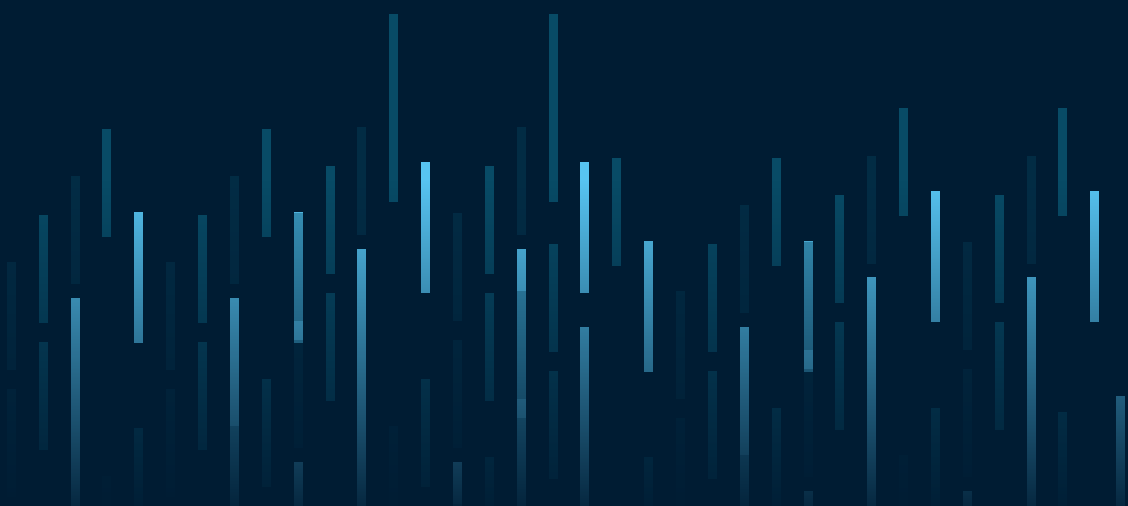


OCEANIC PLATFORM  
OF THE CANARY ISLANDS

# ANNUAL REPORT



2018





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## INTRODUCTION FROM THE DIRECTOR

The Consortium activity in 2018 summarised in this report<sup>1</sup> undoubtedly marks the first year in which the infrastructure has reached sufficient maturity to understand that it is situated in the management regime for which it has been designed.

The information compiled in this report, permanently up-dated on the Consortium web portal, allows us to confirm its excellent position in the international marine-maritime R+D+i system, particularly in the development stages closest to rolling out the initiatives driven and/or supported by the Consortium (high TRLs).

By way of example of the activities engaged in by the consortium in the different areas, one could point to: the connection to the 5MW wind turbine network of the ELICAN project, making use of the electricity grid and the Consortium's submarine data, the first facility of this kind in Spain and in the rest of Southern Europe; the pumping trials with wave energy conducted by RW POWER A/S; and the completion of the verifications of the ZUNIBAL measuring device.

The results of the study of the economic balances as part of the ENTROPI Project provide support for the enormous potential of the multi-purpose concept or co-localisation for the sustainable development of activities in the marine environment, which consolidates the central axis of the approach promoted by this Consortium to drive knowledge of economic growth and employment. The DESPESCA project has enhanced compatibility between traditional and emerging uses of the maritime space, between artisanal fishing and wind generation.

The strengthening of science and technology networks has materialised in many forms, including: support for the complex deployment of the Ocean artUp project, funded with a European Research Council Advanced Grant; support for the EMSO European Consortium, in both the international and domestic sphere; in the Spanish Oceanographic Observation Commission, the EUROGOOS and in the co-ordinated effort in Macaronesia of the European RIS3 strategy.

Integrating the consortium in networks and processes to promote the contribution of the best science and technology to drive institutional and business activity can be seen in examples such as the visit by the European Regional Policy Commissioner, the signing of the memorandum with the Secretariat General of Fisheries to drive Blue Growth in the Central Atlantic, joining the Macaronesia Marine Maritime Alliance and the drive given to the AIR CENTRE.

Actions of special relevance, the approval by the Spanish Scientific Policy Council of the map of Outstanding Scientific-Technical Infrastructures (ICTS, from the Spanish) 2017-2020 (06/11/2018), in which the Consortium directly manages the unique localisation infrastructure, the Canary Island Oceanic Platform (PLOCAN) and the aggregated infrastructure for maritime

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<sup>1</sup> The text of the report has been approved by the PLOCAN Consortium Strategic Council at its 40th meeting and is part of the documentation that accompanies its Annual Accounts.

hydraulic research (MARHIS) in co-operation with others. The council's decision is based on a rigorous assessment process conducted by the advisory committee.

The list of the milestones attained and the opportunities that exist, that confirm that the decision to create and drive the consortium was both right and timely, must be accompanied in this introduction by the threats and weaknesses that will have to be overcome to consolidate and reinforce PLOCAN's position as one of the most efficient international conceptual spaces where science and technology of excellence attain values of environmentally-sustainable economic growth and employment in the marine-maritime space.

The consortium has remained answerable to the Central Government in 2018, coinciding with a process of administrative centralisation and formalisation of different origins based on the capabilities made available by ITCs.

The consequence of this process (despite some specific improvement initiatives) has been an increase in the complexity of management in the broadest sense of the term, from the smallest details up to the larger picture in all procedures, regardless of the conceptual or economic value of each one. It is true that this is not a problem that is specific to this consortium, but it is having a special repercussion as it has to be deployed in very little time, starting from a very different initial situation, because of the nature of the activities and the marine space in which most of them are carried out, and because the core activity of the consortium is carried out with foreign companies and institutions (from over 45 different countries), making it obvious that the process is not designed or adapted to, or take account of the specific development needs of scientific and technical activities in a highly competitive international space.

As already stated, the PLOCAN consortium now directly manages an ICTS on the ICTS map in a unique location, and in "co-ordinated" management, an ICTS entitled "Aggregated infrastructures for maritime hydraulic research" (MARHIS). This decision entails another, additional difficulty for the consortium's management and introduces a significant element of complexity insofar as the singularity of PLOCAN does not arise solely from the nature of each of the facilities, but also from the capabilities of the whole and the synergies that they generate.

Limitations on the development of the staff put the consortium in a critical situation, partially off-set by hiring people for projects, as the current staff is practically half the staff envisaged in the initial scientific-technical project, whereas the number of facilities has grown and they are more complex than envisaged in that document. This situation has been possible due to the high level of commitment and dedication of the staff, despite which, this limitation is one of the negative and limiting elements in the operations of the platform that requires people with specific qualifications and greater dedication for the shift work.

Once the deployment of the infrastructure has been consolidated and commissioned, we now have to address new planning areas, the timing of which is undoubtedly an opportunity (renew the agreement to create the Consortium, regional, national and European planning for the period (21/27), which elements should be integrated in the review of the initial vision and mission, in both sectorial and thematic content, and in terms of projection in the Atlantic. A key element undoubtedly has to be to establish whether our own scientific activity should be added to the impulse to drive the structure, and if so, using what formula and on what scale.

## FACILITIES

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

The Scientific, Technological and Innovation Policy Committee, chaired by Minister Pedro Duque, approved the up-dating of the Map of Outstanding Scientific and Technical Infrastructures (ICTS, from the Spanish) in early November. The new Map is comprised of 29 ICTS, covering a total of 62 infrastructures, all of which are operational. The number of ICTS has been maintained in this new up-date, but the number of infrastructures has been increased by bringing in existing distributed nodes to the ICTS. The new ICTS Map approved by the Committee is the result of a stringent, independent assessment process and it consolidates the single and distributed location infrastructures. PLOCAN is included in the area of Sea, Life and Earth Sciences.

The agreement envisaged including the PLOCAN test site in the MARHIS (aggregated infrastructures for hydraulic maritime research) distributed infrastructure that is comprised of the following nodes:

- Great Basin of Maritime Engineering (GTIM)
- Integrated Coastal Infrastructures for Experimentation and Simulation (iCIEM)
- Pardo Hydro-dynamic Experiences Centre (CEHIPAR)
- Biscay Marine Energy Platform
- PLOCAN Test Site

In its 40<sup>th</sup> meeting, held on the 20<sup>th</sup> of December 2018, the Executive Board agreed to approve putting a works contract out for tender for the functional adaptation of the shore offices. The adaptation of the existing works project was a complex task because of both the age of the building and the implementation of the new Public Service Procurement Act this year. All of this made it impossible to put this contract out to tender this year.

## MULTI-PURPOSE OFF-SHORE PLATFORM



The infrastructure, built on a caisson resting on the sea bed, is comprised of the following different levels, each for a specific use:

**Illustration 1. Off-shore platform on the test bed**

- ◆ Helipad: Situated above the bridge, capable of handling helicopters up to a maximum length of 18m and 6 tonnes. Bridge (86 m<sup>2</sup>): Raised above the deck with 360° view. All the platform and test site control and operation activities are managed from here.
- ◆ Superstructure: Divided into two floors, a laboratory floor and a rest and recreation 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 comprised of a hangar (590 m<sup>2</sup>) and an open work area (546 m<sup>2</sup>) where there is an open test tank (6.0 x 7.8 m). It has a telescopic hoist for working with containers. The test tank facilitates sea trials and the launch of specific vehicles and equipment into the sea.
- ◆ Utilities floor (1,215 m<sup>2</sup>): This houses the installations rooms and the energy-management equipment.

The main facilities of the platform are:

- ◆ Two 3.0 x 6.7 m floating pontoons on the southern corner of the structure
- ◆ Gantry crane with a maximum load capacity of 2 tonnes
- ◆ Personnel transfer basket (by crane) capable of transporting up to four standing passengers or 2 people plus a stretcher (maximum gross weight: 800kg)
- ◆ 17.70m telescopic hoist
- ◆ 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)
- ◆ 3x11 m<sup>3</sup> tanks that collect sea water from different depths and 2x16 m<sup>3</sup> tanks, one with sea water to desalinate and then feed into the other tank, where fresh water accumulates
- ◆ Desalination system capable of producing 16 m<sup>3</sup> / d
- ◆ Fresh water tank
- ◆ Hand tools and other small equipment
- ◆ Two pallet trucks with a maximum load capacity of 2.5tn.

The equipment associated with the platform comprises:

**SAILBOUY** Autonomous surface vehicle. Model Sailbuoy. Year: 2016. Serial Number: 1605. Payload: CTD, dissolved oxygen, fluorometer, turbidity and hydrocarbons meter. Manufacturer: Offshore Sensing (Norway)

**ROV AND ACCESSORIES** Remotely-operated vehicle. Model 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)

**GLIDER SLOCUM** Autonomous submarine glider. Model Slocum G2. Year: 2014. Serial number: 492. Payload: GPCTD, dissolved oxygen, fluorometer and turbidity meter. Manufacturer: Teledyne Webb Research (USA)

**GLIDER SEAEXPLORER** Autonomous submarine glider. Model SeaExplorer. Serial number 031. Year: 2017. Payload: GPCTD, Dissolved oxygen, Fluorometer, turbidity and hydrocarbon meter. Manufacturer: ALSEAMAR (France).

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

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

**WAVEGLIDER** Autonomous surface vehicle (ASV). Model Wave Glider SV2. Serial number: 3051. Manufacturer: Liquid Robotics (USA)

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

**MILI-Q WATER PURIFICATION SYSTEM**. Production of type II and I + water. Model: Elix for producing Type II and Mili-Q water. Advantage for producing Type 1 + water. Millipore, Merck

**FLUOROMETER** This takes measurements of florescence and turbidity using the suitable Application Module. It is fitted with a Chl a-Extracted-Acidification module for determining chlorophyll in sea water samples and for calibrating chlorophyll sensors.

**LAMINAR FLOW CABINET** this reduces particle contamination when handling samples. Model: Kind 100 Helios 72, ALS

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

**FUME HOOD** this is a local ventilation device designed to limit exposure to hazardous or toxic smoke, vapours or dust.

The services available on the facility are as follows:

- ◆ Accommodating any technology that may require support for trials at sea (for instance, corrosion, electricity transfer, etc.)
- ◆ VIMAS operations base (for example, gliders, ROVs, etc.)
- ◆ Autonomous laboratories at sea

The process of equipping and fine-tuning the platform for commissioning it continued in 2018. Progress was also made on the working protocols to ensure safe conditions for accessing and using the platform.

As for the environmental surveillance of the platform, as it does not come into operation until the end of the year, the specific environmental monitoring around the platform has been limited to aspects concerning the presence of the platform itself, rather than the operations it engages in. The environmental impact of the platform is considered minimal in this sense. The activities undertaken are as follows:

- ◆ Monitoring the morphology of the sea bed in the area of the platform
- ◆ Positional control of the platform to monitor any possible movement and settling
- ◆ Monitoring the proliferation of species on the rocky substrate of the protective mantle

### **Morphological conditions of the sea bed in the area of the platform**

The purpose of this activity is to monitor the morphology of the sea bed in the area of the platform, using multi-beam sonar and side-scan sonar. The aim is to assess any possible changes in the morphology of the sea bed that could occur due to the presence of the platform, because it has affected the hydro-dynamics of the sea. The result of the studies conducted show no significant changes, thus leading to the conclusion that there have been no morphological changes to the sea bed in the area of the platform.

### **Positional control of the platform**

This consists of conducting a topographical study aimed at checking for any possible movement and settling of the platform. To do this, co-ordinates and levels are taken at several different check-points of the platform. The result of the study conducted in 2018 is that the platform has not moved and has not settled.

### **Monitoring the proliferation of species in the platform mantle**

This consists of monitoring any possible proliferation of species over the rocky substrate of the protective mantle of the platform, mainly sea urchins, which could be harmful to the eco-system if they proliferate en masse. Two inspections were conducted in 2018. The activities were as follows:

- ◆ Transects covered by Spanish Navy divers as part of the co-operation agreement signed with PLOCAN.
- ◆ Transects covered by divers of the Canary Island Government Department of the Environment.

The results highlighted the fact that there has been no proliferation of sea urchins or other species of interest.

## TEST SITE



**Illustration 2. Test bed off the coast of Jinámar**

The test site encompasses the public domain area 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 approved by the Council of Ministers in March/2014 is aimed at driving marine-maritime R+D+i and to test and follow-up all kinds of scientific and technological activities at sea, including off-shore energy devices, fitted out for observing meteorological and oceanographic parameters. It has its own electricity and

communications infrastructure for feeding power and data from the devices housed on the test site back to shore.

As indicated before, the test site has been part of the MARHIS ICTS since November of that year, when the map was adopted.

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

**FACILITIES IN THE PORT OF TALIARTE.** The Port of Taliarte has been set up as the home port, with a capacity of 100 m of berth space of its own and with water and electricity supply, a minimum depth of 4.5 m and facilities (2,000 m<sup>2</sup>). The port has a launching ramp to facilitate vehicle testing operations, two 40m<sup>2</sup> warehouses, two 1000mm pipes for sea-to shore-to sea connections and multiple communications and control systems.

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

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

**SHIPPING RADAR.** Monitoring sea traffic on 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 that can hold 5 people. Length 5.20m, beam: 2.18m, maximum speed: 40 knots

## CDTICMar EQUIPMENT

- ♦ CIC - Integrated Shore-Off-shore Communications Centre. Shore-off-shore connection point between facilities: the test site, the off-shore platform and its shore station. This includes communications technologies such as: satellite, WiMAX, TETRA and marine band.
- ♦ IPD - Data Processing Infrastructure and Technology. This is where information is processed. It has the resources to provide Cloud Computing-based services and virtual services. 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 source systems (UPS) HP R5000 INTL.
- ♦ IDF - Demonstration and Skill-Building Support Infrastructure. Area of dissemination and co-operation that acts as a space for organising events in the marine-maritime sector, skill-building centre, presentation of commercial products and services between companies, universities, public institutions and suppliers and customers. It includes a 2x3m 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** Unmanned aerial vehicle (UAVs), remotely controlled with on-board sensors and GPS. Model: Phantom 4.

**SECURITY CAMERAS (3 UNITS)** The fixed dome Axis Mod Q6035E cameras (2013) are compact cameras with a domed housing. They are discreetly and strategically placed around the PLOCAN facilities for supervising all components installed on the test site.

**PEOPLE CARRIER** 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 polyethylene and filled with expanded polystyrene foam, ensuring buoyancy in case of rupture. The steel structure supports the anchorage and the tower uniformly, spreading the load over the upper surface of the hull.

This facility can offer an accommodation service by deploying existing technology in the area of the off-shore test site, with or without connection to the wiring.

One of PLOCAN's main objectives in 2018 was to tackle the first phase of the preliminary commissioning of the Electricity Grid that provides support for experimenting and testing new technologies (REDSUB), which involves finishing and commissioning the marine electricity and communications infrastructure. This work has been co-funded by the ERDF and funds from the National Scientific and Technical Research and Innovation Plan 2013-2016 through the call for proposals: Outstanding Scientific and Technical Infrastructures (ICTS) 2016.

The infrastructure is comprised of a Medium and Low-Tension electricity system in direct current and telecommunications, equipped and sized for evacuating on land up to a maximum initial capacity of 15MW produced off-shore by off-shore generating prototypes. Most of this is composed of submarine wiring, connectors and auxiliary electric equipment (marine electricity

system), which runs from the area of the PLOCAN reserve at sea to the sectioning and protection centre, located on the Jinamar coast, allowing the devices connected in the sea to be protected electrically.

The main function of the electricity and communications infrastructure is to evacuate and deliver the electrical power generated on the test site to the transmission grid, along with the transmission of data in real time for processing and analysis in the on-shore control centre. This function is essential for the test site, as, without any connection to the electricity grid, it would be impossible to evacuate the power generated, or to experience the effects and incidents that can be induced by events at sea on the off-shore power generation prototypes to be tested.

The final process of legalising and commissioning prior to the final connection with the transmission grid was completed, along with compiling all the documentation, along with reports on the results of tests and trials of all the material, including the electrical wiring. A brief description had to be included, along with the most important milestones achieved in 2018, regarding the work on the submarine cable that is part of PLOCAN's capabilities.

The first phase for processing the legalisation and commissioning of the infrastructure required all the procedures necessary for the Approval of Bringing up to Tension and Service for Tests (APESp) of the infrastructure to be completed. This process comprised the following phases:

1. The procedures necessary for conducting the Approval of Bringing up to Tension and into Service for tests (APESp) of the Electricity and Marine Communications Infrastructure had to be filed with the System Operator and the Transmission Grid Manager (Red Eléctrica de España). The APESp also implicitly includes processing the files in the Public Agencies concerned; i.e., the Ministry of Industry and the Regional Ministry of Industry of the Canary Island Government. These are filed with the System Operator (REE) and they are linked to the provisional commissioning granted by the aforementioned Public Agencies concerned.

This was filed with the Ministry of Industry and with the System Operator (REE). All of this paper-work made it possible to make a first connection of the first prototype to REDSUB. This prototype was the ELISA-ELICAN Project 5 MW off-shore wind generator. The applications for this project were filed with the Ministry of Industry, initially by ESTEYCO S.A, as the developer and builder of the wind generator.

2. Provisional Administrative Authorisation for the Installation (Ministry or Regional Ministry of Industry). R.D. 1955/200. Article 132. Commissioning Deed.
3. Entry in the Administrative Registry of Electric Energy Production Facilities (RAIPEE). RD 413/2017. Art.39. Preliminary Entry (Ministry of Regional Ministry of Industry).
4. Provisional Authorisation for Bringing up to Tension and into Service. APESp (Red Eléctrica de España).
5. Filing for the necessary permits and preparing and endorsing the associated drawings and technical reports.

6. Supply, installation and conducting the tests and trials of the marine electric cables on the PLOCAN Test site. The supply, laying, mechanical protection and part of burying the grid was completed in 2018.
7. Supply, installation and conducting the electrical works on land, both in the medium-tension station (control and protection systems) and at the high-tension sub-station of the Electricity Power Station (installation and commissioning of a power transformer), where PLOCAN's connection has been authorised to evacuate the power generated by the prototypes to be installed and connected at the test site. The main components of the On-Shore Infrastructure were installed in 2017: transformer at the Endesa 66 KV Power Station and adapting the cells and protection at the Emalsa 13.2 KV Station, and work was aimed at connecting up all the main components installed in 2018, along with tests for proper commissioning.

From an environmental standpoint, all the environmental monitoring associated with actions so requiring, either due to the regulations established in any of environmental rulings arising from the formal environmental impact assessment, or at PLOCAN's own initiative, have all been conducted. The actions taken are summarised below:

#### **REDSUB environmental monitoring on the test site**

Work started on installing PLOCAN's 2 marine electric and communications cables in 2017, and is on-going. In 2018, the environmental monitoring of this work has continued through COBRA, the company that is also responsible for implementing the PVA (Environmental Surveillance Plan), sub-contracted to ELITTORAL. As part of implementing this PVA, monthly monitoring reports are issued, which can be checked for further details.

The environmental monitoring actions taken in 2018 are as follows:

- ◆ Measurement of hydro-dynamic conditions (marine currents) using Doppler acoustic profiler
- ◆ Measurement of submarine noise associated with installing the cable
- ◆ Monitoring the presence of cetaceans in the area in which the cables are installed
- ◆ Water quality: turbidity
- ◆ Sediment quality: metals
- ◆ Preliminary report on levels of electro-magnetic fields associated with the cables

#### **Environmental surveillance of the ELICAN Project on the test site**

The purpose of this project, described in the section on projects carried out and on-going, is to install an off-shore wind generator resting on the sea bed of the PLOCAN test site. The project, led by ESTEYCO, has an environmental report issued by the Ministry of Agriculture, Fisheries, Food and the Environment (MAPAMA) in August 2017 (B.O.E. of the 10<sup>th</sup> of August 2017): *Ruling of the 26<sup>th</sup> of July 2017, of the Secretariat of State of the Environment, formulating the environmental impact report on the MLRT Off-shore Wind Tower Prototype project*. The conclusion of the environmental report was as follows:

*Bearing all this in mind, and at the proposal of the Sub-Directorate General of Environmental Assessment, this Ministry rules in accordance with the simplified environmental impact assessment conducted pursuant to Section 2.<sup>a</sup> of Chapter II, of Title II, and the analysis conducted according to the criteria of appendix III of the environmental assessment act, Act 21/2013, 9th of December, there is no evidence that the MLRT Off-shore Wind Tower Prototype project will produce any significant adverse impact, and it is not therefore, considered necessary to file the documents envisaged in Section 1.<sup>a</sup>, Chapter II, Title II of said Act.*

The environmental surveillance plan (PVA) that should be applicable to the project in question is the one detailed in said ruling, and also included in the environmental assessment document lodged with the environmental body. The PVA provides a structure for the actions to be taken in 3 phases: phase 1) prior to installation, phase 2) during the operation of the wind generator and phase 3) dismantling. The responsibility for implementing the PVA falls to the development company, ESTEYCO, while PLOCAN carries out the task of supervision over ESTEYCO.

Additionally, associated with the PVA, the following actions were taken:

- Communication to the pertinent maritime authorities concerning the installation of the prototype: The Harbour Master of Las Palmas (Ministry of Development), State Ports Authority (Ministry of Development), Spanish Search and Rescue Society (SASEMAR), Naval Hydrographic Institute (IHM – Ministry of Defence). The wind generator is fitted with a beacon and appears on the pertinent nautical charts.
- Communication to the Spanish Air Safety Agency (AESA) concerning the installation of the wind generator.
- Communication to the co-operatives of fishermen of San Cristóbal and Melenara.
- Topographical survey consisting of confirming the location co-ordinates and the maximum height of the wind turbine above sea level.

Once it comes on line, the phase of the environmental surveillance plan associated with the operation of the wind generator will come into operation. For this, ESTEYCO will submit a work plan to PLOCAN for the purposes of co-ordinating and supervising the activities planned.

#### **Monitoring water quality on the test site**

The first oceanographic water quality campaign on the test site was conducted in March 2018, using the Spanish Oceanographic Institute's (IEO) vessel, the *Ángeles Alvariño*. 6 stations are monitored during these campaigns, where profiles are taken with multi-parameter probes and water samples are taken for analysis in the laboratory.

#### **Monitoring marine currents**

PLOCAN's high-frequency radar has been used to continue monitoring the surface currents (and the wave action as a derivative) on the test site.

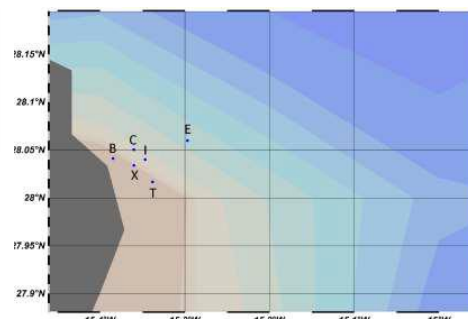
#### **Monitoring shipping traffic**

The X-band surveillance radar is used to monitor shipping traffic in the area of the test site.

In February 2018, it was decided to include 6 stations before mentioned in the test site area in the ESTOC oceanographic campaigns. During the March campaign, measurements were taken in situ from all the sampling stations, from the sea bed to the surface, for oxygen (established and analysed aboard), the CO<sub>2</sub> system (University of Las Palmas de Gran Canaria-ULPGC, analysis in the laboratory), nutrients (duplicated and kept frozen), chlorophyll, salinity and pigments (5 litres of each of the 9 surface bottles). The water was then filtered to extract the chlorophyll and the pigments and the resulting filtrate was refrigerated. The sampling work was carried out by PLOCAN staff in co-operation with staff from the ULPGC.

| ESTACIONES | LATITUD      | LONGITUD     | PROFUNDIDAD |
|------------|--------------|--------------|-------------|
| E          | 28°03.54'N   | 15°17.84'W   | 980         |
| C          | 28°03.024'N  | 15°21.61'W   | 100         |
| I          | 28°02.41'N   | 15°20.81'W   | 350         |
| T          | 28°01.00'N   | 15°20.29'W   | 280         |
| X          | 28°02.04'N   | 15°21.6'W    | 70          |
| G          | 28° 02.458'N | 15° 23.045'W | 32          |

Illustration 3. Stations sampled on the TB



## OBSERVATORY

The PLOCAN multi-disciplinary observation mission is to help in the monitoring and modelling of coastal, regional and global marine eco-systems and phenomena on increasing geographic scales, from shallow water down to the depths of the ocean and to monitor environmental impacts and mitigation for all the scientific and technical experiments, such as testing instrumentation in deep waters and skill-building activities conducted on the platform. Finally, one of the objectives is to offer a large, but continuously controlled area to test deep-water observation systems, offering benchmarking, calibration and instrument validation services. The PLOCAN integrated observatory comprises three nodes:



Illustration 4. Work on ESTOC

- ◆ Deep (ESTOC)
- ◆ Extensive
- ◆ Coastal (Test site)

The equipment associated with the observatory is as follows:

- ◆ DOPPLER ACOUSTIC CURRENT MEASURING SENSOR Doppler Acoustic Current Profiler. Monitoring currents and wave action. Model: RDI 600 kHz

- ◆ HYDROPHONES WITH SUBMARINE ACOUSTIC RECORDING SYSTEM  
Monitoring and recording marine sound waves in situ. Model: RESON TC-4032
- ◆ PH SENSOR MEASUREMENTS Measure pH in samples with low salinity
- ◆ SEDIMENT TRAP (2 units). These are used to study the vertical flow of particles during a given period by collecting them in individual bottles for later analysis.
- ◆ PHYTOPLANKTON SAMPLER. Autonomously collects samples in defined periods of time for analysis of trace metals, phytoplankton and/or particles suspended in the water column.
- ◆ MULTI-PARAMETER PROBES, CONDUCTIVITY, TEMPERATURE CTD FOR OCEANOGRAPHY. Equipment for profiling and recording data. Fitted with pressure, temperature, pH, dissolved oxygen, conductivity, chlorophyll and sound velocity sensors. They are used mainly in oceanographic campaigns and for validation in the laboratory.
- ◆ SP100-SM HIGH-PRECISION MARINE pH SPECTRO-PHOTOMETRIC SENSOR. This measures pH in sea water autonomously. It is moored at pressures similar to laboratory conditions.
- ◆ OCEANOGRAPHIC BUOYS These monitor meteorological and oceanographic parameters in situ. The main oceanographic parameters measured are: temperature, conductivity, pH, dissolved oxygen, turbidity, and chlorophylls. The main meteorological parameters measured are: Temperature, wind, pressure and solar radiation.
- ◆ PH METRO LAB 913. Measures pH in low salinity samples.
- ◆ PORTABLE TURBIDITY METRE 2100Q. This is used to measure turbidity in sea water samples and to calibrate turbidity sensors. Model 2100Q, HACH
- ◆ AQUAPRO 400 KHZ PROFILERS (2 UNITS) Monitoring currents and wave action. Model: 400 kHz
- ◆ HYDROPHONE TC4032. Hydrophones with submarine acoustic data recording systems (3 units). Monitoring and recording marine sound waves in situ. Model: RESON TC-4032
- ◆ SUBMERSIBLE ACOUSTIC DAQ. Acoustic data acquisition system to use on-board that allows measurements of acoustic data to be taken in marine structures when it is used in a remotely operated vehicle (ROV)
- ◆ CONDUCTIVITY AND TEMPERATURE SENSORS. These measure temperature and conductivity in samples in order to estimate salinity values.
- ◆ DOPPLER MONO-POINT CURRENT METRES. For monitoring currents and wave action. Model: RDI 600 kHz.

The variables measured at the ESTOC buoy and mooring are the following:

| <u>Hydro-dynamics</u> | <u>Continuous Mode</u> |
|-----------------------|------------------------|
| ADCP, Current metre   | Currents               |

|                                                    |                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| NOAA drift buoy                                    | Sub-surface currents                                                                                                                                                                                                                                                                                                                                                                                  |
| <u>Meteorology</u>                                 | <u>Continuous Mode</u>                                                                                                                                                                                                                                                                                                                                                                                |
| Surface buoy                                       | Air pressure, air temperature, relative humidity, precipitation, wind intensity and direction, PAR (measurements arrive in real time)                                                                                                                                                                                                                                                                 |
| <u>Oceanography</u>                                | <u>Continuous Mode</u>                                                                                                                                                                                                                                                                                                                                                                                |
| Surface buoy                                       | Pressure, temperature, salinity, oxygen, CO <sub>2</sub> , pH, turbidity, chlorophyll (measurements 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/Rosette (at least twice per campaign) | CTD: pressure, temperature and salinity continuously throughout the water column.<br><br>Rosette: 24 depths down to 3500m. The basic measurements taken are sea water samples for oxygen, 2 CO <sub>2</sub> parameters (ULPGC), nutrients, chlorophyll, pigments and salinity. The analyses are generally conducted in the laboratory on shore. Occasionally, other measurements like micro-plastics. |
| <u>Others</u>                                      | <u>Continuous Mode</u>                                                                                                                                                                                                                                                                                                                                                                                |
| Hydrophone at 150m                                 | Submarine noise                                                                                                                                                                                                                                                                                                                                                                                       |
| Larvae traps with different substrates             | Analysis of what is found (e.g. different species)                                                                                                                                                                                                                                                                                                                                                    |
| Sediment trap                                      | Analysis of what is found (e.g. sedimented particles)                                                                                                                                                                                                                                                                                                                                                 |

The services offered along with the facility will be defined in each application for specific access.

**Oceanographic campaigns in the PLOCAN integral observatory.** The Spanish Oceanographic Institute (IEO) had been asked for two oceanographic campaigns in 2017 regarding the observation activities carried out at the deep node (ESTOC, Canary Island Time Series Station, from the initials in Spanish), for maintaining and up-grading the station in the spring and autumn of 2018 aboard the *Ángeles Alvariño* oceanographic vessel. The campaigns were conducted in March and November. In the spring campaign, the objective was to make a new mooring and recover the part of the mooring that had broken in early March 2018. Bad weather prevented the crew from collecting the mooring from the sea and launching a new mooring. The only thing that was possible in the end, was to take in situ sampling, using the rosette with CT, conducting a hydrological sampling of essential variables such as temperature, salinity, nutrients (nitrates + nitrites, phosphates and silicates), dissolved oxygen, alkalinity, pH, dissolved inorganic carbon and chlorophyll, the base of the ESTOC 25-year time series.

Before leaving ESTOC, a drift buoy was launched as part of the co-operation programme conducted jointly with NOAA since 1998 to study surface circulation in the ocean.

As maintenance on ESTOC was impossible to carry out, the IEO was asked if their vessel could be used for a few extra days once the campaigns had finished in the Canary Islands and before it returned to the mainland. The work was finally done between the 21<sup>st</sup> and the 24<sup>th</sup> of May, and the new mooring was installed on the 22<sup>nd</sup> of May 2018, pursuant to the initial plan.

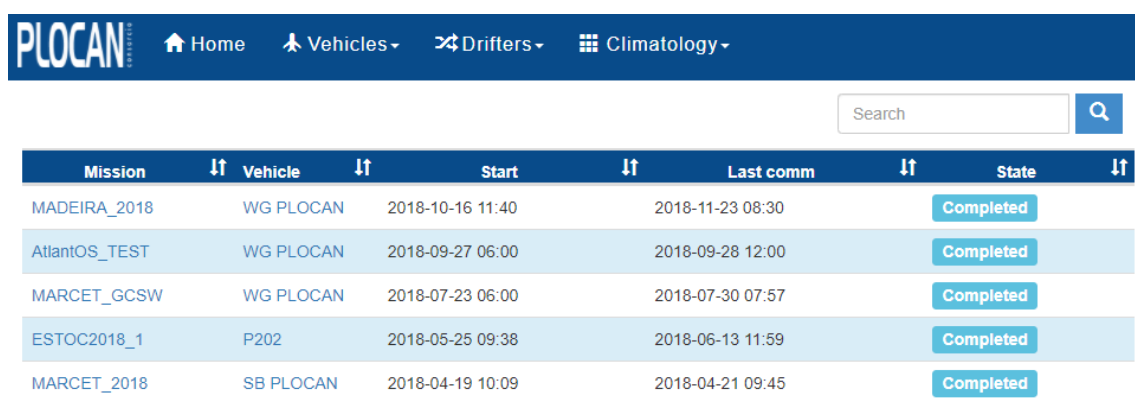
During the campaign that was finally conducted in December, attempts were made to carry out the maintenance on the ESTOC, by removing the mooring placed in May and attaching a completely new mooring system. The tough conditions prevented this from being done however. On the 6<sup>th</sup>, the mooring line was released, but the line got caught in the ship's propeller when the last 50 metres of surface line (including the buoy) were left to deploy, and it snapped. This meant that the manoeuvre had to be aborted and almost 4000 metres of mooring line were recovered the next day.

