and results obtained in the project to date in order to carry out a successful demonstration for the reviewers from the European Commission. PLOCAN took measurements of hydrogen sulfide (H<sub>2</sub>S) in the operations area with a reference probe that was fitted to mobile platforms in order to map the distribution of concentrations that then had to be monitored by autonomous marine vehicles present in the manoeuvres. The result of these measurements was important for demonstrating the project, which was attended by several



Figure 95. SWARMS at Ocean Business



Figure 96. PLOCAN technicians at the demonstration in Romania

representatives of the European Commission. The project trials went according to plan, and the assessment by the auditors of the SWARMS project was highly positive.



Figure 97. Delegates to the sixth project plenary assembly

In December, PLOCAN took part in the sixth plenary assembly of the Smart Submarine Robots Working in Co-operative Networks project (SWARMS) financed by the European Commission and the Ministry of Economy and Competitiveness and organised in the head offices of Tecnalia in Bilbao. This sixth assembly that brought together 32 partners from 10 countries, focused especially on addressing important issues aimed at completing the definition of the platform that will allow submarine robots to work together to carry out different common missions and objectives. Furthermore, they defined details dealing with

the final demonstration of the project that will take place in Trondheim, Norway, in June 2018.

During this year, as part of the project, Teledyne Seabotix gave a course to train 8 people by enhancing their knowledge about ROVs and their accessories.



Figure 98. PLOCAN personnel during the course given as part of the project

# SYMBIOSIS

## *A Holistic Opto-Acoustic System for Monitoring Marine Biodiversities*

Origin of funding: H2020-BG-2016-2017 / Topic: BG-14-2017: Monitoring and assessing fish stocks, other pelagic species and habitats with an automated, non-invasive, opto-acoustic system. / Deadline Id: H2020-BG-2017-1

Participation: Partner

Starting and ending date: 01/11/2017-31/10/2020

Total Project funding: 1.399.960,00 €

Funding for PLOCAN: 13.000,00€

Percentage of external funding: 87 %

We present the SYMBIOSIS project to provide a mature, cost effective autonomous opto-acoustic prototype for the characterization, classification, and biomass evaluation of six target pelagic fish that are important to the fishery industry and that reflect on the health of the environment. The processing will be made in a real-time fashion onsite, and the results will be sent to a shore station. The system will be completely autonomous and will withstand three month deployment without recharging. We will demonstrate the capabilities of the system and its readiness to a TRL6 stage over three sea and ocean mooring sites. SYMBIOSIS is devised as a blend of acoustic and optical components. The acoustic unit will include an active underwater acoustic array of 2X3 elements, to detect, classify, evaluate the biomass, and localize the predefined pelagic fish in the far field of 500m. The optical component will comprise of a fixed frame of six underwater optical cameras, and will perform machine learning-based classification and biomass evaluation in the near field of 2-3 attenuation lengths in low-light conditions. To conserve power the optical unit will be triggered upon detection from the acoustic unit, and will use the results from the acoustic localization. The system will be modular, both in term of performance and in terms of composition, and will adapt to different scenarios and cost requirements.

SYMBIOSIS will involve the university of Haifa, Israel (four groups); IMDEA Networks, Spain (two groups); Patavina Technologies, Italy; and EvoLogics, Germany. The academic partners have already developed all the technical components of the system, and have demonstrated preliminary results in multiple sea experiments. The industry partners have substantial experience with integrating acoustic and optical components for long-term sea development, and is a leading firm for the development of realtime underwater signal processing.

# UNDERWORLD

## *UNDERWater radiocommunications for Optimized monitoring using multiRelay Devices*

Origin of funding: Proyectos I+D+i Retos 2013

Participation: Partner

Starting and ending date: 01/01/2014-30/06/2017

Total project funding: 314.524 €

Funding for PLOCAN: 113.619 €

Percentage of external funding: 100 %

The two research groups from the University of Las Palmas de Gran Canaria and from the Polytechnic University of Madrid have been working on HF communications over for the last sixteen years. Most of their achievements have been obtained thanks to funding obtained from previously awarded domestic projects (TEC2004-06915-C03, TEC2007-67520-C02 and TEC2010-21217-C02) and several private projects funded by AEMIA and the Ministry of Defence. When PLOCAN joined, a sound consortium was created able to face the scientific, technical and technological challenges of this proposal: the re-assessment of electromagnetic communications (EM) in networks of submarine sensors. To date, most wireless underwater communications have been implemented with acoustic systems, generally considering that underwater communications by radio cannot meet the requirements set.

In fact, the limited range of water due to attenuation is the main obstacle to the environment we face. The reasons that arouse interest in the project are as follows: The growing interest of the civil and military industry, environmental and port management entities, among others, in achieving reliable underwater links with higher data rates than acoustic communications. Have a specific key application as an objective: environmental monitoring: in general, it is considered that this is not a better alternative to acoustic communications at great depth between remote sites, with limitations on power or on high data rates. But our scenario focuses on shallow areas both in sea water on the coast and in fresh water in rivers, dams and reservoirs. In this situation, EM systems are the best option as acoustic systems lose performance. Finally, the paradigm change that has come about thanks to aspects such as DSPs, new, more efficient antenna or new considerations concerning alternative propagation mechanisms.

This project will help: 1) to design new antennae, 2) propagation models, 3) to design low power communications systems and mainly, 4) in a new paradigm in which submarine communications are based on a set of static nodes and also on unmanned vehicles (UUV) that resolve the existing attenuation with multi-jump communication protocols. This new network will be able to both improve existing detection and estimation procedures with data fusion and distributed consensus/dissemination algorithms, apart from including functions such as self-location, tracking vehicles or providing help to shipping.

All this can be achieved thanks to the combination of theoretical contributions, measuring campaigns, modelling and the development of software and hardware. In fact, the best asset of this project is the balance between these aspects with a view to creating an operational wireless network of submarine sensors that will also be attractive for transferring technology to the interested entities. The major challenge is only feasible thanks to merging the experience and the skills acquired by each of the institutions involved..

The final project meeting was held at PLOCAN headquarters at the beginning of June. The co-ordinator of the UNDERWORLD Project from the Poly-technical University of Madrid, Santiago Zazo, the co-ordinator of the sub-project from the University of Las Palmas de Gran Canaria, Iván Pérez, and the co-ordinator of the PLOCAN sub-project, Joaquín Hernández Brito, presented the results of the research done on submarine communications by radio as part of the UNDERWORLD project, which imply greater environmental efficiency and technological progress.

The HERAKLES Project was also presented during the event. This is a continuation of the UNDERWORLD Project that comes about as a form of consolidating the ideas and prototypes developed, to carry out real trials and test the features of the point-to-point link. The objective is to attain a degree of maturity that allows the technology to be transferred to companies in the sector as part of the European Commission's "Blue Economy" strategy, by creating new opportunities and technologies that provide support and progress in creating jobs through smart, sustainable, inclusive growth (Europe 2020).



Figure 100. Delegates at the UNDERWORLD project meeting

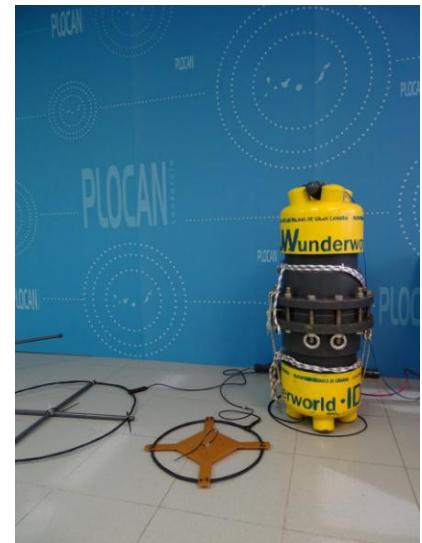


Figure 99. Photo of one of the prototypes developed

## UNDIGEN+

### *UNDIGEN Marine Autonomous System*

Origin of funding: Retos-Colaboración 2014

Participation: Partner

Starting and ending date: 27/01/2014-30/06/2017

Total Project funding: 266.454,81 €

Funding for PLOCAN: 43.168 €

Percentage of external funding: 100 %

The consortium for the Undigen Project (MINECOIPT- 2011-1770-920000), led by the tech company Wedge Global, S.L. has developed a wave energy converter that is in the final stages of sea trials with an innovative electricity generation system, which, in turn, is potentially ideal for different kinds of Wave Energy Converters – WECs –(including Vertical and pendulum point absorbers and Oscillating Water Column). Notwithstanding the potential of this innovative electricity generation system from a purely energy point of view, it also opens up the possibility of applying this technology autonomously; in other words, as a platform for installing equipment to measure the marine environment with a view to addressing a potential industrial-commercial development as imminently as possible.

It is worth mentioning that the Wedge approach to wave power, focusing from the beginning and giving priority to PTO as they consider it the key component of the global conversion system (WEC), once this key component can modify the properties of the collector, configured, in turn, as a direct conversion system that eliminates intermediate stages and, therefore, provides greater reliability and associated shelf life, together with a significant reduction in operating costs and maintenance of WECs. Consequently, the central objective of the project focuses on rolling out this action with a view to being able to use the renewable energy generated to autonomously feed the equipment installed in the collector. This can be equipment of different kinds, coastal surveillance equipment, marine research equipment, etc., along with the characterisation of the marine environment for different purposes from a global perspective.

This year, the project has carried out the final phase of marine functionality tests on the wave power converter.

## Wip 10+

### *Wind Integrated Platform for 10+ MW Power per Foundation*

Origin of funding: ERA-NET COFUND H2020 / DemoWind ERA-NET Cofund Action / Joint Call 2015. Topic: Offshore Wind, Topic 2 - Floating offshore turbines

Participation: Partner

Starting and ending date: 27/01/2016-31/12/2018

Total Project funding: 758.000€

Funding for PLOCAN: 30.000 €

The consortium for the Undigen Project (MINECO IPT- 2011-1770-920000), led by the tech company Wedge Global, S.L. has developed a wave energy converter that is in the final stages of sea trials with an innovative electricity generation system, which, in turn, is potentially ideal for different kinds of Wave Energy Converters – WECs – (including Vertical and pendulum point absorbers and Oscillating Water Column).

Notwithstanding the potential of this innovative electricity generation system from a purely energy point of view, it also opens up the possibility of applying this technology autonomously; in other words, as a platform for installing equipment to measure the marine environment with a view to addressing a potential industrial-commercial development as imminently as possible.

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Consequently, the central objective of the project focuses on rolling out this action with a view to being able to use the renewable energy generated to autonomously feed the equipment installed in the collector. This can be equipment of different kinds, coastal surveillance equipment, marine research equipment, etc., along with the characterisation of the marine environment for different purposes from a global perspective.

On the 21st of February, a monitoring meeting was held for the project in the offices of ENEROCEAN in Malaga. Between the 9th and the 11th of October, there was a steering committee meeting in Malaga at the same time as the ORPHEO Project steering committee meeting.

