DESCRIPTION REPORT OF THE RESEARCH INFRASTRUCTURE

PLOCAN consorcio M.P. PLATAFORMA OCEÁNICA DE CANARIAS

GOBIERNO DE ESPAÑA

Gobierno de Canarias

STRATEGIC PLAN 2021-2024

Contents of the Strategic plan

Executive summary

PLOCAN ICTS aims to fulfil a dual role. At the global level, it aspires to be an international reference facility to provide solutions to the main scientific, technological, social, and environmental challenges of this Decade of the Oceans, Green Deal, and the Digital Transformation. At the local level, it seeks to be driving force and catalyst for the development of an innovation ecosystem around the blue and circular economy, based on knowledge and scientific excellence. To do so, it combines the provision of unique test facilities for knowledge development and technologies acceleration that will drive progress forward, with promoting exploration of the nearby oceanic region, effective preservation of natural heritage and sustainable use of renewable resources, contributing to the creation of equitable prosperity, social and economic value, and a sense of responsibility in the management and use of the marine environment.

PLOCAN strategy for the coming years is to deliver critical marine testing services and data required by research teams and technology developers to accelerate the validation, standardisation, and continued innovation of *Marine Renewable Energy (MRE) and observation* technologies. It will provide the data and scientific findings to the public sector and to industry for efficient, safe, and sustainable regulation and use of these technologies, building prosperity and preserving the services that ecosystems naturally provide. It will contribute to the restoration and conservation of the environment, to its sustainable and responsible use, and to fostering a new relationship with marine ecosystems and their users. The strategy strengthens the alignment of PLOCAN and its research excellence with internationally agreed missions and needs for the coming decades and generations, while creating a multiplier effect and acting as a catalyst in the local social and economic environment, to find workable solutions that will provide a way out of the economic crisis caused by COVID-19.

The strategy focuses on upgrading and improving current services, facilities, internal organisation, and impact. It aims to better align services with facilities, the internal organisation that provides them and the regulatory or financial aspects that shape them. It also seeks to coordinate efforts with international research infrastructures that pursue similar goals, with an awareness of the global coordinated action that is essential to achieve the proposed objectives. The challenges are global in scale and cannot be met by a single country or research facility. Internationally coordinated resources of all kinds are needed, along with the revision of standards, and it is essential that they advance at the same time as knowledge and technological capabilities. Finally, the strategy addresses the continuous measurement and evaluation of results and user needs, the policy and regulatory context, return on investment, and the efficient dissemination of results and transfer of research findings to society.

In all the scenarios, it is essential that there is progress in disseminating the activity pursued, the services provided, their unique features or their impact on excellence in knowledge creation. It is particularly necessary to disseminate the relevance of this ICTS in efficient protection, sustainable production, and equitable prosperity in marine ecosystems and for their users, creating a new dimension in which dissemination and evaluation are coordinated with a view to measuring and quantifying the resulting impacts, while also assessing the intangible elements generated at local and national level. The work that PLOCAN can do to create this new awareness among stakeholders – and in enhancing the knowledge of society as a whole about the importance of the oceans – will also be one of the most lasting and valuable legacies of its work.

Finally, the strategy will pay special attention to accelerating digital transformation processes and the data value chain. The new reality resulting from the health and economic crisis that will be faced in the coming years requires profound changes in the way the organisation is managed, in the relationship with users and in the interactions with the test environment itself. The generation of data is one of the basic services of PLOCAN that must be massively reinforced, alongside an efficient management and processing of these data to optimise their value, capitalising on the scientific and technological advances and the opportunities for collaboration with other ICTS facilities and national and international research centres in this field.

1. Compliance with the previous plans and new challenges

1.1. Compliance and self-assessment

PLOCAN has met the main targets established on its creation and approved by successive strategic plans. The organization has achieved an outstanding track record and capacity to attract and engage the international scientific and technological community studying the ocean and harnessing renewable energies in the marine environment. PLOCAN has fully shown its potential as a catapult to develop science and accelerate enabling technologies to develop the blue economy. EU partnerships fully provide evidence of the national and international impact of PLOCAN, offering a pivotal infrastructure to develop EU funded projects (e.g., 29 projects alone supported by H2020), advancing technology-based enterprises and research groups. Despite its constraints and limitations, PLOCAN has demonstrated its value proposition, providing services to a growing community of users to roll-out technologies to the market, and allowing technologies to pass through the "*valley of death*" in their life cycle, where support from the public sector is essential.

The ICTS has achieved a significant milestone driving the first developments of Marine Renewable Energy (MRE) in Spain, by hosting and catalysing the installation of the first energy projects in the country, harnessing energy from waves, wind and recently floating photovoltaic solar. Moreover, PLOCAN has played a keystone role in facilitating Spanish companies and institutions to lead projects at European level, especially in fields where there is an enormous national strength such as MRE. PLOCAN has been leading European projects related to multipurpose platforms and environmental observation technologies (e.g., TROPOS, NEXOS projects), strengthening its mission and competitive advantage.