During these two days, the seasonal in situ sampling of the water column was carried out on the ESTOC station, down to a depth of 3,500m, using a CTD (instrument for measuring pressure, temperature and conductivity) with a water acquisition system (rosette) that allows the team to take water at different depths (24 levels). To round off the campaign, on the 8th of December a seasonal sampling of the test site off the coast of Telde was done.

The activities engaged in in 2018 as part of the routine activities of the specific VIMAS (Submarine Vehicles and Machines) environmental observation programmes that support the oceanographic campaigns in the PLOCAN integral observatory, were divided into the following distinct areas in 2018:

- ◆ Seasonal Glider Mission Programme in the PLOCAN Integral Observatory
- ◆ Implementation of the Macaronesia Marine-Maritime Network (R3M)
- ◆ Other actions

**Glider Mission Programme in the PLOCAN Integral Observatory.** The programme of glider missions at the PLOCAN integral observatory in 2018 encompassed five missions that used different technologies: Slocum, ASV-Wave Glider and ASV-Sailbuoy.



The screenshot shows the PLOCAN website interface. At the top is a dark blue navigation bar with the PLOCAN logo and links for Home, Vehicles, Drifters, and Climatology. Below the navigation bar is a search bar. The main content area displays a table of glider missions. The table has columns for Mission, Vehicle, Start, Last comm, and State. All five missions listed are marked as 'Completed'.

| Mission       | Vehicle   | Start            | Last comm        | State     |
|---------------|-----------|------------------|------------------|-----------|
| MADEIRA_2018  | WG PLOCAN | 2018-10-16 11:40 | 2018-11-23 08:30 | Completed |
| AtlantOS_TEST | WG PLOCAN | 2018-09-27 06:00 | 2018-09-28 12:00 | Completed |
| MARCET_GCSW   | WG PLOCAN | 2018-07-23 06:00 | 2018-07-30 07:57 | Completed |
| ESTOC2018_1   | P202      | 2018-05-25 09:38 | 2018-06-13 11:59 | Completed |
| MARCET_2018   | SB PLOCAN | 2018-04-19 10:09 | 2018-04-21 09:45 | Completed |

**Illustration 5. Screen shot of the glider missions on the PLOCAN observation platform web site**

The graphs below illustrate the trajectories followed by the vehicles and the graphs generated with the data taken by the different sensors. The missions were joint actions between different projects and seasonal initiatives.

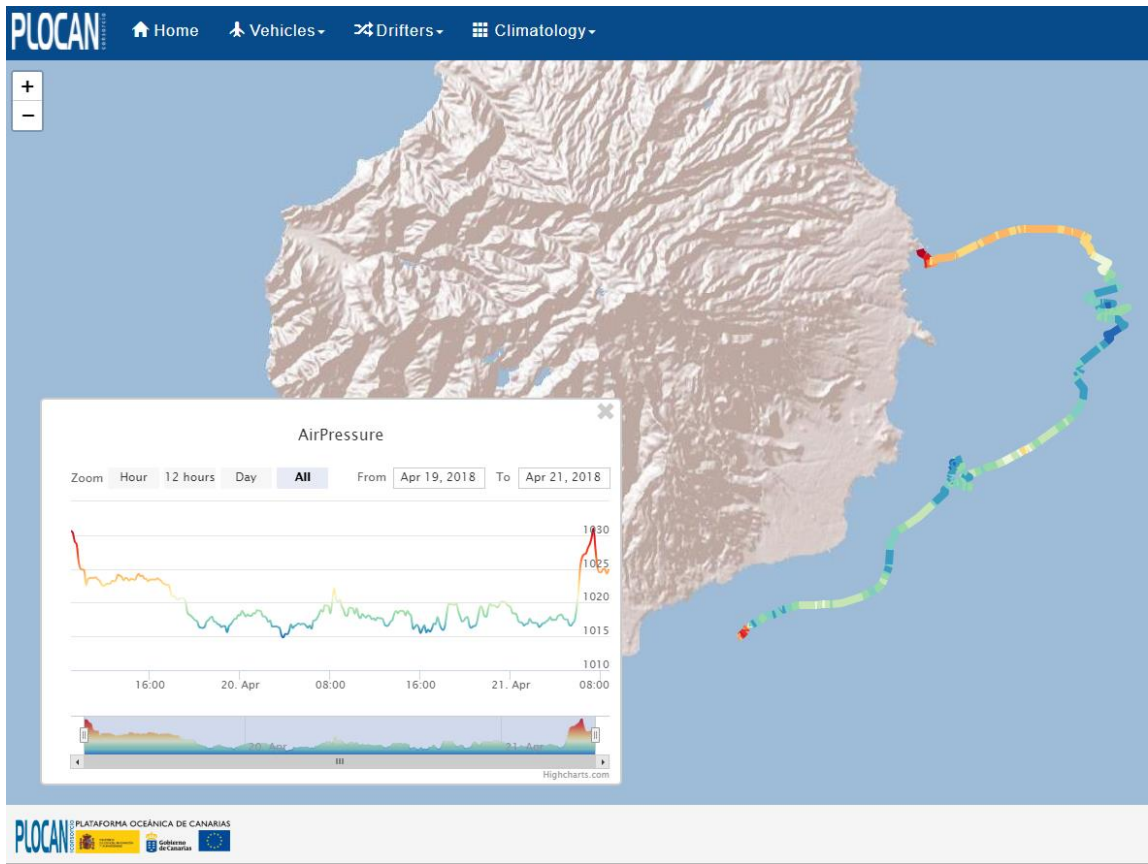


Illustration 6. Mission with Sail Buoy launched in April

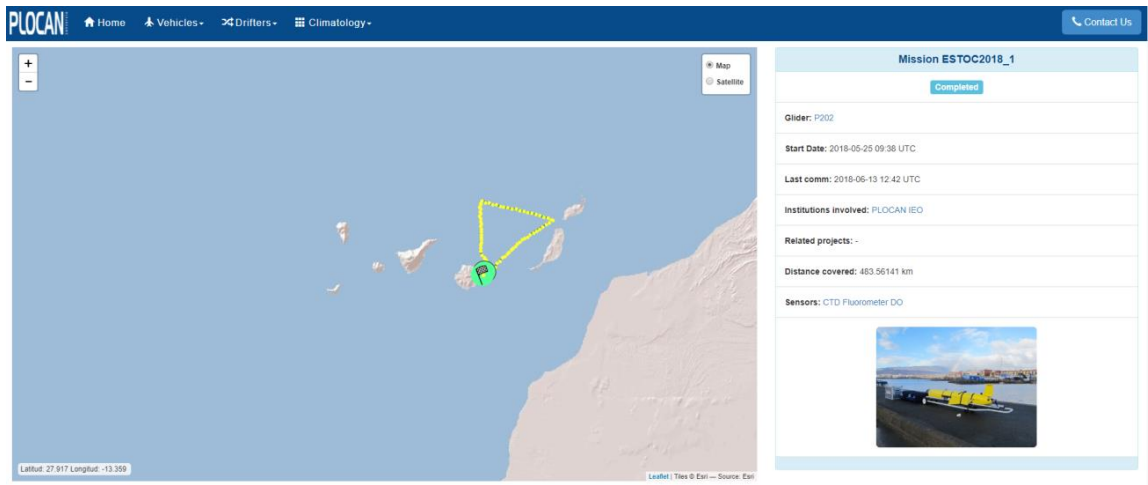
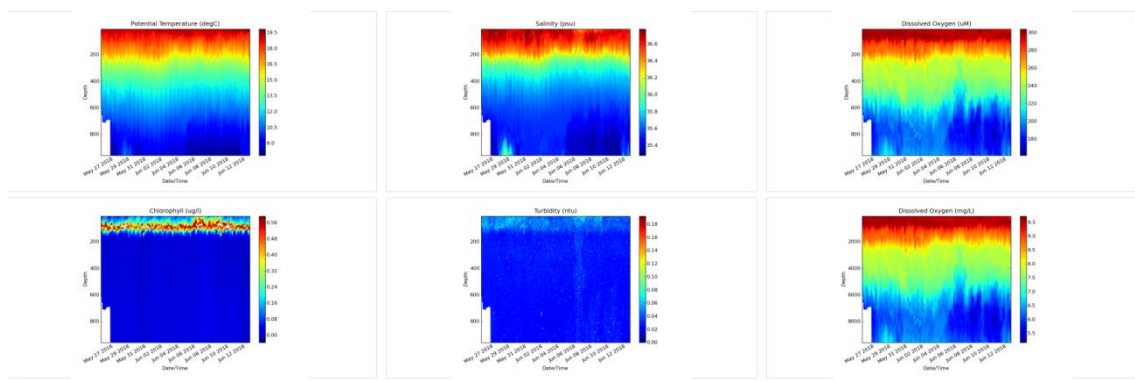
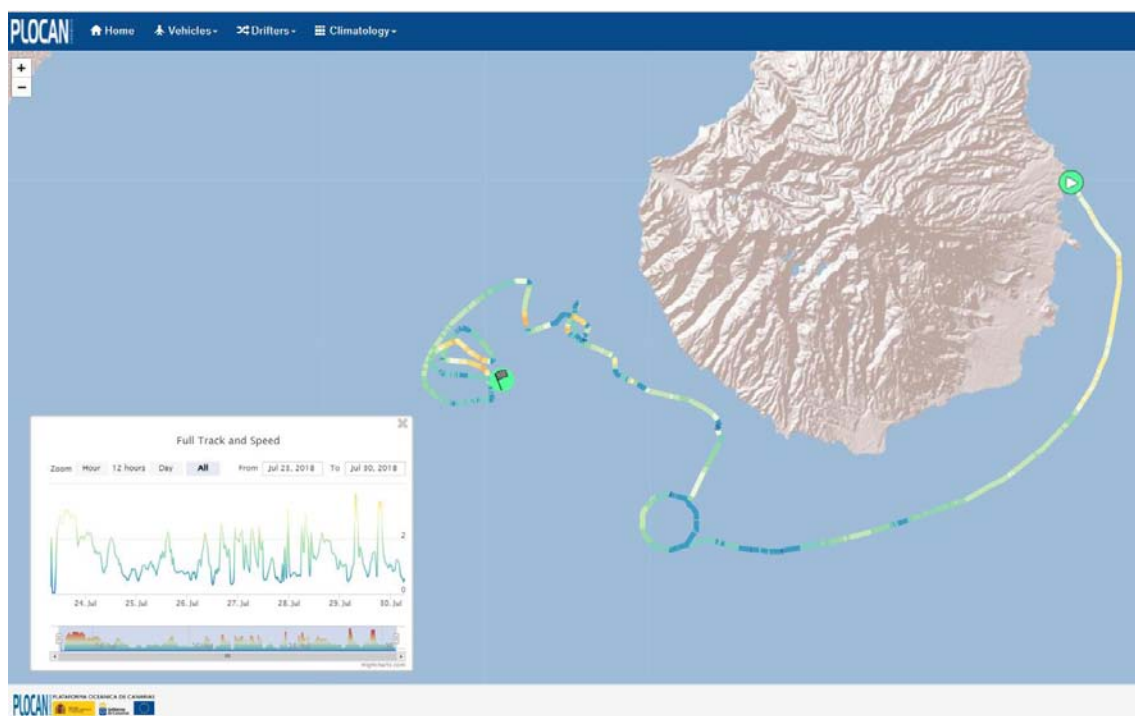


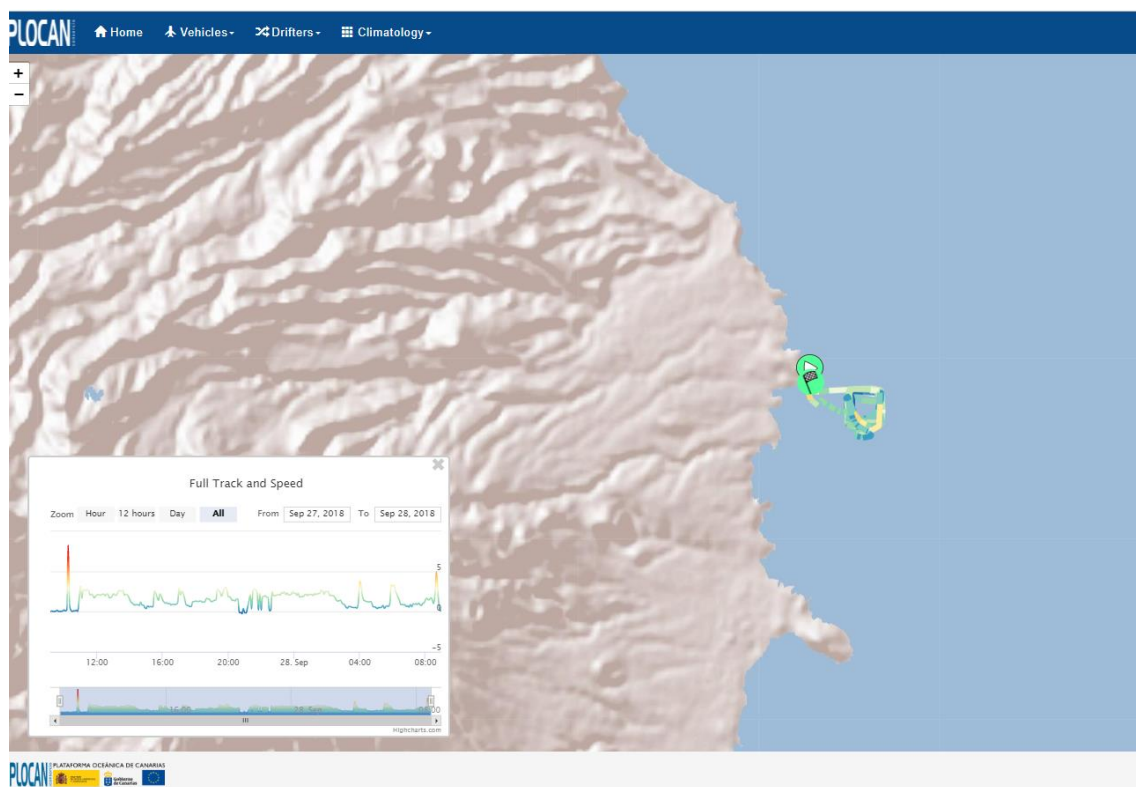
Illustration 7. Mission with Slocum launched in May



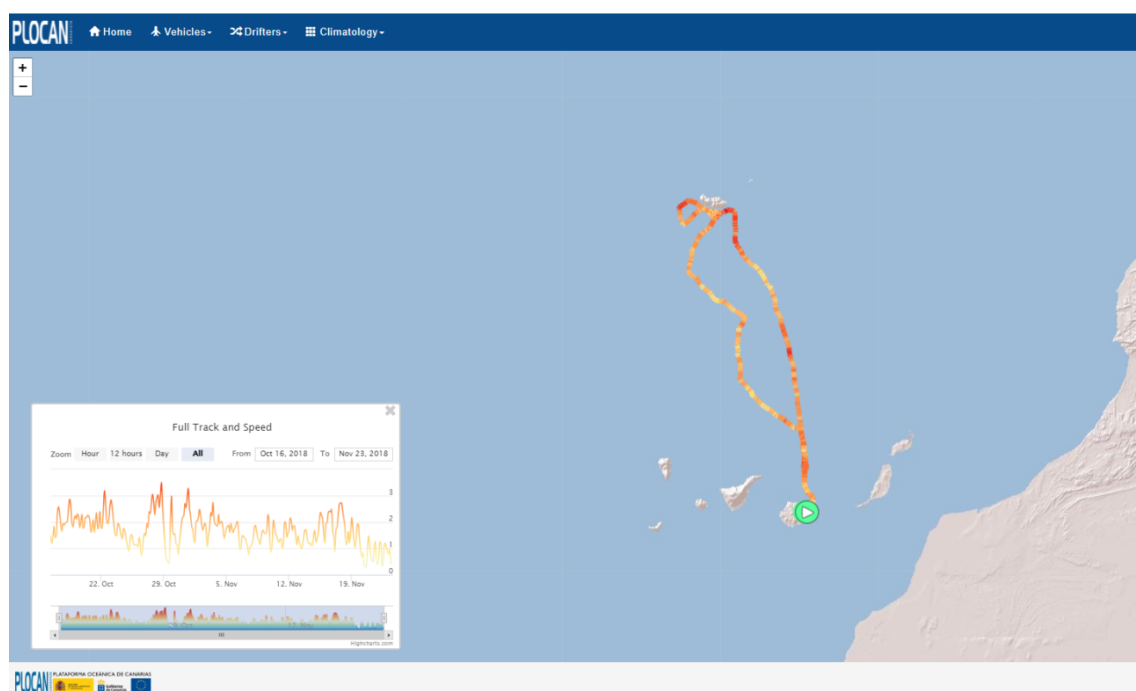
**Illustration 8. Graphs obtained from data from the May mission**



**Illustration 9. Mission with Waveglider launched in July**



**Illustration 10. Mission with Waveglider launched in September**



**Illustration 11. Mission with Waveglider launched in October**

Implementing the Macaronesia Marine-Maritime Network (R3M). 2018 marked an important turning point for the Macaronesia Marine-Maritime Monitoring Network (R3M) as far as

improving the infrastructure and environmental observation equipment was concerned. This activity falls within the ECOMARPORT project (Interreg MAC 2014-2020). The Port of Ponta Delgada on the island of San Miguel, and Angra do Heroísmo on the island of Terceira (Azores), the port of Funchal (Madeira), the ports of Taliarte and Las Palmas de Gran Canaria (Canarias) are the locations where activities have been carried out. These include both the installation of new equipment (weather stations, oceanographic buoys and stations -UMI-) and maintenance of the existing equipment. All of this comprises a similar system for measuring, controlling, processing and telemetry, enabling scientists to use the same operating criteria and allowing them to offer valuable information to the end users in the form of products available on the PLOCAN and R3M data portal. These actions received the support and co-operation of the port authorities of Azores, Madeira and Las Palmas, and from research institutions like the University of the Azores (UAC), the Madeira Oceanic Observatory (OOM), the University of Las Palmas de Gran Canaria (ULPGC) and the National Fisheries Development Institute (INDP) of Cape Verde, all of whom are ECOMARPORT project partners.

**Other actions.** 2018 has also allowed VIMAS to tackle a variety of other technical-operational environmental observation activities in co-operation with companies and international institutions of reference, including:

- 📌 **SILBO-CHALLENGER ONE:** As part of the international Challenger ONE programme, led by American institutions Teledyne Marine and Rutgers University, PLOCAN continued its co-operation from the Macaronesia area. In this case, after recovering the Silbo glider in the waters of the PLOCAN test site in November of the previous year and servicing it in the PLOCAN glider laboratory, the Silbo glider unit was launched on another mission in April 2018 to continue its Atlantic crossing and attempt to cover the Canaries-Caribbean stage non-stop. The glider was launched by VIMAS personnel, in (remote) co-ordination with Teledyne experts.

## SERVICES

### HOSTING

This service comprises hosting marine equipment, devices and technology for trials, experiments and other resources of 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 associated services like transport, installation, maintenance, monitoring, uninstalling, permits, accommodation, insurance and others. The cost of using the 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). PLOCAN services are available for consultation on the web site [www.plocan.eu](http://www.plocan.eu).

In December, the Outstanding Infrastructure Advisory Committee (CASI) adopted the ICTS map and passed on the result of the assessment of the strategy plans to the ICTS. With regard to the MARHIS distributed ICTS, it pointed out the incorporation of the PLOCAN test site to this ICTS, for which an agreement has to be signed. This incorporation will mean a co-ordinated

management with the other MARHIS ICTS nodes and the marine equipment, device and technology hosting service for trials activities.

## DATA SUPPLY

The data obtained from the ICTS resources in the area of integral observation (coastal, oceanic and extended observation) can be applied for by users freely and without charge. Moreover, PLOCAN's observational capabilities supply a series of data and information about its facilities.

Users can download the free access data, using a web app (THREDDS Data Server), from the different web services in the selected format. This service is available at the following URL [data.plocan.eu/thredds](http://data.plocan.eu/thredds). The data is generated from the fixed meteo-oceanographic stations, such as ESTOC, for example, and the mobile platforms like the submarine profilers (gliders).

The EMODnet network ([www.emodnet.eu](http://www.emodnet.eu)), an initiative that centralises access to European marine data, is used by PLOCAN to offer users data from both mobile platforms (autonomous vehicles) like the HF radar vehicles that monitor the test site. The radar provides data on surface marine currents.

Other data are provided to users on request. In this case, they come from fixed platforms (buoys, meteorological and oceanographic stations, oceanographic campaigns, etc.). Users wanting to use the test site as part of the activities authorised for such a purpose, submit a request for information on bathymetry, kind of sea bed, meteorological (wind) and oceanic (waves and currents) conditions and water quality.

## OPERATIONS

This uses PLOCAN's operational resources and capabilities to make the multi-purpose off-shore platform available to users, along with the outstanding vehicles, under regulated conditions. This can involve associated services covering installation, operation, maintenance, transport, insurance, uninstallation and others. In May 2013, the Executive Board approved the daily cost for using a 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 (adopted by the Executive Board in May 2013).



| GLIDERS   |                                                                                   |                                      |                         |                |
|-----------|-----------------------------------------------------------------------------------|--------------------------------------|-------------------------|----------------|
| Name      |                                                                                   | Model                                | Manufacturer            | Status         |
| P201      |  | Stoim Deep G2                        | Teklynx Vitech Research | Out of service |
| P202      |  | Stoim Deep G2                        | Teklynx Vitech Research | In Use         |
| P203      |  | Stoim Deep G3                        | Teklynx Vitech Research | In Use         |
| P302      |  | SeaGlider M1                         | Kongsberg Maritime      | In Service     |
| F401      |  | Sea Explorer -                       | ALSEMAR-ALCEN           | In Use         |
| DIF       |                                                                                   |                                      |                         |                |
| Name      |                                                                                   | Model                                | Manufacturer            | Status         |
| SS PLOCAN |  | Saltbury Water Quality Monitor (WQM) | Coffman Sensing AS      | In Use         |
| WQ PLOCAN |  | WaveGlider D12                       | Liquid Robotics         | In Use         |
| ROVs      |                                                                                   |                                      |                         |                |
| Name      |                                                                                   | Model                                | Manufacturer            | Status         |
| BlueROV   |  | BlueROV 2                            | BlueRobotics            | In Use         |
| ROV 18    |  | Seabotix vL1000                      | Teklynx Marine Seabotix | In Use         |

Illustration 12. PLOCAN submarine vehicles

## ACCESS

| ACCESS DESCRIPTION                                                           | FACILITY                         | ENTITY                                   | PROJECT  | KIND OF ACCESS |
|------------------------------------------------------------------------------|----------------------------------|------------------------------------------|----------|----------------|
| Trials of a prototype autonomous oceanographic device                        | Test site                        | National Oceanography Centre             | NA       | Open           |
| Trials of a sea-water pumping device                                         | Test site                        | TVETER POWER                             | NA       | Open           |
| Experiment Ocean ArtUp                                                       | Test site                        | Geomar                                   | NA       | Competitive    |
| Trials with two prototype ANTEIA buoys                                       | Test site                        | Zunibal                                  | NA       | Open           |
| Access to data                                                               | Observatory                      | Iceberg Designs                          | NA       | Open           |
| Trial of the Monitool project                                                | Multi-purpose Off-shore Platform | Canary Island Institute of Technology    | NA       | Competitive    |
| Sensor trials in sea-water pool and pontoon dock                             | Multi-purpose Off-shore Platform | University of Las Palmas de Gran Canaria | NA       | Competitive    |
| Trial on the off-shore platform                                              | Multi-purpose Off-shore Platform | Sensorlab                                | NA       | Open           |
| Data on measuring waves                                                      | Observatory                      | Acciona                                  | NA       | Competitive    |
| Trials of aerial drones with the prospect of being air-sea drones            | Multi-purpose Off-shore Platform | Canary Island Maritime Cluster           | AEIDRON  | Competitive    |
| Software tools for communications between marine instruments and shore bases | Multi-purpose Off-shore Platform | Canary Island Maritime Cluster           | AEIODA   | Competitive    |
| Test of sensors on observation vehicles                                      | Test site and observatory        | GEOMAR                                   | ATLANTOS | Competitive    |
| Environmental characterisation of a pilot zone to                            | Observatory                      | CANARY ISLAND                            | DESAL+   | Competitive    |

|                                                                                                                                                                                                             |                                  |                                                                |                |             |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|----------------------------------------------------------------|----------------|-------------|
| the north of Cran Canaria<br>Study of survival indexes of net and trap by-catch on the test sites<br>Basic oceanographic observation in Macaronesia<br>Installation of a prototype off-shore wind generator |                                  | INSTITUTE OF TECHNOLOGY                                        |                |             |
|                                                                                                                                                                                                             | Multi-purpose Off-shore Platform | PLOCAN                                                         | DESPESCA       | Competitive |
|                                                                                                                                                                                                             | Observatory                      | PLOCAN                                                         | ECOMARPORT     | Competitive |
|                                                                                                                                                                                                             | Test site                        | ESTEYCO                                                        | ELICAN         | Competitive |
| Trial of a generic EGIM module                                                                                                                                                                              | Observatory                      | NATIONAL GEO-PHYSICS AND VULCANOLOGY INSTITUTE                 | EMSODEV        | Competitive |
| Glider missions                                                                                                                                                                                             | Multi-purpose Off-shore Platform | UNIVERSITY OF PORTO                                            | EUMARINEROBOTS | Competitive |
| Glider missions in Macaronesia                                                                                                                                                                              | Multi-purpose Off-shore Platform | Advanced Technical Institute of Lisbon                         | iFADO          | Competitive |
| Glider missions for observing cetaceans in Macaronesia                                                                                                                                                      | Multi-purpose Off-shore Platform | University of Las Palmas de Gran Canaria                       | MARCET         | Competitive |
| Trials of renewable marine energy components and processes                                                                                                                                                  | Test site                        | University College Cork - National University of Ireland, Cork | MARINET2       | Competitive |
| Trials of renewable marine energy components and processes                                                                                                                                                  | Test site                        | SEN UK                                                         | OCEANERA-NET   | Competitive |
| Wave, wind and current data from the test site for optimising wave action prediction models                                                                                                                 | Observatory                      | Ingeteam Service                                               | ORPHEO         | Competitive |

|                                                                 |                                  |                                  |            |             |
|-----------------------------------------------------------------|----------------------------------|----------------------------------|------------|-------------|
| Compiling environmental data in the area around La Esfinge dock | Observatory                      | INEGI                            | SE@PORTS   | Competitive |
| Trials of behaviour of marine structures                        | Multi-purpose Off-shore Platform | FCC Construcción SA              | STARPORTS  | Competitive |
| VIMAS trials                                                    | Multi-purpose Off-shore Platform | Polytechnic University of Madrid | SWARMS     | Competitive |
| Trials of vehicles, instruments and sensors                     | Multi-purpose Off-shore Platform | University of Haifa              | SYMBIOSIS  | Competitive |
| Sea trials of a wave power converter                            | Test site                        | WAVEPISTON                       | WAVEPISTON | Competitive |
| Sea trials of a wave power converter                            | Test site                        | Nereus Technologies              | WEP+       | Competitive |
| Installation of the Wave2Power prototype                        | Test site                        | ENEROCEAN                        | WIP 10+    | Open        |

More detailed information on some of the accesses granted is provided below:

In 2018, Danish company Wavepiston, which develops technology to harness the energy of the waves and generates water under pressure, signed an ALI with PLOCAN with the intention of installing a prototype on the PLOCAN test site, scheduled for 2019. PLOCAN conducted a preliminary study to define the ideal location for the prototype, which will be connected to the platform by a submarine pipe. The prototype will be anchored to the sea bed in a vegetation-free area, with minimum environmental impact, compatible with the objectives of the test site.

A multi-disciplinary team from the National Oceanographic Centre (NOC) of the United Kingdom conducted trials on a new prototype autonomous oceanographic device in mid-February at the PLOCAN facilities. These consisted of a wireless submarine telemetry system for great depths. The objective of the trials was to assess the performance and functionality of the wireless communications system in real operating conditions. The advantageous operational and logistics conditions offered by the PLOCAN marine test site were decisive for NOC to once again take the facilities and capabilities offered by PLOCAN into consideration for carrying out trials on its technological developments in deep waters. A few days before deploying the device at sea, NOC technical personnel finalised the technical details of the configuration and assembly of all the components that comprise the system in the PLOCAN facilities in Taliarte. In this case, this was made up of a 300-metre mooring line, two surface

gliders with a payload that included acoustic transducers and a sea-bed positioner. At the same time, NOC made the most of their stay at PLOCAN to conduct deep-water trials on two new, recently-acquired submarine gliders.



**Ilustración 13. Glider laboratory with the NOC vehicles**

The trials finished at the beginning of May. After the satisfactory results, the system was scheduled to be incorporated as an improvement to the oceanic observation Network that NOC keeps at latitude 26.5°N as part

of the MOC/Rapid Watch programme. This will allow for far more efficient and sustainable management of the network, apart from making data available far more frequently than now.

The trials of a sea-water pumping device made by Tvetter Power started on the PLOCAN test site in mid-March. The sea-water pumping device is driven by wave power. This project is funded by Innovation Norway through Norwegian company



**Illustration 14. Transfer of the Tvetter Power device**

RW Power A/S. Measurements of the pumping capacity of the device were obtained during the trials period, based on the height of the predominant wave and they verified the device's ability to survive at sea. One potential application of a device of this kind would be to provide sea water in coastal desalination plants without the need to use electricity to pump the sea water. Tvetter Power is a company that was founded in 2011, with the objective of developing and marketing renewable energy generating devices, install and operate desalination plants and conduct research and development of new renewable energy-based technologies. A first stage of the project was carried out in 2016 and 2017 on the Atlantic coast of Norway, where an initial version of the device was put through several resistance trials.



**Illustration 15. Mooring the prototype**

The prototype off-shore wind generator of the project led by ESTEYCO was moored on the PLOCAN test site on the 21<sup>st</sup> of June 2018.

This prototype is comprised of a telescopic tower and it can generate 5MW. It was towed from the port of Arinaga where it was built. The Esteyco wind generator is the first in Spain and the first in the south of Europe with fixed foundations and it is a highly important technological innovation in off-shore renewable energies, as the structure can install itself. This facilitates the assembly of wind generators in off-shore wind farms and reduces the costs of the installation and maintenance processes as there is no need to use conventional structures, which are less profitable from an economic point of view. The Esteyco prototype was transported with the telescopic

tower not deployed using a conventional towing system to take it to its final position on the PLOCAN test site, where the foundations were ballasted in a controlled manner. Once the prototype was moored, the tower was extended.

The KOSMOS GC study started in Bahia de Gando in September, as part of the Ocean artUp project. An international team of 50 marine scientists came to Gran Canaria to study the feasibility, effectiveness, associated risks and potential side effects of artificial oceanic up-wellings for fertilising the ocean and enhance the transfer of energy to higher trophic levels with the potential of increasing fish production. Biologists, chemists, bio-geo-chemists and physical oceanographers worked shoulder to shoulder on a field



**Ilustración 16. Experimento Ocean artUp en Gando**

experiment with meso-cosmoses. Ocean artUp was also set the task of researching the effects of artificial up-wellings on bio-geo-chemical cycles, including the potential to export carbon and the gas exchange between air and sea that could affect the climate. This would be tackled with a combination of experiments on a small scale, experiments in situ with meso-cosmoses, field observations in cyclonic eddies, bio-geo-chemical modelling of ecosystems for pertinent processes, technical development, construction and testing of a floating pump and a pilot study of the implications of artificial up-wellings. Nine meso-cosmoses were put in place to simulate an artificial up-welling on different scales for this experiment (varying the volume of deep water added).

This project is led by the German research centre GEOMAR and has the support of PLOCAN for logistics and processing administrative authorisations. It takes place in Gando Bay (Gran

Canaria), a special conservation area for birds (SCA) and a military zone. PLOCAN was responsible and made the applications to the competent authorities for the following authorisations:

- ◆ Occupation of public domain coastline with the Department of Demarcation of Coasts of the Canary Islands. This permit also involves a report on the compatibility of the project with the environmental objectives of the SCA and the demarcation of the coast of the Canary Islands. Against this backdrop, the installation of the meso-cosmoses had to be shifted slightly from their initially-planned position to avoid affecting the alga *Avrainvillea canariensis*.
- ◆ Authorisation for installing the meso-cosmoses from the Ministry of Defence, as this is a military zone
- ◆ Underwater activities with the Las Palmas Harbour Master's office

In 2017, ZUNIBAL installed two prototype wave-measuring buoys on the test site. In October 2018, the two buoys were recovered and all the mooring components, including the 700kg concrete dead-men, following PLOCAN's commitment to restore the initial environmental conditions after the project was completed, in order to avoid leaving anything on the sea bed unnecessarily.

## ORGANISATIONAL STRUCTURE (BODIES OF GOVERNMENT AND COMMITTEES)

The Strategic Council is the maximum body of governance and administration of the Consortium, comprised of the chairperson, deputy chair and the members of the board. The posts of chair and deputy chair rotate and alternate every two years between the AGE (through the current Ministry of Science, Innovation and Universities) and the Government of the Autonomous Region of the Canary Islands (CAC). Members represent the AGE (through the current Ministry of Science, Innovation and Universities) and the CAC. The secretary, appointed by the Strategic Council itself, attends meeting, as does the director of the infrastructure.