## 9. AGREEMENTS SIGNED AND PARTICIPATION IN NETWORKS

In 2017, PLOCAN signed the following **co-operation agreements**:

- Agreement between PLOCAN and SOCIB to set up the RIM and define its operating regulations in accordance with the guidelines set out by agreement of the CPCTI of the 7<sup>th</sup> of October 2014 and its annexes, signed on the 24<sup>th</sup> of July 2017 and published in the Official State Gazette on the 5<sup>th</sup> of October 2017
- Co-operation agreement between PLOCAN and ENDESA to implement the electricity and communications project for the PLOCAN test site, signed on the 31st of May 2017
- Legal assistance agreement between the central government (Ministry of Justice, State Bar, Directorate of Legal Services) and PLOCAN, signed on the 21<sup>st</sup> of April 2017
- Co-operation agreement between the Ministry of Economy, Industry and Competitiveness and the Consortium to design, build, fit out and manage the Canary Island Oceanic Platform (PLOCAN) for the implementation of the "REDSUB" project co-funded by ERDF funds from the Smart Growth Operating Programme 2014-2020, signed on the 30<sup>th</sup> of October 2017
- Agreement for the establishment of the Atlantic International Research Centre (AIR Centre) to promote a holistic, integrative and systemic approach to knowledge on space, atmosphere, oceans climate-energy, and data sciences in the Atlantic, while fostering an inclusive perspective to science, technology and economic development, signed on the 20<sup>th</sup>-21<sup>st</sup> of November 2017 in Florianopolis (Brazil) between PLOCAN and Governments, Universities, Research Agencies and Industry from Spain, Portugal, Angola, Cape Verde, Brazil, Nigeria and Uruguay.

With respect to **participating in networks**, in 2017, the following actions have been carried out:

In June, PLOCAN signed the protocol of the Modular Platform for Research, Testing and Validating Support Technologies for a sustainable sea economy, TEC4SEA. This is a unique, pioneering institution in Europe tasked with the mission of supporting research, development and testing technologies at sea. The protocol was signed during the Business2 Sea event in Porto. The infrastructure will be co-ordinated by the Portuguese Instituto de Engenharia de Sistemas e Computadores, Tecnologia e Ciencia. The main objectives of this co-operation are to promote multi-disciplinary research and development in the environment of the sea and the oceans and the development of associated economic sectors, within the framework of the competences and activities of the advisory committee; help to interpret and reflect national, regional and sectoral strategies and areas of intervention of the TEC4SEA; and supervise the application of such strategy, also within the framework of competences of the advisory committee.



Figure 101. PLOCAN at Business2 Sea



Since August, PLOCAN has been a member of the Network of Scientific Culture Units of the Spanish Foundation for Science and Technology (FECyT). The main objective of PLOCAN's Unit of Scientific Culture and Innovation (UCC+i) is to promote a culture of science, technology and innovation through activities of different kinds: scientific communication, dissemination, training, etc. UCCs have become one of the main agents in the dissemination of science and innovation in Spain, and they offer a key service for enhancing and increasing scientific training, culture and knowledge for the general public.

In September 2017, after publication, the co-operation agreement signed in July 2017 to set up the Network of Marine Infrastructures (RIM) between the Canary Island Oceanic Platform (PLOCAN) and the Coastal Observation System of the Balearic Isles (SOCIB) came into effect. The two ICTSs will share a collective strategy and develop co-ordination initiatives of common interest. They will also drive co-ordination with other Spanish entities and agencies that engage in activities in their area of action, in areas, such as storage and management of data acquired by different observation platforms.

PLOCAN participates in the Blue Economy Working Group chaired by the Ministry of Economy, Industry, Trade and Knowledge of the Canary Island Government. The first meeting was held on the 24th of November. The purpose of the group is to provide new drive for one of the priority sectors established by the Canary Island Smart Specialisation Strategy, RIS3. The working group is made up of the two public Canary Island universities, the Spanish Oceanographic Institute, the Canary Island Oceanic Platform (PLOCAN), the Maritime Cluster of the Canary Islands, The Marine Sciences Technology Centre and the Canary Island Institute of Technology.

The first six months of 2017 saw the constitution of the AIR Centre initiative on the island of Terceira (Azores), co-ordinated by Portugal, which is one of the priorities and actions highlighted by the Alliance for Research in the Atlantic Ocean. PLOCAN plays an active role in this initiative. It hosted the first Hispano-Portuguese meeting on the AIR Centre at its facilities on the 23rd of June 2017, which explored forms of co-operation between the two countries regarding the five strands of activity that the future Air Centre will have: space and applications, atmosphere, climate change and energy systems, offshore systems and computing and data. At the meeting, Spain and Portugal assessed the strengths and capabilities of research leadership of their R+D+i systems to increase their co-operation around the AIR Centre (Atlantic International Research Centre), a new, distributed international research centre.

In June, there was a Hispano-Portuguese meeting about the Air Centre at the PLOCAN facilities that is described in the section on events held and visits received.



Figure 103. AIR Centre evento in Brazil

Government, at which the Florianópolis Agreement was signed after the final comments by representatives from Angola, Brazil, Cape Verde, Spain, Niger, Portugal and the Autonomous Region of the Azores, with a total of 23 signatories, including 11 research associations and 4 delegates from industry.

PLOCAN is a member of the management board of the OECD project "Fostering Innovation in the Ocean Economy" along with MAPAMA and the IEO. Fourteen institutions from eleven different countries form part of the board:

- ▶ BEL Flemish Government, Department of Economy, Science and Innovation,
- ▶ DEU German Marine Research Consortium (KDM)
- ▶ DNK Danish Maritime Authority
- ▶ ESP Canary Island Oceanic Platform (PLOCAN), Spanish Oceanographic Institute (IEO) and Ministry of Agriculture, Fisheries and the Environment (MAPAMA)
- ▶ IRL Marine Institute
- ▶ ITA Stazione Zoologica Anton Dohrn
- ▶ KOR Korea Marine Institute (KMI)
- ▶ The NOR Research Council
- ▶ PRT DGPM / FCT

On the 20th and 21st of November, PLOCAN participated in the "2nd High-level dialogue between Industry, Science and Government about 'Atlantic Interactions' – AIR Centre – International Atlantic Research Centre", with over 200 representatives from seven countries, in Florianópolis (Brazil). The meeting closed with what is known as the Florianópolis Agreement, signed by PLOCAN and others, that marks a step forward in co-operation between the signatories to create a multilateral organisation in the Azores to research energy systems, space sciences and data in the Atlantic Ocean. The first day saw the Ministerial Round Table and the Dialogue Industry-Science-



Figure 102. Delegates to the evento in Brazil

- ▶ UK/SCOT Marine Science Scotland, Scottish Government
- ▶ USA National Oceanic and Atmospheric Administration



Figure 104. OECD headquarters in Paris

After joining the board, PLOCAN attended its second meeting that was held in Paris on the 24<sup>th</sup> of November. PLOCAN participates, more specifically, in module two of the project. The object of this module is to research emerging patterns of co-operation in R+D+i between marine-maritime players from all over the world.

PLOCAN is a member of the Blue Economy Group of the Canary Island Government, which held its first meeting in November. The Blue Economy Working Group (GEA) driven by the Canary Island Agency for Research, Innovation and Information Society (ACIISI), belonging to the Canary Island Government, in order to promote the growth of the blue economy, one of the priority sectors of the Canary Island Smart Specialisation Strategy (RIS3), held its first working meeting with the presence of the Minister of Economy, Industry, Trade and Knowledge of the Canary Island Government, Pedro Ortega.

This group was initially made up of a range of different public-private entities associated with marine-maritime R+D+i, such as the Spanish Oceanographic Institute (IEO), the Canary Island Institute of Technology (ITC), the University of Las Palmas de Gran Canaria (ULPGC), the University of La Laguna (ULL), the Canary Island Oceanic Platform (PLOCAN), The Marine Sciences Technology Centre (CETECIMA) and the Canary Island Maritime Cluster (CMC), with

institutional and technical representatives from each of these entities attending the meeting.

The Minister of Economy, Industry, Trade and Knowledge of the Canary Island Government opened the meeting and highlighted the competitive advantages that the Canary Islands have to intensify and lead R+D+i associated with the blue economy. The director of ACIISI, Manuel Miranda, and the head of the department of R+D+i of ACIISI, Manuel López Gulías, presented a synthesis of the actions of the Canary



Figure 105. Meeting of the Blue Economy Working Group



Island Government in the context of the blue economy: relations with RIS3, budgets, actions, sources of funding like the ITI, calls for projects and participation. The director of CETECIMA, José Luis Guersi, presented some preliminary data and conclusions of the study "Approach to the blue economy in the Canary Islands" that this agency is currently putting the final touches to. Among other things, he highlighted the fact that the blue economy has a 3x1 multiplier effect, and its contribution to regional GDP is estimated at 6.5%, and 6.8% in terms of jobs. Octavio Llinás, director of PLOCAN, co-ordinated the debate on the strategy that the GEA should follow, proposing a methodology and a work plan based on the pilot project on "Blue Growth" that PLOCAN is currently designing as part of the RIS3\_Net project of the Interreg MAC 2014-2020 call for projects, co-funded with ERD funds.

Finally, on the 19th of December, PLOCAN took part in the first meeting of the Marine Environment Committee of the Canary Island Climate Change Observatory. The Canary Island Climate Change Observatory, created in April, is an independent body set up for the purpose of diagnosing the causes and impacts of global warming on the archipelago and determining the best response to them. Through this agency, the Canary Islands are represented in the World Network of Observatories and in social and scientific public and private bodies devoted to fighting climate change. This body will tackle aspects concerning civil defence and public health, loss of biodiversity and marine and fisheries pollution and its effects on economic activities in general, and mainly on tourism. The sectoral committee on the marine environment is made up of representatives of the Biodiversity and Environmental Impact Services of the Ministry of Regional Policy of the Canary Island Government; the universities of La Laguna and Las Palmas de Gran Canaria; the Spanish Oceanographic Institute; the Canary Island Oceanic Platform (PLOCAN) and the Directorate General of Fisheries of the Canary Island Government.

Between 2012 and 2016, PLOCAN has participated in the following technical/institutional networks:

#### **Institutional networks:**

Since 2012, PLOCAN has belonged to the international Network of innovative maritime territories made up of Spain, France, Germany, Italy, Argentina, Mexico, United States and Vietnam, among others.

PLOCAN participates in the "Energy and Sustainability School" of the University of Las Palmas de Gran Canaria. This school came about with the objective of becoming a meeting point and discussion forum between University and Society on issues of interest for the future of the Canary Islands. It forms part of the programme of university functions of dissemination, promotion and transfer of knowledge for culture, quality of life and economic development.

Since 2014, PLOCAN has formed part of the FECYT EURAXESS Network related to research mobility, and it is an "ECP-Euraxess Contact Point". In April 2016, PLOCAN undertook to apply the "European Charter for researchers and the Code of conduct for the recruitment of researchers".