The catalytic role of the ICTS-PLOCAN in contributing to the observation of the Atlantic Ocean has been fully evidenced during these years, helping to involve the Outermost Regions (ORs) such as the Canary Islands in the global observation network (e.g., EMSO, ICOS, JERICO, and so on). In the scientific and technical field, the oriented and multi, inter and transdisciplinary nature of the test platform has been one of the most valued elements by the user community. This uniqueness of PLOCAN has fostered the confluence of public and private entities, researchers, entrepreneurs, policymakers, and administrators, creating synergies around the knowledge and technologies necessary for a more responsible and efficient management of the marine environment. The knowledge that PLOCAN has developed over the past decade by bringing together interdisciplinary stakeholders in a mission-orientated drive, will prove invaluable over the coming years to tackle wide challenges managing the oceans health, biodiversity, and their role in the energy transition and mitigation of climate change.

Along with these headline milestones and achievements, it is necessary for PLOCAN to self-evaluate its incomplete initiatives, analysing results and circumstances in which the previous plans have been implemented during the past decade. PLOCAN was conceived before the 2008 economic crisis, and it was severely affected by lack of personnel and infrastructures, lagging in its internal capacities and organizational model. Non-compliances have been focused on delays to the construction works, start-up of the infrastructures and services, the lack of development of specific units' performance (especially those related to data processing), and operating services fully. A detailed cause analysis for these will be provided later in this document. However, they can be classified overall as:

(1) *Supervened*, such as economic crisis or incidents in infrastructure, and

(2) *Systemic*, caused by inherent problems like the lack of adequate national regulation to carry out R&D in the sea or outdated regulations for entities carrying out R&D in the public sector, amongst others.

The main supervened issues causing a meaningful effect on the plans have been:

- *Building incidents at the offshore structure and test-site*. Novelty and complexity of new infrastructures built in the sea (offshore platform, underwater electrical infrastructures, etc.) have

been affected by administrative and operational issues and delays or structural incidents, some of them still pending corrections.

- *Delay on the onshore refurbishments.* The significant repair works carried out on the onshore facilities have been delayed because of the knock-on effects of the Covid-19 epidemic.
- *Economical and healthy crisis caused by COVID*. COVID has marked a new context that still has unpredictable consequences, both in the economic aspects and the work model, users' mobility, networking patterns, and relationship with the scientific and technological community.

Among the systemic problems, PLOCAN must deal with restrictive budgets and limited capabilities to attract and retain talent, or an inappropriate regulatory framework for R&D in the maritime space. The main obstacles and drawbacks can be summarized as follows:

- *Reduced workforce.* The chronic lack of personnel (already remarked by external evaluators) caused by the restrictions to hire new staff has impacted the building and operational phase. Infrastructures and instrumentation are now operational with less than half of personnel initially foreseen. After the consortium was affiliated to the state sector during the crisis, the government's staffing laws triggered additional constraints and tightness for hiring. The transition from the construction to the operational stage was carried out without increasing the staff. The lack of incentives, competitive salaries, or opportunities for promotions discourages commitment of excellent researchers and attraction of talent, essential for PLOCAN to keep up in a hyper-competitive global environment.
- *Inadequate regulation.* There is a lack of a favourable legislative framework to build research infrastructures and test technologies in the sea. As an example of the fiendish regulatory environment PLOCAN has operated in, after its successful constitution in 2007, it took another seven years, until 2014, for the testing area to be approved entirely. Moreover, restrictions imposed on testing were severe, requiring the same regulatory procedures needed for commercial activities because of the lack of specific sandbox regulations for ocean R&D in Spain.
- *Budgetary restrictions*. Funding restrictions imposed on the public sector during the last decade in Spain have reduced R&D support for researchers to test and acquire the necessary equipment, services, and infrastructures.
- *Limited internal specialization.* Staffing and hiring limitations prevented further staff specialization affecting several areas, which have been poorly invested in. Data management, digital transformation and all areas related to supporting sea operations are significantly under-resourced.
- *Overoptimistic planning.* The previous strategic planning underplayed the effects of the systematics regulatory and legislative constraints PLOCAN has faced over the past decade to deliver outputs in time.

1.2. New Challenges for the Next Period

PLOCAN main challenge for the coming years (2021-24) is to develop and expand its competitive advantage, uniqueness, and value proposition. PLOCAN should transit from demonstration of its potential carried out during the last decade to fully deliver all its capacities in the next one. It should reinforce services, infrastructures and enlarge its social impact to its immediate local community, whilst updating its infrastructures, extending its service offering, expanding test areas, improving its operations, reshaping its internal organizational model, and collaborating to enhance the regulatory framework it operates in.

The plan should be resilient and consider uncertain and turbulent national and international scenarios, severely affected by the most dangerous health and economic crisis that this generation has experienced (for which there is still no clear exit scenario). Underlying this crisis is another climate crisis of orders of magnitude larger that will become direr in the coming years, whilst time to develop knowledge and technologies to prevent or mitigate it is running out. Strategic planning for the next years will hence require (e.g., annual) updates, considering the accomplishments of prescribed

milestones to develop future scenarios. Those milestones will include new regulations, agreements among governments to extend the testing area, additional staff, and financial support amongst others, which are not fully controlled by the internal governance of the PLOCAN consortium. Others depend on unpredictable circumstances related to the duration and intensity of the COVID crisis, for which the organisation can proactively plan to prevent and mitigate, but not control. The next section will cover those milestones and uncertainties.