The competences of the Strategic Council include setting the guidelines and the general framework for running the project, setting the rules, guidelines and general criteria for the actions and operations of the Consortium, approving the management style with regard to compliance with its purposes and adopt the annual Consortium budget, the annual accounts and the liquidation of the old budget, at the proposal of the Executive Board. The Chairperson of the Strategic Council is the highest representative of the Consortium.

The composition of the Strategic Council at the last meeting held in 2018 was as follows:

### **CHAIRMAN**

Manuel Miranda Medina, Director General of the ACIISI

### **DEPUTY CHAIRMAN**

Rafael Rodrigo Montero, Secretary General of Co-ordinating Scientific Policy

### **MEMBERS**

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

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

Víctor Velasco Rodríguez, Deputy Chairman of Organisation and Institutional Relations of the CSIC

Eduardo Balguerías Guerra, Director of the Spanish Oceanographic Institute

Gonzalo Piernavieja Izquierdo, Deputy Regional Minister of Industry, Energy and Trade of the Canary Island Government

Javier Armas González, Deputy Regional Minister of Finance and Planning

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

The Executive Board is a governing body created to monitor and implement the Consortium's activities. It is comprised of four representatives of the CAC, at least one of which must be a member of the Strategic Council, and four representatives of the AGE (through the current Ministry of Science, Innovation and Universities), at least one of whom must also be a member of the Strategic Council. The chair and deputy chair of the Committee rotate with the same frequency as for the Strategic Council, bearing in mind that the two bodies cannot be chaired by the same institution at the same time.

The Executive Board is the body responsible for putting the draft annual budget for the Consortium, along with the annual accounts and the liquidation of the matured budget, the

draft annual action plan and projects and the scientific programme to be implemented in the infrastructure, to the Strategic Council for approval. The latest composition of the Executive Board in 2018 is shown below.

**CHAIRMAN**

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

**DEPUTY CHAIRMAN**

Manuel Miranda Medina, Director General of the ACIISI

**MEMBERS**

Ángela Fernández Curto, Deputy Assistant Director General of Large Scientific-Technical Facilities

Ana Aricha Yanguas, Head of the Department of Large Scientific-Technical Facilities

María Jesús Marcos Crespo, Head of the Department of the Assistant Director General of Large Scientific-Technical Facilities

Carlos Gustavo Díaz Perera, Director General of Planning and Budget

Ciro Gutiérrez Ascanio, Director General of Universities

Antonio López Gulías. Head of co-ordination and liaison for Research, Innovation and Information Society of the ACIISI

The Socio-economic Activities Advisory Committee (CASE, as it is known in Spanish) is an advisory body to the Consortium whose mission is to advise on PLOCAN's activities, scientific and technological programmes and plans and propose future actions that can focus the Consortium's work on contributing to the sustainable socio-economic development of oceanic activities.

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

The CASE held a meeting in the PLOCAN offices in Taliarte on the 2<sup>nd</sup> of February. The composition of the CASE at the end of 2018 was as follows:

**CHAIRMAN:**

Rafael Robaina Romero. President 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. Chairman of the Canary Island Maritime Cluster

Miguel Montesdeoca Hernández. Chairman of the Canary Island Engineering Cluster

Blas Trujillo Oramas. Chairman of the Canary Island Economic and Social Council

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 objective is to advise on PLOCAN's activities, scientific and technological programmes and plans, propose future actions that can enhance the quality and scope of the work done.

The COCI is made up of people of acknowledged international prestige in fields relating to the purposes and activities of the Consortium. Its members were appointed by the Strategic Council, at the proposal of the institutions that form part of the Consortium. The functions of the COCI include drafting a report once every four years on the future opportunities, prospects and capabilities of the centre, which is presented to the Strategic Council to help them in the strategic orientation of the centre. Due to difficulties with the members' agendas, no committee meeting could be called in 2018. They have scheduled a meeting for the first quarter of the following year. The composition of the COCI at the close of 2018 was as follows:

**CHAIRMAN:**

Prof Gerold Wefer. Professor of the University of Bremen.

**MEMBERS:**

Enrique Álvarez Fanjul, Head of the Area of Knowledge of the Physical Environment of Puertos del Estado (State Port Authority).

María Soledad Izquierdo López, Professor of 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).

## PEOPLE IN PLOCAN

At the close of 2018, PLOCAN had a team comprised of 50 people, 29 of whom were full-time staff, 16 were hired for R+D+I projects, and 6 were signed up to the training plan.

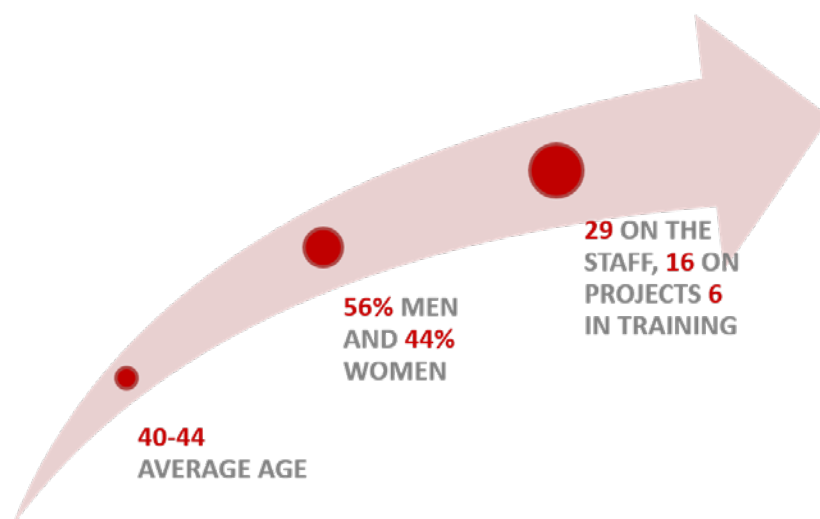


Illustration 17. The staff in PLOCAN

The Consortium is organised into three different areas reporting to the senior management.

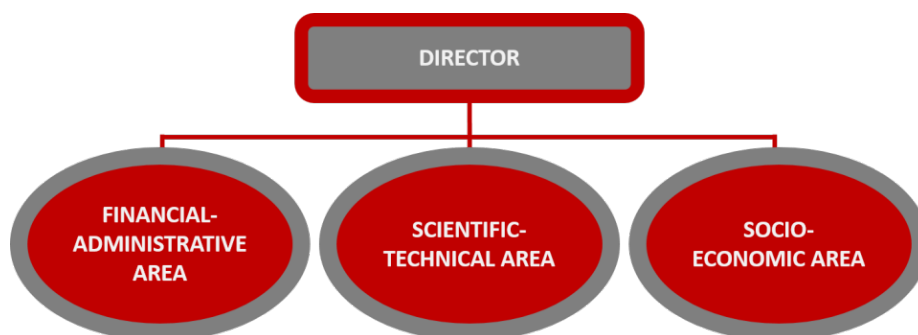
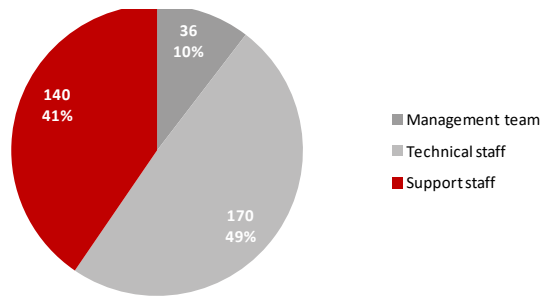


Illustration 18. Areas of the PLOCAN consortium

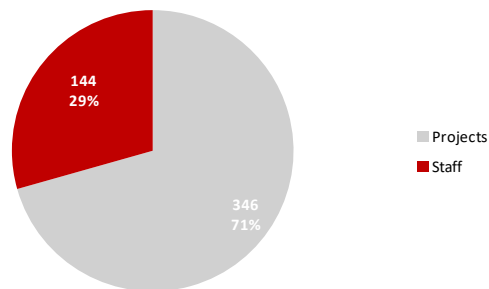
All areas have full-time staff and people on project contracts. The socio-economic area also has a small support group comprised of staff from the Canary Island Marine Sciences Institute, which currently reports to the Canary Island Research, Innovation and Information Society Agency of the Canary Island Government, who work in PLOCAN.

The graph below shows the staff ratio between unit person/month throughout 2018 at the different levels of organisation. It does not include people hired on project contracts or the units concerning people on job placements and internships.



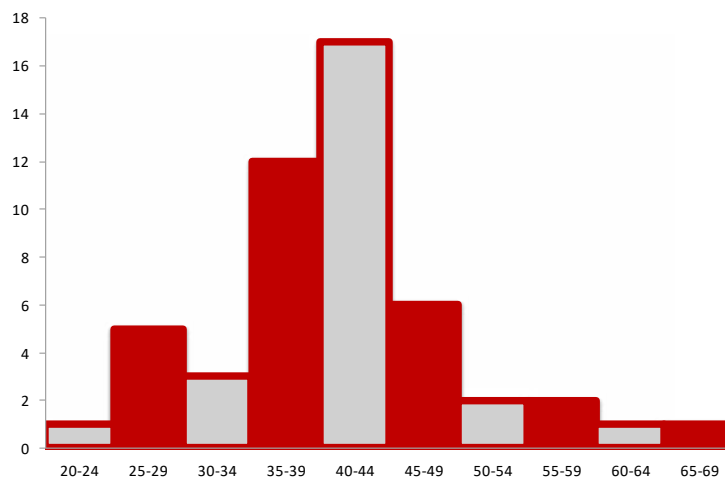
**Illustration 19. Unit of P/M at different levels of the organisation**

The ratio between the unit person/month for people and project contracts and full-time staff is shown in the graph below:



**Illustration 20. Distribution of P/M between full-time staff and projects**

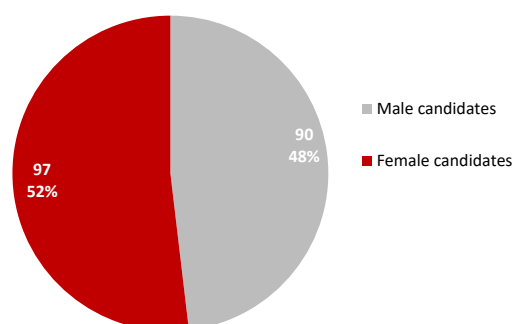
The graph of the distribution of the team at the end of the year shows that the commonest age range in the organisation is 40-44, followed by 35-39.



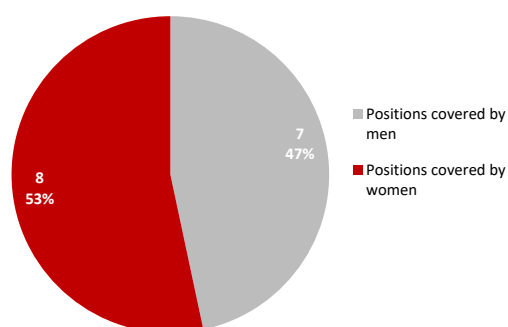
**Illustration 21. Distribution of the staff by age**

## JOBS IN PLOCAN

Job vacancies in PLOCAN this year were covered both directly and through the Canary Island Employment Service. A total of 18 job vacancies were advertised in 6 different calls for candidates. 15 of the vacancies were covered. Information on the number of people by gender that applied for the jobs and those getting the jobs is presented in the graphs below:



**Illustration 22 Distribution of candidates for vacancies by gender**



**Illustration 23. Gender of the selected candidates**

An application was made for funding from the European Social Fund in June 2018 for 8 places on the Youth Employment Programme. This funding is used for the sustainable integration of young people in the labour market, in the context of the National Youth Guarantee System. The purpose is to enhance the employability of people between 16 and 30. The 8 places offered were as follows:

- Marine vehicles
- Remote sensing in the marine-maritime sector
- Specialisation and support for managing R+D+i, with special focus on fostering the use of innovative public procurement
- Managing oceanographic data infrastructures
- Managing Smart Network infrastructure
- Displaying oceanographic data
- Techniques applied in environmental bio-geo-chemical laboratories

## ■ Galvanising the blue economy

A call for projects was put out in February for the **2+2 Training Programme**, which led to the selection of 2 candidates. The area of action defined by the call was “software development”, to replace a candidate who left their job in the same field in February of this year. The 2 candidates that started in 2016 in the area of “oceanographic data observation and processes” and “marine/submarine vehicles, instrument and machines” continued their contracts as part of this programme. The purpose of this programme is to supplement the academic education received in universities with practical experience in a technological environment. It envisages two phases, the first one is covered by a 2-year grant that involves a training programme, and a second phase of a job placement contract.

The 3 candidates selected in 2016 as part of the **0,5+2 training programme**, continued in the phase of the job placement contract in 2018, in the following areas:

- Support for the PLOCAN Socio-economic Area
- Telecommunications and I.T. Systems
- Analysis Laboratory and Quality Control

The purpose of this programme, which is very similar to the previous one, is to facilitate supplementary, highly-specialised training and to enable those finishing Vocational Training to find a job. It comprises a 6-month grant phase and a two-year job placement contract phase.

This year PLOCAN was awarded funding in the Call for Aid for contracts for Technical Support Personnel (PTA, in Spanish) 2017. This funding was for hiring one person to provide technical support for the validation, maintenance and servicing weather and oceanographic sensors in the area of Information and Communications Technology. This ruling was not received until the end of 2018 and arrangements were started for the candidate to start work in the following year.

## PROJECTS CARRIED OUT OR IN PROGRESS

A total of 36 projects were managed in 2018. The following graphs analyse the participation of PLOCAN in both European and national projects.

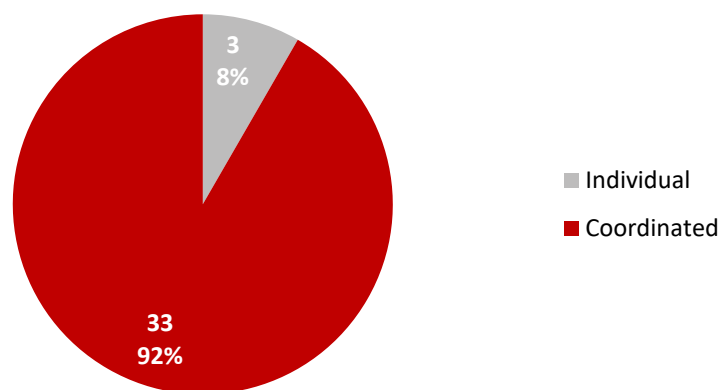


Illustration 24. Projects in progress in 2018 classified by kind of project

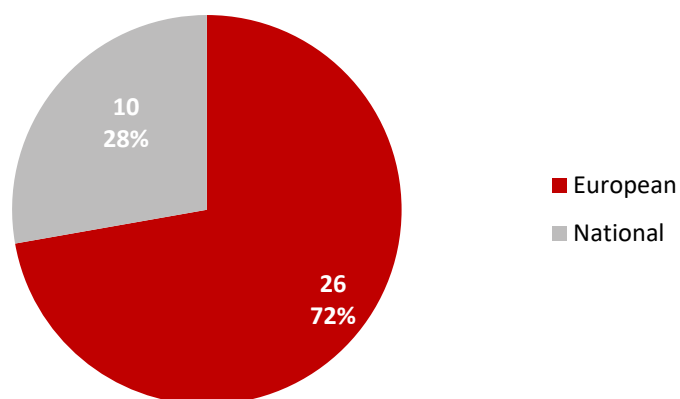


Illustration 25. Projects in progress in 2018 classified by origin of the funding

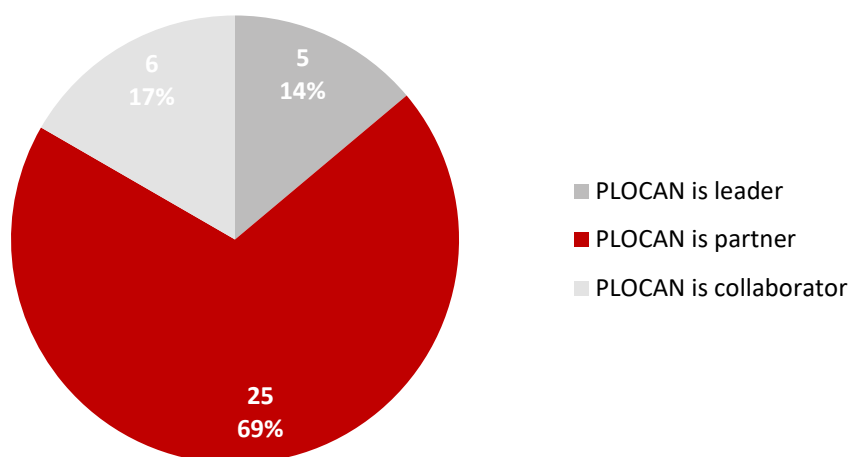


Illustration 26. PLOCAN's role in projects implemented in 2018

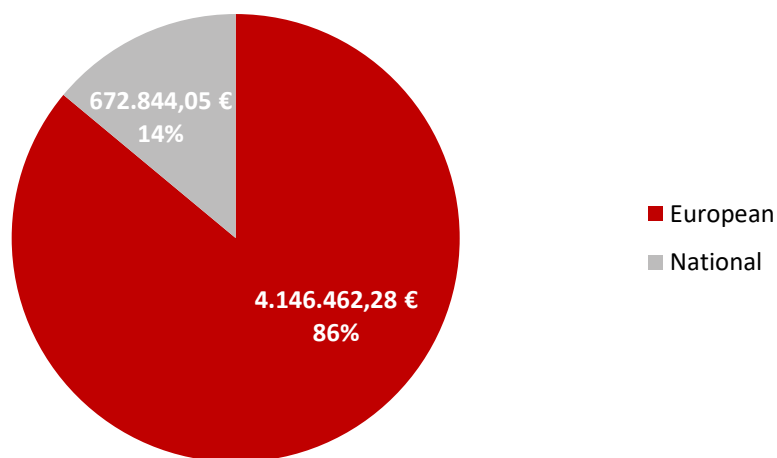


Illustration 27. PLOCAN funding from projects implemented in 2018

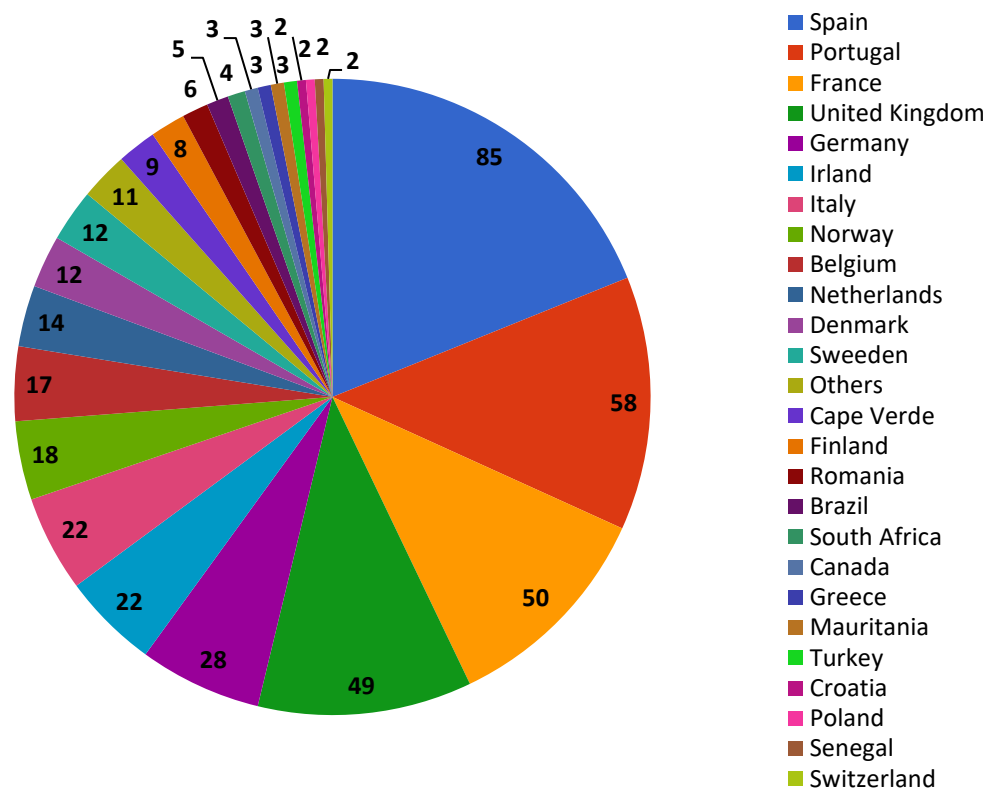


Illustration 28. Partners in projects with PLOCAN participation, by countries

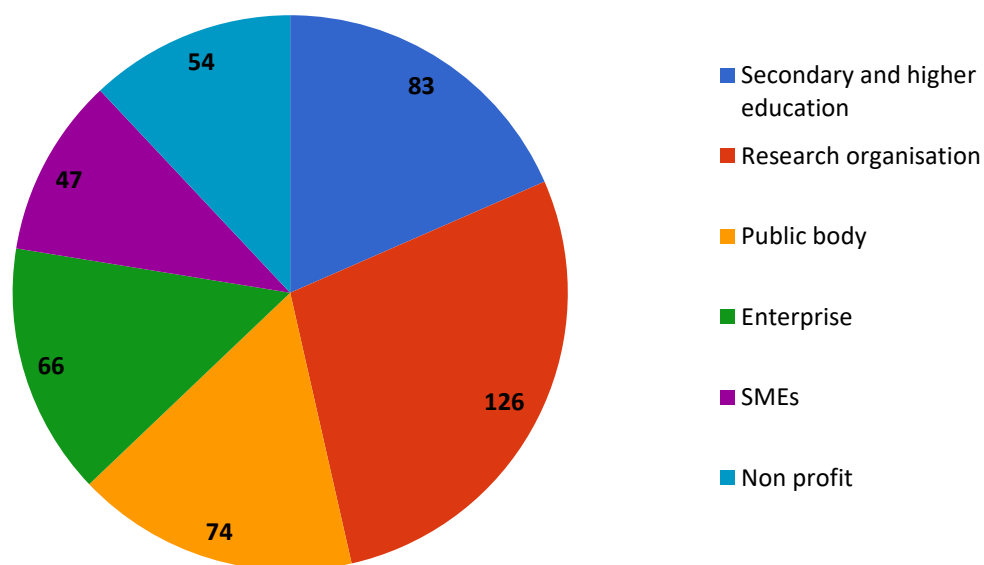


Illustration 29. Partners in projects with PLOCAN participation, by kind of organisation

The table below identifies the projects that have involved access to PLOCAN, those in which the Consortium has participated in work packages and those that promote access:

| PROJECT                   | PROMOTES ACCESS <sup>2</sup> | INVOLVES ACCESS | PLOCAN PARTICIPATES IN WP |
|---------------------------|------------------------------|-----------------|---------------------------|
| AANCHOR                   | MT                           | NO              | YES                       |
| AEIDRON                   | NA                           | YES             | YES                       |
| AEIODA                    | NA                           | YES             | YES                       |
| AORAC-SA                  | LT                           | NO              | YES                       |
| ATLANTOS                  | NA                           | YES             | YES                       |
| BIODIVERSA <sub>3</sub>   | LT                           | NO              | YES                       |
| CODIMAR                   | MLT                          | NO              | YES                       |
| COLUMBUS                  | MT                           | NO              | YES                       |
| DESAL+                    | NA                           | YES             | YES                       |
| DESPESCA                  | NA                           | YES             | YES                       |
| ECOMARPORT                | NA                           | YES             | YES                       |
| ECUVE                     | MT                           | NO              | NO                        |
| ELICAN                    | NA                           | YES             | YES                       |
| EMSODEV                   | NA                           | YES             | YES                       |
| EMSO-LINK                 | MT                           | NO              | YES                       |
| ENTROPI                   | MT                           | NO              | YES                       |
| ENVRI PLUS                | MT                           | NO              | YES                       |
| EO-MAMMALS                | MT                           | NO              | YES                       |
| EUMARINEROBOTS            | NA                           | YES             | YES                       |
| FLOCAN <sub>2</sub> -GRID | LT                           | NO              | NO                        |
| iFADO                     | NA                           | YES             | YES                       |
| MARCET                    | NA                           | YES             | YES                       |
| MARINERG-I                | MT                           | NO              | YES                       |
| MARINET <sub>2</sub>      | NA                           | YES             | YES                       |
| OCEANERA-NET              | NA                           | YES             | YES                       |
| ORPHEO                    | NA                           | YES             | YES                       |
| RIS <sub>3</sub> -NET     | LT                           | NO              | YES                       |
| ROVSTEAM                  | VLT                          | NO              | YES                       |
| SE@PORTS                  | NA                           | YES             | NO                        |
| SMART BLUE                | LT                           | NO              | YES                       |
| STARPORTS                 | NA                           | YES             | NO                        |
| SWARMS                    | NA                           | YES             | YES                       |
| SYMBIOSIS                 | NA                           | YES             | NO                        |
| WAVEPISTON                | NA                           | YES             | NO                        |
| WEP+                      | NA                           | YES             | YES                       |
| WIP <sub>10+</sub>        | NA                           | YES             | NO                        |

<sup>2</sup> NA (not applicable), MT (medium-term), LT (long-term) and VLT (very long term)

The following files summarise the projects along with the most important activities carried out:

## AANCHOR

**Origin of funding: Participation: Call: H2020-BG-2018-2020 / Topic: BG-o8-2018-2019: All Atlantic Ocean Research Alliance Flagship / Deadline Id:H2020-BG-2018-1**  
**Participation: Partner**  
**Period of execution: 01/10/2018-30/09/2022**  
**Total project funding: €3,995,892.50**  
**Funding for PLOCAN: €637,500.00**  
**Percentage of external funding: 86.44 %**

The main ambition of AANChOR is to promote the implementation of the South Atlantic Research and Innovation Flagship initiative and the Belém Statement (BS), signed by the EU, Brazil and South Africa in 2017, to upscale research and innovation cooperation within the Atlantic basin, from Antarctica to the Arctic. AANChOR will pursue this ambition by providing the EC and the BS Implementation Committee (to be established by signatories of the Statement) with a framework to identify and contribute to the implementation of concrete long-term collaborative activities, reinforcing international cooperation between Europe and tropical and South Atlantic countries and connecting with the challenges and research needs of the North Atlantic Ocean.

AANChOR will be responsible for launching a multi-stakeholder platform to identify collaborative activities, building on national and international ongoing initiatives such as the All Atlantic Ocean Research Alliance and addressing activities aimed at reinforcing capacity building, promoting academia-industry knowledge transfer for an enhanced ocean innovation, developing common standards, enhancing citizen awareness and ocean literacy and converging and aligning R&I infrastructure initiatives.

To contribute to the implementation of the identified joint activities, AANChOR will provide seed money for the first development stages of selected joint pilot actions and support the identification of the most appropriate existing funding mechanisms and tools for further development of the selected activities. AANChOR will also define long term measures for the sustainability of the cooperation framework beyond the lifetime of the CSA. Recognising the evolving nature of the BS implementation, flexibility has been incorporated into the structure of the CSA allowing its activities adjustment wherever needed. The consortium brings together partners from 4 European Countries, 2 Latin American countries and 2 African countries.

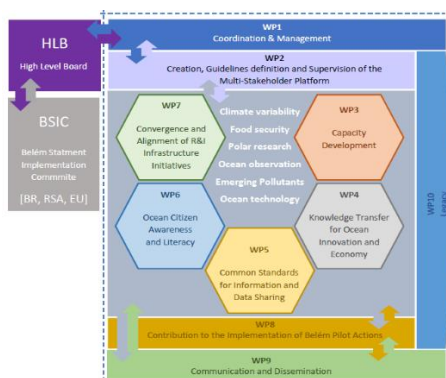


Illustration 31. Project structure

The project kick-off meeting was held in Brussels at the end of October. PLOCAN leads work package 2 "Creating, defining the Guide and Supervision of the



Illustration 30. Participants at the kick-off meeting

Multi-Stakeholder Platforms". The meeting was attended by the project partners, representatives of the EC and the signatories to the Belém Declaration that form part of the project and who will supervise all the activities. This project is vitally important for the sustainable development of the Atlantic Ocean in its entire extension, because it detects the existing knowledge gaps and helps society to understand the value of the blue economy in this ocean and own it.



**Illustration 32. Members of the high-level group**

The project has a high-level board (HLB) that will supervise the right approach and direction for implementing the project. During the KoM, they presented the political contexts to reach the implementation framework of the Belén Declaration.



**Illustration 33. Presentation of work package 2 by the scientific-technical manager of PLOCAN, which leads this WP.**

## AEI DRON (MULTI-PURPOSE DRONE)

Feasibility study for designing a multi-purpose drone

**Origin of funding: Agrupaciones Empresariales Innovadoras (AEI) 2017**

**Participation: Partner**

**Period of execution: 20/06/2017-31/03/2018**

**Total project funding: €50,127.00 €**

**Funding for PLOCAN: €4,150.00 €**

**Percentage of external funding: 50 %**

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.

PLOCAN has participated in all the project work packages and has made its facilities available, along with the technical requirements for the pilot test to be conducted at the end of the project, and has also provided the staff necessary for preparing the vehicles and tests. PLOCAN was also on the project steering committee. More specifically, the MULTI-PURPOSE DRONE project has enabled the team to identify both the technological potential and the potential application of aerial drones in different areas of the marine-maritime sector, such as the gaps and needs in legislative terms, especially with regard to their use, management and application.

## AEI ODA (ODA)

### Onboard Data Analyzer

**Origin of funding: AEI-010600-2017-171**

**Participation: Partner**

**Period of execution: 08/08/2017-31/03/2018**

**Total project funding: €67,377.00**

**Funding for PLOCAN: €5,031.00**

**Percentage of external funding: 50%**

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.

In order to study the development of ODA, software technologies used in maritime sector operations were analysed, along with their integration and inter-communication. The result has been vitally important for the phase of analysis and definition of the environments in the sector. The ODA feasibility study also made it possible to lay the foundations for developing a highly attractive and innovative prototype for the maritime sector. PLOCAN has been used as a test site for studying and analysing ODA. This was used to analyse the environments concerned, which has been essential to make the project useful vis a vis the future development of ODA. PLOCAN took part in all the work packages.

## AORAC-SA

### Atlantic Ocean Research Alliance Support Action

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

**Participation:** Partner

**Period of execution:** 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).

PLOCAN is the leading partner for work package 5.



**Illustration 34. Participants in the meeting in Salvador de Bahía**

A meeting was held on the 23<sup>rd</sup> and 24<sup>th</sup> of July in Salvador de Bahía (Brazil), with the participation of the manager of the scientific-technical area. The purpose of the meeting was to move forward on implementing the Belén Declaration by enhancing relations in this area between Europe Brazil and South Africa.

The “AHORA next steps” workshop was held on the 6<sup>th</sup> of July, bringing together the leading partners of the work packages to plan the project tasks for the next few months.



The project has developed a highly active strategy in social media, not just covering the project activities, but also ocean conservation, as shown in the following tweets:



## Optimizing and Enhancing the Integrated Atlantic Ocean Observing System

**Origin of funding:** H2020-BG-2014-2 / BG-o8-2014: Developing in-situ Atlantic Ocean Observations for a better management and sustainable exploitation of maritime resources

**Participation:** Partner

**Period of execution:** 01/04/2015-30/06/2019

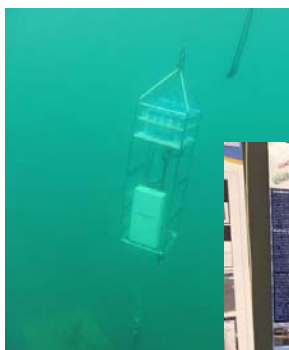
**Total project funding:** €20,652,921.00

**Funding for PLOCAN:** €427,231.25

**Percentage of external funding:** 100 %

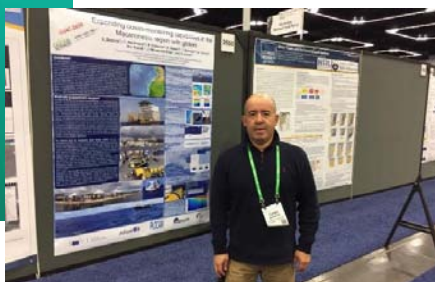
The overarching objective of AtlantOS is to achieve a transition from a loosely-coordinated set of existing ocean observing activities to a sustainable, efficient, and fit-for-purpose Integrated Atlantic Ocean Observing System (IAOOS), by defining requirements and systems design, improving the readiness 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.



**Illustration 35. Testing the PPS on the test bed**

Tests were carried out in February at the Taliarte dock, mooring the PPS phytoplankton sampler to prepare it for its up-coming mooring at ESTOC.



**Illustration 36. PLOCAN at the Ocean Sciences Meeting stand**

PLOCAN presented papers on gliders at the Ocean Sciences Meeting 18 held in Portland (USA) in February.