PLOCAN forms part of the following initiatives:

- ▶ Atlantic Stakeholder Forum for galvanising blue growth in the European strip of the Atlantic
- ▶ Galway Statement Implementation for defining strategy on blue growth in the European Atlantic

- ▶ Ocean Energy ERA-Net Consortium for galvanising the renewable marine energy sector in Europe.

PLOCAN participates in the R+D+i Working Group set up in March 2016, under the presidency of the Minister of Economy, Industry, Trade and Knowledge, Pedro Ortega, with a view to analysing and proposing improvements to the Smart Specialisation Strategy (RIS3), together with possible actions and identify new key technologies for the Canary Islands. The general purpose of this working group is to foster R+D+i activities and processes of transfer of their results to the productive fabric.

Apart from the Canary Island Government, the working group is made up of the University of Las Palmas de Gran Canaria (ULPGC), the University of La Laguna (ULL), the Canary Island Institute of Technology (ITC), the Canary Island Oceanic Platform (PLOCAN), the Canary Island Astrophysics Institute (IAC), the Large Telescope of the Canary Islands (GRANTECAN) the Canary Island Institute of Agricultural Research (ICIA) and the Canary Island Health Research Foundation (FUNCANIS).

PLOCAN is a member of the Management Committee and the technical committee PRO-GRAN CANARIA (currently known as BESTinGC) set up in 2016 and driven by the Cabildo of Gran Canaria through the Gran Canaria Economic Promotion Society (SPEGC). In the technical committee, it also participates in this committee's marine-maritime group.

PLOCAN is a member of the working group of the OR Energy Network, created by the Ministry of Industry, Energy and Trade of the Canary Island Government to foster co-operation among the outermost regions in order, among other objectives, to put common projects to the EU that allow the development of a new energy model. The OR Energy Network was presented by the regional minister Pedro Ortega in Madeira at the end of September. The working group made up of the players involved in the energy sector in the archipelago was set up in November 2016.

#### **Technical networks:**

The PLOCAN (ESTOC) oceanic observatory forms part of the European EMSO (European Multidisciplinary Seafloor and Water Column Observatory) and FixO3 (European Fixed Open-Ocean Observatories Network) Network. The European Commission agreed to set up the European Multidisciplinary Seafloor and Water Column Observatory-European Research Infrastructure Consortium (EMSO ERIC). The agreement was published in the official journal of the European Union on the 1<sup>st</sup> of October 2016. The members of this infrastructure are Ireland, Greece, the Kingdom of Spain, the French Republic, the Italian Republic, the Portuguese Republic, Romania and the United Kingdom of Great Britain and Northern Ireland. The entity representing Spain in EMSO is the Canary Island Oceanic Platform. EMSO is made up of ocean observation systems that monitor environmental processes in real time, including natural risks, climate change and marine ecosystems. The EMSO observation nodes are sited at strategic sites in Europe, from the Arctic to the Atlantic and from the Mediterranean to the Black Sea. EMSO ERIC will establish, co-ordinate, facilitate and optimise the use of instruments and resources for pan-European marine operations in order to reap the greatest benefit for the community specialising in oceanic observation.



Figure 106. Delegates to the EMSO ERIC All Regions workshop

countries, observation sites and scientific disciplines to participate in EMSO. The event also provided the community with information about the state of the existing ERIC EMSO nodes, and a general description of potential and expected nodes; the current situation of submarine observatories, their design and operation and the state of the exchange of know-how and best practises with EMSO ERIC entities outside of Europe to help align strategies and encourage new developments that promote a global dimension. PLOCAN presented the status and future plans of the Canary Island facilities for EMSO, including the open sea and coastal observation capabilities. The workshop also promoted a discussion on access to and services required by the scientific community and the industrial sector and about the skill-building needs of operators, managers and users.

PLOCAN is part of the EMODnet (European Marine Observation and Data Network) comprised of more than 160 members that share oceanographic data, products and meta-data in order to make them available to public and private users. PLOCAN's membership was formalised in December 2016. PLOCAN belongs to the robotics and automation, maritime security and marine energies of the Spanish Maritime Sector Technology Platform (PTME). This organisation provides a place for meeting and dialogue for all stakeholders involved with the sea and with other aquatic media.

PLOCAN has been a member of the European network Everyone's Gliding Observatories (EGO) since 2008. This is an international scientific-technical forum of users of submarine glider technology (gliders).

PLOCAN has been a member of the I-COOL (International Coalition of Ocean Observing Laboratories) since 2010, led by Rutgers University.

PLOCAN has been a member of the MARTECH international committee on marine technologies since 2008.

PLOCAN is a member of the Technology Society (MTS).

In October, PLOCAN took part in the EMSO ERIC All Regions workshop as the EMSO Spain organisation in charge and the representative of the Canary Island node. The workshop, entitled "Seabed and water column observatories of the European Union: challenges and opportunities for integration", took place in Rome from the 9th to the 11th of October 2017 to bring together members of scientific and marine industrial communities to exchange knowledge and best practices related to advances in the context of the mission and the objectives of EMSO.

The workshop also had a two-level purpose: to proactively improve co-ordination and efficiency of the scientific and technological teams that are already engaged in EMSO activities and attract new participants to prepare the ground for new



PLOCAN is a member of the European Atlantic Group of Gliderport facilities, along with CNRS (France), SAMS (Scotland), NACO (Norway), GEOMAR (Germany) and NOCS (Great Britain).

PLOCAN is a member of the international Waveglider-Users group, led by German institution MARUM, along with MBARI, SCRIPPS, CMRE, LAMMA, IFREMER, WHOI, GEOMAR, NOCS, etc.

PLOCAN is an active member of the international educational programme Educational Passages, led by NOAA. Two sail boats were launched from the island of El Hierro in 2016, fitted with GPS to track their route across the Atlantic for students.

PLOCAN is working in co-ordination with a network of glider users in the North Atlantic led by Memorial University of Canada, along with institutions from Ireland, Germany, Portugal and the United Kingdom.

PLOCAN is a member of the European technology and Innovation Platform for Ocean Energy (TP Ocean) that brings together over 200 experts from the off-shore energy sector to define a clear strategy for technological development. TP Ocean is officially recognised by the European Commission as a European Technology Platform (ETP).

PLOCAN is a member of the European ocean energy association (Ocean Energy Europe). The objective of this association is to galvanise the off-shore energy sector in Europe, and PLOCAN sits on one of the committees of the Ocean Energy Forum, a specific working group to tackle the main challenges that off-shore energies face in the advance towards the industrialisation of the sector.

PLOCAN is a member of the Spanish Standards and Certification Association (AENOR, in Spanish) through its sub-committee AEN/206/SC114. The purpose of this sub-committee, known as "Marine energies. Wave and current converters", is to draft standards in everything associated with harnessing energy from waves and the ocean currents to produce electricity. The duties of the sub-committee deal with the standardisation of the technology and procedures associated with transforming the energy contained in waves and marine currents into electricity. PLOCAN is currently contributing experts to the working groups dealing with assessing the environmental impact and assessing the energy resource.

PLOCAN is a member of the Association of Renewable Energy Producers APPA Marina, which has twenty-six partners. It was founded in 2006 to bring the industrial sector together and work on developing this technology in Spain. Most of the companies and entities engaged in activities in this sector in Spain are members, so it is in a unique position to provide a realistic overview of the sector. The immediate objective of the Marine section of APPA is to promote an appropriate legal framework and the associated technological development that will enable off-shore energy to achieve an important position in renewable energy production in 2020.

PLOCAN co-operates with Ocean Energy Systems, an initiative of the international energy agency on off-shore energy. The PLOCAN test site is included as a facility to test devices in the open sea.



In 2013, PLOCAN joined the initiative to set up a Steering Committee for the Macaronesia Marine Maritime Cluster that seeks co-operation and the creation of synergies in the maritime sector in order to formulate projects and make optimum use of the legislative and financial instruments of the EU for 2014-2020.

PLOCAN takes part in the EuroGOOS HF-Radar Group, led by EMODNEt Physics.

PLOCAN takes part in the Scientific Access Committee of the EU-TNA Glider Programme.

PLOCAN is part of the Programme Committee of the Oceans of Tomorrow Projects to assess progress, contributions and impact of projects funded by the European call for projects Oceans of Tomorrow.

PLOCAN belongs to the Wave Power Working Group of EVE to galvanise technological progress and the application of the technology used in wave-driven energy generating devices.

## 10. TRAINING, FOSTERING AND DISSEMINATING SCIENTIFIC AND TECHNOLOGICAL VOCATIONS

### TRAINING

The eighth edition of the glider school was held in November

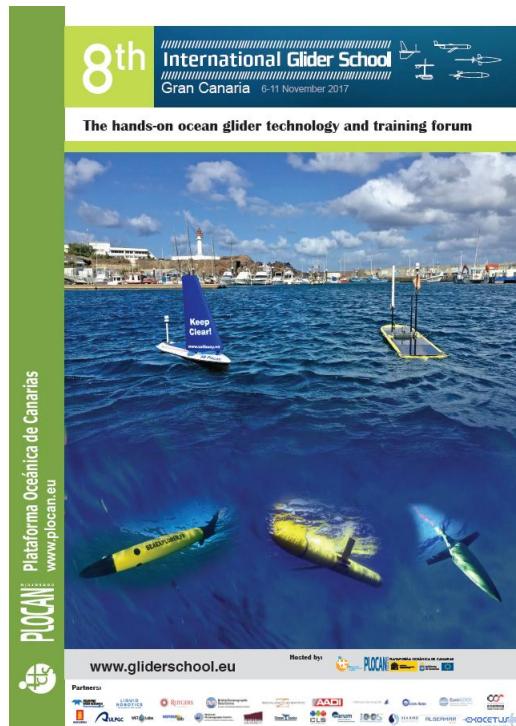


Figure 107. People attending the Glider School 2017

The PLOCAN Glider School ended on the 13th of November after six days of intensive training activity. As in previous editions, the school received the support and co-operation of the leading manufacturers in the industry (Kongsberg Maritime, Teledyne Marine, Liquid Robotics, ALSEAMAR, Offshore Sensing, CLS, or EXOCETUS among others) and international benchmark institutions such as the Memorial University, MARUM, Rutgers University, MBARI, EGO-Network, as final users of these latest-generation autonomous oceanic observation platforms. The 8th edition enabled PLOCAN to surpass the figure of one hundred students trained in this technological discipline, which in turn, represents the participation of a total of twenty-seven countries.

Figure 108. Poster of the Glider School 2017

Students from Finland, Canada, Portugal, Spain, Chile, Nigeria, Turkey and Ireland tackled both theoretical and practical sessions over the course of the week in the PLOCAN facilities, Taliarte dock and the open waters of the east coast of Gran Canaria. For this, they had access to PLOCAN's glider fleet, the five main available and operational technologies of gliders that are currently on the commercial market, allowing the PLOCAN Glider School to consolidate its position as a high-level international benchmark in glider training. The school gave the participating companies the chance to present some of their latest technological advances, which included the deep glider version for 6000 metres developed by Kongsberg Maritime, the Slocum G3 from Teledyne Marine and the hydrocarbon sensor developed by ALSEAMAR and fitted to the Seaexplorer glider.