PLOCAN strategy is to centre its focus on accelerating technologies and innovative research for a responsible and sustainable ocean stewardship, while providing positive societal impacts. Key challenges in this area include:

Integrated Ocean Observation**:** One of PLOCAN main pillars was supporting a long-term ocean observation at the ESTOC station in the Canary Islands. Long-term time series stations can only be supported by scientific research infrastructures or similar institutions, keeping long-term commitment beyond projects or political cycles. Besides, PLOCAN has also a foundational engagement in supporting global reference observations in the Central Atlantic Ocean. The new strategy will keep this responsibility and will extend the core of observations that have been carried out periodically since the last century at ESTOC. This reference station is already contributing to European infrastructures (ERICs) such as EMSO. It will be valuable to add others oriented and specific challenges to contribute to the EU mission (Starfish 2030) and the Decade of the Oceans, such as knowledge of essential biological variables or new observations in the field of omics. Besides, PLOCAN should extend observation strategies working together with industry. It is a shared endeavour, ocean observation concerns fisheries, transport, the environment, energy, and all other ocean uses. PLOCAN is committed to explore innovative governance strategies involving collaboration between the public and private sector.

Green Deal and Energy Transition**:** The scientific framework established to accelerate enabling technologies to harness marine renewable energies is still entirely in force. The next decade will provide challenging technologies to improve efficiencies and roll-out market ready solutions. There is no time to lose to avoid climate tipping points. The EU strategy for green demands fast-track solutions to search for urgent solutions to deliver on time and meet the targets. Demand for the energy transition has worsened, which is leading us to scenarios of no return concerning global warming. A special focus is dedicated to tune PLOCAN as an effective tool in the entire value chain of MRE, promoting the development of observation and monitoring of technology interactions with the environment, development of technologies as well as mitigation alternatives, such as carbon fixation in the marine environment using solutions based on natural processes.

Digital Transformation: COVID has made clear the urgency of digital transformation in all domains, but even more urgently in environmental management, administration, or the generation of new business opportunities. PLOCAN should urgently accelerate a complete digital transformation, producing and profiting from spill-overs around users, stakeholders, and society. The demands are focused on the availability of data in real-time to develop applications that can generate social and economic value. The data provision demands not only sensorial, new observation platforms, communications or IoT, but also big-data, integration in models and application development. In general, the demand for data and technologies for their treatment, as well as their applications in all fields of the blue economy, traditional or emerging, continues to be a need and an opportunity for PLOCAN, offering an interdisciplinary space to generate, manage and value the data generated.

Ocean Stewardship and Blue Economy*:* PLOCAN should deliver towards ocean stewardship and blue economy on the global and local scale. In the Canary Islands, society demands solutions ready to solve huge problems caused by COVID and derived from an overdependence of the region in tourism monoculture. PLOCAN should generate an innovation hub, promoting an innovative ecosystem around the blue economy to help diversification of the regional economy, now profoundly dependent on the touristic sector, heavily impacted by the COVID crisis. The blue economy is growing fast, but value

should be provided to both traditional and emerging activities. The requirement of knowledge and technology to create new jobs and business opportunities is adamant. Sustainable development and environmental conservation of the marine environment is a value strongly supported by residents, and the protection of pristine marine space has been carried out extensively (>40% of the maritime area is protected). However, now it is necessary to go further to develop a new societal relationship with the marine ecosystem, providing sustainable and resilient solutions based on innovative models of interaction with the marine environment. Industry and users of the marine space should take collective responsibility. In this sense, PLOCAN represents the Test Site providing the playground to develop this responsibility. The industry is growing a new stewardship role and demands demonstration and pilot areas to learn and show how to carry out this transformation of technologies, business models or regulatory environments.

The overarching role of PLOCAN resides in tackling the global problems, involving global stakeholders in demonstrating enabling technologies that latterly are escalated globally. In the same way, data, information, and knowledge are integrated into the global value chains, profiting all from integrated but distributed networks.

Enhanced and Mission Orientated Services: The offshore platform and the test site facilities will provide multipurpose services for R&D&I, integrating several blue growth activities (e.g., aquaculture and energy productions, safety, security, or leisure). Furthermore, the platform will be used as a "*virtual ship*" and an "*offshore smart grid*" for some maritime and industrial initiatives, such as testing shipping, innovative offshore technologies or materials. The test site will also be used as a "*field lab*" for marine sensors (e.g., IoT[1]) and robotics. The offshore test site will also seek to accelerate the development of offshore technologies and overcome barriers to promote a more efficient and sustainable use of the oceans. PLOCAN will encourage the testing of innovative devices in the sea at higher TRLs[2] (>4) during the next period. The main objective will be the integration of activities and services, using renewable energy produced as a source of an offshore smart grid based on the platform, exploring technologies and new concepts to generate and use electricity offshore (e.g., charging marine vehicles, using new energy vectors, integrating observation for modelling, etc.), including deep waters. A key set of research topics and technologies pertinent to this objective will be:

- Blue growth innovative research and enabling technologies to harness sustainably used ocean resources, including aquaculture, ocean renewable energies, monitoring, or leisure.
- Marine and maritime robotics, including new platforms and sensor-payloads, reduced energy consumed or smart integration and inter-robotic cooperation (swarms model) to tackle complex and multidisciplinary challenges autonomously.
- Environmental sustainability and ecosystem-based management of oceanic resources, including new technologies providing integrated data to improve marine spatial planning.
- Clean and smart technologies in the maritime sector, including new fuels, safety or security, smart ports, and logistics.