**Illustration 37. Members of PLOCAN at Oceanology International**

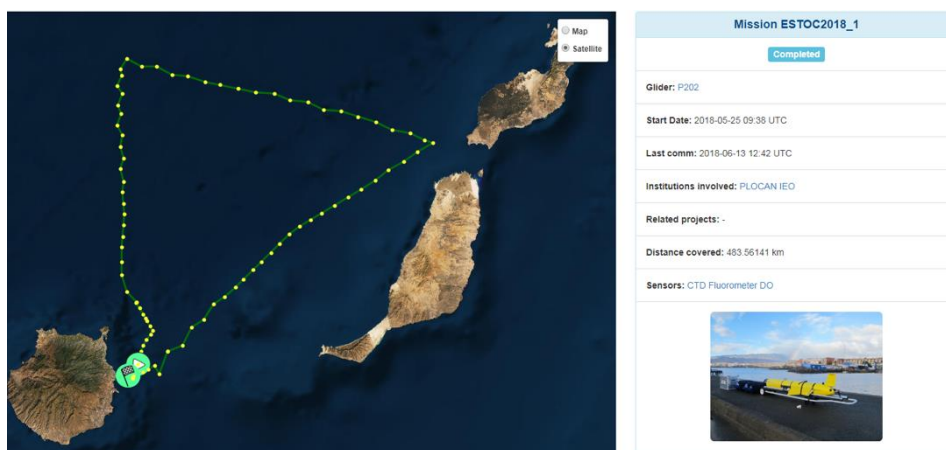
A mission was conducted between the 19<sup>th</sup> and the 22<sup>nd</sup> of April with a Sailbuoy autonomous surface vehicle in waters to the east and south of Gran Canaria. Temperature, conductivity, dissolved oxygen, hydro-carbons, chlorophyll A, turbidity, wind speed and direction, atmospheric pressure, relative humidity and air temperature were sampled. The mission was aborted due to an error in the vehicle servo, which meant it had to be sent back to the manufacturer for repairs after a series of verification tests by technical staff from the supplier.



**Illustration 38. Mission with Waveglider**

A joint mission was launched in May between the Atlantis project and Marcet. A Sailbuoy autonomous device was launched to take environmental observations of the ocean surface. This vehicle forms part the PLOCAN fleet. The aim of the mission was to respond to the operational and observation tasks that the two projects include in their implementation plan. The mission took place in an area to the north of the Canary Islands

that is part of the PLOCAN oceanic observatory. Data was compiled on a series of both meteorological parameters (wind direction and strength, temperature, relative humidity, air pressure) and oceanographic parameters (temperature, dissolved oxygen, hydrocarbons, pigments, turbidity).



**Illustration 39. Mission in May**



**Illustration 40. Operation with glider in the May mission**

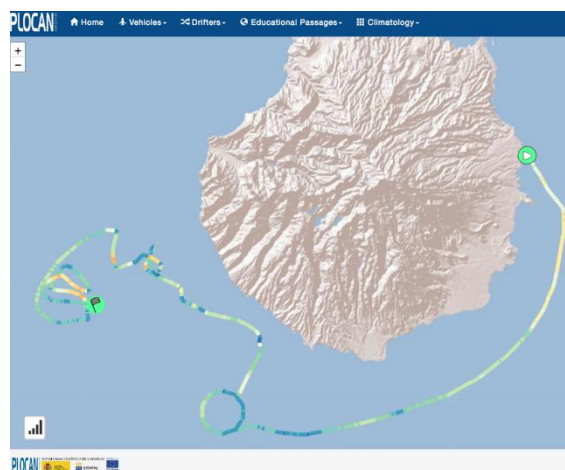
In June, PLOCAN presented papers on gliders at the 5<sup>th</sup> Conference on Hydrographic Engineering in Lisbon.



**Illustration 41. Presentation in the Hydrographic Engineering Conference**

On the 4<sup>th</sup> and 5<sup>th</sup> of June, PLOCAN took part in a workshop on the European view for an Atlantic Ocean Observation System, organised by EuroGOOS in Brussels.

A Wave Glider mission was conducted between the 23<sup>rd</sup> and the 24<sup>th</sup> of July in the South of Gran Canaria. The vehicle was fitted with CTD, dissolved oxygen sensors, weather station and PAM hydrophone.



**Illustration 42. Mission with Wave Glider in July**

A Wave Glider mission was conducted between the 27<sup>th</sup> and 28<sup>th</sup> of September to test the result of the inter-operability experiment. In the course of this mission, the Wave Glider was fitted with CTD, dissolved oxygen sensors, weather station, PAM hydrophone and 3 Turner Cyclops sensors for measuring Chlorophyll, Turbidity and hydrocarbons, which had been previously calibrated in PLOCAN. The connection box manufactured during the Nexos project was used to fit these sensors to the Wave Glider.



**Illustration 43. Mission with Wave Glider in September**

At the end of October, the project, along with EMSO-ERIC and JERICO-RI organised a three-day scientific-technical workshop during the Sea Tech Week held in Brest (France) with a view to harmonising procedures and driving the inter-operability of technologies to share oceanic observation instruments promoted by the European Commission. Based on the results of similar inter-operability workshops, the event focused on implementing SWE (Sensor Web Enablement) standards, hard-wired coastal observatory missions, measuring dissolved oxygen, pCO<sub>2</sub> and pH in the marine environment, and dissolved oxygen and temperature: data from the water column and the sea bed, from sensors to users.



**Illustration 44. Sea Tech Week**

The results of the PLOCAN glider observation missions carried out as part of the International AUV '18 Symposium project, organised by the University of Porto, were presented, with the support of the International Electronic and Electrical Engineers Institute (IEEE). The Porto event attracted the leading players of the marine robotics sector, including the National Oceanographic Centre (NOC) of the United Kingdom, the Monterey Bay Aquarium Research Institute (MBARI), the Woods Hole Oceanographic Institution (WHOI) and the universities of Rhode Island and Stanford, United States.



**Illustration 45. AUV 18 Symposium**

In mid-November, as part of the project, a meeting was held to set up the National Oceanic Observation Co-ordination Group described in the section "Agreements signed and participation in networks".

The Wave Glider mission was completed at the end of November, that had been run jointly with the iFADO and Atlantos projects. This Wave Glider mission was to monitor cetaceans in the waters of Macaronesia.



**Illustration 46. Pictures of the Wave Glider mission in November**

They also presented the work they had done on glider missions and R3M at the EOOS conference, organised by EuroGOOS (<http://www.eoosconference2018.eu/>) and held in Brussels on 21-23 November 2018.



**Illustration 47. PLOCAN at Martech 2018**

On the 10th and 11th of December, PLOCAN took part in the Martech 2018 workshop on marine technologies held in the Engineering School of the University of Porto, where PLOCAN presented the results obtained from the project in different Glider missions and co-operative experiments. PLOCAN contributed with two oral communications.

It played an active role on social media and published newsletters as part of the project dissemination.



# BIODIVERSA<sub>3</sub>

**BiodivERsA<sub>3</sub>: 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**

**Period of execution: 01/02/2015-31/01/2020**

**Total project funding: €11,988,018.00**

**Funding for PLOCAN: €62,512.50**

**Percentage of external funding: 100 %**

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, BiodivERsA<sub>3</sub> aims to strengthen the ERA on biodiversity. Building on the previous experiences of the projects BiodivERsA<sub>1&2</sub> and NetBiome, BiodivERsA<sub>3</sub> 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

The project general assembly took place in Paris on the 28<sup>th</sup> of June, organised by the coordinators (FRB, France). A second meeting of the Management Committee of the next call for proposals was held on the 29<sup>th</sup> of June. PLOCAN attended both meetings.



**Illustration 48. Preliminary announcement of the 2018 call for proposals**

The general assembly was held in Bucharest (Romania) on the 5<sup>th</sup> and 6<sup>th</sup> of December.

## CODIMAR

Communication and Dissemination of activities in the marine-maritime sector

**Origin of funding: Call for aid proposals for fostering scientific, technological and innovation culture 2017**

**Participation: Co-ordinator**

**Period of execution: 01/01/2018-30/06/2019**

**Total project funding: €15,000.00**

**Funding for PLOCAN: €15,000.00**

**Percentage of external funding: 28.13 %**

The scientific community requires international scientific and technological cooperation to achieve a sustainable observation of the ocean and an understanding of the involved processes. At the same time, it is essential to be able to bring to society the uniqueness of the work carried out by PLOCAN and the facilities and services that derive from it. Therefore, a series of Communication and Dissemination activities in the Marine-Maritime sector (CODIMAR) are proposed, which serve as planning for 2018 to the Scientific Culture and Innovation Unit (UCC+i) of PLOCAN created in August 2017.

The CODIMAR project seeks to generate new communication and scientific dissemination mechanisms, as well as to take advantage and reinforce the projects in execution and the events held in PLOCAN with specific actions. The proposed actions are aimed at society in general, although they consider different target audiences depending on the used means of communication. The project integrates both face-to-face actions, based on interactive exhibitions and workshops; as online actions, making use of the corporate website of PLOCAN and the social networks Facebook and Twitter and the videos container service YouTube. Online actions make visible the projects and events of PLOCAN and consider a contest of dissemination videos oriented to students of different ranges of age.

The main axis around which the actions developed will focus will be the lines of activity of PLOCAN, to bring the activities carried out to society, especially considering the inauguration of the marine headquarters, scheduled for 2018, and which will involve a large media repercussion. The CODIMAR project is executed with the collaboration of the Spanish Foundation for Science and Technology (FECyT), the Cabildo (Island Government) of Gran Canaria and the Obra Social Charity of La Caixa bank.

The CODIMAR and ROVSTEAM projects held a joint kick-off meeting on the 3<sup>rd</sup> of May at the PLOCAN offices in Taliarte. A total of 32 teachers attended the meeting, representing over 100 education centres that took part in PLOCAN's marine robotics educational initiative EDUROVs in 2018.



**Illustration 49. Project kick-off meeting**

The following activities have been carried out in the project, which are described in the sections "Participation in events and visits received" and "Training and fostering scientific technological vocations":

- ◆ Participation in the Scientific Vocations Fair
- ◆ Participation in the annual ComCiRed (Communicate Science through Networks) event
- ◆ Participation in the "A night in the Museum" event of the Elder Science and Technology Museum
- ◆ Participation in the International Sea Fair, FIMAR
- ◆ Participation in "Macaronight, The European Researchers' Night"
- ◆ Interactive presentation of the PLOCAN facilities in El Mirador Shopping Centre

## 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**

**Period of execution: 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.

The Columbus Project organised a workshop on the 23<sup>rd</sup> of January in the facilities of the European Global Oceanic Observation System (EUROGoos) in Brussels on marine sensor technology. The workshop addressed the challenges faced by companies to make progress on the levels of technological readiness (TRL) in the initial phases of funding R+D and cases in which the objective lies in closing the gap between the funding and bringing to market. A manual of best practices was drafted from the information that came to light during the workshop.

The closing event of the project was held in the European Parliament under the title of “Accelerating Blue Growth through Marine and Maritime Knowledge Transfer”. This event was organised by EurOcean as the leading partner of the work package “Knowledge Collection” and chaired by Ricardo Serrao Santos, with the participation of the head of the Marine Resources Unit of the Directorate General of Research and Innovation, Sigi Gruber. The aim of the event focused on reflecting on the lessons learned about transferring knowledge for blue growth with

regard to enhancing the transfer of knowledge from research and innovation projects funded nationally and with European funds in the marine and maritime sector.



Illustration 50. Columbus event in the European Parliament

The project enabled the partners to publicise the capabilities of PLOCAN to an extensive network of stakeholders in marine – maritime sub-sectors: observation, renewable energy, aquiculture and maritime shipping in particular. It also helped to put the spotlight on PLOCAN as a “multi-purpose area” for simultaneous trials/operation, in the same marine space, for a range of activities. It also helped to create close co-operation with some strategic partners that continues today: EUROGOOS and EMODNET.

It also facilitated the transfer of research results from the NeXOS and AtlantOS projects within the framework interpreted by COLUMBUS. Basically, to enhance the visibility and scope beyond the original plans for both projects in particular. The Brokerage Events organised by PLOCAN with the support of EuroGOOS and EMODnet were especially important.

The latter allowed PLOCAN to publicise its role as a player in the transfer of knowledge and support for marine research. As a result of the trust acquired, PLOCAN played a successful part in the GRRIP Project proposal that is set out as a continuation of the experience gained in COLUMBUS and from its line of action.

PLOCAN took part in drawing up the following documents:



Illustration 51. Columbus publications that include PLOCAN participation

## DESAL+

Macaronesia platform for enhancing excellence in R+D matters in the desalination of water and in awareness of the desalinated water-power link

**Origin of the funding:** INTERREG V A Spain-Portugal (MAC 2014-2020) Territorial Co-operation Programme / CROSS-BORDER Co-operation: STRAND 1 Reinforce research, technological development and innovation / PI.1.an Improvement of research and innovation I+I infrastructures and the capability to develop excellence in I+I matters and foster centres of competence, especially those of interest to Europe

**Participation:** Partner

**Period of execution:** 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:

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

The project activities in 2018 were as follows:

- ✦ Planning and acquisition of laboratory equipment for the future analysis of water quality to be carried out in the northern zone of Gran Canaria
- ✦ Visit to the Arucas-Moya desalination plant to discover the electrical characteristics of the plant
- ✦ Manage the call for proposals for hiring a technologist to support the execution of the project tasks, as initially planned.
- ✦ Meeting with project partners, at the proposal of the lead partner (ITC) to start work on putting together the course for training trainers in desalination and renewable energies, co-ordinated by the ULPGC in the project. PLOCAN will lead and co-ordinate module 8 on marine energies.
- ✦ Application to several companies for budgets for the marine environmental characterisation of the pilot zone off the north coast of Gran Canaria.

In the context of the project, PLOCAN started on the marine environmental characterisation of an area off the north coast of Gran Canaria, near a desalination plant in November 2018. In the future, this will be used for trials relating to desalination driven by wave power.

In the second half of the year, PLOCAN took part with the presentation of a lecture in the conference on “Application of Marine Renewable Energies in key sectors” held in the Naval Technology and Sea Centre (CTN) in Murcia.



**Illustration 52. PLOCAN lecture in the CTN in Murcia**

In 2018, PLOCAN has worked on creating the following deliverable:

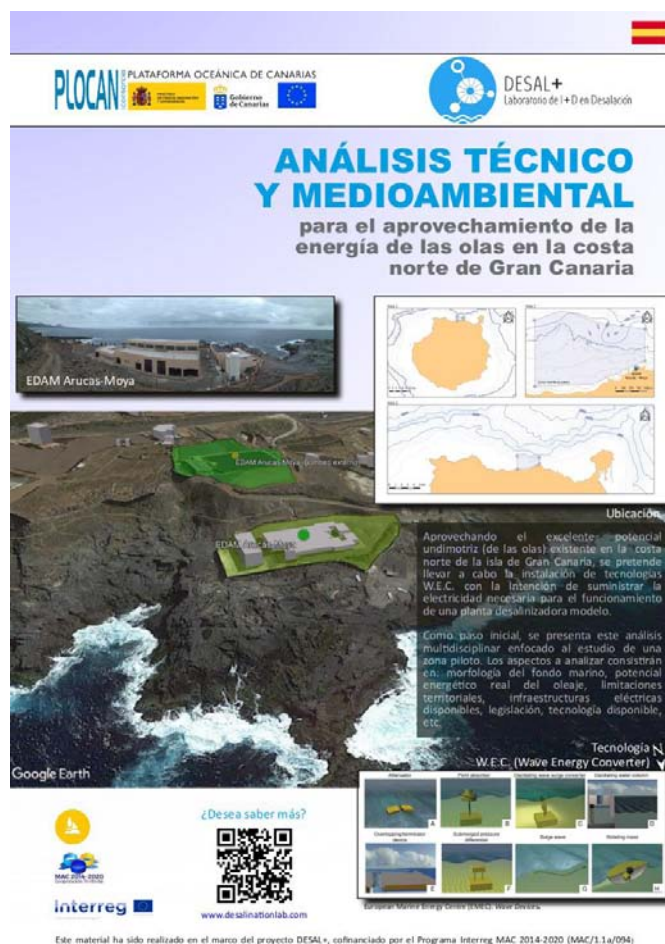


Illustration 53. Front page of the deliverable in which PLOCAN participated

## DESPESCA

Monitoring side catch species caught with gill net and traps on the test site in Gran Canaria

Origin of funding: Call for proposals 2017 of the Pleamar Programme

Participation: Co-ordinator

Period of execution: 03/01/2018-02/02/2019

Total project funding: €61,846.40

Funding for PLOCAN: €61,846.40

Percentage of external funding: 75 %

The main objective of this project is to acquire new technical and scientific know-how about artisanal fishing with traps and gillnets to reduce their negative impacts on the environment. Nothing has been published to date concerning the survival rates of specimens of the different target species freed (because they are below

the minimum catch or commercial size) or side catch caught with both fishing techniques, one using traps, and the other using gillnets. This know-how will allow us to propose improvements in the use of these traditional techniques to the competent authorities, both regarding their construction and how they are used, as the survival of the non-commercial specimens often depends on how long the gear is set for, or how fast they are turned around.

Consequently, material will be published with recommended Best Practises for using this gear. The field activities are concentrated on the PLOCAN test bed, where the Fishing Co-operatives of Melenara and San Cristóbal usually fish with traps. PLOCAN can moor nursery cages in this area for the side-catch and monitor their behaviour using underwater robotic technologies (ROV). The surveillance provided for the test area is a guarantee that there will be no illegal fishing in the area that could spoil the results. The trial will also allow us to identify the needs and challenges to be tackled in planning and defining the co-existence of activities that could interact with artisanal fishing.

All the results will be compiled in a document that will make recommendations to the competent administrations for planning the professional fishing sector and introducing improvements in the regulations of both fishing techniques. Furthermore, these same results will be presented to the fishermen of both co-operatives working on the project and to all other fishermen of the island to raise their awareness about the importance of best practices with a view to reducing the number of non-marketable specimens that have to be thrown back. An assessment of the operations conducted on the test bed will also be made to identify the co-existence options between R+D+i activities and traditional fishing in the reserve area, which will be shared with the co-operatives working with us to define activities on the test bed and uses of the space. The ICT supports envisaged in the dissemination activities will be used as a knowledge-transfer platform, along with events scheduled to disseminate the results.

The project is carried out with the collaboration of the Biodiversity Foundation, the Ministry for the Ecological Transition, through the Pleamar Program, co-financed by the FEMP (European Maritime and Fisheries Fund).



**Illustration 54. Project kick-off meeting**

The kick-off meeting of the project was held on the 20<sup>th</sup> of March in the PLOCAN offices in Taliarte. The meeting was attended by: The Head of the Fisheries Inspection Service of the Canary Island Government and a technician from the unit, technicians from Fisheries of the Cabildo of Gran Canaria, the chairs of both fishermen's co-operatives, three ship owners from the Melenara Co-operative, seven from San Cristóbal and the director and a team of technicians from PLOCAN. The purpose of the meeting was to co-ordinate all the parties involved in the project to make a start on the field activities aboard the fishing vessels taking part.

In the context of the project, PLOCAN has conducted a characterisation of the artisanal fisheries on the test site and the surrounding areas, with a view to discovering the fishing effort in the area and the survival rate associated with the gill-net and trap fishing gear.

The fishing boats involved started on the 3<sup>rd</sup> of May, making 19 trips over the first seven weeks of the on-board study of the fishing vessels from the San Cristóbal and Melenara Fishermen's Co-operative taking part in the project, and they recorded 62 fishing operations, 10 with gill-nets and 99 with traps. The species captured with traps included parrot fish (*Sparisoma cretense*), Planehead Filefish (*Stephanolepis hispidus*), Pink Dentex (*Dentex gibbosus*), Black Seabream (*Spondyliosoma cantharus*) and Common Pandora (*Pagellus erythrinus*). The most wide-spread species captured with gill-net are Axillary Seabream (*Pagellus acarne*), Two Banded Seabream (*Diplodus vulgaris*), Red Mullet (*Mullus surmuletus*) and Parrot Fish (*Sparisoma cretense*). The intention of the project is to assess the survival rates of side catch after being kept in fish farms at sea.

During the first phase with the fishing boats (March/July), trips were made with two vessels, but in the second phase of the field work (August/November), 3 more boats were involved. The 100 landings initially planned in the project were completed (50 for traps and 50 for gill-nets) in professional fishing vessels from the Co-operatives of San Cristóbal and Melenara, along with several trips with the PLOCAN<sub>1</sub> for project activities (recording with the ROV, etc.)



**Illustration 55. Work on the DESPESCA project**

An article was published in September in the digital edition of the "La Razón" newspaper, which described the work done on the project in the area of "Blue growth", quoting this work as an example of traditional fisheries activities and of harnessing marine energies.

The project was also present on social media, on the PLOCAN Facebook and Twitter accounts.



**Illustration 56. Publications on social media about DESPESCA**

## ECOMARPORT

Technological transfer and eco-innovation for environmental and marine management in port zones in Macaronesia

**Origin of funding:** INTERREG V A Spain-Portugal (MAC 2014-2020) Territorial Co-operation Programme / CROSS-BORDER Co-operation: STRAND 1 Reinforce research, technological development and innovation / PI.1.b Promotion of company investment in innovation, developing ties and synergies among companies, R+D and higher education centres, especially in developing products and services, the transfer of technology, open innovation through smart specialisation, supporting technological and applied research, pilot lines, early validation actions of products, advanced manufacturing capabilities and first production in essential facilitating technologies and dissemination of multi-purpose technologies.

**Participation:** Co-ordinator

**Period of execution:** 01/01/2017-31/12/2019

**Total project funding:** €1,156,606.13

**Funding for PLOCAN:** €252,063.79

**Percentage of external funding:** 85 %

The objective of the ECOMARPORT 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, ECOMARPORT 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.



Illustration 57. Installing the UMI in Azores

Against the backdrop of integrating and up-grading observation systems and incorporating water quality parameters, work has been done on integrating and up-grading the stations at Madeira (Port of Funchal) and Azores (Port of Ponta Delgada and Marina de Angra do Heroísmo), along with the PLOCAN weather station.

On the 12<sup>th</sup> of May, as part of the project, PLOCAN installed a latest-generation UMI (Integral Measurement Unit) oceanographic station in the Funchal marina in Madeira, thus enhancing the observation capabilities of the Macaronesia Marine Maritime Observation Network (R3M). The UMI device is fitted with a specific array of oceanographic sensors of reference, aimed at the continuous measurement of essential sea water

variables like temperature, conductivity, dissolved oxygen, turbidity and hydrocarbons. The data recorded are made available every hour, along with the rest of the data compiled by the existing devices in the four archipelagos of Macaronesia, on the PLOCAN data portal, accessible from the R3M web site.

In June, two new UMI oceanographic stations were installed, in co-operation with Ports of Azores and the University of the Azores. One was installed in the commercial port of Ponta Delgada (San Miguel), associated with a weather station that the Lisbon Hydrographic Institute has in these facilities as part of the Portuguese national network. The second station was installed in the marina of Angra do Heroísmo on Terceira. As in the case of the station installed in Madeira beforehand, the parameters measured were the same and the data was made available to users on the R3M web site.



Illustration 58. Poster of the conference in Lisbon

The project was presented at the fifth Conference on Hydrographic Engineering held in Lisbon between the 19<sup>th</sup> and the 21<sup>st</sup> of June at the offices of the Portuguese Hydrographic Institute. The event attracted over 300 delegates in a range of parallel sessions of lectures and posters on the latest technological advances and scientific-technical studies on disciplines such as marine geology, physical oceanography, hydrography, marine observation systems and platforms, etc. It was attended by leading companies from the industry that exhibited new technologies regarding new

technology for hydrographic and oceanographic control and measurement systems and devices, coinciding with world hydrography day.

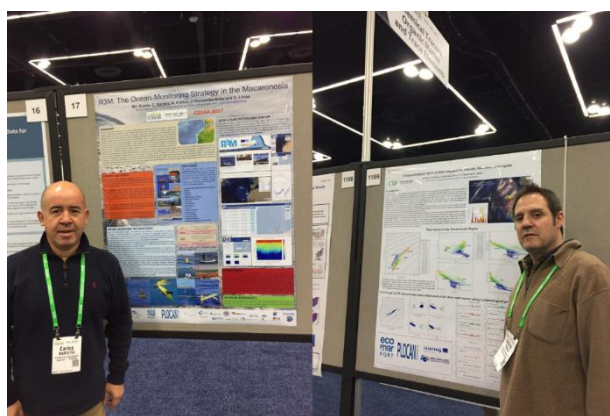
In the area of project dissemination activities, PLOCAN took part in producing the 17<sup>th</sup> Macaronesia marine maritime newsletter (B3M) in May, including an article entitled "R3M. Expanding operational and dissemination capabilities in Cape Verde", which describes the recent activities carried out in these islands. It also included another article entitled "A climatological vision from a compilation of the biogeochemical data collected at the region of the Macaronesia", as part of the R3M oceanographic data compilation programme. The article describes the different masses of water present in the area of Macaronesia from the point of view of their thermo-haline and bio-geo-chemical



Illustration 59. Front page of the B3M

characteristics. The project took part in the Ocean Sciences Meeting 2018 conference with two papers presented by PLOCAN:

- ◆ The first presentation was entitled “R3M: The Ocean Monitoring Strategy in the Macaronesian Region” in the area of Coastal Dynamics, was part of the session entitled “Advancing Water Quality Monitoring and Forecasting in Coastal and Inland Waters; II Posters”. The intention of this presentation was to explain the monitoring strategy applied by a consortium of Institutions located in the four archipelagos of Macaronesia (Azores, Madeira, Canary Islands and Cape Verde). This strategy is based on using each of the consortium member’s own and different observation platforms, along with those of other institutions through a series of co-operation agreements. The final purpose is to generate the largest source of information in the region for use in economic, scientific and leisure-type activities. The session was held on Monday 12<sup>th</sup> between 4 and 6 p.m. During the session, delegates had the chance to see the presentation and clear up any doubts arising from it directly with the authors present.
- ◆ The second presentation was entitled “A Biogeochemical Vision of data compilation from the Macaronesian Region”. This presentation formed part of the session entitled “Biogeochemistry and Nutrients in Open-Ocean Waters: Sustainable Ocean Observations from Profiling Floats and Time Series II Posters” in the area of knowledge denominated “Biogeochemistry and Nutrients”. This presentation dealt with a set of bio-geo-chemical data from the region of Macaronesia, collected in research campaigns conducted between 1980 and 2010. This climatological set was analysed to determine the bio-geo-chemical characteristics of the main water masses in the water column in the region. A study was also conducted on the existing trend in the variability of these variables in Central North Atlantic water, in order to show aspects pertaining to Climate Change. The presentation was made during the session held on Thursday 15<sup>th</sup> from 4 to 6 p.m. During the session, delegates had the chance to see the presentation and clear up any doubts arising from it directly with the authors present.



**Illustration 60. Members of PLOCAN at the Ocean Sciences Meeting**

An article entitled “Annual variability and anomalies of air temperature, pressure and relative humidity at three sites of the Macaronesia” was included in October. This showed the time series of air temperature, air pressure and relative humidity of the stations located in Gran

Canaria and Mindelo belonging to the R3M. It also included another article entitled “Sistema hidralerta no âmbito do projeto ECOMARPORT”, which recounted the progress associated with the over-spill alert system as part of an activity within the ECOMARPORT project. Another article included in this new edition of B3M covers the commissioning of the new Mindelo Marine Sciences Centre. This is run by the INDP, a partner in the ECOMARPORT project. Finally, another article was included, entitled “Anomalous warming of sea surface temperature in the Eastern Subtropical North Atlantic. Causes and consequences”. It is based on the analysis of the surface temperature time series at the ESTOC station, a reference station for the R3M, which identified this anomalous event.



Illustration 61. Front page of B3M

## ECUVE

### Environmental Control with Unmanned Vessels

**Origin of funding:** Call for proposals processed in advance for 2018, for subsidies for high-tech and knowledge-intensive companies in priority areas of the RIS3 (EATIC 2018)

**Participation:** Co-operating partner

**Period of execution:** 01/04/2018-31/03/2019

**Total project funding:** €96,810.00

**Funding for PLOCAN:** €0

The proposed R&D activity consists in the realization of an innovation project related to a product oriented to the development of USVs. USVs appear as a complementary solution to manned boats, although for some applications they can be an alternative. In short, it can be said that USVs are appropriate for maritime activities that are dangerous for crews or are repetitive or those needing continuous operation. The advantages of using USVs versus manned systems for the above mentioned applications are:

- ◆ Risk reduction for crews in hazardous situations.
- ◆ Reduced costs by not having to ship crews.
- ◆ Allow continuous operation only limited by available fuel.
- ◆ Ability to operate in adverse maritime conditions.
- ◆ Faster deployment of the boat by not carrying crew.
- ◆ They can be deployed and operated from land or from a mother ship allowing to increase their range of action

The general objective of the ECUVE project is to develop a system based on unmanned vessels known as USV. With regard to the uses, this product is suitable for various naval applications, in particular those of repetitive type, which require a rapid intervention or which represent a risk for the crews. In particular, the specific objective of the project is to orient it to environmental surveillance and control in the marine field. Another

The trials scheduled for 2018 were delayed for both technical and regulatory reasons, and could not be run during this year.

## 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**

**Period of execution: 01/01/2016-31/03/2019**

**Total project funding: €11,181,986.88**

**Funding for PLOCAN: €50,000.00**

**Percentage of external funding: 80 %**

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 crane-free 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 prototype off-shore wind generator of the project led by ESTEYCO was moored on the PLOCAN test site on the 21<sup>st</sup> of June 2018, as described in the section "Accesses" of this report.

## 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

**Period of execution:** 01/09/2015-28/02/2019

**Total project funding:** €4,298,602.00

**Funding for PLOCAN:** €46,660.80

**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.

In the context of the EMSODEV project, a study was carried out of the potential sites for installing the EGIM observation device on the PLOCAN test site. The module consists of a structure fitted with different oceanographic sensors that will measure marine physical and chemical parameters. The EGIM will be installed at a depth of 40m.

Preparatory work was done on the digital infrastructure and the marine operations necessary for deploying the EGIM. PLOCAN staff from the technical and I.T. areas also took part in the month of June, in a dedicated training workshop held in the facilities of the National Nuclear Physics Institute of Italy.

## EMSO-LINK

### Implementation of the Strategy to Ensure the EMSO ERIC's Long-term Sustainability

**Origin of funding:** H2020-INFRADEV-2016-2017/ **Topic:** INFRADEV-03-2016-2017: Individual support to ESFRI and other world-class research infrastructures / **Deadline Id:** H2020-INFRADEV-2016-1

**Participation:** Partner

**Period of execution:** 01/03/2017-29/02/2020

**Total project funding: €4,359,451.25**

**Funding for PLOCAN: €30,500.00**

**Percentage of external funding: 100 %**

EMSO-Link is a 3-year project underpinning the long-term sustainability of EMSO ERIC, the pan-European distributed Research Infrastructure (RI) composed of fixed point open ocean observatories for the study and monitoring of European seas. EMSO pursues the long-term objective to be part of the upcoming European Ocean Observing System (EOOS), which is expected to integrate multiple platforms and data systems, including other ERICs, to achieve the first sustained, standardized and permanent observatory network of the European seas. EMSO ERIC coordinates the access to the facilities and supports the management of data streams from EMSO observatories.

EMSO-Link will accelerate the establishment of EMSO ERIC governance rules and procedures and will facilitate the coordination of EMSO infrastructure construction, operation, extension and maintenance. Specifically, EMSO-Link will:

- 1) Reinforce and expand the EMSO ERIC membership to optimize the inclusion of the whole European Marine technology and research institutions.
- 2) Progress towards coordinated operations of the infrastructure nodes, interoperability and standardization as well as capacity increase and synchronizing funding of regional nodes.
- 3) Enhance stakeholders (e.g., marine operators, industry, academia, universities and marine experts) active engagement through a number of awareness raising campaigns.
- 4) Enhance relations with sister marine initiatives and counterpart/complementary RIs through Memoranda of Understanding also in coordination with COOP+ EC Project.
- 5) Strengthen EMSO ERIC contribution to European economic growth and innovation through implementation of a powerful marine technologies Innovation Platform serving and cooperating with Industry and SMEs.
- 6) EMSO-Link will contribute to the identification of methodologies for the achievement of Good Environmental Status of the European marine waters by 2020, according to the Marine Strategy Framework Directive.

PLOCAN joined the project as a partner in 2018. It helped to create the EMSO-ERIC services by taking part in the following groups:

- ◆ Science service group
- ◆ Data service group
- ◆ Communication and dissemination service group
- ◆ Logistics and engineering service group

PLOCAN participates specifically in creating the contents necessary for the EMSO-ERIC scientific-technical description. PLOCAN also represents Spain as a delegate of the Ministry of Science, Innovation and Universities in the ERIC. Finally, PLOCAN promoted the creation of the future Spanish "Joint Research Unit" in collaboration with the CSIC, UPC, IEO and SOCIB, among others.

# 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**

**Period of execution: 01/04/2017-31/03/2019**

**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.

The project partners' meeting was held on the 13<sup>th</sup> of March in London, attended by the scientific-technical manager of PLOCAN. Three use cases recommended in D3.1 drawn up previously, were reviewed during the meeting and the leadership of each one was established.

The project set up a stakeholders group comprised of over 50 institutions and companies.

A project workshop was held on the 4<sup>th</sup> of July, coinciding with the Seawork event in Southampton, during which PLOCAN was introduced along with the case of renewable energies in Canaries.



**Illustration 62. Presentation by a member of PLOCAN at SeaWork**

A face-to-face meeting of partners was held in Cork (Ireland) on the 19<sup>th</sup> of September.



**Illustration 63. Face-to-face meeting of partners in Ireland**

Another project workshop was held in Porto on the 16<sup>th</sup> of November, coinciding with the Business2Sea – Sea Forum 2018.

On the 30<sup>th</sup> of November, PLOCAN held the third working meeting of the European “Facilitating Technologies and road maps for innovation on Off-shore platforms” (ENTROPI) project on “Multi-use platforms in the Atlantic: funding and road map to marketing”. Several of the main key players in off-shore innovation attended the event, including: MSE, PMBA, Forum Oceano, Halpin Centre, Enerocean, Grupo Enhol, Bureau Veritas, Zabala Innovation Consulting, and Atlantic Bass.