Figure 109. School students during a training session

practical aspect in a working environment, organised into two distinct phases. The first one is a two-year grant phase that provides the student with the know-how they require to work in a real-life employment environment and the second phase, also two years, is a contract to work as an intern.

The two candidates that started in this programme 2+2 in 2016 continued their work in 2017, one on the theme of “oceanic observation and data processing” and the other on “marine/submarine vehicles, instruments and machines”.

The three candidates that joined the **0.5+2 programme** the previous year entered the internship contract phase in 2017. This programme facilitates very highly specialised supplementary training and finding a job for Vocational Training graduates. In this case, the grant phase lasts six months, followed by a two-year internship. The people currently participating in this programme are working in the following areas:

- Support for PLOCAN’s Socio-economic Area
- Telecommunications and I.T. Systems
- Quality Control and Analysis Laboratory

One student was given practical and theoretical training in the Canary Island Agency for Research, Innovation and Information Society (ACIISI), part of the Canary Island Government, **Innovation Managers programme**, co-funded by the European Social Fund (ESF).

Three students took part in the **Inserta Dual Training programme** that PLOCAN manages along with the Las Palmas University Foundation to foster finding a job for both university graduates and for vocational training graduates. The different areas of this training programme were as follows:

- Innovation unit

The observation capabilities of gliders have multiplied the support provided to oceanic research worldwide, and Macaronesia is the reference for the Eastern Central North Atlantic. PLOCAN is part of the international EGO-gliderports network, set up by highly-specialised infrastructures, with technical capabilities to provide both operational and training services concerning the technological development and use of gliders, not only to enhance oceanic observation capabilities, but also to make this more efficient and sustainable.

As for student training, October saw the opening of a call for candidates for the **training programme 2+2** with the thematic focus on “marine energies and connections” to replace a candidate who stopped work on the same subject in February. This programme supplements the training received at universities with a

- PLOCAN legal service
- Developing web applications

As part of the **Innova programme** promoted by the Las Palmas University Foundation as patronage for carrying out research in ULPGC and for companies, institutions and individuals to transfer this research to the productive fabric.

In 2017, sixty-four students from other national or foreign institutions were received for short "stages":

- 28 from the KOSMOS project (from the German GEOMAR institute)
- 20 from the Canary Island Science and Technology Campus (ULPGC)
- 10 from the University Foundation Innova Programme
- 4 from KMOU (Korea Maritime and Ocean University).
- 2 from Experts in Marine Engineering.



Figure 110. KOSMOS Project of the German GEOMAR institute



Figure 111. Students of the Science and Technology Campus at PLOCAN

Ten university students in degrees relating to PLOCAN activities and two Higher Diploma students have done their **curricular practicals** this year at PLOCAN. Two-degree dissertations in Sea Sciences and Naval Engineering were also started and two Master's dissertation on I.T. Engineering and Industrial Technologies.

In 2017, PLOCAN took part in the **Canarias Masterclass** initiative promoted by the Canary Talent association for professionalisation, which advises future university students. The students shared a working day with an expert from the professional sector that they are interested in.

With regard to training for PLOCAN's own personnel, in 2017, a total of 34 training actions took place. The list of training actions by areas of the organisation follows below:

ECONOMIC-ADMINISTRATIVE AREA	SCIENTIFIC-TECHNICAL AREA	SOCIO-ECONOMIC AREA	GENERAL
Practical workshop on public procurement	Safety and Emergency systems aboard PLOCAN's boats	Endnote	Handling the Integral Time Control Service web application (user level)
Handling the Integral Time Control Service web app (supervisor level)	PRINCE2 Foundation level	Scratch and Visualino for Arduino	Theory-practical training in handling extinguishers
Negotiating Techniques	ROV Seabotix	Configurating and Managing the Climate Control System for CPD Liebert CRVo35RA	Advanced Word
Crime Prevention Plan	Advanced course for remotely piloted aircraft (RPA)	CISCO CCNA	Health and Safety at Work
Customs and AEIM	Basic Safety Training Course	New ISO 14001:2015 standard	Advanced Excel
Administrative Procedure	The Laboratory Measurement of Salinometry		Wordpress Content Manager user level
EU Customs	BOSIET		Handling a defibrillator
How to organise an event	IMIST		
Implementation of CANOA analytical accounting systems	Radar HF		
	Glider SeaExplorer		
	Glider Slocum		
	Self-loading crane operator		
	Glider Seaglider		

## FOSTERING SCIENTIFIC AND TECHNOLOGICAL VOCATIONS

PLOCAN has two training initiatives for secondary students. Their objective is to foster scientific-technological vocations. On the one hand, the **EDUROVs programme** that seeks to attract and motivate high school students in science and technology by building and remotely operating submarine vehicles (ROVs). This programme is conducted in co-operation with the VICOROB group from the University of Gerona.



Figure 112. Photos of the demonstration evento of the EDUROVs project

In 2017, the project was funded by La Caixa Social Charity Foundation and by the Cabildo (Island Government) of Gran Canaria. Students from thirty-three schools built the submarine vehicles, and they had the chance to show them off at a demonstration event held in the municipal swimming pool of San Bartolomé de Tirajana in May.

The second initiative in this area is the **local Educational Passages programme** arising from the international version of the project. In this case, primary and secondary students build small sail boats fitted with a GPS (Global Position System) allowing their course to be tracked once they have been launched into the ocean. The boats sail for months without any kind of support and they can cover long distances. In 2017, two of these boats were launched from Gran Canaria.



Figure 113. Launching the educational boats Canarias IV and VLIZ

## DISSEMINATION

In August, the Spanish Foundation for Science and Technology (FECyT) validated PLOCAN as a Scientific Culture and Innovation Unit (UCC+i). To do so, the FECyT assessed the scientific dissemination activities implemented by PLOCAN in 2016.

Scientific Culture and Innovation Units (UCC+i) act as intermediaries between the institutions that host them and the general public, with the main objective of promoting scientific and technological culture and innovation through activities of different kinds: scientific communication, dissemination, training, etc. They have become one of the main agents for disseminating science and technology in Spain and they are a key service for enhancing and increasing training, scientific culture and know-how among the general public.

Hence, PLOCAN is accredited in the following modalities:

- ◆ UCC+i to communicate R+D+i results. The activities of communicating R+D+i results include all activities associated with disseminating information and content that meets certain newsworthiness criteria. Specifically, they must be new and current and they must be directly associated with results produced in the centres to which the UCC+i belongs.
- ◆ UCC+i that engage in general dissemination of scientific and technological knowledge: These are understood to be activities aimed at disseminating information and content that are not necessarily new or current, but which help to enhance the level of scientific and technological knowledge among the citizenry. This section presents a comparison of the results against the previous year, based on several tables, graphs and statistical data.

## 11. PARTICIPATION IN EVENTS AND VISITS RECEIVED

A total of 17 events have been held in the PLOCAN facilities in 2017 and many visits have been received, including the visit of the King and Queen of Spain on the 24th of April.

At the beginning of February, officers and ranks of the Search and Rescue Co-ordination Centre (SAR RCC Canarias) and personnel from PLOCAN held a meeting as part of the co-operation agreement signed between the SAR Co-ordination Centre and the outstanding scientific-technological infrastructure. The meeting was attended by personnel from the University Institute of Smart Systems and Numeric Applications in Engineering of the University of las Palmas de Gran Canaria (SIANI) and addressed one of the main aspects of the co-operation agreement, studying marine currents to establish search and rescue pattern, in case of marine incidents in the area of the Canary Islands.



Ilustración 115. Reunión en la sede de PLOCAN con el SAR RCC Canarias

operations that may be needed in the marine environment. Over the last ten years, PLOCAN and the RCC Canarias have worked together on different research projects, accident drills and real emergencies.

In February, the director of Innovation Norway for Africa, Ole Johan Sandvær, and the aide of the Trade and Tourism attaché of the Norwegian Embassy, Rodrigo Ballesteros Cruz, visited the PLOCAN facilities in Taliarte. Innovation Norway is an instrument of the Norwegian government for innovation and the development of Norwegian companies and industry. They met the manager of the scientific-technical area and toured the PLOCAN shore facilities. In the glider laboratory, they were given detailed information about the activities that PLOCAN is engaged in with these autonomous submarine devices. A PLOCAN representative then attended a working lunch organised by the Hispano-Norwegian Chamber of Commerce and the Norwegian Embassy to introduce the new Norwegian

Scientists from the SIANI presented the software that they have developed, PLATEA 4D, a latest-generation technological platform designed to facilitate the development of monitoring systems, geographic representation and the analysis of information. The software allows current and wind prediction data to be incorporated and it also includes a transport model that allows the course of a drifting object to be predicted.

The RCC Canarias will have access to the software as a tool to support decision-making, for search and rescue

manoeuvres in the event of air accidents at sea, or in any co-



Figure 114. Visit by Innovation Norway to the PLOCAN glider laboratory

Ambassador to Spain to Norwegian business people living in Gran Canaria. PLOCAN has forged close ties with Norwegian companies and institutions with whom they take part in European projects.



Figure 117. Visit by students of the BIMeTIC master

In March, students of the Master in BIMeTIC (university master in ICT Solutions for Welfare and the Environment) visited PLOCAN. The visit was part of the master's educational content and the main objective is to show the students the shore facilities of the infrastructure and its capabilities, lines of work and both operational and training activities of a scientific-technological nature that PLOCAN is currently engaged in, and also as a potential professional opportunity in the area of ICT with applications in the marine and maritime sectors. The main novelty this year was the presentation of the current state of PLOCAN, located at the site envisaged for its installation on the sea bed on the test site to the north-east of Gran Canaria, after completing the mooring manoeuvre.

In March, the Commercial Attaché of the Canadian Embassy in Spain, Karen Kennedy, met a large group of institutions and companies of the marine-maritime sector at the PLOCAN

offices and took part in a round table on the opportunities for co-operation between Canadian and Canary Island companies and institutions in the framework of the bi-lateral Free Trade Treaty between the European Union and Canada (CETA).

The purpose of the PLOCAN meeting of the Commercial Attaché of the Canadian Embassy in Spain was to discover in depth the potential that there is in Gran Canaria. The Commercial Attaché was accompanied by the Commercial Attaché of the Canadian Embassy in Spain, Isidro García. The meeting was also attended by representatives of the Canary Island Maritime Cluster, the Canary Island Society for Economic Promotion (PROEXCA), Special Canary Island Zone, Official Chamber of Commerce, Industry and Shipping of Gran Canaria, Casa África, Canary Island Institute of Technology, University of Las Palmas de Gran Canaria, Marine Sciences Technology Centre and PLOCAN. After the representatives from the Embassy had presented the CETA, the participants explored the possibilities for co-operation with Canada together.