2. Mission, Vision, Value proposition and Core Values

PLOCAN **mission** is to provide a cost-effective combination of services, including housing, operations, data, and access to the offshore multi-use platform, observatories, and test site facilities that meets the upcoming scientific challenges of the oceans and the socioeconomic needs.

The **vision** is to become a world-class testing site contributing to accelerate the development of enabling technologies and knowledge to conserve, regenerate, and harness renewable resources

[1] Internet of the Things

[2] Technology Readiness Level

efficiently and sustainably, providing equitable prosperity to users and efficient protection to the environment. The ICTS offers unique value services, attracting excellent science and technology users at national and international level, responding to the R&D&I challenges of the marine and maritime sector, and contributing to underpinning the Canary Islands, Spain, and the EU at the forefront of this sector.

The **value proposition** is providing a first-class multipurpose testing environment. The main items providing uniqueness are:

- Offshore platform and cable-connected infrastructures
- Broad range of depths, providing access to deep waters near shore
- Middle conditions allowing testing most of the year
- Logistic and value chain provided by nearby port infrastructures
- Insular conditions providing suited applications
- Subtropical and oligotrophic conditions within the EU
- PLOCAN also provides a distinctive by promoting a blue economy hub for innovation attracting international talent, resources, and flagship initiatives to an outermost archipelago in the middle of the Atlantic, which wants to harness the untapped potential of the marine economy and show to the other ORs and remote island areas a new way forward (FORWARD project).

PLOCAN **Core Values** are as follows:

- *Excellence***:** strive to deliver the highest quality and value possible (and approach every marine and maritime challenge with a determination to succeed).
- *Integrity:* honest, fair, and respectful.
- *End User's orientation:* focused on meeting our End Users' needs and take pride in helping them to accelerate science and technologies.
- *Innovative thinking:* relentlessly search for better solutions and embrace change.
- *Collaborative work:* one team working together to bring out the best of our quadruple helix strengths.
- *Empowerment:* a shared common sense of corporate strategy and goals, through an open planning and co-design process, encouraging all our team to take initiative and responsibility, and providing training if needed.
- *Transparency and equal treatment and opportunities:* promoting a working environment which provides transparency, equal treatment and opportunities, and deleting unlawful discrimination.

3. SWOT Analysis

This SWOT[3] analysis is complementary to the relational analysis. It focuses on the strengths, weaknesses, opportunities, and threats, that are either aspects of PLOCAN itself (especially, strengths and weaknesses) or are elements of the external environment (especially, opportunities and threats) causally related to, or could significantly influence, PLOCAN core mandate and operations. Thus, whereas the relational analysis deals with more distal factors, the SWOT analysis focuses on issues which are more proximal and therefore more within the control of PLOCAN.

3.1. Strengths

- *Unique facilities, location, capabilities, experience, networking, and equipment.*
  - Strong international profile of PLOCAN as a novel state-of-the-science ocean observatory, specifically a multi-purpose offshore platform, marine laboratory, and workshop for studying simultaneous uses and management of marine resources.

[3] Strengths, Weaknesses, Opportunities and Threats analysis

- Island effect living-laboratory in an Outermost Region.
- Commitment, experience, and expertise of PLOCAN's Executive Board and Strategy Council. Strategic location in the Eastern North Atlantic, with oceanographic links to both the African and American continental margins. Location in the subtropical part of the Eastern North Atlantic allows for marine operations that are rarely affected by sea state hazards.

- *Excellent record of accomplishment, extensive demand, and large impact of services*
  - Universally recognised expertise, leadership, competence, and experience in international collaboration of PLOCAN's staff and researchers.
  - Successful funding record of accomplishment and diverse current awards (ERDF[4], FP7, H2020[5]) (more than 50 projects in the starting phase).
    - Experience of running ocean observatories during decades, focusing attention and maximising both research and commercial opportunities.
    - High demand and a global interested community, collaborative partners, and expanding users' database.

3.2. Weaknesses

- *Shortage of staff, budget, and entangle bureaucracy*
  - Complex legal and administrative constraints that are a handicap to operational progress (procurement, hiring, licenses, grants).
  - Deficient career path and promotion for the staff.
  - Limitations of operational effectiveness, including risk management and human resource management within the public sector.
  - Low salaries compared to other national ICTS or research organisations.
  - Deficiency or lack of qualified staff on data management, offshore operations, robotics, or renewable resources, among others.
  - Partially develop operational policies and procedures.
  - Inadequate regulatory framework for hiring staff.
  - Limited economic resources for maintenance and operations due to COVID
- *Restrictions for testing*
  - Restrictions for wind turbines of more than 10MW. Future wind turbines will increase the size and power to improve efficiency.
  - Lack of specific legislation for testing R&D experiments in the marine environment.
  - Lack of access to a medium-large size research vessel for deep water and open-ocean operations
- *Immature branding, communication, and promotion implementation strategy*
  - Partially accomplishing RRI challenges.
  - Distant from European research and industrial centres, as well as North and South American centres.

3.3. Opportunities

- *Fully aligned to social needs, Green Deal, UN 2030 SDGs, EU Recovery Plan, Decade of the Oceans, and others such blue economy, national and local priorities.*
  - Fully prepare for attracting innovative research, interdisciplinary, mission-oriented and integrated ocean science and technology development.
  - Enable to provide data and evidence for ocean policies and ocean science and technology issues for Spanish, Canary Islands, and EU government agencies.
  - Fully aligned to funding opportunities from Foundations that foster funding for oceans (Moore Foundation, Packard Foundation, Belmont Forum).