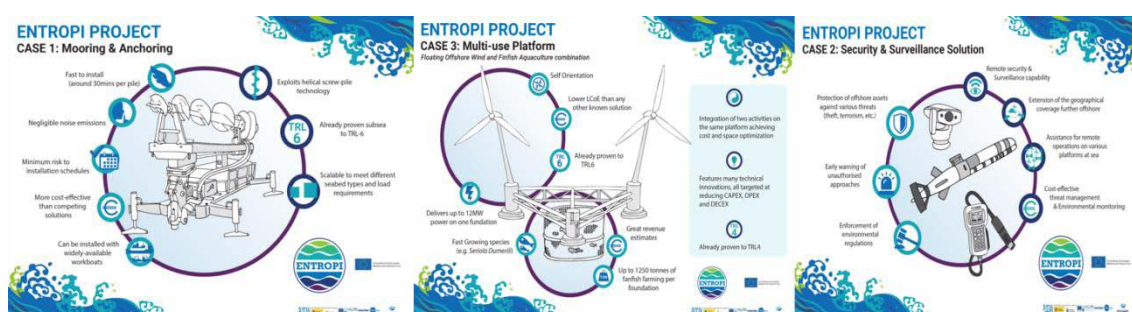


**Illustration 64. Participants in the project workshop held at PLOCAN in November**

The meeting programme focused on lectures and round tables with experts in different areas of interest, with a view to compiling key information for developing robust investment plans, continue reinforcing the capabilities of multi-use platforms, highlight areas in which innovation could mean a significant reduction in costs and continue defining investment proposals for these innovations to materialise.

The objectives set for ENTROPI are to identify and develop investment plans for critical capabilities throughout the value chain of multi-use platforms; reinforce the participation of SMEs in innovations in the value chain; focus the potential for deploying them in the Atlantic basin that has strong industries in the sectors that could benefit from multi-use facilities and ensure alignment of the investment plan with regional and national investment priorities, specialisation (RIS3) and funding resources.

The project has produced three use cases:



**Illustration 65. Use case produced by PLOCAN**

# 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**

**Period of execution: 01/05/2015-31/07/2019**

**Total project funding: €14,683,534.25**

**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-infrastructure and Integrating Activities together with technical specialist partners. ENVRIPLUS is driven by 3 overarching goals:

- favouring 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.

The organisation's role in this project is to take part in creating and rolling out a demonstrator of low-cost, inter-operable sensors in collaboration with other entities (CNR, Ifremer, etc).

The project took part in a joint Atlantos-EMSO session held at Oceanology International. The latter was devoted to the inter-operability of data in real time and sensors. The aim of taking part was to open up the results obtained on standards and inter-operability of data and sensors to the industry.

## EO-MAMMALS

Earth Observation for Marine Environment: Application for Marine Mammals  
Environmental  
Public Management

**Origin of funding:** ESA Call for Tenders: EO Science for Society Permanently Open Call for Proposals EOEP-5 BLOCK 4 / ITT/RFQ: AO/1-9101/17/I-NB

**Participation:** Partner

**Period of execution:** 03/12/2018-02/12/2019

**Total project funding:** €149,993.26

**Funding for PLOCAN:** €41,243.00

**Percentage of external funding:** 100 %

The technical solution is conceived with the objective of producing a downstream service (EO\_MAMMALS) for analysing associations between oceanic environment data remotely sensed and biological data in order to provide a marine mammals' dashboard in the context of the Macaronesia area (Atlantic Ocean).

In particular, the proposed service is aiming at identifying biological hotspots for cetaceans and, therefore, help the management of marine protected areas. -electricity conversion. The resulting WEC system will undergo rigorous testing and characterization at Las Palmas Harbour, Canary Islands.

No project activities were carried out in 2018, except for signing the contract.

## EUMARINEROBOTS

Marine robotics research infrastructure network

**Origin of funding:** Call: H2020-INFRAIA-2016-2017 / Topic: INFRAIA-02-2017: Integrating Activities for Starting Communities / Deadline Id: H2020-INFRAIA-2017-1-two-stage

**Participation:** Partner

**Period of execution:** 01/03/2018-28/02/2021

**Total project funding:** €4,998,736.75

**Funding for PLOCAN:** €279,727.00

**Percentage of external funding:** 100 %

Our oceans are the least-explored region of planet Earth. Protection and sustainable development of ocean resources presents formidable challenges. Robots will play an increasingly key role in the near future and this role will expand and become more challenging as we extend into deeper, remote and hostile marine environments.

Europe leads in many aspects of maritime, but lacks well integrated and coordinated oceanic robotic infrastructure or presence. The marine-robotics industry is growing rapidly. It is a crucial high-value/high-cost sector with considerable entry barriers to R&D. The full growth potential of this industry will be greatly enhanced with access to shared robotic research infrastructure.

EUMarineRobots (EUMR) proposes an access-infrastructure for the deployment of a full-range of aerial, surface and sub-surface marine robotic assets, the combined value of which is far greater than the sum of their parts. EUMR will open transnational access to significant national marine robotics R&D assets across Europe. The EUMR consortium comprises 15 partners from 10 countries who, collectively, can deploy a comprehensive portfolio of marine robotic assets with required associated support assets and expertise. The network is a strong and balanced grouping of globally distinguished key players with diverse, track-record of excellence across marine /robotic sectors. Partners are members of a wide variety of existing networks, and research infrastructure collaborations both formal and informal across Europe and the world. EUMR is a first stage in aggregating these networks and assets as world-leading for support and growth of a strong community of practice in marine robotics and marine.

The project kick-off meeting was held on the 1<sup>st</sup> and 2<sup>nd</sup> of March in the facilities of the Porto University Faculty of Engineering, the institution that is the lead partner in the project. During the meeting, partners introduced their institutions in order to get to know each other and generate synergies with a view to the project implementation. They also planned the activities of the different work packages, determining in detail the responsibilities for the different tasks to be carried out.



**Illustration 66. Project kick-off meeting**

The project plenary meeting was held on the 30<sup>th</sup> of September in the Croatian town of Biograd na Moru, where partners finalised the profiling and completed the guide for candidates for transnational access to be published in the following days. They also established a promotion and communication strategy for the TNAs, which includes events like OCEANS '19, EMRA



**Illustration 67. Participants in the project kick-off meeting**

'19 and Oceanology International '20. The aim of the project, led by the University of Porto, is to make a large number of vehicles, tools and infrastructure available to the scientific

community and research and development groups. They would access these through transnational access. The project partners provided a complete pallet of assets distributed around Europe to make available to the scientific community to establish and reinforce existing connections with different marine robotics networks.

The project had a stand at the Oceanology International 2018 fair held in March.



**Illustration 68. Stand at Oceanology International**



**Illustration 69. Participants in the European Robotics Forum**

The project was also presented in March at the European Robotics Forum 2018 in Finland and in May at the 3<sup>rd</sup> High-Level

Industry-Science-Government Meeting held in Praia (Cape Verde). In June, it was presented at EMRA in Ireland and in November, PLOCAN presented two papers on marine robotics at AUV2018.

Participating in the project allows, not only PLOCAN as an institution, but also the Canary Islands and Spain to be seen as benchmarks in Blue Growth strategy from the standpoint of one of the most innovative sectors as marine sciences and technologies for oceanic observation, and especially, marine robotics as far as technological and industrial development, applications and highly-specialised training are concerned, as central issues that the project addresses.

## FLOCAN<sub>2</sub>-GRID

*New innovative platform and technology solutions associated with evacuating power and injecting it into grids from off-shore floating wind farms*

**Origin of funding:** CIEN Strategy Programme. Call for proposals 2015

**Participation:** Co-operating partner

**Period of execution:** 01/09/2015-31/08/2018

**Total project funding:** €4,914,845.00

**Funding for PLOCAN:** €12,767.20

**Percentage of external funding:** 100 %

FLOCAN to GRID emerges as a strategy to research and develop the technical and economic viability of two floating technologies at real scale, as well as the necessary energy evacuation infrastructure for its integration to the grid in a real representative operational environment along with the tools needed to define the operation logistics associated with the lifecycle of an infrastructure located in an adverse environment. The technologies to be developed in the project; robust, efficient, aimed at mass production floating solutions for turbines from 5MW to 8MW in deeper waters; will minimize the operations in deep sea environments with human, economic and environmental risks. In addition, by having two solutions, all the necessary elements for the general power evacuation in an offshore farm will be studied, differing from other ad-hoc defined evacuations for a single prototype. In this way, all concepts will be integrated in the global development of operations associated to multi-megawatt wind production in deep water as a new sustainable and renewable resource.

Project results aim at developing the first experimental marine wind farm, called FLOCAN<sub>5</sub>, which will be located in the Canary Islands. The innovations associated with the project will be technically and economically viable in the medium term, with the aim of achieving market acceptance, fostering high value-added knowledge generation and new competitive industrial capacities associated with the priorities of the Horizon 2020 objective. The consortium, led by COBRA Instalaciones y Servicios, provides an answer to this sector's need through this strategic positioning in a new industry.

PLOCAN was sub-contracted in this project to monitor populations of cetaceans during the process of laying electric cables in Scotland. These tasks were carried out in 2018.

## iFADO

*Innovation in the Framework of the Atlantic Deep Ocean*

**Origin of funding:** Interreg Atlantic Area / First call for EOIs / Priority Axis 1: Stimulating Innovation and competitiveness. Specific Objective 1.2:

**Strengthening the transfer of innovation results to facilitate the emergence of new products, services and processes**

**Participation:** Partner

**Period of execution:** 04/11/2017-03/11/2021

**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.

The general assembly of partners was held on the 24<sup>th</sup> of May in the offices of PLOCAN, co-ordinated by the Higher Technical Institute of Lisbon to assess the technical and management advances made in the project.



**Illustration 70. Project general assembly in PLOCAN**

The third general assembly of project partners was held at the head offices of PMBA (Pôle Mer Bretagne Atlantique) in the French city of Brest. Co-ordinated by the Portuguese Higher Technical Institute (IST), leading partner of the project, the main purpose of the meeting was to assess the technical and management advances made in the last six months, with regard to the tasks and objectives set in the project work plan, and for partners to plan future actions for the coming months.

The Wave Glider mission carried out jointly with the iFADO and Atlantos projects to monitor cetaceans in the waters of Macaronesia was completed at the end of November.



**Illustration 71. Third general assembly of partners held in Brest**

The project has co-operated in several missions with Wave Glider autonomous surface vehicles and also in preparing educational boats. The project also contributed to the poster session of the European Ocean Observing Systems Conference held in November.



**Illustration 72. Pictures of tweets about the project**

PLOCAN leads work package 5 on new technologies for in situ monitoring.

## MARCET

Macaronesia Inter-Regional and Multi-Disciplinary Network for the Transfer of Knowledge and Technologies to provide protection, surveillance and monitor cetaceans in the marine environment and to analyse and sustainably exploit the associated tourism activity

**Origin of funding:** INTERREG V A Spain-Portugal (MAC 2014-2020) Territorial Co-operation Programme / CROSS-BORDER co-operation

**Participation:** Partner

**Period of execution:** 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.

A joint mission was carried out in early May with the Atlantos project described above in the summary of activities of this project.

In early August, PLOCAN launched a Wave Glider autonomous marine vehicle to the south of the island of Gran Canaria, fitted with a set of weather and oceanographic sensors to pick up acoustic traces of cetaceans as part of the MARCET project that studies marine mammals in



**Illustration 73. Wave Glider in its August mission**

Macaronesia. The Macaronesia Network for the Inter-Regional and Multi-Disciplinary Transfer of Knowledge and Technologies to provide protection, surveillance and monitoring cetaceans in

the marine environment and analyse and sustainably exploit the associated tourism activities (MARCET project) brings together public and private entities from Azores, Madeira, Senegal, Cape Verde and Canaries.

The operational trial, co-ordinated by PLOCAN, with the co-operation of the University of Las Palmas de Gran Canaria, through the University Institute of Animal Health, and local companies of the sector, intends to assess both the scientific-technical and the socio-economic feasibility of the routine use of new autonomous marine observation technologies specifically designed for monitoring cetaceans.

The Wave Glider device launched belongs to the PLOCAN fleet of autonomous marine vehicles, fitted with an array of weather and oceanographic sensors that include a passive hydrophone system (PAM) to pick up acoustic traces of cetaceans of interest in the area of operation, situated in the waters to the south of Gran Canaria.

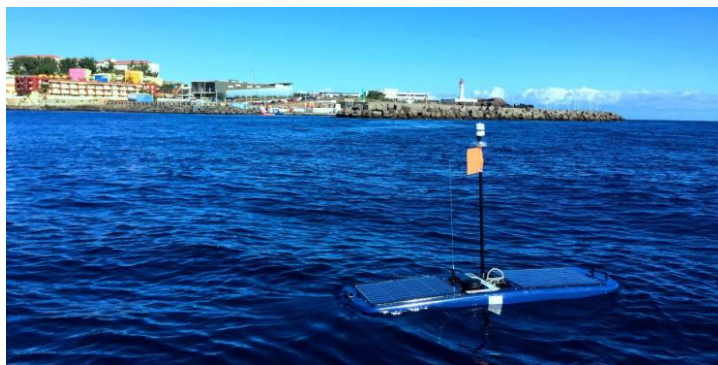
The University of La Laguna, PLOCAN, The Marine Sciences Technology Centre, Gran Canaria Blue and Loro Parque, from the Canary Islands; the Whale Museum and the Oceanic Observatory, from Madeira; The Regional Directorate for Affairs of the Sea, from Azores; the Regional Conservation Society and the Inter-State School of Medicine and Sciences, from Senegal; and the Association of Biologists and the Association for Environmental Conservation and Sustainable Development Bios CV, from Cape Verde, all took part in the Macaronesian research network.

In mid-October, PLOCAN launched a Wave Glider fitted with an array of meteorological and oceanographic sensors to pick up acoustic traces of cetaceans between Gran Canaria and Madeira as part of the project.

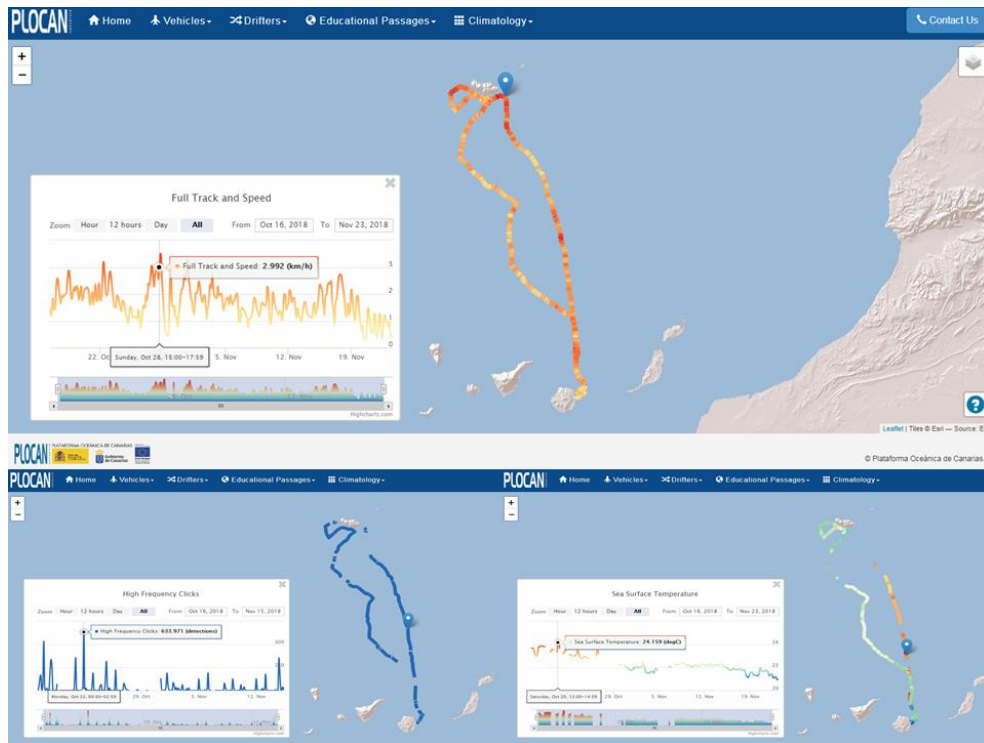
The Wave Glider, belonging to the PLOCAN fleet of autonomous marine vehicles in the waters of the test site in Gran Canaria, was launched in the waters of the test site in Gran Canaria with the array of meteorological and oceanographic sensors that included a passive acoustic detection hydrophone system (PAM) designed to pick up the level of noise and acoustic traces in the ocean of cetaceans in the operational area.

The aim of the operational trial is to assess both the scientific-technical and socio-economic feasibility of including new marine autonomous observation technologies aimed specifically at monitoring cetaceans on a routine basis. This was all co-ordinated by PLOCAN with the direct co-operation of the University of Las Palmas de Gran Canaria (ULPGC) through the University Institute of Animal Health (IUSA) and the Madeira Oceanic Observatory (OOM).

The Wave Glider mission conducted jointly with the iFADO and Atlantos projects to monitor cetaceans in Macaronesian waters was completed in late November. The glider was recovered on the 23<sup>rd</sup> of November, having covered a total of 1539km in the course of 39 days, collecting meteorological and oceanographic variables, including acoustic traces of cetaceans of interest in the operational area, using a passive acoustic monitoring (PAM) hydrophone system (PAM).



**Illustration 74. Wave Glider on the mission completed in November**



**Illustration 75. Trajectories of the glider on the MARCET missions**



**Illustration 76. Publication drafted by the project**

In May, PLOCAN took part in the activity entitled “A night in the museum” with a talk on cetaceans for children.

# MARINERG-i

## Marine renewable energy research infrastructure

**Origin of funding:** H2020-INFRADEV-2016-2017 / **Theme:** INFRADEV-02-2016:  
**Preparatory phase and support for the initial phase of the ESFRI projects / Job Id:**  
**H2020INFRADEV-2016-2.**  
**Participation:** Partner  
**Period of execution:** 01/01/2017-30/06/2019  
**Total project funding:** €1,999,798.70  
**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 responsibilities of PLOCAN are focused on developing contacts with stakeholders, with a view to including them in the ERIC.

The General Assembly of the project was held on the 22<sup>nd</sup> and 23<sup>rd</sup> of March 2018 in The Hague, where PLOCAN presented an up-date of work package 7 (Outreach & Engagement), which is led by PLOCAN.



**Illustration 77. General Assembly of the project in March**

PLOCAN took part in a workshop from work package 5 organised by Bird & Bird in The Hague to address legal issues of the future ERIC proposal.

PLOCAN took part in the ICOE conference between the 11<sup>th</sup> and 12<sup>th</sup> of June to disseminate the project.

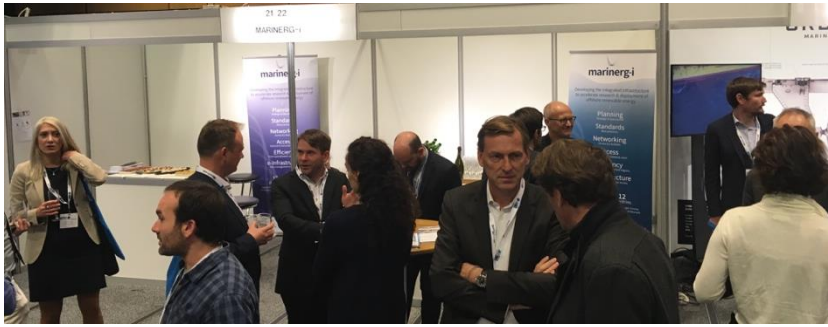


**Illustration 78. PLOCAN at ICOE**

At the same time, PLOCAN, in co-operation with IEA-OES, organised a workshop on Marine Energies in island regions to promote initiatives like MARINERG-i and to support the development of the industry on islands as a potential niche market. The results of this event were presented at the IEA-OES Executive Board meeting.



**Illustration 79. PLOCAN presenting the workshop on marine energies on islands**



**Illustration 80. PLOCAN at Ocean Energy Europe**

PLOCAN took part in the Ocean Energy Europe Conference 2018 in Edinburgh on the 30<sup>th</sup>-31<sup>st</sup> of September. As part of the project, they set up a stand and held a workshop on integrating the different

work packages of the project and a networking event with stakeholders.

In August, PLOCAN attended the OES International WATERS meeting and AWTEC held in Taipei.



**Illustration 81. OES meeting in Taipei**

In September, the manager of the PLOCAN's scientific-technical area took part in an advisory workshop of the European Commission held in Las Palmas. During the workshop, he presented the project mission.

The 35<sup>th</sup> meeting of the OES Executive Board was held in PLOCAN in November, to present the status, mission and vision of the project, in order to include participants in the data base. Finally, the synergies with the OES sub-task on Marine Energies in Islands were presented. Information on this event is included in the section on "Participation in events and visits received" of this report.

PLOCAN took part in the second Irish meeting of stakeholders, where the ERIC business plan and a scheme of possible ways of funding it were presented.



**Illustration 82. Meeting held in Ireland**

# MARINET<sub>2</sub>

## Marine Renewable Infrastructure Network for Enhancing Technologies 2

**Origin of funding:** Call: H2020-INFRAIA-2016-2017 / Topic: INFRAIA-01-2016-2017:  
**Integrating Activities for Advanced Communities /Deadline Id: H2020-INFRAIA-2016-1**  
**Participation:** Partner  
**Period of execution:** 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.

The second call for proposals was opened on the 15<sup>th</sup> of January to provide support for developers of marine renewable energies in Europe. The call offered access to 57 test facilities in 13 European countries.

PLOCAN took part in the first general assembly and in the first trans-national access workshop that took place between the 17<sup>th</sup> and the 21<sup>st</sup> of April in Lisbon. These actions are activities designed to attract users of the PLOCAN test site.

The project was disseminated during FIMAR (International Fair of the sea) held in Las Palmas de Gran Canaria between the 18<sup>th</sup> and the 20<sup>th</sup> of May.



Illustration 83. Dissemination poster of the project produced in PLOCAN

The project launched the third call for proposals for trans-national access in November. A call was also put out for the trans-national exchange of personnel, in which some proposals have been studied that involve a “stage” in PLOCAN



Illustration 84. Announcement of the call for proposals on the PLOCAN web site



**Illustration 85. Announcement of the call for exchange of personnel on the project web site**

## OCEANERA-NET

Supporting the 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**

**Period of execution: 01/12/2013-28/02/2018**

**Total project funding: €2,205,037.57**

**Funding for PLOCAN: €142,154.61**

**Percentage of external funding: 89.59 %**

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.

The OCEANERA-NET project held its wrap-up conference on the 30<sup>th</sup> and 31<sup>st</sup> of January under the title of “Breaking Through: Innovation & Collaboration in Ocean Energy”. International representatives of the industry, politics and academia from the marine renewable energies sector all took part in the event. There were over 120 delegates who addressed issues such as how the industry and research centres should face the challenges of the sector successfully by increasing scale in marine energy technology. They also dealt with the messages that society has received from the industry to give it greater acceptance by society. The Minister of Economy, Innovation and Energy of the Scottish Government took part in this event.



**Illustration 86. Project wrap-up conference**

All the objectives of the project were considered as attained. The Canary Island Government took part as the funding entity for the Canary Islands in the 2<sup>nd</sup> call for proposals put out by the project, and finally funded two projects, with the involvement of PLOCAN as the Test site in one of these (SE@PORTS).

# ORPHEO

## Optimising the Profitability of Wind-Wave Hybrid Power Platforms

**Origin of funding: National Scientific Research, Technical and Innovation Plan 2013-2016 / National R+D+I Programme Aimed at Society Challenges / Call for Proposals: Challenges-Co-operation 2016**

**Participation: Partner**

**Period of execution: 01/07/2016-30/06/2019**

**Total project funding: €416,881.79**

**Funding for PLOCAN: €62,513.20**

**Percentage of external funding: 100 %**

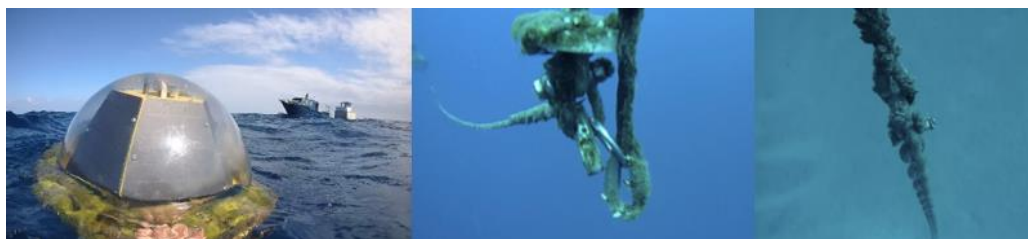
The aim of the ORPHEO project is to study techniques that enable the optimization, through advanced and intelligent control, of the profitability that can be obtained from an integrated hybrid floating platform that includes generation from wind power and wave energy and is connected to the grid as part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

Meetings and working sessions were held in PLOCAN on the 1<sup>st</sup> and 2<sup>nd</sup> of February with technicians from EnerOcean. The purpose of the meetings was to monitor joint tasks and, specifically, the activity of the "application of combined techniques to wind platforms and hybrid platforms". The working sessions were organised to integrate the inertial sensor (SBG) acquired by PLOCAN for monitoring and controlling the Wip10+ platform. The sensor was configured and the data was displayed in real time and analysed.

The technical revision of a wave buoy moored on the PLOCAN test site took place on the 30<sup>th</sup> of April. The data provided by this buoy is available to the project as a complement to the maritime study to validate the prediction systems developed.



**Illustration 87. Wave buoy moored on the test site**

Technical staff from PLOCAN took part in the event “PROSPECTS FOR OFF-SHORE WIND TECHNOLOGY IN CANARIES” that was held on the 17<sup>th</sup> of May as part of the International Sea Fair- FIMAR2018, organised by The Gran Canaria Blue Economy Forum. The technical director of ENEROCEAN and member of the project presented “the first Spanish floating wind platform in the sea” at this event.



**Illustration 88. Presentation of the project in the conference held at FIMAR 2018**

The project took part in the meeting on “Multi-use platforms in the Atlantic: funding and road map to market” organised by the ENTROPI project in PLOCAN on the 30<sup>th</sup> of November.

It also had a presence at the conference on off-shore wind generation held in PLOCAN for the visit of a Japanese delegation on the 8<sup>th</sup> of July 2018. The representatives of Japanese companies had the chance to discover the capabilities of the Spanish industry and identify future challenges that could be tackled jointly. Pedro Mayorga from EnerOcean, presented the “W2POWER platform, the first floating wind platform in Spain, a unique, multi-use opportunity for Japan”.

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

**Participation: Partner**

**Period of execution: 01/11/2016-31/10/2019**

**Total project funding: €537,997.53**

**Funding for PLOCAN: €162,775**

**Percentage of external funding: 85 %**

RIS<sub>3</sub>\_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. RIS<sub>3</sub>\_Net will enable:

- An increase in common knowledge of the RIS<sub>3</sub> 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".

In February, PLOCAN took part in a regional workshop on Smart Specialisation Strategies with R+D+i players from the Canary Islands, organised by the project in Tenerife in the offices of the ITC (Canary Island Institute of Technology).



**Illustration 89. Regional workshop on Smart Specialisation Strategies**

The second meeting of the project consortium was held in April in Madeira.

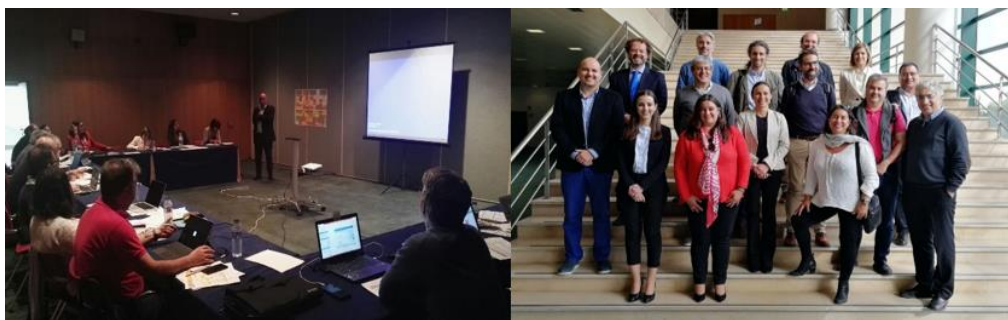
On the 1<sup>st</sup> of May, the project organised a working panel on blue growth in the offices of the ITC in Santa Cruz de Tenerife, with researchers from IEO and ULL. PLOCAN organised the panel as the leader in the design and execution of the "Blue Growth" sub-project that aims to characterise and drive R+D+I relating to the European Union blue growth strategy in Macaronesia. This is one of the different working panels organised in Macaronesia with a view

to discovering and analysing the barriers faced by researchers in their R+D+I projects in the marine-maritime area and the opportunities offered by inter-regional co-operation in the European Outermost Regions of Macaronesia.



**Illustration 90. Working panel on blue growth held in Santa Cruz de Tenerife**

PLOCAN also took part in the trans-regional working panel held by the project in Madeira in May. At the same time, a co-ordination and steering meeting was held to study the progress of the project. The trans-regional panel was held in the offices of the Madeira Tecnopolo Technology Park in Funchal with a view to discussing and reaching a consensus on the results of the comparative analysis of the smart specialisation strategies (RIS3) designed by the three outermost regions that comprise the MAC space (Madeira, Azores and Canarias). This meeting enabled partners to identify the main challenges to implementing RIS3 strategies and the areas of convergence between the development priorities, in accordance with the different economic and scientific domains.



**Illustration 91. Trans-regional panel held in the Madeira Tecnopolo**

In May, the project was disseminated at the FIMAR Fair held in Las Palmas de Gran Canaria.



**Illustration 92. RIS3\_Net at PLOCAN**

Meetings among PLOCAN members and partners from the Azores were held in June in Ponta Delgada.



**Illustration 93. Meetings held at the Fundo Regional de Ciencia y Tecnología**

On the 20<sup>th</sup> of July 2108, PLOCAN took part in the presentation conference for the RIS3\_MAC Strategy drawn up by the project.



**Illustration 94. Opening of the conference for the presentation of the regional strategy**

On the 27<sup>th</sup> of September, PLOCAN, with the support of the Fundo Regional para a Ciência e Tecnologia (FRCT) of the Azores Government, held a working panel on Blue Growth with researchers from the University of the Azores (including the Institute of the Sea and the Okeanos Centre), the Observatory of the Sea, Regional Directorate of Fisheries and a range of

different regional companies interested in the transfer of knowledge in the marine-maritime field (Sailazores and seaExpert), in the conference room of the Hotel Horta, on the island of Faial (Azores).

The actions planned in this “Blue Growth” pilot initiative led by PLOCAN, includes holding a range of working panels with the research community of Macaronesia, in order to discover and analyse the barriers they face in implementing their R+D+I projects in the marine-maritime field and the opportunities offered by inter-regional co-operation in the Madeira, Azores and Canary Island Space.



**Illustration 95. Working panel held in Horta (Azores)**

These working panels, held both in the Canary Islands and in Azores, are also aimed at discussing mechanisms that can help to enhance the socio-economic value of regional R+D+i in the area of blue growth and to identify possible practical co-operation projects and actions in the MAC space in the marine-maritime field.



**Illustration 96. Working panel son agro-industry and tourism held in Gran Canaria**

On the 14<sup>th</sup> of November, PLOCAN organised a Workshop on Blue Growth in Madeira. In October, the partners from Madeira and the Canary Islands met in Madeira to monitor the objectives of the project. In November, PLOCAN, as the co-ordinator of the pilot experiences in Agro-Industry and Tourism, provided support in holding workshops on the 29<sup>th</sup> of November in the offices of the ITC in Las Palmas de Gran Canaria.

## ROVSTEAM

Develop STEAM competences through low-cost Educational Marine Robotics

Origin of funding: Call for aid for fostering scientific, technological and innovation culture 2017

**Participation: Co-ordinator**

**Period of execution: 01/01/2018-31/03/2019**

**Total project funding: €16,000.00**

**Funding for PLOCAN: €13,300.00**

**Percentage of external funding: 22 %**

This project proposes the construction of programmable marine robots in several areas for educational purposes, from low cost tools, with free hardware and software. The proposal constitutes the continuation and extension of the FECYT 2017 project "ROVINO - Low Cost Educational Robotics with Arduino Technology", growing the experience grow in all senses.

On the one hand, to carry out a science and technology dissemination that can reach more people (students of different standard and nonstandard educational levels, families, and the general public). The experience held at the Elder Museum of Science and Technology in Las Palmas de Gran Canaria in August 2017 will be considered as a reference, but taking it to a National Museum of the FECyT. On the other hand, the project incorporates more elements and technological tools appropriate to the different levels of education through a project-based learning methodology, both using appropriate hardware and software programming platforms and presenting 3D printing of certain pieces related to different aspects of the marine robotics activity. The project also considers a greater integration to the education and scientific-technical vocation of girls and young women. Recent studies show that girls get more involved in these activities when technology is not the goal by itself (usually social projects). Therefore, girls might be more interested in these projects when technology is not the goal by itself. Thus, a pilot experience of access to classrooms in hospitals is proposed.

The ROVSTEAM project is part of the Educational, Marine Robotics Initiative EDUROVs, with the collaboration of the Spanish Foundation for Science and Technology (FECyT), the Cabildo (Island Government) of Gran Canaria and the Obra Social Charity of La Caixa bank.



**Illustration 97. "A night in the Elder Museum"**

The project kick-off meeting was held on the 4<sup>th</sup> of March, jointly with the CODIMAR project. This project is described in the pertinent section. The dissemination of the project has been carried out as part of a range of different actions that have already been mentioned in this report, such as: the annual ComCiRed event, a night in the museum, submarine robotics meetings etc.

The project's "Blue Education" summer campus was held in PLOCAN between the 2<sup>nd</sup> and the 6<sup>th</sup> of July. The campus integrated theoretical-practical contents relating to the marine-

maritime sector. In its first edition, it was organised in five sessions with the participation of nine students from the island of Gran Canaria, although 20 students from the Canary Island Science and Technology Campus joined in the final session. During the week, students gained insight into a variety of topics with a high degree of innovation, such as detecting and classifying micro-plastics, 3D design and printing, programming, construction and operation of marine robots, observation platforms and off-shore renewable energies. Each of the Summer Campus students had the chance to build their own robot based on the knowledge acquired and the additional knowledge garnered from the Campus.