Figure 116. Meeting with the Canadian Embassy in the PLOCAN facilities

Students studying Specialist in Marine Energies, certified jointly by the University of Las Palmas de Gran Canaria (ULPGC) and Raley Estudios Costeros and Hexia Formación visited the PLOCAN facilities at the end of March, along with two of their teachers. The main objective of the visit was to inform the students of the facilities of the infrastructure's shore offices, their capabilities, lines of work and both operational and training activities of a scientific-technological nature that PLOCAN is currently engaged in and the potential professional opportunity associated with the field of marine renewable energies. These following aspects were of interest to the students studying Specialist in Marine Energies, a five-year course: Appraisal of Marine Energies, Marine Converters, Auxiliary Facilities, Maintenance Management and Feasibility Studies.

In April, technicians and scientists from PLOCAN visited the Brazilian oceanographic vessel Vital de Oliveira on its stop-over at the port of La Luz y de Las Palmas. This modern Brazilian vessel was officially presented by the Brazilian Navy in July 2015, as the results of a co-operation agreement between Brazilian companies Petrobras S.A., Vale S. A. and the Brazilian Ministry of Science, Technology and Innovation. The ship has 28 research teams for different scientific disciplines, including areas for 5 laboratories aimed at tackling research in the areas of oceanography, hydrography, geology and meteorology, apart from a remotely-operated submarine vehicle that can dive to a depth of 4,000 metres. The Vital de Oliveira is fitted with a modern azimuth propulsion system and a dynamic positioning system (which allows it to stay at a given position precisely, in spite of marine currents). The ship has a displacement of approximately 3,500 tonnes, it measures 78 metres long, a beam of 20 metres, draft of 4.8 metres, sustained maximum speed of 12 knots and it can carry 140 people, 90 of which are crew members.



Figure 118. Visit by students of the course Specialist in Marine Energies



Figure 119. King Felipe in the offices of PLOCAN

In April, PLOCAN was honoured to receive a visit by the King and Queen of Spain. During their visit, King Felipe praised the work of the researchers and scientists during the meeting held in the PLOCAN offices, attended by Queen Letizia and the president of the Canary Island Government Fernando Clavijo. "Your work is excellent, it is essential for the prosperity of our society, for the environment, for the health and quality of life of our citizens", highlighted the King, before adding that the scientists were carrying out this work "with discretion and with the passion and dedication to be expected of those fighting for knowledge to discover and to improve the lives of all in greater harmony with our planet. Thank you for everything that you do", he said.

In reference to PLOCAN, he emphasised the "major benefits that it is called on to provide as an Outstanding Scientific and Technical Infrastructure, not just because of the importance of the marine environment in the field of research, but also because it is closely linked to an emerging productive fabric, in full consonance with the blue economy strategy established in the context of the European Union".

During the visit, King Felipe and Queen Letizia, accompanied by the president of the Canary Island Government, Fernando Clavijo, held a meeting with scientists from the University of Las Palmas de Gran Canaria, from the PLOCAN Consortium, the Spanish Algae Bank and from other Canary Island research institutes IUCTC, IUMA, IUSA, IUSIANI, IDETIC, IOCAG, IATEXT, IUIBS, I-ECOAGUA, i-UNAT and TIDES. The meeting with the monarchs in PLOCAN brought together the leading authorities of the Canary Islands, the Speaker of the Canary Island Parliament, Carolina Darias, the Government Delegate in the Canary Islands, Mercedes Roldós, the Secretary of State for Tourism, Matilde Asiain, the Minister of Economy, Industry, Trade and Competitiveness of the Canary Island Government, Pedro Ortega, the President of the Cabildo of Gran Canaria (Island Government), Antonio Morales, the Mayor of Telde, Carmen Hernández, the director of the Canary Island Agency for Research, Innovation and Information Society, Manuel Miranda, the secretary general of science and innovation, Juan María Vázquez, the director of the Spanish Oceanographic Institute, Eduardo Balguerías and the Chancellor of the University of Las Palmas de Gran Canaria, Rafael Robaina, among others.



**Figure 120. Moments from the visit by the King and Queen to the PLOCAN offices**

by the Canary Island Oceanic Platform".

Octavio Llinás, director of PLOCAN, made a presentation of the activities of the Consortium in the assembly hall, and then the visitors toured the PLOCAN facilities to show the King and Queen some of their activities, including the EDUROV educational project to stimulate vocations among young people in the scientific disciplines, the Operations Room and the Submarine Vehicle Laboratory.

Fernando Clavijo, President of the Canary Island Government referred to the Strategy for Internationalising the Economy, rolled out by the Canary Island Government to become a platform between Europe, Africa and South America, which will "offer a leading role to researchers that carry this land forward; the people who work every day in fields like studying the behaviour and efficiency of different maritime devices and technologies, and which are represented at the highest possible level



Figure 121. Technicians from the Cide Network at the PLOCAN offices

In June, technicians from the Network of Business Innovation and Development Centres (Cide Network) of the Canary Islands visited the PLOCAN facilities during the XII Encounter of Technicians of the Cide Network. The facilities of the shore offices of the infrastructure and its capabilities, lines of work and both scientific and technological operational and training activities that PLOCAN is currently engaged in, and as a potential professional opportunity and opportunity for co-operating with companies of the marine-maritime sector, were presented to the technicians of the Cide Network.

The visit was part of the XII Encounter of Technicians of the Cide Network that brought together personnel from the sixteen centres that comprise the Network of Centres of Business Innovation and Development, found on all the islands, for two days, after receiving a subsidy from the Ministry of Economy, Industry, Trade and Competitiveness of the Canary Island Government in June – through the

Canary Island Agency for Research, Innovation and Information Society, which recognises them as Cide agents for 2017. The CIDE Network is comprised of experts in innovation that work in entities close to companies like Chambers of Commerce, Business Federations and Associations, etc., and also close to

universities, such as University Foundations. Its job basically is to foster innovation and a culture of innovation in business through training and dissemination activities and by providing free information and advisory services.

In June, the secretary general of Science and Innovation, Juan María Vázquez, headed up the Spanish delegation at the I Hispano-Portuguese meeting about the AIR Centre that has helped to explore channels of co-operation between the two countries in the five strands of activity of the future Air Centre: space and applications, atmosphere, climate change and energy systems, oceanic systems and computing and data. The Delegate of the Central Government in the Canary Islands, Mercedes Roldós Caballero, the director of the Canary Island Agency for Research, Innovation and Information Society, Manuel Miranda, the secretary for the Sea, Science and Technology of the region of the Azores, Gui Menezes, and the Chairman of the Foundation for Science and Technology of Portugal, Paulo Ferrao, attended the presentation of the working session.



Figure 122. Hispano-Portuguese AIR Centre Meeting in PLOCAN



Figure 123. Participants in the AIR Centre meeting

As a result of the meeting, a White Paper was drafted, entitled "Towards a Science and Technology Agenda for an integrative approach in Atlantic regions through North-South Co-operation". Almost one hundred researchers, academics and business people from different countries took part in drafting it. This document includes the synergies and strengths for laying the foundations of the new international research centre that will be located in the Azores, built on existing infrastructures. This initiative –co-ordinated by Portugal– is one of the priorities and actions highlighted by the Alliance for Research in the Atlantic Ocean. The meeting brought together researchers and heads from some twenty research centres from both countries. From Spain, the meeting was attended by members of several Outstanding Scientific and Technical Facilities (ICTS), Public Research Agencies, technological and industrial development centres and universities. On the Portuguese side, there were representatives from the Foundation for Science and Technology, the University of the Azores, Institute of the Sea and the Atmosphere (IPMA) and from the

Centre for Environmental and Marine Science and Technology (MARETEC), among others.

At the end of June, we received a visit from a delegation from SINTEF-Ocean, research centre of the aquiculture, marine resources, oil and gas, processing, environmental technology, fisheries and new oceanic industries sectors, from Scandinavia. They came to visit PLOCAN and met with technicians to identify new lines of co-operation.

The scientific director of SINTEF-Ocean, Arne Fredheim, Vice President of New Oceanic Industries, Bård Wathne Tveiten, and researcher Even Ambros Holte, visited the PLOCAN facilities on shore and the oceanic platform in the waters of the Outstanding Scientific and Technical Infrastructure's test site. In the course of the meetings, PLOCAN and SINTEF Ocean made presentations of the two institutions and explained the most important projects in which they are participating, focusing particularly on identifying new lines of co-operation and matters of common interest.

SINTEF Ocean and PLOCAN have already worked together on several projects of the European H2020 Framework Programme with positive results. The visit and the working meetings have helped to reinforce co-operation for future joint actions. SINTEF is the largest non-profit-making foundation in Scandinavia, with around 2,000 employees.



Figure 124. Visit by Sintef Ocean



**Figure 125. Manoeuvres by the Directorate General of Security and Emergencies on the platform**

Manoeuvres were carried out in June by the Directorate General of Security and Emergencies on the platform. These consisted of a simulated evacuation of a person who has suffered an accident. The rescue manoeuvre consisted of two rescuers descending to the platform from a helicopter with the right resources to evacuate an injured person on a stretcher. These manoeuvres allow the personnel to anticipate situations of risk that could arise in the future, while also offering training for all the personnel involved. This reduces the response time of both in the face of a hypothetical need to evacuate somebody from the platform by air. The rescue exercise was programmed in the framework of co-operation established between the Directorate General of Security and Emergencies of the Canary Island Government and the Canary Island Oceanic Platform.

In July, the PAT18, Renewable Energies of Marine Origin working group (ENERMAR), of the Association of Naval and Oceanic Engineers of Spain promoted the VIII edition of their Technical Conference, organised by the Engineer Jorge Juan Foundation in the head offices of the Canary Island Oceanic Platform (PLOCAN) in Taliarte. The VIII Technical Conference of Renewable Energies of Marine Origin hosted a large number of technicians and specialists in renewable energies, who explained the state of the art of platforms for off-shore wind power, highlighting a lecture on the "ELISA" Project, given by José Serna from ESTEYCO, the current state of off-shore energies, existing specialised support services and training that, with support from the PAT 18-AINE, is offered in the E.T.S.I. Navales (UPM) on Harnessing Offshore Renewable Energies, in the format of a Master's course.

The ORPHEO Project, with an integral vision of floating platforms; reducing submarine electricity connection costs and electricity infrastructure like substations on the high seas, were addressed at the conference, aimed at providing practical answers from electricity companies, manufacturers and fitters, technology centres, ship yards, shipping lines, rating societies, etc., from both Spain and



**Figure 126. Photo of the ENERMAR conference with the director of PLOCAN moderating a round table**

abroad, providing a suitable environment for forging relations that the naval industry needs in renewable energies of marine origin.