[4] European Regional Development Fund

[5] Horizon 2020, European Union research and development funding program (2014-2020)

- Creating commercial opportunities for the Spanish marine S&T industry.
- Aligned with Spanish, Canary Islands, and EU S&T research and funding priorities.

- *Unserved demands for testing and observation to build alliances, partnerships, and new engagements*
  - Partnering with international ocean agencies and national ocean observatories.
  - Collaboration with Spanish, Canary Islands, and EU ocean universities and research institutions to mount major collaborative and multidisciplinary research proposals and programmes.
  - Engaging students and exciting the public about ocean research, novel technologies, environmental issues, and career opportunities.
- *Providing value, social and economic impact, and environmental awareness*
  - Promoting the PLOCAN observatory as a testbed for commercial technology development, from technological demonstrators and prototypes to commercial products, especially offshore renewable energy.
  - Create value and progressively demonstrate social and economic impact.
  - Promote citizen awareness about responsible and sustainable use of ocean and the several opportunities that it offers to the islands' communities.

3.4. Threats

- *Uncertainty and volatile social, economic and regulatory scenario in a fast moving COVID and post-COVID society.*
  - Securing and sustaining sufficient long-term operational funding.
  - Ship access for essential maintenance and new deployments.
  - Securing new capital funds to enhance the capability of the facilities.
  - Subject to legal alterations, new regulations, financial constraints, and governmental shifts, amongst others.
  - Oceans may not maintain a high priority in Spanish, Canary Islands, and EU agendas
  - Update and maintenance of adequate equipment at laboratories to comply with the analysis of variables derived from observation (e.g., nutrients), and other requirements.
- *Ability to retain, retrain, and replace highly qualified personnel*
  - Maintaining international competitiveness as other ocean observatory facilities are completed.
  - Too many mandates and accountability chains.
  - Fragmentation of Spanish research and educational institutions.
  - Competition from and insufficient coordination with other EMSO-ERIC observatories.
  - Uncertainty to become part of the ICOS ERIC (Integrated Carbon Observation System) despite sensor measurements of CO_2 at ESTOC.

4. Objectives 2021-2024

The goals and objectives are orientated by the funding agreements[6], focussed on the observation, study and testing processes affecting the conservation and sustainable use of the oceans and global change. It also includes integrated services to improve offshore technologies and stewardship of the ocean, based on ecosystem-based management and sustainable use of ocean resources. The knowledge and evolution of marine ecosystems, their conservation status and associated risks are essential topics in this approach. Those general objectives are key pillars during the next four-year period (2021-2024).

However, there are substantial and critical factors that should be tackled.

[6] The Cooperation Agreement "between the Ministry of Education and Science and the Government of the Canary Islands Autonomous Community to establish the Consortium for the Design, Construction, Equipment and Exploitation of the Oceanic Platform of the Canary Islands", signed initially on December 10th, 2007 and revised in 2012 and 2015. These objectives were developed and evaluated by the Advisory Committee on Unique Infrastructures (CAIS - ACUI).

- *COVID crisis.* Social and economic context demands solutions to the socio-economic crises providing jobs and solutions for the blue economy.
- *Climatic crisis and energy transition*. Ongoing climatic crisis requires urgent solutions, novel studies, approaches and enabling technologies, sustainable business models, innovative regulations, and social engagement. There is also an Increasing awareness and support for a global ocean stewardship and responsible use of resources. International commitment through SDGs, Green Deal or Decade of the Oceans are strong references to follow up and contribute.
- *Digital transformation and technology evolution.* Digital transformation beyond digitalization, creating innovative approaches to sustain observations, creating new services, added value and benefits for human and ecosystems.

4.1. Description of the objectives

The General Objective (GO) is to consolidate PLOCAN as a reference site and innovation hub for the testing, demonstration, and acceleration of enabling knowledge and technologies, to achieve 2030 objectives in a new social reality and a climate change emergency. PLOCAN will provide an essential infrastructure to develop solutions to achieve Canary Islands, Spanish and European objectives related to the green deal, digital transformation, and a sustainable and circular economy while keeping the EU leadership in the Marine-Maritime sector.

PLOCAN will create synergies to mission-oriented strategies such as the healthy ocean, mitigation of climatic change or sustainable ocean economy. It will promote the search for solutions to build a new relationship with the ocean that is more efficient, resilient, equitable and sustainable, which will be emphasized following the Decade of the Oceans, EU missions, and the high-level panel for a sustainable economy.

The general objective to implement PLOCAN 2021-2024 strategy will be channelled through the following three lines:

1.-Observation and Testing Services*:* The objective is maintaining and extending unique and innovative highly demanded mission orientated services, critical for the Green Deal, UN 2030 SDGs, and Decade of the Oceans. Update and strengthen services provided by PLOCAN with a new integrated and holistic vision of the living laboratory and innovation hub.

2.-Capacities and Facilities**:** The objective is completing internal capacities and infrastructures to deliver services. Provide greater capacities in scientific, technological, knowledge or data management, including an updated legal framework.