**Illustration 98. Students of the summer campus**

The 2018-2019 edition of the Face-to-face Submarine Robotics Workshop was opened in early December, organised by the project, with a forecasted participation of 31 education centres of different levels (Primary, Secondary and 6<sup>th</sup> Form) between now and May 2019.

## 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 and ProID2017010021 through R+D projects from research bodies and companies in the priority areas of the Smart Specialisation Strategy of the Canary Islands RIS-3, co-funded with ERDF funds 2014-2020 / Call 2017

**Participation:** Partner

**Period of execution:** 16/01/2017-30/06/2019

**Total project funding:** €553,579.77

**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 (TRL<sub>3</sub>) in breakwaters of large ports will be studied by means of numerical (WP<sub>3</sub>) and physical (WP<sub>4</sub>) 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 (WP<sub>5</sub>). To realize SE@PORTS ambition, it is necessary to characterize the case study sites (WP<sub>2</sub>): (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-foreXcellence (LDfX) tool. Then, the most promising concept will be physically studied in both sites at different scales. Dissemination (WP<sub>6</sub>) 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.

Steering meetings were held for the project on the 16<sup>th</sup> and 17<sup>th</sup> of January 2018 in Antwerp, Belgium, in the offices of the IMDC (International Marine and Dredging Consultants). The results obtained by all the partners to date were presented at the meeting. PLOCAN presented WP<sub>2</sub>, "Characterisation of the Case Study".

In February, the report on the results of WP<sub>2</sub> were corrected and completed, in accordance with the considerations taken into account in the partners' meeting. In March, the report on the results of WP<sub>2</sub> were sent to the Las Palmas Port Authority for review.



**Illustration 99. ADCP moored in the Port of Las Palmas**

In the context of this project, PLOCAN conducted a full environmental characterisation of the port of Las Palmas. With this objective in mind, on the 13<sup>th</sup> of March, the PLOCAN ADCP was moored in the Port of Las Palmas (at a depth of 34 metres off the Nelson Mandela Dock) to study currents and waves as a complement to the characterisation study of the study area. On the 9<sup>th</sup> of May, PLOCAN's ADCPEI moored in the Port of Las Palmas was recovered.

The data compiled from the ADCP moored in the Port of Las Palmas were processed.

The project was disseminated at the FIMAR Fair in May.



**Illustration 100. Stand at FIMAR 2018 with a poster of the project**

The project held a meeting in early October in the offices of the Environmental Hydraulics Institute of the University of Cantabria (IHCantabria). The purpose of SE@PORTS is to study the implementation of Wave Energy Converters (CEO) on maritime ports. Port breakwaters are designed to resist wave action and the project intends to show the high potential of these port structures for integrating CEO.



**Illustration 101. Participants in the partners' meeting**

During the meeting, partners presented the technical progress made by the different work packages and they discussed the next steps to take. Presentations were made on the progress in the design of a hybrid wave power converter device (CEO) and the analysis of its hydraulic behaviour using different numeric models.

On the 13<sup>th</sup> of November, La Provincia newspaper interviewed the PLOCAN technicians involved in the project.



Illustration 102. Article on SeaPorts focusing on the technicians from PLOCAN

## SMARTBLUE

Network of regional marine-maritime clusters for SME competitiveness of the blue economy

**Origin of funding: INTERREG V A Spain-Portugal (MAC 2014-2020) / CROSS-BORDER**

**Co-operation:**

**Participation: Partner**

**Period of execution: 01/11/2016-31/10/2019**

**Total project finance: €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.

The aim of the project in 2018 was to set up the Macaronesia Maritime Alliance and to this end, work was carried out throughout the year in the form of a series of both face-to-face and video-conference meetings with partners. Meetings were held in the Azores with the Ponta Delgada Chamber of Commerce and the Regional Science and Technology Fund.

At the same time, PLOCAN was driving the dissemination of the project over the web site and on social media. An article, "Smart Blue: Conference on the transfer of technology and funding R+D+i in SMEs of the blue economy" was published in B3M newsletter N° 14.

PLOCAN has been working throughout the year, not only on networking, but also on innovation with the design of a competitive surveillance action for the Atlantic and the office of network projects. They also planned the conference held in November by making the necessary contacts for bringing together the players that



**Illustration 104. Meeting of SmartBlue partners in Horta (Faial)**

should form part of this international Alliance.

At the end of September, the project partners met on the island of Faial in the Azores and agreed on the future signing of the Macaronesia Marine Maritime Alliance. For two days, the entities taking part in the project held a steering meeting,

they had a day for presenting the clusters and pre-clusters and they took part in a conference on transfer organised by the Chamber of Commerce and Industry of the Azores (CCIA), also as part of the project.

During the meeting, the partners reviewed the execution of the project activities, specifying and planning the activities to be carried out in 2019. They resolved to sign the agreement to create the Macaronesia Marine Maritime Alliance on the 28<sup>th</sup> of November in Gran Canaria, as part of the transfer conference organised by the Canary Island partners. This Alliance will set the co-operation framework among companies and institutions of the Macaronesia region to drive the blue economy in the Spanish and Portuguese outermost regions of Europe and in Cape Verde. Finally, future options for co-operation among all participants in SmartBlue were studied, with a view to driving the Alliance and to giving it international projection.



**Illustration 103. Article on the project in B3M 14**



**Illustration 105. Pre-cluster conference in Horta (Faial)**

During the pre-cluster conference, the three regions presented the model chosen by each one to bring together companies and entities associated with the blue economy. The Canary Island Maritime Cluster has long experience in driving the sector, but there were no similar organisations in the regions of the Azores and Madeira until the SmartBlue project was rolled out. The project activities were completed with

the transfer conference organised by the Chamber of Commerce and Industry of the Azores (CCIA), with the participation of a range of entities associated with the marine-maritime field on both a regional and international level. The choice of Horta (Island of Faial) to host this event was based on the close ties that the island economy has with nautical activities. Its location in the central Atlantic, half-way between two continents, makes it a stop-over port for a large number of sailors crossing the Atlantic by sail boat.

In October, the project presented its deliverable, “activity report on the blue economy in the Canary Islands 2017” in a presentation made by the Regional Minister of Economy, Industry, Trade and Knowledge.



**Illustration 106. Front page of the report on the blue economy and presentation in the Canary Island Government**

On the 28<sup>th</sup> of November, the project promoted the signing of the Macaronesia Marine-Maritime Alliance with the Canary Island Maritime Cluster, research centres and business associations of Azores, Madeira and the Canary Islands with a view to promoting socio-economic activity, sustainable investment and growth based on scientific-technical knowledge in the marine-maritime area, through active regional, national and international co-operation.



**Illustration 107. Photo of participants in the event and signatories to the Macaronesia Alliance**

The agreement to set up the Macaronesia Marine-Maritime Alliance was signed in Casa Africa in Las Palmas de Gran Canaria and was attended by the Regional Minister of Economy, Industry, Trade and Knowledge of the Canary Island Government, Pedro Ortega, the Spanish Ambassador to Cape Verde, Dolores Ríos, the President of the Cabildo of Gran Canaria, Antonio Morales, and the Director General of Casa África, Luis Padrón.

The Alliance will drive co-operation in the marine and maritime sectors, including transport and ship-building, ports and logistics, oil and gas, cruise tourism, the construction of pleasure boats and marinas, marina/defence, the mining of minerals from the sea bed, fishing, aquiculture, off-shore wind power, wave power and tide power, maritime surveillance, coastal and eco-system protection, blue bio-technology and marine bio-fuels and other sectors of mutual interest, along with the water sectors, including the fresh water resources (if any) that feed the ocean basins, the run-off of waste water into coastal waters and desalination.

The signing took place at the SMART BLUE project conference "Blue growth in the Central Atlantic economy" organised by PLOCAN in Casa Africa in Las Palmas de Gran Canaria, with a view to reinforcing the competitiveness of blue economy companies in the region of Macaronesia. The conference was opened by the Regional Minister of Economy, Industry, Trade and Knowledge of the Canary Island Government. The Chairman of TMA, Michael Jones, gave the opening speech entitled "The Maritime Alliance (TMA) and the Alliance of the Blue Technology Cluster", which was followed by three working sessions

## STARPORTS

Distributed wireless system for monitoring, preventing and acting on coastal management

**Origin of funding: ERDF Interconecta projects 2018**

**Participation: Co-operating partner**

**Period of execution: 01/09/2018-31/12/2020**

**Total project funding: €536,531.00**

**Funding for PLOCAN: €35,000.00**

**Percentage of external funding: 100 %**

The main objective of the STARPORTS project is the development of an intelligent platform capable of providing in real time detailed and multiple information on the state of any coastal and maritime infrastructure, and as well capable of quantifying, automatically and intelligently, changes in time, such as pathologies or other anomalies. It also aims to develop advanced sensor networks that can be integrated within that infrastructure to obtain significant and reliable data on its status.

It should be noted that maritime infrastructures are subject to daily use and severe environmental conditions (waves, rain, humid environments, salinity and corrosion problems, among many others), which can vary significantly depending on the location and the environment. These affect the integrity of the structures and their lifespan. Given the importance of maritime infrastructures in our society (ports, dams, offshore platforms, wind turbines, etc.), where any problem can significantly affect the economy or safety of the locality, region or country, continuous inspection and maintenance of those infrastructures is necessary.

The problem is that the current monitoring and maintenance strategies and techniques to avoid problems and failures entail a great economic cost, as well as enormous efforts and resources, for installers and operators. This is why STARPORTS 'innovative technology will mean a significant technological leap in the maritime market, which will not only mean a significant reduction in the monitoring, maintenance and conservation costs, but will also improve maintenance strategies through the early detection of future problems or failures.

In 2018, PLOCAN designed the future installation of sensors on the off-shore platform.

## 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) and National R+D+i Programme Aimed at the Challenges of Society / Joint International Programming Actions 2014. Swarms national and Swarms international are considered two independent projects based on the origin of funding, although they are included in the same file.**

**Participation: Partner**

**Period of execution: 01/07/2015-30/07/2018**

**Total project funding: €6,389,046.38 + €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 organised a course on the Blue ROV2 in January.



**Illustration 108. Students on the course on Blue ROV2**

A stand was organised in March at the Oceanology International Fair held in London, where the results of the project were presented. The results of the project were also presented at Ocean Science '18 in March, held in Portland.

Operational trials were held in Oslo in mid-May to drive the use of unmanned submarine vehicles and facilitate the creation, planning and execution of maritime and off-shore operations by reducing their operational costs and enhancing security. The trials were co-ordinated by Acciona and were run in the facilities of the UPEC technology pole in the port of Leixoes. PLOCAN helped to operate a BlueROV2 ROV made by Blue Robotics Inc.



**Illustration 109. Blue ROV vehicle during the trials**

On the 18<sup>th</sup> of June, the project presented its preliminary results at the EMRA workshop 2018, an event organised by the Polytechnical University of Madrid (UPM), the lead partner of the project, in the University of Limerick (Ireland). The event spent one session on presenting the results obtained after three years of the project. It attracted other European projects, representatives of the submarine robotics industry and end users.



**Illustration 110. Session at the EMRA workshop 2018**

The project was presented at the fifth conference on hydrographic engineering held in the Hydrographic Institute of Portugal between the 19<sup>th</sup> and the 21<sup>st</sup> of June, as was the ECOMARPORT project.

On the 28<sup>th</sup> of June, SWARMS organised its final demonstration in the Norwegian city of Trondheim.



**Illustration 111. Participants in the final demonstration held in Norway**

The offices of the Norwegian University of Science and Technology (NTNU) situated in the Trondheim fjord, in Norway, was the venue chosen for demonstrating and validating the final stage of the project. This third and final demonstrator was designed to validate the final state of the technology developed in the project and it was co-ordinated by SINTEF, one of the largest independent research organisations in Europe. The final result consisted of an integral AUV, ROV and ASV control system that allows them to work together efficiently on missions to achieve a given objective. The technologies generated in the course of the three years of the project in matters of co-operation among vehicles include acoustic and radio-electric communications and a range of developments of both software and hardware integrated in the equipment.

The commissioner and technical advisors from the European Commission attended the final days of the demonstration to conduct the final audit on the project. After watching several missions unfold and appraising the project results, they corroborated the fact that the objectives had been met, thus ending three years of co-operative work, in which PLOCAN played a leading role in design and validation of operations and demonstrators, and in tasks of reconnoitring the surroundings and disseminating the project.

## SYMBIOSIS

### A Holistic Opto-Acoustic System for Monitoring Marine Bio-diversities

**Origin of funding:** Call: 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:** Co-operating partner

**Period of execution:** 01/11/2017-31/10/2020

**Total project funding:** €1,399,960.00

**Funding for PLOCAN:** €16,000.00

**Percentage of external funding:** 100 %

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.

PLOCAN has not been allocated any tasks or deliverables in this project. PLOCAN's participation consists of making a cable of certain characteristics available to one of the project partners.

## WAVEPISTON

### Competitive Wave Energy on Islands

**Origin of funding:** Call: H2020-EIC-SMEInst-2018-2020 / **Topic:** EIC-SMEInst-2018-2020: SME instrument / **Deadline Id:** H2020- SMEInst-2018-2020-2

**Participation:** Co-operating partner

**Period of execution:** 01/12/2018-30/11/2020

**Total project funding:** €2,500,000.00

**Funding for PLOCAN:** €105,600.00

**Percentage of external funding:** 100 %

Wavepiston is developed on the shoulders of the first-generation wave energy technologies. Due to its low weight, low-tech design, simple installation and operations & maintenance, Wavepiston will be the disruptive technology that can make wave energy competitive with the other renewable energy sources. Our prototype test and Phase 1 feasibility study have confirmed this potential. The Wavepiston system is easy to assemble on site by local staff and can be deployed from a regular tug boat, just like operations and maintenance can be carried out without expensive specialists. In the Phase 2 project we will install a full-scale Wavepiston demonstration system to demonstrate the energy potential, durability and survivability ensuring a low cost per kWh.

In the first step our customer focus is islands and isolated coastal communities. We already have the first 4 commercial customers in the pipeline; Isola Piana at Sardinia, Ebeye at Marshall Islands, Siargao at the Philippines and the Alidhoo J-resort at the Maldives. During Phase 2 we will prepare the first commercial projects together with professional energy project developers. This will enable us to start the commercialisation right after the finalisation of Phase 2.

The Wavepiston technology is protected by several patents. The Phase 2 project plan has 5 work packages; WP1 Management, WP2 Preparation for the full scale demonstration, WP3 Manufacturing demonstration system and site installation, WP4 Demonstration and qualification, WP5 Business plan, commercial exploitation and dissemination.

In this project, PLOCAN will facilitate the trials of a prototype that harnesses wave energy on the test site. The prototype will be connected to the platform by a submarine pipe for pumping water under pressure.

## WEP+

### Wave+ Energy Project

**Origin of funding: First OCEANERA-NET COFUND Joint Call**

**Participation: Partner**

**Period of execution: 01/09/2018-29/02/2020**

**Total project funding: €645,635**

**Funding for PLOCAN: €0**

This project aims to improve and demonstrate the reliability and performance of W1 wave energy converter electronics while demonstrating and validating in real sea environment grid connected to Las Palmas Harbor grid. Lessons learned from this project can be applied by Centrale Nantes in the surrounding of SEM-REV test site (Le Croisic Peninsula and local fishing harbor such as La Turballe) and Aquatera worldwide presence in harbors around the globe. The intention is to progress Wedge Global technology from TRL 6 through to TRL 7.

- TRL 6. Since January 15 th 2014, Wedge Global has been continuously testing its W1 floating point absorber with direct drive linear generator PTO in the ocean, at PLOCAN and at Las Palmas Harbor.
- TRL 7. Scope of work under WEP+ will include design, manufacturing and installation of power and control electronics for connection of W1 device to the Las Palmas Harbor grid.

The energy systems of interest in this project are grid-connected wave energy converters (WEC) that convert energy carried by waves into electricity. The project objective is to reduce the levelized cost- of-energy (LCOE) to be economically attractive in island harbors plagued by high energy costs.

The project leverages and builds upon an existing WEC design that embodies the results of nine years of development, full-scale laboratory validation tests and open-ocean tests. This development and operational experience has identified design improvements and further innovations that will result in a reduction of the cost of energy. The improvements and innovations include power electronics modifications that will enable grid connection, sensor and controller changes that will provide the basis for advance knowledge of wave characteristics and configuration changes that will increase the efficiency of wave-to-electricity conversion. The resulting WEC system will undergo rigorous testing and characterization at Las Palmas Harbor, Canary Islands.

The project started in September with a project kick-off meeting held in the offices of the Las Palmas Port Authority. In November, a project steering meeting was held in CIEMAT.

## Wip10+

### 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:** Co-operating partner

**Period of execution:** 27/01/2016-30/06/2019

**Total project funding:** €758,000

**Funding for PLOCAN:** €30,200

**Percentage of external funding:** 100 %

The project WIP 10+, "Wind integrated platform for 10+ MW power per foundation" will demonstrate at sea and at significant scale a fully integrated offshore wind floating platform Wind2Power that holds a couple twin wind turbines of up to 6 MW each, and that it is also able to host additional functions due to its size.

The objectives of the innovation are:

- To provide a floating foundation for high installed wind capacity.
- To optimize the O&M procedures.
- To prove that cost reduction is possible acting both on capital and O&M costs.
- To improve sea space management.
- The project addresses the need for cost reduction in offshore wind by providing a light but large semisubmersible platform able to host two 5-6 MW wind turbines for a total of 10-12 MW per platform.

Specific expected results are: validation of numerical and laboratory estimations on forces and motions, proof of engineering design including moorings and wind vaning platform concept. More comprehensive expected results are survivability of the platform through winter conditions in real sea environment, quantification of cost reduction compared to two floating wind turbines, and optimization and validation of specific installation, operation and maintenance procedures.

The work of defining a mooring system for the prototype continued in 2018 and the final position of the 3 anchors has been defined. They will be located in an area of sand. Furthermore, a location study has been conducted for the batteries in the columns of the prototype and their recycling system has been defined. Work will start on manufacturing the prototype in ASTICAN (Gran Canaria) mid-way through 2018 and installation on the PLOCAN test site is scheduled for March - April 2019. PLOCAN will provide the test site in this project for the future installation of the prototype and advisory services for the project developer.



**Illustration 112. Photo of the prototype to be installed on the test site**

## AGREEMENTS SIGNED AND PARTICIPATION IN NETWORKS

The three agreements listed below were signed this year:

- ◆ General agreement for the mobility and exchange of personnel between the University of Las Palmas de Gran Canarias and the Consortium for designing, building, fitting and managing the Canary Island Off-shore Platform signed on the 13<sup>th</sup> of December 2017 and published in the Official State Gazette (BOE) on the 1<sup>st</sup> of February 2018.
- ◆ Technical contract setting out the conditions for connecting the Generating Facility to the transmission grid, to use the Generating Facility and other renewable generating facilities connecting to the Jinamar 66kV Sub-Station, between Red Eléctrica, EMALSA and the Canary Island Off-Shore Platform Consortium signed on the 19<sup>th</sup> of June 2018.
- ◆ Educational co-operation agreement for students from the University of Deusto to apply and supplement the know-how acquired in their academic training, so that they acquire competences that prepare them for exercising their professional activities and enhance their employability and entrepreneurial capacity through external academic internships at PLOCAN, signed on the 3<sup>rd</sup> of August 2018.

At the beginning of February, the secretary general of fisheries of the Ministry of Agriculture, and Fisheries, Food and the Environment, Alberto López Asenjo, signed a co-operation protocol with the director of PLOCAN to drive Blue Growth in the Central Atlantic, aimed basically at identifying new economic development activities and promote the compatibility of uses of the maritime space.



**Illustration 113. Agreement signing ceremony**

The signing ceremony was attended by the Delegate of the Central Government in the Canary Islands, Mercedes Roldós Caballero, and the director general of Fisheries of the Canary Island Government, Orlando Umpiérrez García. The protocol identifies a series of priority areas, including the areas of fisheries sustainability, safety of fishing vessels and aquiculture. Moreover, the protocol seeks to generate a knowledge space for each activity identified, where business and technology centres can

contribute initiatives for the development of such activities. The agreement was left open for other public or private entities interested in driving blue growth to sign up to it.

During 2018, PLOCAN has maintained its participation in a range of technical networks associated with observation, marine technologies, renewable energies, the blue economy, etc. and it has joined new networks, including the Air Centre, the Macaronesia Marine-Maritime

Alliance and the National Oceanic Observation Co-ordination Group, for example. In short, PLOCAN currently takes part in the following technical networks:

- ◆ The EC EMSO-ERIC (European Multidisciplinary Seafloor and Water Column Observatory), representing Spain in the network. In late October, PLOCAN took part in the eighth assembly of the European EMSO ERIC initiative held in the CSIC offices in Barcelona.



**Illustration 114. Participants at the EMSO-ERIC meeting**

- ◆ EMODnet (European Marine Observation and Data Network) comprised of over 160 organisations that share oceanographic data, products and meta-data in order to make them available to public and private users.
- ◆ Spanish Standards and Certification Association (AENOR), through its AEN/206/SC114 sub-committee. The purpose of this sub-committee, known as "Marine energies: Wave and Current Converters", is to draft standards for everything to do with harnessing marine wave and current power to generate electricity. In 2018, PLOCAN took part in the mooring group and the submarine noise group.
- ◆ Association of Renewable Energy Producers APPA Marine, which has twenty-six partners. It was founded in 2006 to bring together the industrial sector and work for the development of this technology in Spain. Most of the companies and entities that operate in the sector in Spain belong to this association, putting it in a unique position to provide a realistic, overall view of the sector. The immediate purpose of the APPA Marine section is to promote a suitable legal framework and the associated technological development, to allow marine power to become considerably important in marine power production in 2020.
- ◆ Wave Power Working Group galvanised by EVE in order to galvanise the technological progress and application of wave-driven power-generating technology.
- ◆ Modular Research, Testing and Validation Platform for Support Technologies for a sustainable sea-faring economy TEC4SEA. This is a unique, pioneering institution in Europe, whose mission is to support research, development and testing of technologies at sea.
- ◆ Ocean Energy Systems, initiative of the International Energy Agency on off-shore power, with the PLOCAN test site as a testing facility for devices on the open ocean.

On the 29<sup>th</sup> of November, PLOCAN hosted the 35<sup>th</sup> Executive Board meeting of the Agency, as described in the section “Participation in events and visits received”

- ◆ Automation and robotics, maritime security and marine energy groups of the Spanish Maritime Sector Technology Platform (PTME). This organisation provides a place for meeting and dialogue among all players associated with the sea and other aquatic environments.
- ◆ Everyone’s Gliding Observatories (EGO) European Network, an international scientific-technical forum of submarine glider technology (gliders) users
- ◆ I-COOL (International Coalition of Ocean Observing Laboratories), led by Rutgers University
- ◆ MARTECH International Committee on marine technologies
- ◆ Marine Technology Society (MTS)
- ◆ EuroGOOS HF-Radar Group, led by EMODNEt Physics
- ◆ European Atlantic Group of Gliderport facilities.
- ◆ European technology and Innovation Platform for Ocean Energy (TP Ocean) an umbrella organisation for over 200 experts from the off-shore energy sectors, aimed at defining a clear strategy for technological development. TP Ocean is officially recognised by the European Commission as a European Technology Platform (ETP).
- ◆ Network of Scientific Culture Units of the Spanish Foundation for Science and Technology (FECyT). The main purpose of the Scientific and Innovation Culture Unit (UCC+i) at PLOCAN is to promote a scientific, technological and innovation culture through activities of different kinds: scientific communication, dissemination, training, etc.
- ◆ Network of Marine Infrastructures (RIM) between the Canary Island Oceanic Platform (PLOCAN) and the Coastal Observation System of the Balearic Islands (SOCIB).
- ◆ Blue Economy Working Group chaired by the Regional Ministry of Economy, Industry, Trade and Knowledge of the Canary Island Government to drive one of the priority sectors set by the Canary Island Smart Specialisation Strategy, the RIS3. This working group takes part in drawing up the Canary Island Blue Economy Strategy. In March, meetings were held of the three operating study groups set up to analyse and discuss matters specifically related to blue growth and the contribution made in this field to the Canary Island RIS3s by R+D+i. Convened and co-ordinated jointly by the Canary Island Agency for Research, Innovation and Information Society (ACIISI) and PLOCAN, the meetings focused on the three operative study groups: “Calls for R+D+i aid in support of the Blue Economy”; “Barriers to public and private R+D+i in the Blue Economy of the Canary Islands”; and “Sustainability indicators concerning the contribution of the RIS3 to the Blue Economy”. Representatives from different entities that comprise the GEA in Canary Islands took part in this day of meetings: ACIISI, PLOCAN, University of Las Palmas de Gran Canaria (ULPGC), University of La Laguna (ULL), the Canary Island Institute of Technology (ITC), the Marine Sciences Technology Centre (CETECIMA) and the Canary Island Maritime Cluster.



**Illustration 115. Meeting of the blue economy working group**

- ✦ Canary Island Maritime Cluster that brings together business and institutions related to the blue economy in the Islands.
- ✦ Blue Tech Cluster Alliance (BTCA), global Network of clusters, with the mission of promoting investment and sustainable growth of the knowledge-based marine-maritime industry. In early November, PLOCAN took part in the fourth annual meeting held in San Diego, California, as part of the X Blue Technology Week organised by the Maritime Alliance of San Diego. The meeting was chaired by Michael Jones, chairman of the Maritime Alliance.



**Illustration 116. Presentation of PLOCAN at the BTCA meeting**

- ✦ Macaronesia Marine Maritime Alliance, set up by public and private entities from Azores, Madeira, Cape Verde and the Canary Islands with the mission of driving the blue economy. It is a trans-national network linked to the International Maritime Alliance. The Alliance agreement was signed on the 28<sup>th</sup> of November in the conference organised by the SmartBlue project, as described in the section "Projects implemented and in progress".
- ✦ Inter-governmental initiative "Atlantic Interactions - AIR Centre", set up for the purpose of driving research programmes and projects around the Atlantic Ocean. This initiative, which more countries from both shores of the Atlantic can sign up to, focuses on five main areas: space, atmosphere, climate-energy, ocean and data analysis and computing. This centre will thus contribute to the sustainable

development of the Atlantic countries and regions. PLOCAN is the entity that represents Spain in the network. The Declaration of the Canary Islands was signed in Las Palmas de Gran Canaria in November, as described in the section “Participation in events and visits received”

- ◆ OECD working group “Fostering Innovation in the Ocean Economy” in which PLOCAN participates with the MAPAMA and the IEO, along with another fourteen institutions from eleven different countries. In 2018, PLOCAN worked on the framework of this programme, drawing up the document “Rethinking Innovation for a Sustainable Ocean Economy” in which PLOCAN’s innovation network analyses the case of a new form of emerging co-operation in the blue economy.
- ◆ Canary Island Climate Change Observatory Marine Environment Committee, an independent body set up to diagnose the causes and impacts of global warming in the Islands and determine the best response to them. This entity represents the Canary Islands in the Global Network of Observatories and in public, private, social and scientific bodies dedicated to fighting climate change.
- ◆ National co-ordination group in oceanic observation. The main Spanish institutions linked to oceanic observation sciences and technology met in mid-November in the head offices of the Spanish Oceanographic Institute (IEO) to discuss improvements in co-ordination protocols for Spanish oceanic observation and to create this National Co-ordination Group in Oceanic Observation in which PLOCAN participates. The meeting, driven and co-ordinated by GEOMAR, was scheduled in two sessions. IEO, EuroGOOS and IOC-UNESCO spoke in the first session to explain the current situation of Spanish oceanic observation against the backdrop of international benchmark initiatives. The AtlantOS co-ordinator, in turn, presented the joint project to delegates in this session, as well as explaining the motivation of the meeting, in line with its own objectives.



**Illustration 117. Meeting of the national co-ordination group in oceanic observation**

- ◆ Atlantic Stakeholder Forum for discussing blue growth in the European Atlantic Arc.
- ◆ Galway Statement Implementation to define the strategy on blue growth in the framework of the European Atlantic.
- ◆ Ocean Energy ERA-Net Consortium to galvanise the renewable marine energies sector in Europe.
- ◆ OR Energy Network, created by the Canary Island Ministry of Industry, Energy and Trade to foster co-operation among the outermost regions to put common projects that lead to the development of a new energy model to the EU.

## EDUCATION, DISSEMINATION AND FOSTERING SCIENTIFIC TECHNOLOGICAL VOCATIONS

### TRAINING

In 2018, the PLOCAN staff (its own personnel) has offered a total of 36 training courses, both in its own facilities and in external venues.

| TOPIC                                                               | MONTH            | PARTICIPANTS | HOURS |
|---------------------------------------------------------------------|------------------|--------------|-------|
| Geographic Information Systems (ArcGIS 10.4)                        | January          | 1            | 32    |
| BlueROV2 Assembly and Operation                                     | March            | 7            | 16    |
| Health and Safety                                                   | March            | 1            | 15    |
| New Public Sector Contracts Act 9/2017 8th November                 | March            | 1            | 3     |
| Health and Safety                                                   | April            | 1            | 15    |
| Use of an Automatic Defibrillator (DESA)                            | April            | 5            | 8     |
| SBL Positioning in the BlueROV2                                     | May              | 4            | 8     |
| Public Sector Contracts and Centralised Procurement Act (Session 1) | May              | 14           | 1:15  |
| Type 3B Lifting Platform Operator Course                            | May              | 1            | 8     |
| EGIM (EMSO Generic Instrument Module)                               | June             | 2            | 16    |
| Transition to the new ISO 45001 standard                            | June             | 2            | 8     |
| Public Sector Contracts and Centralised Procurement Act (Session 2) | June             | 15           | 2     |
| Public Sector Contracts and Centralised Procurement Act (Session 3) | June             | 9            | 1     |
| Financial Aspects of the H2020 Programme                            | July             | 9            | 7     |
| Health and Safety at work on the Platform                           | July             | 8            | 3     |
| APNEA Rosette                                                       | July             | 13           | 8     |
| 3D Printing                                                         | August           | 4            | 6     |
| Health and Safety                                                   | August           | 1            | 15    |
| Course on Geographic Information Systems with QGIS                  | Sept-<br>October | 2            | 30    |
| OPEIN Maritime Jobs Course                                          | October          | 2            | 20    |
| "Fibre Optics I" Course                                             | October          | 2            | 20    |
| Technique for working at heights                                    | October          | 3            | 8     |
| Training Course in Handling and Safety Fork-Lift Trucks             | December         | 3            | 12    |

All the courses have been assessed anonymously by the participants. Their opinions are taken into account for later training courses.

PLOCAN has developed the following training programmes:

- 2+2 Training Programme.** This is a programme aimed at providing highly-specialised supplementary training to facilitate finding a job for university graduates by developing know-how, attitudes and competences that can help in the active exercise of the university education received and their capacity to find a job in the highly-specialised international technology market. The programme is divided into two separate phases: (a) A 1<sup>st</sup> phase consists of a 2-year grant to provide the student with the pertinent knowledge to work in the job market. (b) A 2<sup>nd</sup> 2-year phase based on a job-placement contract. This year, a call was put out in February, which selected 2 candidates. Moreover, the 2 candidates that started in 2016 in the areas of "Oceanographic observation and data processes" and "Marine/submarine vehicles, instruments and machinery" continued in the contract phase.
- 0.5+2 Training Programme.** This is a programme aimed at offering supplementary, highly-specialised training and a job for Vocational Training graduates. The purpose of

this is to supplement academic education and provide work experience for specialist qualified staff from vocational training cycles. The programme is divided into two different phases: a first phase consisting of a 6-month grant to reinforce the theoretical-practical know-how of the student in the specialities of the entity, followed by a second phase of a job-placement contract. In 2018, the 3 candidates selected in 2016 in the following areas: (a) Support for PLOCAN's Socio-Economic Area, (b) Telecommunications and I.T. Systems and (c) Analysis and Quality Control Laboratory, continued with their job-placement contract.

- ◆ **Dual Inserta Training Programme.** Since January 2016, PLOCAN and the Las Palmas University Foundation have had a framework agreement to foster finding jobs for university and vocational training graduates that acts as a supplement to the 2+2 and 0.5 +2 training programmes. The period of training for the students on this programme is 6 or 10 months. 2 students have finished their grant in 2018 by enrolling on this training programme, covering the following areas: (a) PLOCAN legal department and (b) Developing web-based apps.
- ◆ **Innovation Management training and skill-building Programme.** This project is part of a project of the Canary Island Agency for Research, Innovation and Information Society (ACIISI) of the Canary Island Government, co-funded by the European Social Fund (ESF) in the terms set out in the Canary Islands Operational Programme 2014-2020. Thus, this is practical training lasting three months spent on innovation tasks. At the same time, theoretical training is provided in different formats. Some of the modules are entirely based on *e-learning* and others are semi-face-to-face. No innovation manager has joined PLOCAN in 2018, something that has occurred in the last two years.
- ◆ **Innova Programme.** Innova Canarias 220 is a mentorship programme that started in 1984 to carry out research at the Universidad de Las Palmas de Gran Canaria and then transfer it to the productive fabric via entrepreneurs, institutions and private individuals. The University Foundation of Las Palmas drives this with the financial resources that it attracts. The Innova programme has allowed one woman to join PLOCAN up to January 2018.
- ◆ **Short-Stages.** These are for students from national or foreign institutions to provide them with specific training, defined and agreed upon previously. They are offered on demand by sending in an application at least one month in advance. This year, a total of 9 students have been received training in the "Blue Education" Summer Campus (ROVSTEAM) project.
- ◆ **Curricular placements.** PLOCAN also continues to promote curricular and extra-curricular placement for university and vocational training students. These are necessary and mandatory for the students to complete their studies and they are regulated by a specific teaching project. PLOCAN offers students a placement option with novel lines of work and an enormous potential for expansion. These students stay in the facilities for an average of 3 months on a full-time, daily basis. 7 students were received in 2018 studying qualifications relating to PLOCAN activities, including engineering (I.T., industrial, mechanical and naval), chemistry and Business Administration. 4 vocational training students from Superior Degree cycles in Telecommunications and Information Technology have also had placements, along

with 1 student from a Higher Cycle in Web-based Development and 1 student from a Higher Cycle in Chemistry.