The sessions were organised over two days with the participation of leading persons from Industry, Technology, University and Public Administrations in technical panels and round tables. Two visits were also organised, one to the oceanic platform in the waters of the test site, and to the port of Arinaga to the construction work of the "ELISA" project.

In July, a delegation from the Centre for Research and Innovation in Marine Energy (MERIC) of Chile visited the PLOCAN facilities in Taliarte. MERIC is a centre of excellence set up by a company called DCNS and funded by the Energy Ministry of Chile through CORFO, where Enel Green Power Chile, the Pontifical Catholic University of Chile, the Austral University of Chile the Inria Chile Foundation, Chile Foundation and Chilectra as a partner company, currently participate in order to establish a national and international reference in renewable

marine energy to drive the development of marine energy through applied research, technological development and innovation.

The technical co-ordinator of the MERIC, Dernis Mediavilla, and the co-ordinator guide for Marine Energy in Chile and Technological Transfer, Nathalie Almonacid, visited the PLOCAN facilities in Taliarte. During the visit, the co-ordinators had the chance to discover the details of the PLOCAN glider fleet first hand. The senior management of the MERIC then dealt with matters of common interest with PLOCAN experts, such as managing spaces used for testing marine energy devices, and they explained the most important projects they were working on. Both parties declared their interest in identifying new lines of co-operation for future projects.

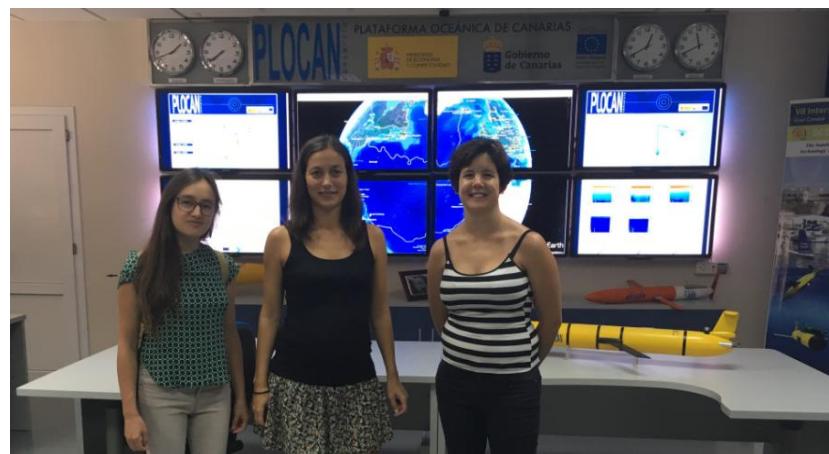


Figure 128. MERIC delegation in the operations room of PLOCAN

At the end of July, PLOCAN hosted the I Technical Conference of the Specific Plan for Accidental Marine Pollution of the Canary Islands for national and international experts. The conference was opened by the Regional Planning, Sustainability and Security Minister of the Canary Island Government, Nieves Lady Barreto. Scientists and emergency personnel analysed the methods and material necessary to face an oil spill and reviewed the procedures followed in recent incidents in the Canary Islands and in important historical cases, such as the Exxon Valdez spill in Alaska, 1989, or the oil spill of 2010 in the Gulf of Mexico, among



Figure 127. Participants in ENERMAR during a visit to the construction works of the ELISA project

others. During the PECMAR Conference, one of the main objectives set was to create a group of experts to guide the administrations involved during contingencies of this kind and to establish a working agenda for the group of experts and to define future lines for developing contingency plans, hold new meetings, plan drills, training activities, etc. The Minister of Regional Planning explained that over the last two years a range of oil spill-related incidents and the potential for the oil to reach the coast have triggered the emergency plans of the Canary Island Government and, although the incidents were on a small scale, "they have shown us the need to improve our plans, protocols and arrangements and to prepare properly to face large-scale events" she emphasised.



Figure 130. Participants at International Waters

opportunities for co-operation for test centres, allowing for an exchange of knowledge and to prevent unnecessary duplication of efforts and resources. The initiative was launched in 2013 on the tenth anniversary of EMEC, recognising that a decade of operations of four test sites in Orkney had led to significant learnings that would be beneficial for other test centres throughout the world, to support the development of a global marine energy industry. During the forum organised in Gran Canaria, discussions focused on the exchange of knowledge within trans-national research programmes -including FORESEA, MaRINET<sub>2</sub>, Marinerg-i and MET-CERTIFIED- and in specific areas of R+D, where test centres can co-operate with the industry towards commercial marketing. Delegates also got the chance to visit the PLOCAN multi-purpose oceanic platform, located on a 23 km<sup>2</sup> test site, which has already seen testing conducted on three wave energy devices (Penguin, UNDIGEN and Welcome). Back on dry land, the delegates visited the construction works of the prototype for the off-shore wind project ELISA / ELICAN that will be tested on the PLOCAN test site in 2018. This structure will become the first fixed, off-shore wind turbine fully installed without the need to use heavy vessels during the installation process.



Figure 129. Declarations of the Minister at the conference held at PLOCAN

The fourth meeting of the international WaTERS network (aimed at wave and tide energy research centres) took place at the PLOCAN head offices at the beginning of November. Organised jointly by the European Marine Energy Centre (EMEC) and PLOCAN, the 4th International WaTERS workshop brought together 17 delegates representing ten research centres and eight countries: DanWEC (Denmark), DMEC (Holland), EMEC (United Kingdom), HINMREC (Hawaii), Nagasaki - AMEC (Japan), PLOCAN (Spain), SENEEOH (France), SEM-REV (France), SmartBay (Ireland) and WaveHub (United Kingdom).

As a global network of test sites in open waters, International WaTERS sets out as its objective to identify common challenges and



Figure 132. Visit by the cónsul general of Korea

The consul general of the Republic of Korea in Las Palmas, Oh Dongil and the consul of fisheries, Park Ingu, visited the shore headquarters of the Canary Island Oceanic Platform in November to discover the work that the Outstanding Scientific Technological Infrastructure carries out to attract investors, projects and investment in the marine-maritime sector. José Joaquín Hernández Brito, director of the Scientific-Technical Area informed the Korean representatives of PLOCAN's strategy, objectives, scientific-technological capabilities and its most important projects. The encounter included a visit to PLOCAN's light marine vehicle laboratory (gliders), with the head of the marine vehicle, instruments and machinery unit, Carlos Barrera Rodríguez.

On the 1st of December, the Gran Canaria Coastal Action Group held a conference at the PLOCAN offices, entitled "Sailing together for coastal

development". The objective was to discover different success stories of projects implemented both in Gran Canaria and in other coastal zones, and propose solutions for the main problems to be found on the island coast.



Figure 131. Conference in the PLOCAN offices of the Gran Canaria Coastal Action Group

On the other hand, PLOCAN has been representing a series of external events apart from project partner meetings:

Event	Location	Start	Finish
<i>EMSO ERIC initiative meeting</i>	<i>Rome, Italy</i>	<i>26/01</i>	<i>27/01</i>
<i>IEC TC-114 committee meeting</i>	<i>Madrid, Spain</i>	<i>13/03</i>	<i>17/03</i>
<i>Jerico Next initiative meeting</i>	<i>Helsinki, Finland</i>	<i>15/03</i>	<i>17/03</i>
<i>Marine Energy Week</i>	<i>Bilbao, Spain</i>	<i>27/03</i>	<i>31/03</i>
<i>Outermost Regions Forum</i>	<i>Brussels, Belgium</i>	<i>30/03</i>	<i>31/03</i>
<i>Ocean Business 2017</i>	<i>Southampton, United Kingdom</i>	<i>04/04</i>	<i>06/04</i>
<i>EGU 2017</i>	<i>Vienna, Austria</i>	<i>23/04</i>	<i>28/04</i>
<i>Business2SEA event</i>	<i>Porto, Portugal</i>	<i>05/06</i>	<i>06/06</i>
<i>Africa Assembly event</i>	<i>Paris, France</i>	<i>13/06</i>	<i>14/06</i>
<i>OCEANS'17 Congress</i>	<i>Aberdeen, United Kingdom</i>	<i>19/06</i>	<i>22/06</i>
<i>Green Energy Ports Conference</i>	<i>Vigo, Spain</i>	<i>27/06</i>	<i>29/06</i>
<i>A New Era for Blue Enlightenment</i>	<i>Lisbon, Portugal</i>	<i>12/07</i>	<i>14/07</i>
<i>Robotics and Marine Comms Demonstration</i>	<i>Gran Canaria, Spain</i>	<i>08/08</i>	<i>03/09</i>
<i>Blue Growth Workshop: Sustainable development of the fisheries and aquaculture sector (success H2020)</i>	<i>Santander, Spain</i>	<i>07/09</i>	<i>08/09</i>
<i>I Security and Prevention on the Canary Island Coastline Conference</i>	<i>Gran Canaria, Spain</i>	<i>03/10</i>	<i>04/10</i>
<i>ICHCA International Conference</i>	<i>Gran Canaria, Spain</i>	<i>03/10</i>	<i>04/10</i>
<i>CANAGUA&amp;Energía</i>	<i>Gran Canaria, Spain</i>	<i>05/10</i>	<i>08/10</i>
<i>Our Ocean Conference</i>	<i>Malta, Italy</i>	<i>05/10</i>	<i>06/10</i>
<i>Science and Innovation Weeks</i>	<i>Gran Canaria, Spain</i>	<i>08/11</i>	<i>10/11</i>
<i>Cabo Verde International Symposium</i>	<i>Cape Verde</i>	<i>13/11</i>	<i>17/11</i>
<i>Bioeconomy Week</i>	<i>Brussels, Belgium</i>	<i>16/11</i>	<i>17/11</i>

## 12. PUBLICATIONS AND COMMUNICATIONS AT CONFERENCES

ID_BIB	KIND OF BENEFICIARY	TITLE OF BENEFICIARY	TITLE OF THE PUBLICATION	AUTHORS
[QMP+17]	Scientific Journal	Sensors	Underwater Electromagnetic Sensor Networks. Part I: Link Characterization	Gara Quintana-Díaz, Pablo Mena-Rodríguez, Iván Pérez-Álvarez, Eugenio Jiménez, Blas-Pablo Dorta-Naranjo, Santiago Zazo, Marina Pérez, Eduardo Quevedo, Laura Cardona and J. Joaquín Hernández
[LGCH17]	Scientific Journal	Atmospheric Environment	Solubility of aerosol trace elements: Sources and deposition fluxes in the Canary Region	Patricia López-García, María Dolores Gelado-Caballero, Cayetano Collado-Sánchez and José Joaquín Hernández-Brito
[RKP+17]	Congress	IS&T Symposium on Electronic Imaging 2017	The Challenge of Preparing Teams for the European Robotics League: Emergency	J. Röning, M. Kauppinen, V. Pitkänen, A. Kemppainen, A. Tikanmäki, M. Furci, M. Palau Franco, A. Winfield, E. Stengler, B. Brueggemann, F. Schneider, A. Castro, M. Cordero Limon, A. Viguria, G. Ferri, F. Ferreira, Xingcun Liu, Y. Petillot and D. Sosa
[GHB+17]	Congress	OCEANS'17	Validation and demonstration of novel oceanographic sensors on selected measurement platforms in the NeXOS project	Lars G. Golmen, Nils-Roar Hareide, Carlos Barrera, Laurent Delauney, Eric Delory, Simone Meme, Jay Pearlman, Jean-Francois Rolin, Stefania Sparnacchia, Christoph Waldmann, Oliver Ferdinand, Svein Østerhus
[PPD+17]	Congress	OCEANS'17	NeXOS, developing and evaluating a new generation of in-situ ocean observation systems	Jay Pearlman, Francoise Pearlman, Eric Delory, Simone Meme, Joaquín del Río, Daniel Mihai Toma, Lars Golmen, Emanuele Reggiani, Oliver Ferdinand, Oliver Zielinski, Nils Roar Hareide, Karsten Kvalsund, Jean-Francois Rolin, Patrice Woerther, Allison Haeffner and Christoph Waldmann
[DMC+17]	Congress	OCEANS'17	New compact passive digital acoustic sensor devices with embedded pre-processing	Eric Delory, Simone Memè, Alessandra Casale, Alberto Figoli, Diego Pinzani, Pablo Cervantes, Pablo Ruiz, Daniel Mihai Toma and Joaquín del Río