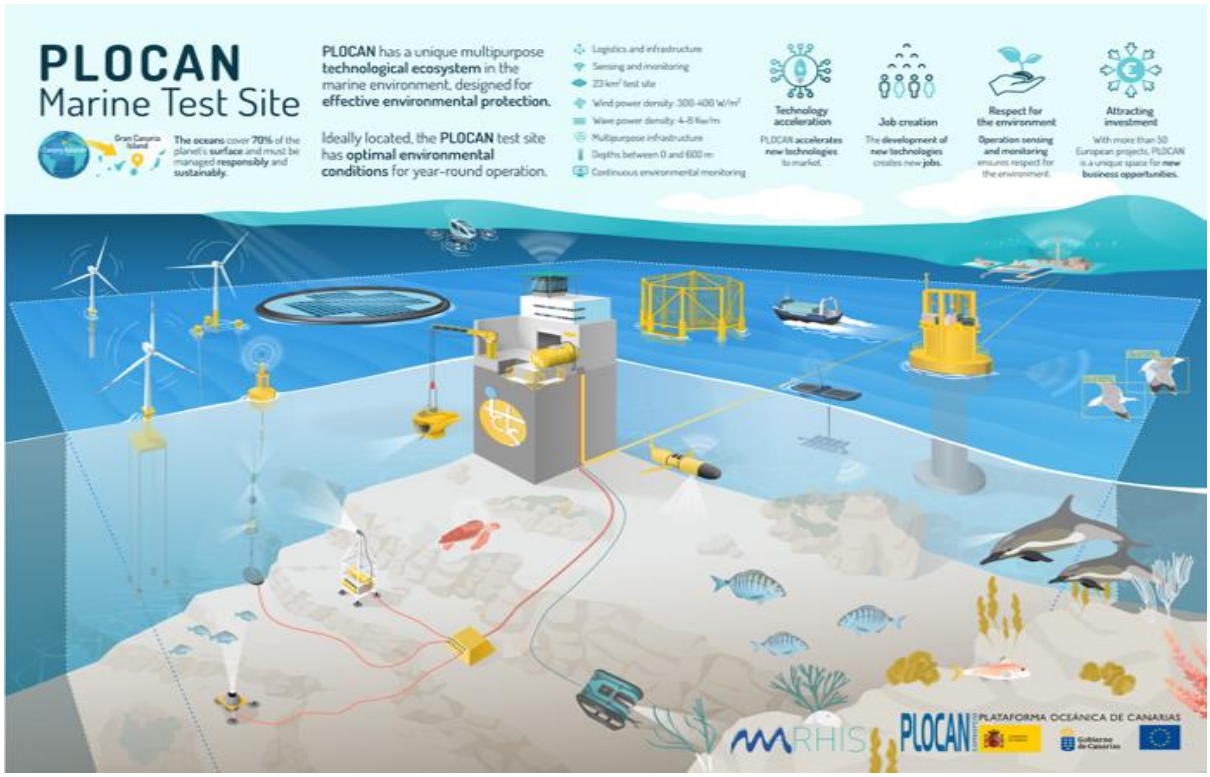
3.-Collaboration, Diffusion, and Impact: The objective is strengthening cooperation and impact by rethinking and reinforcing innovate spaces and models of local, national, and international cooperation in the new social, economic, scientific, technological, and educational reality. Strengthening diffusion, impact assessment of ICTS in the scientific, technological, social, environmental, economic, public engagement and educational fields.

The specific objectives of these strategic lines are set out below. They aim to support users' needs and societal challenges.

4.1.1. Observation and Testing Services

OE-1.1 ***Ocean observation and data*****:** to improve the spatial-temporal resolution and quality of relevant data for a better understanding of the Atlantic Ocean system and anthropogenic interactions both in coastal and oceanic areas; to contribute to build EuroGOOS and EOOS vision to a connected European ocean observation community; to improve data and service sharing (INSPIRE), digital transformation, including three main domains:

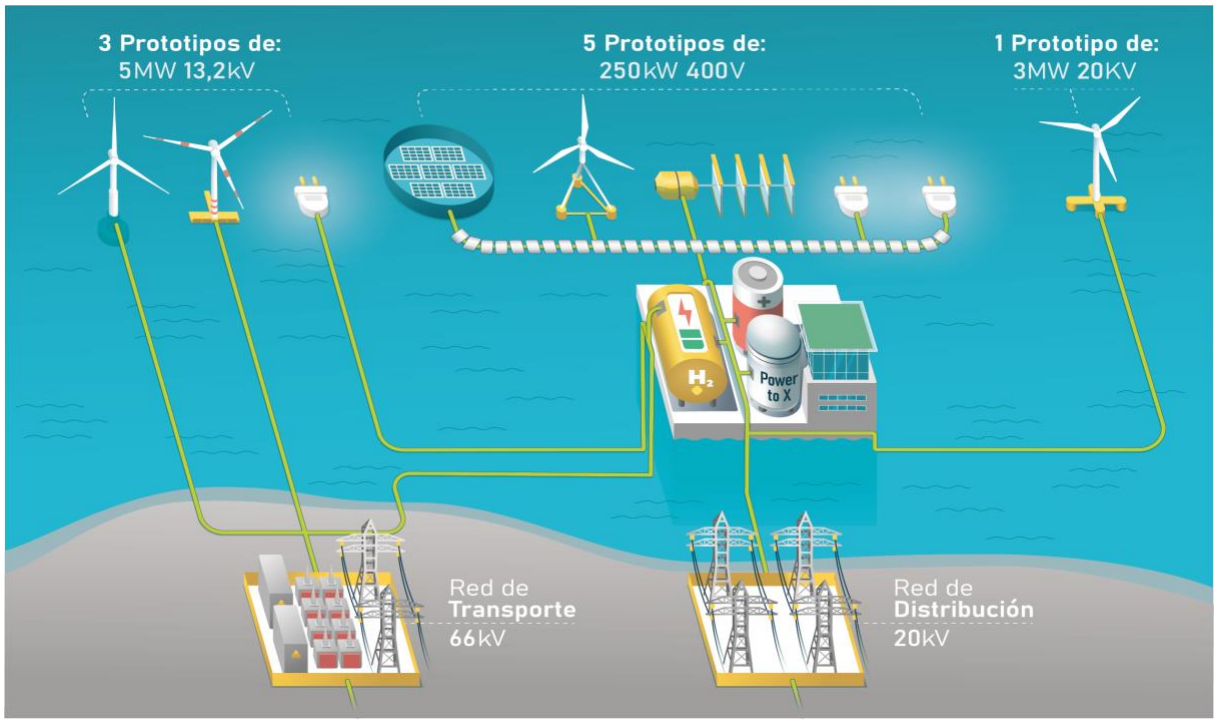
- OE1.1.1 *Test-site and coastal observation:* to provide high-quality *in situ* data towards the European networks of coastal observations, aiming to support coastal communities with models to forecast, enabling free and open data, and increasing sensors, observing platforms, innovative TRL technologies and working together with stakeholders.