- ◆ **Final Degree Dissertations (TFG) , Final Master's Dissertations (TFM) and Doctoral Theses (TD).** 2 Chemical Engineering TFGs and 1 I.T. Engineering TFG and 1 Maritime Engineering TFM were done in 2018. One Doctoral Thesis was also started, focusing on developing a portable system for determining pollutants.
- ◆ **Canarias Masterclass.** An initiative promoted by the Canary Talent professionalisation association, aimed at advising future university students. Canarias Masterclass is an innovative programme, in which students have the chance to share a working day with an expert in the professional sector they are interested in. The aim is to help students to choose their university courses and get first-hand experience of what they are getting into in the future. The intention is for the advice given to students to spread over the students' full degree course. PLOCAN continues to mentor two students.

The Glider School celebrated its IX edition, with a total of 14 students, giving an accumulated total of 121 students trained after nine editions, from over twenty countries since it first started. The 2018 edition, held in the PLOCAN facilities in Taliarte between the 1<sup>st</sup> and the 5<sup>th</sup> of October, brought together a teaching body comprised of 16 representatives from the leading glider manufacturers (Teledyne Marine, Liquid Robotics, Alseamar, Offshore Sensing, Kongsberg Maritime) and international benchmark institutions such as Memorial University, MARUM, Rutgers University, CNRS, etc, as end users of these latest-generation autonomous oceanic observation platform. The programme this year included both theory and practical sessions in the PLOCAN facilities on the Taliarte dock and in open waters off the coast of Telde. The main submarine glider technologies and operations available were there for students to try and study (Slocum G3, Seaglider 1K, SeaExplorer, Waveglider and Sailbuoy), along with oceanic sensor developers and associated component modules, with the PLOCAN Glider School continuing to remain an international benchmark in high-level submarine glider training.

As part of the quality procedure followed in the Glider School, at the end of the school, students filled in satisfaction surveys, along with the participating entities and the head of the school, in order to have an assessment of the school and determine aspects with room for improvement.



**Illustration 118. Participants in the 2018 Glider School**

## DISSEMINATION AND FOSTERING SCIENTIFIC TECHNOLOGICAL VOCATIONS

**Social media.** The Twitter account has continued to grow progressively since it was started in 2016. PLOCAN has taken an active stance in managing social media by posting and re-tweeting regularly, in an attempt to reinforce publications with photos and videos.

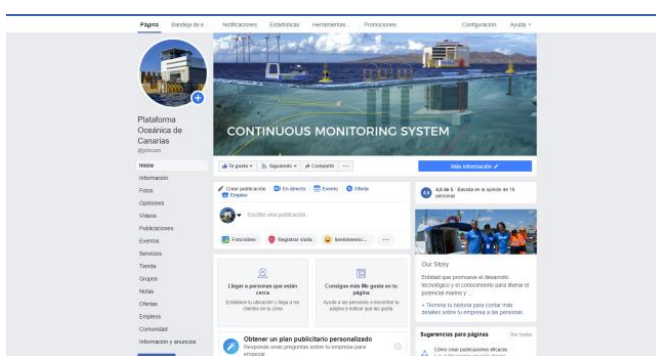


**Illustration 119. PLOCAN Twitter account**

There has been a 31.2% increase in 2018 in the number of followers over last year (from 810 to 1,178), as shown in Figure 3-5 of the Appendix. Reinforcement was provided for following events in real time, in order to generate more impact. June was especially important, accumulating an average of over 1,000 impressions

a day.

The PLOCAN Facebook account continued to grow progressively in 2018. A new, far more active stance was taken on managing the social media by publishing and connecting to news regularly, in an attempt to reinforce publications with pictures and videos.



**Illustration 120. PLOCAN Facebook account**

The barrier of 1923 "likes" was exceeded in 2018, reaching 1,946 followers, including the real-time following of the installation of the ELICAN project wind generator from the May call for candidates to cover vacancies. One of these posts reached over 13,000 people according to Facebook and was shared 139 times.

### Scientific and Innovation Culture Unit.

PLOCAN is accredited by the Spanish Foundation for Science and Technology (FECyT) as a Scientific and Innovation Culture Unit (UCC+i). UCC+is act as intermediaries between institutions that host them and the people, mainly in order to promote scientific and technological culture and innovation through activities of different kinds: scientific communication, dissemination, training, etc. Accreditation encompasses the following modalities:

- ❖ UCC+i that communicate the results of R+D+i: Communicating R+D+i results encompasses all activities associated with disseminating information and contents that meet certain newsworthiness criteria. Specifically, they must be new and current affairs and they must be directly associated with results produced in the centres to which the UCC+is belong.
- ❖ UCC+is that disseminate scientific and technological knowledge in general: Scientific and technological knowledge dissemination activities are

understood to be all activities aimed at disseminating information and contents that are not necessarily new or current, but which help to enhance the level of scientific and technological culture of the people.

With a view to promoting scientific dissemination and aligning with the UCC+i, PLOCAN has a specific dissemination web site. UCC+i activities in 2018 included the **Exhibition in El Mirador Shopping Centre**. The aim of this exhibition is to introduce the facilities and services of PLOCAN, and specifically of the supporting electricity grid for experimenting and testing new technologies that use marine energy resources (REDSUB). The exhibition has one part adapted for children, with explanatory panels adjusted to their language and knowledge.



**Illustration 121. Exhibition in the El Mirador Shopping Centre**

**Participation in Science Fairs and Weeks.** PLOCAN played an active part in a range of scientific dissemination events like FIMAR, The Canary Island International Water and Science Fair, the Macaronight: European Researchers' Night, A Night in the Elder Museum, The Gran Canaria MiniFeria of Science and Innovation weeks, among others. All these actions will be described in the section of this report entitled "Participation in events".

**Educational marine robotics workshop for secondary students.** The municipal swimming pool of San Fernando in Maspalomas hosted the exhibition of the prototypes built in the VI edition of the Educational Marine Robotics Workshop (ROV Workshop) with the participation of 56 secondary schools from the Canary Islands and the Mainland. During the academic year, secondary students and their teachers build their remote-controlled submarine robots, and then show their vehicles and handling skills at the Submarine Robotics Meeting. The exhibition brought together almost 200 students from 44 schools, 26 from Gran Canaria, 7 from Tenerife, 6 from Fuerteventura, 1 from Lanzarote, 1 from El Hierro, 1 from La Palma and 2 from the mainland.



**Illustration 122. Photo of participants in the submarine robotics event**

The ROV workshop was promoted by PLOCAN, the Computer Vision and Robotics Group of the University of Girona, "laCaixa" Charity, the Spanish Foundation for Science and Technology, the Cabildo of Gran Canaria, the San Bartolomé de Tirajana Local Council and the Canary Island Agency for Research, Innovation and Information Society of the Canary Island Government. The main aim of the ROV Workshop is to stimulate vocations among young people in technical and scientific subjects by building prototypes at school to foster an interest in submarine robotics in a practical fashion, in the hope of awakening their motivation, vocation and interest in technology and knowledge of the ocean.

**Educational marine robotics workshop for primary students.** The offices of PLOCAN hosted two hundred and thirty seven students, fifteen teachers and relatives from the following primary schools on the 9<sup>th</sup> of May: (CEIP) Tagoror, La Garita, Pintor Néstor, Giner de los Ríos and Nicolás Aguiar to take part in the event entitled "Primary from the Techno-future: Building Marine Vocations", where several designs of remotely-controlled robotic vessels were discussed and prepared as training in the schools over six months. The event closed the "Seminar Maker Primary: think, create and disseminate" in which students worked in the area of computational thought using the Scratch tool, allowing them to create inter-active stories, games and animation; in 3D design and printing. This activity forms part of the "CODIMAR – Scientific Dissemination of Activities in the Marine Maritime Sector" project in its actions of support for disseminating events and projects and the development of 3D printing. Both activities are part of the "ROVSTEAM – Developing STEAM competences with Low-Cost Educational Marine Robotics", in co-operation with the Spanish Foundation for Science and Technology (FECyT) – Ministry of Science, Innovation and Universities, La Caixa Charity and the Cabildo of Gran Canaria.



**Illustration 123. Robotics event for primary students held at PLOCAN**



**Illustration 124. Presentation of PLOCAN at the scientific vocations fair**

**V Scientific Vocations Fair.** The PLOCAN Scientific and Innovation Culture Unit took part with a lecture on scientific-technological vocations at the V Canary Island Scientific and Professional Vocations Fair, held on the 12<sup>th</sup> and 13<sup>th</sup> of April in Tenerife to enhance interest among young people in science, technology, innovation and entrepreneurship,

such that they can appraise all these options when choosing the next stages of their education. The lecture explained the professions that, according to the European Commission are developing currently in the marine-maritime sector from the blue growth strategy regarding renewable energies, biotechnology, aquaculture, mineral resources and coastal and maritime tourism. The Fair is aimed especially at the students of Tenerife, but it is also aimed at people in general, who the organising institutions encourage to come along and discover high-level science and technology first hand. This is the entertaining technology developed at both the University of La Laguna and the different specialist centres of the island. There were thirty demonstration stands, fifteen professional talks and five practical workshops.

**Educational Passages.** This initiative came about from the international educational project, Educational Passages, created in the USA. Primary and secondary students take part in building small boats from a single mould, they assemble and seal the main parts and fit them with a GPS (Global Position System) transmitter and



then they launch them into the ocean (North Atlantic mainly) and follow their journey remotely. The basic building materials form part of a single kit that is supplied to each school. The initiative not only allows the student to access the field of technology, but also transversal subjects like biology, oceanography, history and information technology, and enables them to interact with other schools taking part from other countries in order to exchange know-how and experiences. One of these boats was launched from the island of El Hierro in May 2018, with the collaborative and co-ordinated participation of the Amurga High School (Gran Canaria) and the Garoe High School (El Hierro). As a technological novelty, linked to the VIMAS observation programme, a system for measuring sea water parameters was included on a platform of this kind for the first time (in this specific case and as a first approach, a temperature sensor) developed at PLOCAN. The Educational Passages Programme is led by a multi-disciplinary consortium of specific American agencies and programmes that includes NOAA (National Oceanic and Atmospheric Administration), and recently, European ones too, like AHORA (Atlantic Ocean Research Alliance), along with several secondary education schools from the United States and Europe, including countries such as Portugal, France, Canada, Norway, United Kingdom and Spain.

**Educational talks for children.** At the beginning of May, PLOCAN gave a talk for children of 10 or over as part of the activity “A night in the museum” organised by the Elder Museum of Science and Technology in Las Palmas de Gran Canaria. 180 people took part in this “science camp”. The talk was given as part of the MARCET project, and was entitled, “How technology can monitor cetacean activity in Canary Island waters”. The programme was completed with a series of workshops and alternating guided tours, with a range of actions such as an explanation of cetaceans using the modules available in the museum, a practical exhibition of the units of measurement, a visit to the museum planetarium and a marine robotics workshop organised by the PLOCAN EDUROVs Marine Robotics Initiative.



**Illustration 126. PLOCAN staff presenting MARCET at the “A night in the museum” event**

In 2018, the European Commission continued to implement the communication project to drive sustainability and innovation through projects like PLOCAN. Apart from the dissemination carried out on its own social media in this area, specific dissemination actions were implemented like publications in the Iberia magazine, Ronda and in the magazine, Muy Interesante. The pictures of the two numbers of the Ronda magazine that carried the PLOCAN articles that were published in 2018 are shown below:





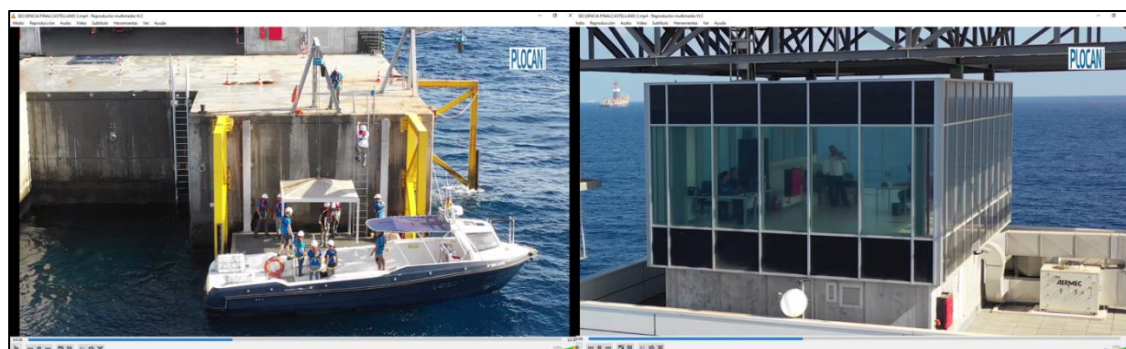
Illustration 127. Article in the magazine “Muy Interesante” about PLOCAN published in February

The publications produced by the EC on Facebook included a promotional video about PLOCAN.



**Illustration 128. Screen shot from the video about PLOCAN posted on social media by the EC**

Finally, in the field of dissemination, PLOCAN produced a 12-minute video in four languages in 2018 (Spanish, French, English and Portuguese). The video explains the objectives of PLOCAN and runs through the facilities, both on-shore and at sea, and the most important projects implemented by the ICTS.



**Illustration 129. Frames from the video produced by PLOCAN**

## **PARTICIPATION IN EVENTS AND VISITS RECEIVED**

On the 25<sup>th</sup> of January, PLOCAN took part in the celebrations of the 75<sup>th</sup> anniversary of the Lanzarote Fisheries School with an extensive presentation of the blue economy and the main activities of the Outstanding Scientific Technological Infrastructure and the educational

initiatives it is engaged in: the EDUROVs marine robotics initiative and the Educational Passages initiative.



**Illustration 130. Presentation of PLOCAN in the Lanzarote Fisheries School**

The PLOCAN visit helped students of the Fisheries School to get a better idea of future marine professions, based on the growing blue economy. The event was also attended by other schools from the island of Lanzarote, thus providing a point of connection between different initiatives mooted during the event.

The Lanzarote Fisheries School (also known as the Maritime-Fisheries Vocational Training Institute) has been a national benchmark in fisheries-related teaching for 75 years. With state-of-the-art facilities, it attracts hundreds of candidates each year, and it takes in 150 students from vocational training, training cycles and adult education.



**Illustration 131. Ocean Sciences 2018**

PLOCAN took part in the biannual conference Ocean Sciences 2018 between the 12<sup>th</sup> and the 16<sup>th</sup> of February, sponsored by the American Geo-Physics Union (AGU), The Association for Sciences Limnology and Oceanography (ASLO) and The Oceanographic Society (TOS), held in Portland (USA). Ocean Sciences is a benchmark international forum for scientists, engineers and users of the ocean to promote, disseminate and exchange know-how, ideas, applications and scientific-technical advances concerning the multi-disciplinary and broad set of current oceanic sciences and marine technologies. The conference was attended by almost six thousand delegates registered in representation of institutions associated with research in marine sciences on a global level, along with some one hundred and something firms and organisations from the industry.

PLOCAN contributed with several communications about some of the projects currently in progress, which are described in greater detail in the section “publications and conferences” of this report.

On the 23<sup>rd</sup> of February, the PLOCAN facilities received a visit from the Secretary of State for Research, Development and Innovation of the AGE (THOROUGH THE CURRENT MINISTRY OF SCIENCE, INNOVATION AND UNIVERSITIES), Carmen Vela Olmo. During the visit, she had a brief meeting with the staff and later, the director showed her around the main on-shore facilities of the ICTS.



**Illustration 132. Visit by the Secretary of State for Research, Development and Innovation**

At the end of February, PLOCAN was visited by students from the BIMeTIC Master in ICT-Information and Communication Technologies – Solutions for Welfare and the Environment (BIMeTIC). The visit was part of the educational content of the master's and its main purpose was to make students aware of the on-shore facilities, as well as the infrastructure, capabilities, lines of work and activities, both operational and training in the area of science and technology that PLOCAN is currently engaged in, as a potential professional opportunity in the area of the ICTs and with application to the marine and maritime sectors.



**Illustration 133. Students from the BiMeTIC Master**

A group of students from the training ship TS Älva visited PLOCAN on the 9<sup>th</sup> of March. These students spend approximately two months, of a total of three years of training, aboard the TS Älva. This way, they can combine an extensive study programme with interesting visits in the different ports they stop over at, in order to complete their training.



**Illustration 134. Students from the TS Älva**

An industry meeting of the Canary Island Aquaculture sector was also held on the 9<sup>th</sup> of March as part of the Blue Growth Strategy, in order to explain the strategy from the standpoint of the Secretariat of Fisheries and as part of the Spanish fisheries sector. The meeting was chaired by the head of the Aquaculture Department of the Directorate General of Fisheries and Aquaculture Planning.



**Illustration 135. Participants in the aquaculture meeting**

Between the 13<sup>th</sup> and the 15<sup>th</sup> of March, PLOCAN took part in the twenty-fourth edition of Oceanology International 2018 held in London.



**Illustration 136. Oceanology International**

The presence of PLOCAN at the event, allowed them to disseminate some of the main international technological projects and initiatives (SWARMs, EUMarineRobots, AtlantOS, EMSO, etc.) and to promote the 9<sup>th</sup> edition of the Glider School and interact directly with suppliers and

international partners, reinforce co-operation ties and identify new synergies for future actions and discover the latest technological developments in the industry first hand. The event

allowed more than 1000 exhibiting companies and institutions to show their main and latest products and technological developments in sensors, autonomous marine observation platforms and arrays of their sensors, along with consulting services covering the operation and use of this kind of marine technology, among others, to over 8000 delegates.

On the 16<sup>th</sup> of March, PLOCAN received the visit of almost one hundred industrial engineers from the Santa Cruz de Tenerife College of Industrial Engineers (COITF) and the Official College of Industrial Engineers of the Eastern Canary Islands (COIICO), to celebrate their patron saint, San José. The visit started with an introduction to PLOCAN and its relations with the engineering sector, given by the director of the institution. The engineers then visited the facilities, including the glider laboratory, the warehouse for building and maintaining oceanic devices and the classroom used for training in educational robotics for Primary and Secondary students.



**Illustration 137. Introduction to PLOCAN during the visit by Industrial Engineers**

On the 21<sup>st</sup> of March, a business forum was organised in PLOCAN on the blue economy. Business, research centres and Spanish associations and clusters had the chance to discuss and forge possible alliances with companies from USA in the blue economy sector. The meetings formed part of a US business mission to the Canary Islands scheduled for 20<sup>th</sup>-22<sup>nd</sup> of March and organised by the US Department of Trade, the Maritime Alliance Association and the Regional Ministry of Economics, Industry, Trade and Knowledge of the Canary Island Government, through PROEXCA and PLOCAN. The activities included a presentation about the blue economy sector in the



**Illustration 138. Business forum with firms from USA**

Canary Islands in the offices of the President of the Canary Island Government in Las Palmas de Gran Canaria, and a first session of the business meeting in the Hotel Santa Catalina.

On the 12<sup>th</sup> of April, the director of PLOCAN took part in a conference on the management and transfer of knowledge generated in the public R+D system, convened by the President of the Canary Island Government. This meeting brought together all the knowledge-related public institutions in the Canary Islands with the top research authorities. The objective of the meeting

was to harness the economic benefit of transferring the knowledge generated in the Canary Island public system.



**Illustration 139. Canary Island Government conference on transferring knowledge**

On the 19<sup>th</sup> and 20<sup>th</sup> of April, PLOCAN took part in the annual ComCiRed event (Communicate Science On-Line) organised by the Spanish Foundation for Science and Technology in co-operation with the University of Granada. The event attracted 30 national scientific dissemination projects from 2017. Among these, PLOCAN presented "ROVINO – Low-Cost Educational Robotics with Arduino Technology". The event was aimed at Scientific and Innovation Culture Units (UCC+i), and its main purpose was for members of the UCC+i Network to spend two days getting to know each other and exchange experiences and best practice, as well as enjoying a series of interesting lectures in their area of work, all co-ordinated by FECYT.



**Illustration 140. PLOCAN presentation at ComCiRed**

From the 10<sup>th</sup> to the 12<sup>th</sup> of May, PLOCAN took part in the VIII International Sea Fair (FIMAR) held in Las Palmas de Gran Canaria. This received the visit of forty-five thousand people in the course of three busy days of activity. The exhibition offered a panoramic view of the test site, where off-shore renewable energy trials are currently being run, along with a series of other projects in the same field. As a prologue to the opening ceremony of FIMAR, and as part of it, the first Gran Canaria Blue Economy Forum was held in the Gran Canaria Conference Centre, where one session was devoted to "Prospects for Off-Shore Wind Technology in Canaries", in which the director of PLOCAN and the manager of Scientific-Technical Area intervened, along with speakers from Spanish and European firms from the sector. The conference addressed the funding instruments for entrepreneurship and innovation in the Canary Islands, and finished up with a round table that addressed the present and future of off-shore wind power.



**Illustration 141. PLOCAN stand at FIMAR 2018**



**Illustration 142. Opening ceremony of the Gran Canaria blue economy forum**

On the 30<sup>th</sup> of May, the Regional Councillor of Economic Development, Energy and R+D+i of the Cabildo of Gran Canaria (Island Government), Raúl García Brink, and the director of PLOCAN presented an assessment of the Gran Canaria Marine Robotics Workshop (EDUROV GC), which saw the participation of over 1,700 students from 44 schools from the island, and the “Blue Education” Summer Campus. In 2017, the Cabildo of Gran Canaria became involved in developing this initiative with a contribution of €17,800 for holding face-to-face workshops in PLOCAN as a preliminary step to holding these workshops in each school. Thanks to this contribution, 87% of the schools on the island took part in this programme, a figure that both institutions hope to exceed next year.



**Illustration 143. Visit to the robotics workshop by the representative of the Cabildo**

A conference entitled “Blue growth, challenge and opportunity: ULPGC-PLOCAN” was held in late April to mark the opening of the 26<sup>th</sup> of April hall in the Rectory of the ULPGC. The director of PLOCAN and the first chairman of the University of Las Palmas de Gran Canaria Social

Council gave a lecture during this event chaired by the president of the university, Rafael Robaina. The name of the hall commemorates the date on which the Canary Island Parliament enacted the Canary Island University Reorganisation Act, which gave rise to the creation of the University of Las Palmas de Gran Canaria, the 26<sup>th</sup> of April 1989. "The University and PLOCAN are the fruits of that date and of the same initiative that allows us to address problems we face today to be able to participate in the economic activity of the future associated with the sea" proclaimed Llinás. In his speech, he explained what PLOCAN is and what it means in the Canary Island science system. He pointed out that we need to be aware of the fact that the blue economy is an opportunity for society and for economic activity in the Canary Islands, and he claimed that co-operation between the University and PLOCAN was the smart option to even greater things that are being done by each one separately, as competition no longer takes place on a national or local level, but where "the major resources, the major companies and the major initiatives are".



**Illustration 144. Director's lecture at the ULPGC**

At the beginning of June, PLOCAN took part in a workshop on the role of off-shore renewable energies as an alternative power source in the island, organised jointly with the Ocean Energy Systems (OES) institution, as a preliminary event to the opening of the ICOE 2018 (International Conference on Ocean Energy 2018), an international benchmark on off-shore energy that will open on Tuesday the 12<sup>th</sup> of June in the city. The workshop analysed the opportunities and barriers to the local adoption of off-shore renewables in island communities from different standpoints, and the possible solutions to tackle the challenges faced by the sector. The objectives of the workshop were to address the achievements attained in the field of off-shore renewable energies and their applicability in island conditions, and to analyse the contribution made by the players involved in making use of energies of this kind.

On the 4<sup>th</sup> of July, the President of the Canary Island Government, Fernando Clavijo, visited the wind generator moored on the test site, along with a delegation that included the Regional Minister of Economy, Industry, Trade and Knowledge of the Canary Island Government, Pedro Ortega, and the Chairman of the Committee of Experts for the Study of Climate Change and to Foster the Circular and Blue Economy, Aridane González.

An industrial and scientific delegation from Japan took part in a conference focusing on off-shore wind power on the 6<sup>th</sup> of July and were then taken out to see the test site. The visit was organised by PLOCAN in co-operation with the CDTI (Centre for Technological Industrial Development), NEDO (Japanese Organisation for the Technological Development of New

Energies) and the JWPA (Japan Wind Power Association), as part of a Japanese mission to Spain that has attended several different sessions in Bilbao, Navarre and Madrid. The aim of these meetings is for representatives of Japanese companies to discover the capabilities of the Spanish industry and identify future challenges that could be tackled jointly. Japan is one of the countries with the best growth forecasts in the off-shore wind power market in the short-medium term, with special interest in the floating version for deep waters.



**Illustration 145. Japanese delegation visiting the area of the wind generator after the conference in PLOCAN**

The Deputy Chair of JWPA, Shigeru Yasu, spoke at the opening ceremony, along with the Canary Island authorities, pointing out that the Japanese Wind Power Association is the only umbrella organisation for the industry in the country, and it is comprised of 350 companies, 40 of which had taken part in the visit to PLOCAN and the test site. Once the technical session was over, the Japanese delegation were taken to the area of Jinámar to see the prototype Esteyco wind generator from shore. The delegation was also accompanied by the Regional Minister of Economy, Industry, Trade and Knowledge of the Canary Island Government, Pedro Ortega.

Scientists and technicians from German research institutions Fraunhofer and DFKI visited the PLOCAN facilities at the end of August to get a first-hand impression of the capabilities and potential for technological development and trials of marine robotics prototypes under real operational conditions offered by the ICTS on the marine test site. The meeting between the German delegation and the personnel of PLOCAN was an initial contact aimed at show-casing the capabilities and interests of each of the parties, in order to identify synergies through which to set up specific co-operation frameworks.



**Illustration 146. Representatives from Fraunhofer and DFKI on the PLOCAN test site**

PLOCAN took part in “Macaronight, The European Researchers’ Night” in Parque de Santa Catalina, Las Palmas de Gran Canaria. This is a public event held throughout Europe devoted to popular science and learning through playing, funded by Marie Skłodowska-Curie actions. It takes place each year in September with the participation of around 30 countries and over 300 cities. The purpose of European Researchers’ Night is to bring science and the daily routine of researchers to the general public, around projects implemented in Macaronesia. The contribution to “Macaronight” was made by the EDUROVs Educational Marine Robotics Initiative.



**Illustration 147. PLOCAN stand at the European Researchers’ Night**

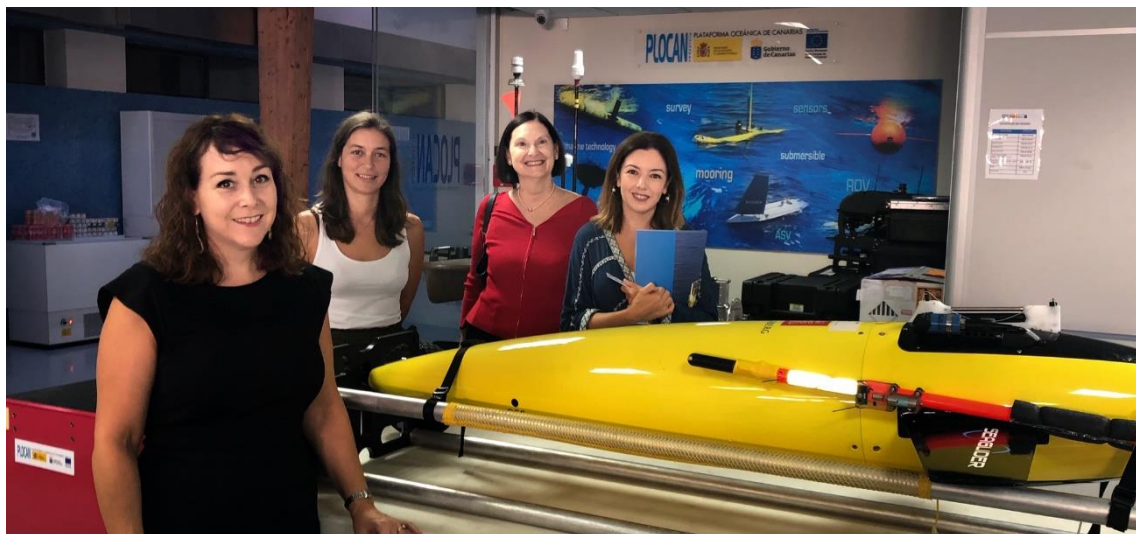
In early October, PLOCAN took part in the International Water and Energy Fair of the Canary Islands (Canagua&Energía). PLOCAN’s presence consisted of setting up a stand focusing on its sea-trials bed and the projects implemented around this relating to Blue Energy, including a boat trip for professionals at Canagua&energía to the area of the test site. The visitors had the chance to see the off-shore platform and the ELISA project wind generator, one of the latest

devices installed on the test site, and they were given ample information about the characteristics of the marine infrastructure and the wind generator of the ELISA project.



**Illustration 148. Canagua&Energía visit to the test site**

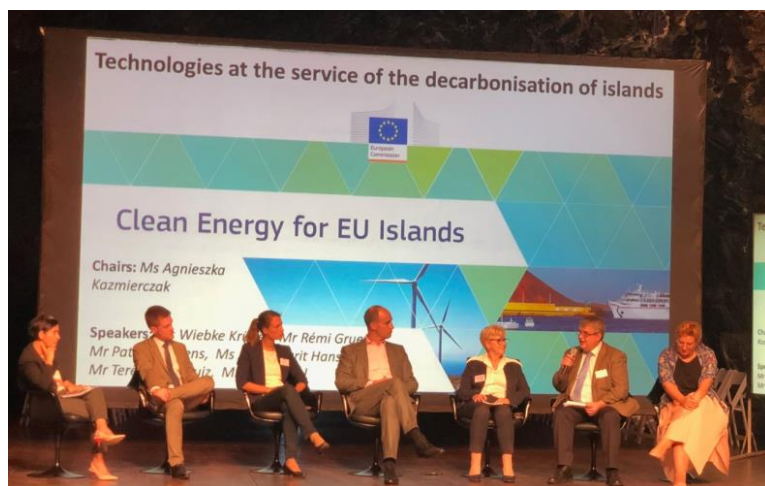
On the 11<sup>th</sup> of October, the consul general of the US Embassy in Madrid, Liza Petrush, visited the PLOCAN facilities, accompanied by the US consular agent Ana María Quintana Figueroa. The visit showed them the offices of PLOCAN, where they were shown the main lines of work done by ICTSs and the activities engaged in with the co-operation of American entities.



**Illustration 149. Visit by the US consul general in Madrid to the glider workshop**

In October, PLOCAN took part in Sea Tech Week held in Brest (France). This activity is described in the section of this report on “projects implemented and in progress”, and specifically in the description of the activities of the Atlantos project.

At the beginning of November, the head of the Scientific-Technical Area spoke at the II Forum of the Clean Energy for European Union Islands Initiative held in Lanzarote, representing Ocean Energy Europe, the European Renewable Energies Association, which PLOCAN forms part of, an umbrella organisation of 125 European institutions and companies from the marine renewable energy sector.



**Illustration 150. PLOCAN at the Forum of the Clean Energy for European Union Islands Initiative**

This forum was organised by the European Commission and the Canary Island Government, for the purpose of accelerating the energy transition process in the more than 2,700 islands of the EU. It attracted over one hundred civil servants from the EU and experts from the fields of politics, technology, energy, business, academe and social affairs, among others.

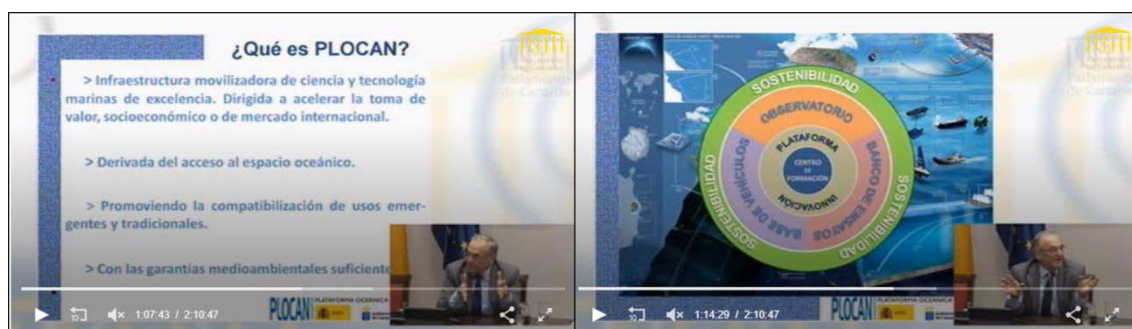
The President of the Canary Island Government, along with the Director General of Energy of the European Commission, Dominique Ristori, opened the forum and made a call for a "joint and co-ordinated effort between administrations and public and private agents of the EU to progress towards a clean and renewable-based energy model without delay".

In mid-November, PLOCAN took part in the Gran Canaria MiniFeria of Science and Innovation Weeks in the Canary Islands with the EDUROVs Educational Marine Robotics Initiative. The Gran Canaria MiniFeria is designed as a point of dissemination and demonstration of the work carried out in the island's main R+D+i centres.



**Illustration 151. Children at the Gran Canaria MiniFeria**

On the 21<sup>st</sup> of November, the director appeared before the Canary Island Parliament (gL/PCC-0193) at the Economy and Knowledge Committee, dealing with PLOCAN activities and the contribution it makes to Marine Science and Technology research.