[CHQ+17]	Congress	EGU'17	Certified Integral Programme Management for R&D European Projects in Marine Sciences	Ayoze Castro, Silvia Hildebrandt, Eduardo Quevedo, Simone Meme, Josefina Loustau, Joaquin Hernandez-Brito and Octavio Llinás
[CMQ+17]	Congress	EGU'17	Management tools for R&D engineering projects: Coordination perspective for large international consortium (NeXOS)	Ayoze Castro, Simone Memè, Eduardo Quevedo, Christoph Waldmann, Jay Pearlman, Eric Delory and Octavio Llinás
[JRT+17]	Congress	EGU'17	SWE-based Observation Data Delivery from the Instrument to the User - SensorWeb Technology in the NeXOS Project	Simon Jirka, Joaquín del Río, Daniel Toma, Enoc Martínez, Eric Delory, Jay Pearlman, Matthes Rieke and Christoph Stasch
[RMC+17]	Congress	EGU'17	SWARMS Early Trials Management for The SWARMS ECSEL-H2020 Project	Daniel A. Real-Arce, Tania Morales, Ayoze Castro, C. Barrera, Joaquin Hernández-Brito and O. Llinás
[HQQ17]	Dissemination Journal	Industrial Maintenance	El futuro de la ingeniería pasa por el mar	J.J. Hernández-Brito, E. Quevedo and O. Llinás
[LMO17]	Master Dissertation	ULPGC	Revision, modelling and analysis of offshore renewable energies integration to an isolated power system	Rubén Lijó Sánchez (author), José Fernando Medina Padrón and Octavio Llinás González (tutors)
[Gon17]	Bachelor Dissertation	ULPGC	Sistema de control de calidad en tiempo real para instrumentación oceanográfica	Josua M. Gonzalez Santana Tutors: Blas J. Galván González Tania Morales Morales
[QDC+17]	Scientific Journal	Optics Communications	Underwater Video Enhancement using Multi-Camera Super-Resolution	E. Quevedo, E. Delory, G. M. Callicó, F. Tobajas and R. Sarmiento

[QVC+17]	Congress	AO4ELT5	Processing diffraction-limited images through innovative Super-Resolution techniques	E. Quevedo, S. Velasco, C. Colodro-Conde, A. Oscoz, R. L. López, G. Rodríguez-Coira, J. Font, J. H. Brito, O. Llinás, S. Robaina, G.M. Callicó, R. Sarmiento and R. Rebolo
[LML17]	Congress	ENERMAR	Considerations about marine renewable energy integration in isolated power systems	R. Lijó-Sánchez, J.F. Medina-Padrón and O. Llinás
[Her17]	Congress	ENERMAR	Estudio de los costes de generación de un parque eólico offshore de 12 MW ubicado en el sur de Tenerife	Carlos Hernández Hernández
[MHL17]	Congress	ENERMAR	Diseño y optimización de una boya de observación autosuficiente	Javier Martín Almansa, Miguel Ángel Herreros Sierra, Octavio Llinás González
[DFM17]	Bachelor Dissertation	ULPGC	Aplicación web de procesado, almacenamiento y visualización de datos oceanográficos tipo perfiles verticales	José Orlando Díaz Cueva, José Fortes Gálvez and Tania Morales Morales
[Rea17]	Doctoral Thesis	ULPGC	Aportaciones a la Geolocalización Eficiente	Daniel Alcaraz Real-Arce
[RMM+17]	Scientific Journal	IEEE Journal of Oceanic Engineering	Sensor Web Architecture for Integrating Smart Oceanographic Sensors into the Semantic Sensor Web	Joaquín del Río, Daniel Mihai Toma, Enoc Martínez, Thomas C. O'Reilly, Eric Delory, Jay S. Pearlman, Christoph Waldmann and Simon Jirka

## 13. COMMUNICATION

In 2017, PLOCAN has drafted the annual communication plan and sent out press releases to the media about the acts and events held and, on other occasions, invited the media to the PLOCAN facilities. Bearing in mind all the publications in the printed media, the repercussion was as follows:

DATE	MEDIUM	HEADLINE
25/02/17	El Día	Canarias estudia en Cabo Verde el monte submarino
25/02/17	La Provincia	Científicos de la PLOCAN participan en el estudio del monte submarino Senghor
2/03/17	Diario de Avisos	Demola, un modelo de innovación que potencia a los jóvenes canarios con talento
6/04/17	Canarias 7	La Economía Azul, pilar fundamental de la riqueza canaria
8/04/17	La Provincia	Los Reyes impulsan la plataforma oceánica en su visita a las Islas
8/04/17	La Provincia	Los Reyes aprovecharán su visita a Canarias para inaugurar la PLOCAN
8/04/17	La Opinión de Tenerife	Los Reyes aprovecharán su visita a Canarias para inaugurar la PLOCAN
11/04/17	La Provincia	El espacio se mira mejor gracias al mar
11/04/17	La Opinión de Tenerife	El IAC eleva la nitidez de sus telescopios con una técnica usada en submarinismo
11/04/17	El Día	Una técnica mejora la nitidez de los telescopios
19/04/17	Canarias 7	La ciencia y la solidaridad, ejes de la visita de los reyes al Archipiélago
19/04/17	Canarias 7	La absorción de anhídrido carbónico da riqueza al mar
19/04/17	La Provincia	Ciencia, música y solidaridad en la agenda de los Reyes en las Islas
19/04/17	Diario de Avisos	Los reyes de España visitan desde el próximo lunes el Archipiélago
19/04/17	El Día	Los mares con afloramientos son más productivos al absorber CO <sub>2</sub>
24/04/17	La Provincia	Los Reyes respaldan a Canarias como puente humanitario con África
24/04/17	Canarias 7	Una mancha al sur de la PLOCAN, que entra hoy en la agenda real
25/04/17	La Provincia	Apoyo real a la apuesta científica, cultural y humanitaria de las Islas
25/04/17	La Provincia	Los Reyes avalan la apuesta de las Islas por la investigación y la cultura
25/04/17	La Provincia	Atracción turística por un solo día
25/04/17	La Provincia	PLOCAN
25/04/17	La Provincia	En busca del apreciado apretón de manos
25/04/17	La Provincia	Clavijo y los Reyes en PLOCAN
25/04/17	Canarias 7	Apoyo a la investigación

25/04/17	Canarias 7	Con la ciencia en la PLOCAN
25/04/17	La Opinión de Tenerife	Apoyo real a la apuesta científica, cultural y humanitaria de las Islas
25/04/17	La Opinión de Tenerife	Los Reyes avalan la apuesta de las Islas por la investigación y la cultura
25/04/17	El Día	El Rey señala que la PLOCAN es un buen ejemplo de I+D
25/04/17	Diario de Avisos	El rey defiende en las Islas el valor de las montañas sagradas de los aborígenes
25/04/17	Diario de Avisos	Felipe VI: "Canarias es desarrollo, investigación y progreso"
25/04/17	Diario de Avisos	PLOCAN
27/04/17	Canarias 7	El freno al proyecto de energía no veta los ensayos a la PLOCAN
6/05/17	El Día	Impulsan una red de clústeres en economía azul
6/05/17	La Provincia	Canarias propone la construcción de un muelle de cruceros en Cabo Verde
6/05/17	La Opinión de Tenerife	Las Islas proponen la construcción de un muelle de cruceros en Cabo Verde
18/05/17	Canarias 7	El primer molino autoinstalable en el mar se desarrolla en la Isla
26/05/17	La Provincia	Los robots submarinos llegan a Maspalomas
26/05/17	Canarias 7	Crear un robot para despertar las vocaciones científicas
26/05/17	Canarias 7	100 robots se zambullen en la piscina
27/05/17	El Día	Canarias y País Vasco cooperan en energía eólica marina
1/06/17	La Provincia	Sostenibilidad en el medio submarino
14/06/17	Canarias 7	Un bote con el sello de la PLOCAN
15/06/17	La Provincia	La "Odisea" se lanza a hacer Las Américas
15/06/17	Canarias 7	El "Canarias IV" navega por el Atlántico
18/06/17	El Día	PLOCAN diseñará el sistema de vigilancia del oleaje en Garachico
21/06/17	El Día	Crean un nuevo centro de investigación en el Atlántico
21/06/17	La Opinión de Tenerife	España y Portugal lideran un nuevo centro de investigación del Atlántico
27/06/17	La Opinión de Tenerife	14 días para empaparse de ciencia
30/06/17	La Opinión de Tenerife	El Ejecutivo prevé elevar la potencia eólica obtenida desde el mar en siete años
30/06/17	La Provincia	La ingeniería que hay detrás de las olas
30/06/17	La Opinión de Tenerife	La ingeniería que hay detrás de las olas
20/07/17	La Opinión de Tenerife	El Campus de la Ciencia y la Tecnología llega a su fin tras un mes de actividades
25/07/17	La Opinión de Tenerife	Expertos del Golfo de México validan el plan canario de contaminación marina
25/07/17	La Provincia	Expertos del Golfo de México validan el plan canario de contaminación marina
11/08/17	Canarias 7	La primera torre eólica marina de España se instalará en la isla
23/08/17	La Provincia	La PLOCAN se convierte en Unidad de Cultura Científica e Innovación
6/09/17	La Opinión de Tenerife	Canarias y Azores analizan la evolución marina en la Macaronesia