- OE1.1.2 *ESTOC observatory:* to maintain a long-term (30 years) series of ocean and atmospheric variables related to ocean essential variables and the carbon cycle and improve the station design with deep water communication and key variables (e.g., ocean sound, geohazards), and a two-mooring solution to increase quality and reliability.
- OE1.1.3 *Oceanic observations:* to enhance observations in the Macaronesia and North Africa Upwelling system to understand regional processes and impact of global change. These observations are supported by PLOCAN Unmanned ocean vehicles (VIMAS), extending portfolio and expansion goals of EOVs, new variables at increasing depths and routinize transects of greater scope (i.e., North Atlantic basin), implementation of endurance lines in certain locations.

OE-1.2 ***Hosting innovative testing services****:* to develop solutions to mitigate global change, accelerate energy transition and restore ocean health, by providing unique and value-added hosting-services critically demanded by users to advance:

- OE1.2.1 *Marine Renewable Energy:* supporting testing devices to harness MRE, particularly floating offshore wind and wave energy, exploring hybrid and multipurpose solutions including wave energy, floating photovoltaic or living stocks. Providing a unique space to accelerate technological development, environmental protection, business models and innovative regulation.



- OE1.2.2 *Energy storage and vectors-H2/NH3/Desalination*: to develop innovative onshore and offshore storage systems and reduce cost of production and transportation. The platform will be conditioned to support transformation and smart management of energy into energy vectors like $H_2/NH_3/H_2O$, enhancing capacities to support research and testing innovative concepts around energy value-chain.
- *OE1.2.3 CO_2 sequestration, restoration, and regeneration of a healthy ocean*: to develop knowledges and technologies using nature-based solutions, testing devices and innovative concepts based on natural solutions (e.g., trials related to pumping deep water rich in nutrients to shallow areas for biomass generation and carbon fixation).
- *OE1.2.4 Unmanned maritime and aerial navigation.* To support the development of new unmanned technologies, platforms, maritime and aerial navigation, providing new services, including a test-site area duly certified (like existing initiatives in Norway and Finland), as a cross-cutting element where the three domains converge, in partnership with agencies and collaborators from public and private sectors. Autonomous aerial vehicles (AAV) and eVTOLs aircrafts (Electrical Vertical Take-off and Landing) will be supported for testing new services.

4.1.2. Capacities and facilities

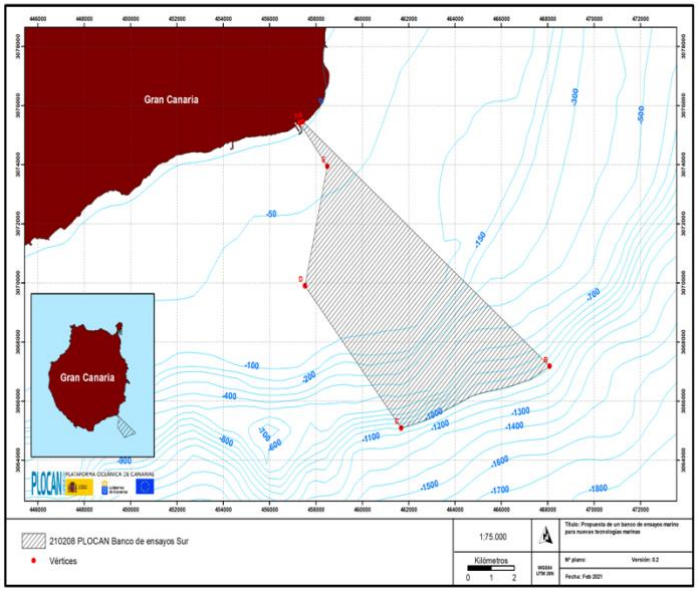
The main objective is releasing the full potential of existing infrastructures, building extensions, and improving resources and internal capacities demanded by users to attract flagship projects and services. The main priorities and objectives are making operative the principal functions of the platform as:

Improve secure transfer of personnel, access to the offshore platform, ICT facilities and smart grid capabilities. The transfer of personnel from the boat to the offshore platform is done climbing by a boarding ladder, posing difficulties for untrained staff. An improved and secure access solution should be developed. The telecommunications infrastructure should deliver a 10Gb connectivity of the platform using 24 pairs. This infrastructure should be operational. The offshore platform plays the role of an energy hub, where production, conversion, storage and consumption of different energy carriers takes place in an integrated and controlled way (see OE1.2.2 and OE1.4.1*)*.