**Illustration 152. Appearance before the Canary Island Parliament by the director**

On the 22<sup>nd</sup> of November, the President of the Canary Island Government and the Regional Minister of Economy, Industry, Trade and Knowledge received the EU Commissioner for Regional Policy, Corina Cretu, and the chairpersons and representatives of the outermost regions of the EU (OR), at the exhibition of PLOCAN on display at the El Mirador Shopping Centre. From here, they had a view of the platform for developing marine technology and knowledge.



**Illustration 153. The EU Regional Policy Commissioner after the event held in El Mirador**

President Clavijo highlighted the fact that the Canary Islands has a window onto the sea for research, innovation and excellence and that "the Canary Islands are situated as a tri-continental Atlantic platform for generating synergies among the outermost regions. A privileged position that comes on top of the fact that this Outstanding Scientific Technical Infrastructure of PLOCAN, is in alignment with the Regional Smart Specialisation Strategy (RIS3). This facility is on the Canary Island Government road map for the knowledge-based economy. These are two factors that promote our safe bet on the blue economy". The Regional Policy Commissioner declared that PLOCAN goes far beyond the ORs, "It is a project of Europe,

which has invested €7m in the infrastructure and many millions more in research projects”, she explained that the role that the ORs can play in research is highlighted in the new budgetary programme called “Horizon Europe”, “the idea of Horizon Europe is going to create new synergies to involve the ORs to work on renewable energies, climate change, biodiversity, the ocean and space technology”, and she announced support for all regions to develop the Blue Economy.

Prior to the opening of the exhibition, a video was shown about the off-shore infrastructure, with a virtual visit to the facilities that host researchers, and several projects with European funding were shown.

On the 23<sup>rd</sup> of November, PLOCAN presented two papers on the Macaronesia regional marine observation strategy (R3M) and the use and management of cutting-edge technologies for oceanic observation aimed at efficiently and sustainably enhancing capabilities and services, at the meeting “Evolving EOOS: Connecting communities for end-to-end solutions”, of the European Ocean Observation System, which hosted 400 experts and users from the field of international ocean observation in Brussels.



**Illustration 154. Participants at the Evolving EOOS meeting**

The Directorate General for Sea and Fisheries Affairs (DG-MARE) of the European Commission, along with the Secretariats of the European Marine Board (EMB), the European Global Ocean Observation System (EuroGOOS) and the European Marine Observation and Data Network (EMODnet), and the Advisory Committee of the EOOS (European Ocean Observation System), organised the event with a view to bringing together the main sectors, industry, academe/research and government, who manage, conduct and depend on Europe’s capacity for ocean observation for discussions and to show and assess the current capacity and establish prognoses for the future and connect the different communities and sectors that manage and conduct ocean observation with those that depend on its products and services.

Apart from the papers presented, PLOCAN also took part in several thematic groups that gave rise to proposals and recommendations that were put to the summary and wrap-up session of the EOOS event by a panel of experts designed by DG-MARE and moderated by the Director of EuroGOOS. The event closed with interventions from the Executive Secretary of the UNESCO International Oceanography Committee (IOC) and the European Commissioner for the Environment, Marine Affairs and Fisheries (DG-MARE).

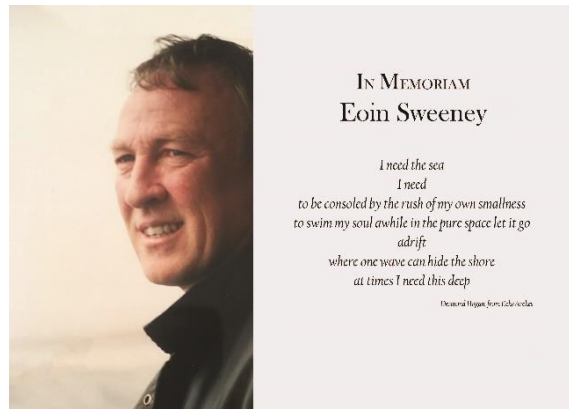
From the 25<sup>th</sup> to the 27<sup>th</sup> of November, PLOCAN took part in the fourth high-level intergovernmental meeting of 'Atlantic Interactions-AIR Centre' held in the Alfredo Kraus Opera House in Las Palmas de Gran Canaria. The Spanish Minister of Science, Innovation and Universities, Pedro Duque, signed the Declaration of the Canary Islands, which rolls out the AIR Centre intergovernmental initiative, with the objective of driving research programmes and projects dealing with the Atlantic Ocean. The declaration was signed by Portugal, Nigeria, Cape Verde, Angola and Sao Tomé y Príncipe, as well as Spain. This initiative, which is open to other countries from both shores of the Atlantic to sign up to, will focus on five main areas: Space, Atmosphere, Climate-Energy, Ocean and Data Analysis and Computing. This way, the centre will contribute to the sustainable development of the countries and regions of the Atlantic.

AIR Centre is organised as a distributed international network in which the research facilities of different countries will provide services to the programme's initiatives. To facilitate governance, an Association for the Development of the AIR Centre has been set up, with PLOCAN as the entity that represents Spain in this association.



**Illustration 155. PLOCAN at the AIR Centre meeting held in Gran Canaria**

On the 28<sup>th</sup> of November, a conference was organised entitled "Blue growth in the Central Atlantic economy" in Casa África, Las Palmas de Gran Canaria, for the purpose of reinforcing the competitiveness of blue economy companies of the regions of Macaronesia. The conference was held as part of the SmartBlue project described in the section "Projects implemented and in progress". At the end of the conference, posthumous tribute was paid to Eoin Sweeney, the Irish economist behind the first marine policy in Ireland and an enthusiastic co-operating partner with PLOCAN right from the beginning.



**Illustration 156. Tribute to Eoin Sweeney**

The 35<sup>th</sup> meeting of the International Energy-Ocean Energy System Agency (IEA-OES)'s Executive Board was held in PLOCAN on the 30<sup>th</sup> of November in collaboration with the MARINERG-I project and the Local Energy Authority of the Cabildo of Gran Canaria. Ocean Energy Systems (OES), also known as the Technological Collaboration Programme in Ocean Energy Systems, is an intergovernmental collaboration among countries within a framework established by the International Energy Agency in Paris.

The OES brings together world experts to advance research, the development of off-shore renewable energies, like tide, wind, current, temperature gradient (oceanic thermal energy conversion and submarine geo-thermal energy) and salinity gradient for generating electricity and other uses, such as desalination, through international co-operation and the exchange of information.

The OES currently has 25 member countries from all over the world, along with other observer countries in the process of joining. The Executive Board (ExCo) is the OES decision-making body that meets twice a year to discuss the Work Programme. Delegates had the chance to visit the PLOCAN infrastructure and gain information on the projects in the Blue Economy sector, both in progress and planned.



**Illustration 157. Participants in the OES meeting in PLOCAN**

A delegation of students and teachers from the Swedish maritime school Marina Läroverket visited the PLOCAN offices in Taliarte at the end of December, as part of their training stage aboard the training ship Älva in Canary Island waters, giving them the chance to get a closer look at the main lines of action and capabilities of the Consortium, the facilities themselves and some of the scientific-technical equipment used for engaging in these activities. Marina Läroverket is a school based in the port of Stocksund, Stockholm, which provides secondary and adult education and separate courses on demand, in subjects such as marine biology, aquiculture, geology and marine technologies, among others. Their method is to base much of their activity on field work aboard its fleet of training ships.



**Illustration 158. Students from the TS Älva watching a video about PLOCAN**

## PUBLICATIONS AND COMMUNICATIONS TO CONFERENCES

| KIND OF BENEFICIARY       | TITLE OF THE BENEFICIARY                 | TITLE OF THE PUBLICATION                                                                               | AUTHORS                                                                                                                                             |
|---------------------------|------------------------------------------|--------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Book Chapter              | Colorimetry and Image Processing, pp     | Color Reconstruction and Resolution Enhancement                                                        | Eduardo Quevedo Gutiérrez y Gustavo Marrero Callicó                                                                                                 |
| Dissemination Journal     | ROV Planet - Issue 14 (Q1/2018) pp. 47   | The Oceanic Platform of the Canary Islands - A Mu with a Base for Autonomous Ocean Vehicles            | Carlos Barrera                                                                                                                                      |
| Book Chapter              | Aquaculture Perspective of Multi-Use     | The EU-Project "TROPOS"                                                                                | Nikos Papandroulakis, Claudia Thomsen, Katja Mintenb Hernández-Brito                                                                                |
| Dissemination Journal     | Ronda Iberia                             | Ciencia inmersiva                                                                                      | Ronda Iberia                                                                                                                                        |
| Conference                | Ocean Sciences Meeting                   | A biogeochemical vision of data compilation from                                                       | A. Cianca, C. Barrera, J. Hernández Brito, M. J. Rueda y C                                                                                          |
| Conference                | Ocean Sciences Meeting                   | Observation of two mesoscale events anomalies w                                                        | M. Villagarcía, A. Cianca, C. Barrera, M. J. Rueda y O. Llin                                                                                        |
| Conference                | Ocean Sciences Meeting                   | Smart and Networking Cooperation Meshes for Ur                                                         | Daniel A. Real-Arce, C. Barrera, T. Morales, J. Hernánde                                                                                            |
| Conference                | Ocean Sciences Meeting                   | R3M: The Ocean-Monitoring Strategy in the Maca                                                         | M.J. Rueda, C. Barrera, A. Cianca, J. Hernández-Brito y C                                                                                           |
| Conference                | Ocean Sciences Meeting                   | Expanding ocean-monitoring capabilities in the Mi                                                      | C. Barrera, C. Waldmann, R. Caldeira, R. Morán, T. Mora Hernández-Brito y O. Llinas                                                                 |
| Conference                | Ocean Sciences Meeting                   | The PLOCAN Ocean Data Portal                                                                           | C. Almísis, T. Morales, C. Barrera, O. Llinás, M.J Rueda                                                                                            |
| Dissemination Journal     | Muy Interesante                          | PLOCAN, una puerta al mar                                                                              | Muy Interesante                                                                                                                                     |
| Conference                | Oceanology International 2018            | Poster SWARMs                                                                                          | Daniel Alcaraz, Carlos Barrera, Joaquín H. Brito, María J                                                                                           |
| Scientific Journal        | Journal of Analytical Methods in Chem    | In Situ Miniaturised Solid Phase Extraction (m-SPE Samples                                             | B. Abaroa-Pérez, G. Sánchez-Almeida, J. J. Hernández-I                                                                                              |
| Scientific Journal        | Measurement                              | Smart Embedded Passive Acoustic Devices for Real-Time Hydroacoustic Surveys                            | Daniel Mihai Toma, Ivan Masmitja, Joaquín del Río, Enoc Martínez, Carla Artero-Delgado, Alessandra Cervantes, Pablo Ruiz, Simone Memè y Eric Delory |
| Final Degree Dissertation | University of Las Palmas de Gran Canaria | Diseño de Metodología Miniaturizada para la Extracción de Contaminantes Químicos en Sedimentos Marinos | Elena Fátima Barrera Flores                                                                                                                         |
| Final Degree Dissertation | University of Las Palmas de Gran Canaria | Análisis Químico de Residuos Industriales Plásticos Contaminantes Procedentes de Muestras Marinas      | Atteneri Esther Caballero Martel                                                                                                                    |

|                             |                                                                                      |                                                                                                                                                 |                                                                                                                                                                                                                 |
|-----------------------------|--------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Final Degree Dissertation   | University of Las Palmas de Gran Canaria                                             | Diseño de Metodología Miniaturizada para la Extracción de Contaminantes Químicos en Sedimentos Marinos                                          | Cervantes, Pablo Ruiz, Simone Memè y Eric Delory                                                                                                                                                                |
| Final Degree Dissertation   | University of Las Palmas de Gran Canaria                                             | Análisis Químico de Residuos Industriales Plásticos Contaminantes Procedentes de Muestras Marinas                                               | Atteneri Esther Caballero Martel                                                                                                                                                                                |
| Final Master's Dissertation | Norwegian University of Science and Technology and Chalmers University of Technology | Time Domain Simulation Parameters for Fatigue Assessment of an Offshore Gravity Base Wind Turbine                                               | Álvaro Ortega Nadal                                                                                                                                                                                             |
| Scientific Journal          | Ocean and Coastal Management                                                         | Co-location opportunities for renewable energies and aquaculture facilities in the Canary Archipelago                                           | Carlos V. C. Weiss, Bárbara Ondiviela, Xabier Guinda, Fernando del Jesús, Javier González, Raúl Guanche y José A. Juanes                                                                                        |
| Conference                  | EMRA 2018                                                                            | Technical improvements in Unmanned Vehicles working in SWARMS                                                                                   | Daniel A. Real-Arce, C. Barrera, T. Morales, J. Hernández and O. Llinás for the SWARMS consortium                                                                                                               |
| Conference                  | Hydrographic Engineering Conference                                                  | Technical improvements for AUV's in SWARMS                                                                                                      | C. Barrera, Daniel A. Real-Arce, T. Morales, J. Hernandez and O. Llinas for the SWARMS consortium                                                                                                               |
| Conference                  | Hydrographic Engineering Conference                                                  | Improving monitoring capabilities in the Macaronesian region with ocean gliders                                                                 | C. Barrera, R. Caldera, C. Waldmann M.J. Rueda, J. Hernandez and O. Llinas                                                                                                                                      |
| Conference                  | AUV 2018                                                                             | Ocean-gliders contribution to improve monitoring capacity in the East-Central North Atlantic                                                    | C. Barrera, D. A. Real-Arce, C. Waldmann, R. Caldera, M.J. Rueda, J. Hernández and O. Llinás                                                                                                                    |
| Conference                  | AUV 2018                                                                             | Smart and Networking Cooperation Meshes for Unmanned Underwater Vehicles                                                                        | Daniel A. Real-Arce, C. Barrera, T. Morales, J. Hernández and O. Llinás, for the SWARMS Consortium                                                                                                              |
| Conference                  | MARTECH 2018                                                                         | Smart Sensing Interoperability Platforms in the scope of AtlantOS                                                                               | Daniel A. Real-Arce, Ehsan Abdi, Enoc Martínez, E. Delory, C. Barrera, J. Hernández-Brito and O. Llinás                                                                                                         |
| Conference                  | MARTECH 2018                                                                         | Ocean-monitoring operations in the Macaronesia with unmanned mobile platforms                                                                   | C. Barrera, C. Waldmann, R. Caldera, D. Alcaraz, MJ Rueda, J. Brito and O. Llinás                                                                                                                               |
| Workshop                    | The drone sector for professionals in Gran Canaria - SPEGC                           | Unmanned systems for ocean observation and dissemination: Trends and Opportunities                                                              | C. Barrera, J. Brito and O. Llinas                                                                                                                                                                              |
| Conference                  | EOOS Conference 2018                                                                 | Ocean-Monitoring Strategy in the Macaronesia region: the R3M Network                                                                            | C. Barrera, A. Cianca, E. Brito de Acevedo, R. Caldera, MJ. Rueda, J. Brito and O. Llinas                                                                                                                       |
| Conference                  | EOOS Conference 2018                                                                 | Expanding observing capabilities in the East-Central north Atlantic area with ocean gliders                                                     | C. Barrera, C. Waldmann, R. Caldera, MJ. Rueda, A. Cianca, J. Brito, and O. Llinas                                                                                                                              |
| Conference                  | EOOS Conference 2018                                                                 | Challenges for Sustainable Monitoring and Evaluation of the Marine Strategy Framework Directive in the Atlantic offshore waters: IFADO project. | Campuzano F., Dabrowsky T., Groom S., Ruiz-Villareal M., Brotas V., Kaufmann M., Hartman S., Oliveira P., Martins A. , Juliano M., Vieira F., Lux M., Barrera C., Rebour X., Simao A.P., Garcia M. and Neves R. |

## COMMUNICATION

In the framework of the communication plan in 2018, promotion actions were taken in the press, covering certain events and milestone. The list of news items that mentioned PLOCAN and which were printed in the press is as follows:

| DATE     | MEDIUM                 | HEADLINE                                                                          |
|----------|------------------------|-----------------------------------------------------------------------------------|
| 3/01/18  | La Provincia           | Robots, culture and improvement                                                   |
| 15/01/18 | La Provincia           | The Cabildo earmarks € 21m for technological projects                             |
| 7/02/18  | La Provincia           | PLOCAN and Esteyco will install the first wind generator at sea before the summer |
| 7/02/18  | Canarias 7             | Agreement between the Dept. of Fisheries and the Oceanic Platform                 |
| 7/02/18  | La Opinión de Tenerife | PLOCAN and Esteyco will install the first wind generator before the summer        |
| 7/02/18  | Canarias7              | A blue 2018 for Gran Canaria                                                      |
| 8/02/18  | La Provincia           | Macaronesia opts for smart specialisation                                         |
| 15/02/18 | La Opinión de Tenerife | Ortega the blue economy the drive demanded by the European Union                  |
| 15/02/18 | Canarias 7             | Canaries advance in their Blue Economy strategy                                   |
| 15/02/18 | La Provincia           | Ortega gives the blue economy the drive demanded by the European Union            |
| 16/02/18 | La Provincia           | Marrero "The Blue Economy could double its percentage of the Canary Island GDP"   |
| 23/02/18 | La Provincia           | Th estate injects 6m in the Island to reactivate marine research                  |
| 13/03/18 | El Día                 | The Cabildo supports Garachico in its demand for monitoring waves                 |
| 16/03/18 | El Día                 | The Canary Island Government will install the wave monitoring buoy this year      |
| 25/03/18 | Canarias 7             | Engineers in PLOCAN                                                               |
| 25/03/18 | Canarias 7             | A bio-axis for the blue economy                                                   |
| 2/04/18  | La Provincia           | European Union PLOCAN Announcement                                                |
| 3/04/18  | El Día                 | European Union PLOCAN Announcement                                                |
| 12/04/14 | La Provincia           | The remains of liquid natural gas in ports under discussion in La Luz             |
| 21/04/18 | Canarias 7             | 26th April Hall in the ULP GC                                                     |
| 5/05/18  | La Provincia           | The telescopic wind generator, assembled and ready for installation               |
| 31/05/18 | Canarias 7             | The first off-shore wind generator of Spain installed in the island in June       |
| 1/06/18  | La Provincia           | Robots to fatten future scientists                                                |
| 1/06/18  | La Opinión             | Robots to fatten future scientists                                                |

|          |                        |                                                                                                    |
|----------|------------------------|----------------------------------------------------------------------------------------------------|
| 11/06/18 | Diario de Avisos       | Educational robots “for playing” from the Canary Island Oceanic Platform end up in the Royal Guard |
| 21/06/18 | Canarias 7             | The first off-shore wind generator in Spain sets out for the Jinámar coast                         |
| 21/06/18 | La Provincia           | The first off-shore wind generator in Spain sails from Arinaga to the Jinámar coast                |
| 22/06/18 | Diario de Avisos       | The prototype of the first off-shore wind generator in Spain starts to moor in Gran Canaria        |
| 22/06/18 | Canarias7              | The wind generator is installed in the sea at Jinámar and will raise its 90-metre tower            |
| 22/06/18 | Canarias7              | The wind generator is installed in the sea at Jinámar and will raise its 90-metre tower            |
| 22/06/18 | La Provincia           | The wind generator now looks at The Triton                                                         |
| 24/06/18 | La Provincia           | Canaries stands out in energy                                                                      |
| 30/06/18 | Canarias 7             | A clean energy giant                                                                               |
| 30/06/18 | Canarias 7             | A marine giant that marks a milestone in renewable energy                                          |
| 30/06/18 | La Provincia           | The PLOCAN test site will have two more off-shore wind generators                                  |
| 30/06/18 | El Día                 | Canaries to test the first off-shore wind generator in the country                                 |
| 30/06/18 | La Opinión de Tenerife | The PLOCAN test site to have two more off-shore wind generators                                    |
| 1/07/18  | Canarias7              | A mill in La Marfea                                                                                |
| 1/07/18  | Canarias7              | A great blue future for the Canary Islands                                                         |
| 2/07/18  | La Provincia           | The PLOCAN wind tower in all its glory                                                             |
| 7/07/18  | La Provincia           | Off-shore wind energy attracts a delegation of 40 Japanese companies                               |
| 7/07/18  | La Opinión             | Off-shore wind energy attracts a delegation of 40 Japanese companies                               |
| 7/07/18  | Canarias 7             | Japan discovers the wind power advances of Canaries                                                |
| 25/07/18 | La Provincia           | The Cluster will bring together 40 experts in renewable energies from the Atlantic area            |
| 3/08/18  | La Provincia           | Testing robots in the south of the island for studying and conserving whales and dolphins          |
| 3/08/18  | Canarias 7             | PLOCAN tests technologies for studying whales and dolphins                                         |
| 3/08/18  | El Día                 | A new vehicle studies cetaceans                                                                    |
| 6/08/18  | La Opinión             | Canaries tests robots for studying and conserving whales and dolphins                              |
| 6/08/18  | Canarias 7             | An experimental zone next to PLOCAN                                                                |
| 6/09/18  | La Provincia           | Canaries wastes the fishing potential in the industry                                              |
| 7/09/18  | La Opinión             | Canarias wastes the fishing potential in the industry                                              |
| 13/09/18 | La Provincia           | Europe drives the development of off-shore energy in islands                                       |

|          |                  |                                                                                              |
|----------|------------------|----------------------------------------------------------------------------------------------|
| 6/10/18  | Canarias7        | Gliders launched into the sea at Taliarte                                                    |
| 6/10/18  | La Provincia     | Taliarte, world glider capital                                                               |
| 7/10/18  | Canarias 7       | Blue strategy for the island                                                                 |
| 1/11/18  | La Provincia     | Blue economy in Canaries: an inspiration for Europe                                          |
| 15/11/18 | Canarias7        | The off-shore wind generator continues to wait to be connected to the shore                  |
| 17/11/18 | La Provincia     | The King and Juncker to meet in the Islands at the OR Summit marked by "Brexit"              |
| 18/11/18 | Canarias 7       | Canaries, the laboratory of the seas                                                         |
| 18/11/18 | La Provincia     | La Esfinge Dock, model for generating power from the waves                                   |
| 20/11/18 | Canarias7        | The acidification of the sea triggers the mass development of toxic algae                    |
| 20/11/18 | La Provincia     | CO2 sews the sea with toxic algae                                                            |
| 20/11/18 | Canarias 7       | The blue economy generates 7.5% of jobs and 6.4% of regional GDP                             |
| 20/11/18 | El Día           | The blue economy generates almost 59,000 jobs                                                |
| 20/11/18 | Diario de Avisos | The blue economy represents 7.5% of jobs and 6.4% of GDP                                     |
| 20/11/18 | La Opinión       | The blue economy provides almost jobs for almost 60,000 people in the Islands                |
| 21/11/18 | Canarias 7       | The ORs negotiate so that "Brexit" does not give rise to a cut-back in funds                 |
| 22/11/18 | El Día           | One single off-shore wind generator can cover the entire demand of La Palma                  |
| 23/11/18 | La Provincia     | The outermost regions will not allow Brussels to close its crisis with further spending cuts |
| 23/11/18 | La Provincia     | The King closes the conference today                                                         |
| 23/11/18 | La Opinión       | The outermost regions will not allow Brussels to close its crisis with further spending cuts |
| 23/11/18 | La Opinión       | The King closes the conference today                                                         |
| 23/11/07 | Canarias 7       | Canaries showcase their blue economy and energy projects                                     |
| 24/11/18 | Diario de Avisos | Felipe VI calls for "belief in all the singularities to understand Europe"                   |
| 26/11/18 | La Provincia     | PLOCAN brings the steers the Canary Island economy towards technological development         |
| 26/11/18 | Canarias 7       | Support for the Atlantic Research Centre                                                     |
| 27/11/18 | La Provincia     | Canaries lead the Spanish researchers' Network on the Atlantic                               |
| 27/11/18 | La Provincia     | All the studies of the Atlantic driven by Spain will be routed through PLOCAN                |
| 27/11/18 | Canarias 7       | Octavio Llinás: "PLOCAN channels Spanish investment"                                         |

|          |                  |                                                                               |
|----------|------------------|-------------------------------------------------------------------------------|
| 27/11/18 | Canarias 7       | PLOCAN to be the Spanish partner in the Atlantic research centre              |
| 27/11/18 | El Día           | Hispano-Portuguese agreement with African countries for research              |
| 27/11/18 | Diario de Avisos | Duque signs an agreement for studying the Atlantic                            |
| 27/11/18 | La Opinión       | All the studies of the Atlantic driven by Spain will be routed through PLOCAN |
| 29/11/18 | Diario de Avisos | Canaries bet on promoting the blue economy in Macaronesia                     |
| 29/11/18 | El Día           | Ortega encourages the blue economy in Macaronesia                             |
| 29/11/18 | La Provincia     | Canaries drive an Alliance for blue growth in Macaronesia                     |
| 29/11/18 | La Opinión       | Canaries drive an Alliance for blue growth in Macaronesia                     |
| 29/11/18 | Canarias 7       | The Government bets on the blue economy                                       |
| 2/12/18  | La Provincia     | We are developing technologies for electric ships to re-charge at sea         |
| 2/12/18  | La Opinión       | We are developing technologies for electric ships to re-charge at sea         |
| 9/12/18  | Canarias 7       | Nutrient lift in the middle of the sea                                        |
| 9/12/18  | La Provincia     | The raw material for plastics pollutes the waters of the Canary Islands       |
| 9/12/18  | La Provincia     | The raw material for plastics pollutes the waters of the Canary Islands       |
| 9/12/18  | La Opinión       | The raw material for plastics pollutes the waters of the Canary Islands       |

## CORPORATE SOCIAL RESPONSIBILITY

In compliance with CSR, initiatives and actions relating to environmental conservation, the continued advance in matters of rights and the development of employment policies applicable to the employees and with the advance in matters of efficiency and quality of services are included in this report.



### ENVIRONMENTALLY FRIENDLY MEASURES



### EMPLOYMENT RIGHTS AND POLICY RELATED MEASURES



### GOOD GOVERNANCE RELATED MEASURES

**Illustration 159. Classification of CSR measures addressed by PLOCAN**

The first group includes measures concerning water, electricity, paper and other raw material consumption, the control of emissions and spills, waste and its recycling, environmental management and biodiversity.

The second group includes social dialogue and collective bargaining, equality policies, work-life balance, health and safety in the workplace, training and promotion, the means and organisation of work and performance assessment.

The third group includes measures concerning transparency and public information, actions relating to stakeholders, service quality, communication and innovation in organisational matters.

## MANAGEMENT SYSTEM

The PLOCAN integral management system (IMS) is certified to cover “marine science and technology services and the administrative management associated with training schools and management of oceanic observation, marine energy, submarine sensors and vehicles, blue economy and growth and biodiversity and sustainability services. PLOCAN operations were conducted in line with the procedures included in the IMS in 2018 and pursuant to the following ISO and OHSAS standards ISO 9001, ISO 14001 and OHSAS.

An internal audit was conducted on the 22<sup>nd</sup> of March. The internal Audit was carried out by Auditorías Ambientales Canarias S.L. The system was audited in accordance with the new versions of the following standards UNE EN ISO 9001:2015 and UNE EN ISO 14001:2015 (updated) and the OHSAS 18001 standard. As no breaches of the standards were found and no comments made, the audit concluded that the IMS had been satisfactorily implemented and under control in general. All the staff intervening in the control of the documentation knows how the system works.

On the 27<sup>th</sup> of March, a review was conducted by the senior management at a meeting of the director, the head of maintenance and the head of the IMS. Pursuant to the standards the pertinent procedure and the results of the internal audit analysed: the risks and opportunities, legal compliance, external and internal communications, complaints, breaches of standards, satisfaction surveys, the assessment of suppliers, compliance of the training plan and PLOCAN behaviour regarding the environment and health and safety in the workplace. The conclusion drawn was that the system was on-track with respect to its degree of maturity and that it contributed to the organisation's strategy plan and its objectives.

The external audit was conducted on the 3<sup>rd</sup> and 4<sup>th</sup> of April by SGS, the company that certifies management systems. The audit team comprised of two auditors came to the PLOCAN offices for two days to analyse compliance with IMS procedures. Two minor breaches of protocol were found in the audit of quality and environmental standards. One of these concerned an environmental objective and the other the processing of some points of the minutes of the senior management review. PLOCAN was given 30 days to send proposed corrective actions to the head auditor. After making the modifications indicated, IMS issued documents to certify that the PLOCAN Consortium was assessed on compliance of the requirements of the three standards.

## HEALTH AND SAFETY

Apart from the continued application of all the H&S procedures of the aforementioned management system, the leading H&S measures taken in 2018 were the following:

- Renewal of the contract with the external health and safety agency PREVING for the PLOCAN shore facilities.
- Training of staff in general and specific health and safety aspects, depending on each job description, including handling the semi-automatic defibrillator (DESA).
- External H&S audit, giving rise to the renewal of the OHSAS 18001 certificate.

Regarding the H&S activities carried out on the platform in 2018, the first version of the platform Operations Manual has been drafted in collaboration with the Stier off-shore training centre that is Opito certified. The off-shore self-protection plan has also been drawn up and an external service (ESP) hired. The main purpose of the ESP was to draft an H&S plan that includes a risk assessment of the platform, planning of preventative action to reduce the chances of occurrence and the severity of the consequences of these risks, and training and information for employees.

## PLOCAN IN FIGURES

This section analyses the most important figures concerning the liquidation of the budget for 2018.

### REVENUE AND CONTRIBUTIONS 2018

Total revenues and contribution for 2018 amount to €14,564,319.05. Revenues include, among others, those arising from the ordinary allocations of the consortium bodies (AGE through the current Ministry of Science and Innovation and the Canary Island Government - €2,085,853.00) and those earned from PLOCAN's participation in R+D+I projects from national and international bodies (€4,611,744.35).

| ITEM                          | AMOUNT                |
|-------------------------------|-----------------------|
| <b>REVENUES</b>               | <b>€14,199,469.96</b> |
| -Revenues from previous years | 7,423,856.25          |
| -Revenues from Projects       | 4,611,744.35          |
| - Ordinary Allocations        | 2,085,853.00          |
| - Financial Revenues          | 1.94                  |
| - Revenues from Activities    | 78,014.42             |
| <b>OTHER CREDITORS</b>        | <b>364,849.09</b>     |
| <b>TOTAL</b>                  | <b>14,564,319.05</b>  |

### OPEX AND CAPEX 2018

Opex and capex for 2018 includes the sum of an Aquisition of fixed assets that amounts to €1,616,535.51. There is also the sum for expenses arising from conducting R+D+i projects (€1,046,451.16).

| ITEM                                 | AMOUNT               |
|--------------------------------------|----------------------|
| Personnel                            | 1,321,454.80         |
| Current Expenses, Goods and Services | 699,739.92           |
| Acquisition of fixed assets          | 1,616,535.51         |
| Training                             | 112,157.09           |
| Project expenses                     | 1,046,451.16         |
| Others                               | 147,012.43           |
| Amount committed                     | 9,62,96.14           |
| <b>TOTAL</b>                         | <b>14,564,319.05</b> |

## CONTRACTS

| Contract number            | Type of contract | Object of contract                                                                                                                                                         | Form of award               | Date of Award of Declaration of Null and Void Procedure | Estimated value | Tender budget w/on IGC | Sum of award w/o IGC | Beneficiary                                           |
|----------------------------|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|---------------------------------------------------------|-----------------|------------------------|----------------------|-------------------------------------------------------|
| L-CSU-PA-1/2018            | Supplies         | Acquisition of an unmanned profiler glider                                                                                                                                 | Open                        | 10/12/18                                                | €334,000.00     | €334,000.00            |                      | Null and Void                                         |
| L-CP5-PAS-2-2018           | Service          | Service contract for first-level controller to verify the IFADO Project expenses, INTERREG Atlantic Space programme 2014-2020.                                             | Simplified open             | 19/09/18                                                | €8,000.00       | €6,200.00              | €6,000.00            | CET Auditores, S.L.                                   |
| L-CSU-PAS-3-2018           | Supplies         | Acquisition of two submersible optical analysers (ultraviolet) to measure nitrate in sea water and use on long-term oceanographic moorings                                 | Simplified open             | 19/09/18                                                | €77,000.00      | €77,000.00             | €76,206.00           | EMS Sistemas de Monitorización Medio Ambiental, S.L.U |
| L-CP5-PA-4-2018<br>(LOT 1) | Service          | Cleaning service contract for the on-shore offices of the Consortium to design, build, fit out and manage the Canary Island Oceanic Platform                               | Open                        | 21/12/19                                                | €100,000        | €100,000               | €97,300.00           | Proyectos y servicios generales Hespérides, S.L.      |
| L-CP5-PA-4-2018<br>(LOT 2) | Service          | Cleaning service contract for the on-shore offices of the Consortium to design, build, fit out and manage the Canary Island Oceanic Platform                               | Open                        | 21/12/19                                                | €57,600.00      | €48,000.00             | €33,600.00           | Proyectos y servicios generales Hespérides, S.L.      |
| L-CP5-PASA-5-2018          | Service          | Health insurance service contract for Consortium employees working on the design, building, fitting out and managing the Canary Island Oceanic Platform                    | Abbreviated simplified open | 16/01/19                                                | €34,920         | €34,920                | €27,360.00           | DKV Seguros y reaseguros, S.A.E.                      |
| L-CP5-PASA-6-2018          | Service          | General/maritime public liability insurance service contract for the Consortium for the design, building, fitting out and management of the Canary Island Oceanic Platform | Abbreviated simplified open | 31/01/19                                                | €30,000.00      | €30,000.00             | €26,537.50           | RSA LUXEMBOURG, S.A. Sucursal en España               |
| L-CSU-PA-7/2018            | Supplies         | Acquisition of an unmanned profiler glider                                                                                                                                 | Open                        |                                                         | €334,000.00     | €334,000.00            |                      | Pending publication of tender announcement            |
| L-CO-PA-8-2018             | Works            | Works contract "functional adaptation of the on-shore offices of the PLOCAN consortium platform".                                                                          | Open                        |                                                         | €2,774,988.93   | €2,774,988.93          |                      | Pending publication of the tender announcement        |