6/09/17	La Provincia	Canarias y Azores analizan la evolución marina en la Macaronesia
8/09/17	El Día	Las Islas quieren crear bancos de pesca artificialmente
8/09/17	La Opinión de Tenerife	Canarias ensaya cómo convertir en bancos de pesca zonas sin ejemplares
8/09/17	La Provincia	Canarias ensaya cómo convertir en bancos de pesca zonas sin ejemplares
10/09/17	Canarias 7	Océanos amenazados
15/09/17	La Provincia	PLOCAN lidera un proyecto que sitúa a Canarias como observatorio marino
15/09/17	El Día	El PLOCAN lidera un proyecto de desarrollo de sensores marinos
15/09/17	Canarias 7	La PLOCAN lidera un plan europeo para observar el mar
23/09/17	El Día	Una compañía sueca se interesa por la eólica marina en las Islas
2/10/17	Canarias 7	Engullido por la PLOCAN
17/10/17	Canarias 7	Planificar para ser más fuertes
23/10/17	Canarias 7	PLOCAN pone línea eléctrica a sus ensayos con renovables
3/11/17	La Provincia	Las empresas de economía azul piden menos trabas a la financiación
5/11/17	La Provincia	La PLOCAN inicia el tendido del cable submarino para el aerogenerador
6/11/17	Canarias 7	Escuela de Planeadores Marinos
7/11/17	Canarias 7	PLOCAN reúne a fabricantes de planeadores submarinos
7/11/17	La Provincia	PLOCAN inaugura la Escuela de Glider
7/11/17	La Provincia	El arma contra los ciberpiratas del mar
10/11/17	La Provincia	El glider "Silbo" atraca en PLOCAN
11/10/17	La Opinión de Tenerife	El glider "Silbo" atraca en PLOCAN
23/11/17	La Provincia	El futuro de la observación oceanográfica se decide en Canarias
26/11/17	La Provincia	Canarias duplicará su producción eólica con el despliegue de molinos en el mar
26/11/17	La Opinión de Tenerife	Canarias duplicará su producción eólica con el despliegue de molinos en el mar
1/12/16	La Provincia	Clúster Marítimo
5/12/17	Diario de Avisos	Endesa colabora con la Plataforma Oceánica de Canarias
14/12/17	La Provincia	"Canarias es la entrada en España de toda la investigación atlántica"
14/12/17	La Opinión de Tenerife	"Canarias es la entrada en España de toda la investigación atlántica"
14/12/17	La Provincia	PLOCAN acoge una cumbre para frenar la contaminación en aguas atlánticas
18/12/17	La Provincia	Alumnos de la ESO de Grecia, Estonia y el IES Schamann visitan PLOCAN

## **14. CORPORATE SOCIAL RESPONSIBILITY**

PLOCAN takes the report on socially responsible practises of the Secretariat of State for Public Administrations that the MINHAP publishes each year as a guide, along with the Spanish Strategy of Social Responsibility of Companies 2014-2020 adopted by the Council of Ministers on the 24<sup>th</sup> of October 2014. The measures implemented are grouped around three themes: environment, labour rights and policies and good governance. Some of them arise from the actions envisaged in the action plan and others are general. A substantial part of the measures has been regularly implemented in recent years, whereas others have only just been implemented.



Figure 133. SCR issues that encompass the measures applied

- ◆ Control of fuel consumption
- ◆ Continual environmental monitoring of the test site
- ◆ Implementation of environmental surveillance programmes for monitoring the impact of the oceanic platform and its operations
- ◆ Energy saving measures regarding climate control and office machinery

Strand 2 covers the measures aimed at enhancing the welfare and working atmosphere of employees:

- ◆ Training actions. Drafting and assessing the annual training plan
- ◆ Measures aimed at motivating the staff regarding the vision and awareness of the project's objectives

The measures implemented and maintained in 2017 include the following:

In the case of Strand 1 measures, some concern the internal management and operation of the Consortium and others, the marine-maritime scientific-technological activity itself. These measures include:

- ◆ Periodic control of water consumption, electricity consumption, paper and other raw materials and managing incidents detected in the control exercised by the management system implemented in the organisation.
- ◆ Improvement of the selective collection of waste and controlling the management of hazardous and non-hazardous waste
- ◆ Controlling the risk of spills and implementing an environmental emergencies procedure
- ◆ Study of the improvement of the energy efficiency of building and replacing lamps with LEDs

- 
- ◆ Reinforce health and safety above and beyond mere compulsory compliance
  - ◆ More flexible working hours
  - ◆ Provision of work resources and systems that provide ideal conditions
  - ◆ Work in co-ordination with representatives of the staff to improve the working atmosphere
  - ◆ Improve communication. Implementation of action of interest for employees on the intranet
  - ◆ Personal performance assessment
  - ◆ H&S training for the staff, over and above what is stipulated by the health and safety regulations
  - ◆ Installation of two semi-automatic defibrillators (SADE) and training for the personnel in how to use them. One has been installed in the PLOCAN shore facilities and the other on the platform

Strand 3 envisages measures concerning good governance. These include:

- ◆ Improving the transparency section on the organisation's web site with access to the regulations, institutional and organisational information and financial, budgetary and contractual information
- ◆ Maintaining an integral management system in accordance with UNE-EN ISO 9001:2008 standard (certified in 2015), ISO 14001:2004 (environment) and OHSAS 18001:2007 (health and safety) in the PLOCAN facilities and services in its on-shore offices
- ◆ Implementation of a time management portal that helps the personnel with human resource management procedures by simplifying them
- ◆ Applying the SCR plan itself
- ◆ Interaction with the general public and stakeholders. Draw up and improve the communication plan. Stakeholder service.
- ◆ Fostering scientific-technological vocations
- ◆ Shared management of the infrastructures with other institutions and synergic use of resources
- ◆ Co-operation with public and private institutions. Propitiate national and international co-operation agreements with public and private entities.
- ◆ Implementation of work and document management systems that promote collaborative working among members of the organisation and with third parties.
- ◆ Propitiate the exchange of knowledge and temporary mobility of persons with other institutions.
- ◆ Propitiate attracting new projects that provide the Consortium with additional funding.
- ◆ Increase the kind and number of services
- ◆ Assess project management
- ◆ Up-date and maintain documented working procedures

## 15. MANAGEMENT SYSTEM

In 2017, the integral management system certified by the standards listed below has been fine-tuned and maintained:

- ◆ ISO 9001 Quality management systems
- ◆ ISO 14001 Environmental management systems
- ◆ OHSAS 18001 Health and safety at the workplace management systems

IMS-related activities are co-ordinated by the PLOCAN management.



Figure 134. Presentation of the certificates by SGS

along with the team that manages the system. These reviews highlight management anomalies and actions are established to remedy them. Secondly, the system undergoes an external audit by a certifying body. This latter audit is sometimes to monitor the system and sometimes to certify it. The certification audit takes place when new elements are included in the scope or in the event of new standards. In 2017, a monitoring audit was conducted on the complete system regarding the three standards to which it was certified in 2016.

In February, the regional director of SGS, Juan G. Argenti Biering and the Head of Certification in the Canary Islands, Héctor González Álvarez, presented the new ISO 9001, ISO 14001 and OHSAS 18001 certificates to the director and to the manager of the economic-administrative area of the PLOCAN Consortium, Octavio Llinás and Paula Pacheco.

This system is comprised of three kinds of procedures: strategic, key and support. Strategic procedures are those that describe the system planning and how this is reviewed and validated. Key procedures describe the training schools held in PLOCAN and the management of oceanic observation, marine energy, sensor and submarine vehicles, economy and blue growth and biodiversity and sustainability projects that the organisation manages. These are the two central elements included in the scope of certification. Finally, the support processes describe all the transversal activities that the organisation engages in, such as managing procurement, customer satisfaction, human resources, emergencies, legal requirements, etc.

First of all, this system undergoes an annual internal audit and review process by the directors along with the team that manages the system. These reviews highlight management anomalies and actions are established to remedy them. Secondly, the system undergoes an external audit by a certifying body. This latter audit is sometimes to monitor the system and sometimes to certify it. The certification audit takes place when new elements are included in the scope or in the event of new standards. In 2017, a monitoring audit was conducted on the complete system regarding the three standards to which it was certified in 2016.



On the 26th of May, an internal audit was conducted on the system, and on the 9th of June, it was reviewed by the senior management. The external certification audit was conducted on the 15th and 16th of June and the audit team considered afterwards that the organisation had established and maintained the management system in line with the requisites of the standards and demonstrated the system's ability to comply efficiently with the service requisites and the objectives and policies of the organisation.

Work started in the final quarter of 2017 to adapt to the new versions of the ISO 9001 and ISO 14001 standards to which the system will be audited in 2018. These new versions include the identification of risks in the organisation.

## 16. HEALTH AND SAFETY

Apart from constantly applying all H&S procedures included in our management system, in 2017, the most important H&S actions were as follows:

- ◆ Renewal of the H&S contract with external contractor PREVING to cover the PLOCAN shore facilities
- ◆ Staff training in general and specific aspects of health and safety in accordance with each job
- ◆ Audit of the H&S system, renewing the OHSAS 18001 certificate
- ◆ Installation of two semi-automatic defibrillators (SADE) and training the personnel how to use them. One has been installed in the PLOCAN shore facilities and the other on the platform.
- ◆ Annual emergency drill in the shore facilities.
- ◆ Hiring a specific, external H&S service to apply H&S policies on the platform. The company selected was MGO.

## 17. PLOCAN IN NUMBERS

Below is an analysis of the most important figures from the 2017 budget.

### REVENUES AND CONTRIBUTIONS 2017

Regarding revenues and contributions, we would point out that the total figure for 2017 amounts to €15,518,307.51.

Revenues include those arising from the ordinary assignations of the consortium entities (Ministry of Economy and Competitiveness and the Canary Island Government - €2,085,853.00) and those earned during the year for the participation of PLOCAN in R+D+I projects from national and international bodies (€4,417,795.81).

ITEM	AMOUNT
<b>REVENUES</b>	
<b>Revenues carried over</b>	15,409,893.42
<b>Project revenues</b>	8,862,222.63
<b>Ordinary assignations</b>	4,417,795.81
<b>Financial revenues</b>	2,085,853.00
<b>Revenues from activity</b>	3.04
<b>OTHER CREDITORS</b>	44,018.94
<b>TOTAL</b>	108,414.09
	<b>15,518,307.51</b>

### EXPENSES AND INVESTMENTS 2017

ITEM	AMOUNT
<b>Personnel</b>	1,369,284.33
<b>Current expenses, goods and services</b>	696,650.92
<b>Acquisition of fixed assets</b>	4,790,280.62
<b>Training</b>	111,528.14
<b>Project expenses</b>	862,941.24
<b>Taxes</b>	263,766.01
<b>Amount committed</b>	7,423,856.25
<b>TOTAL</b>	<b>15,518,307.51</b>

Regarding the expenses and investments of 2017, we would highlight the amount of Acquisition of Fixed Assets that amounts to €4,790,280.62. This sum includes the payments made over the year in completing the construction of the platform.

We would also highlight the sum for Personnel Expenses (€1,369,283.33) and those arising from R+D+I projects (€862,941.24).