OE-2.1 ***Refurbishment of the Oceanic Platform:***

OE-2.2 ***Updating actual test site and consenting PLOCAN SOUTH new test site*:**

Extend electrical infrastructure in the actual test site, consent a new test site in the south of the island and install electrical facilities for evacuation. The actual test site requires new electrical berths for testing MRE devices connected to the grid. The demand is especially high for testing offshore wind floating devices. A New test site able to work with +10MW machines is required to overcome the 150 m high restriction from air traffic interferences in the actual site. The offshore wind industry is evolving towards larger turbines to decrease LCOE and demands testing fields without high limitations.



PLOCAN-SOUTH new testing area

OE-2.3 Updating land experimental laboratories and access to harbour area:

Enhance mechatronics research and development equipment is required to attract students and researchers willing to design, develop, test, and maintain innovative technologies such as new interfaces, sensors, ad-hoc solutions not available off-the-shelf, and increase in Technology Readiness Level.

OE-2.4 Human resources, skills, and organization structure:

Increase human resources, enhance skills, training and attracting talent, improving efficiency of the admirative structure deepening digital transformation. New human resources are required for energy (smart grid, storage, source, and so on), marine livestock production, observation, and data management. The digital transformation should be complete in all administrative management, services, projects, and O&M operations, improving governance, and fully implementing Responsible Research and Innovation (RRI) in the organization.

4.1.3. Collaboration, diffusion, and impact

OE-3.1 ***Alliances, partnerships, and cooperation:*** Extend joint research centres, third party or public-private agreements, collaboration with local, national and international centres, and networks. Focus on observation and harnessing of renewable resources, public and private.

OE-3.2 ***Knowledge management and technology transfer*****:** Improve knowledge management and sharing platforms to boost productivity and cut down time wastage. Focus on documenting and training employees to act as PROSUMERS to profit tacit knowledge, expertise, and networking, boosting the efficiency of decision making, and providing higher added value to services and users. Training and capacities will be developed to enhance technology transfer skills, specially support cross-fertilization opportunities and technology monitoring tools.

OE-3.3 ***Diffusion and communication*****:** Improve outreach and education (outreach & education support unit) to give visibility and support to the activities, as accelerator of the economy derived from activities carried out at sea. Support societal scientific literacy and RRI principles. Dissemination will be promoted through social networks towards different segments of the population, promoting communication with students. Collaboration on citizen awareness through European projects at both sides of the Atlantic will be pursued, as well as the participation in outreach events aimed at citizens. Visits to PLOCAN facilities will be promoted both for students and other groups (neighbourhood associations, etc.). Outreach materials will be developed focused on different target groups.

OE-3.4 ***Impact in the blue economy:*** Prioritize creation of social and economic impact in all the activities carry out, measuring and learning through experience and best practices. COVID crisis demands valorisation of knowledge and technology to diversify economy, create jobs and greening complete sector, including the blue economy itself. Working together with the four-helix approach, tailoring services to match demands aiming to develop solutions producing relevant social, economic, environmental, or technological impact. Involving social scientists to innovate in monitoring impact and intangible value creation.

4.2. Strategies to achieve the objectives

The principal strategic approaches to achieve the objectives are listed below:

- *Comprehensive approach:* To conduct an integrated approach, converting the multidisciplinary nature of its facilities, services and users into a strategic advantage, a cross- sectorial ecosystem.
- *User-oriented:* To consolidate, promote and innovate facilities and services, working together with users or potential user communities, monitoring quality, examining performance levels, and benchmarking services provided by the infrastructure. The culture of the organisation should reward and recognise the efforts to innovate and improve services, evolving according to the users' needs. The requirements to provide these services with higher standards should be a priority to engage with the consortium bodies supporting PLOCAN.
- *Collaborative:* To build-up partnerships with the leading national and international institutions (public and private) and initiatives, pursuing a global approach to ocean research and developing marine technologies, such as networks, distributed infrastructures, clusters, or similar actions. Special attention should be focussed on collaboration with national infrastructures (ICTS), European Research Infrastructures (ERICs), and with transatlantic initiatives or international initiatives related to islands or remote areas. PLOCAN has a global vision that can only be achieved working together

and in collaboration with institutions and countries based on heterogeneous and multidisciplinary research networks.

- *Transnational:* To make the infrastructure more widely available to transnational and cross-border access, even outside the EU, by working together with other countries to synchronise national research infrastructure roadmaps, funding systems and evaluation frames.
- *Inclusive:* To operate in an open mode, promoting community-driven principles to release data produced with tax-payers' money, promoting an Open Innovation, Open Science and Open to the world (3Os Strategy) organisation.
- *Stakeholder-driven:* To follow the principles of Responsible Research and Innovation (RRI) to work together with stakeholders from the start of an activity, engaging them to identify synergies, find new opportunities, best practices, and learn from experiences in other fields. At the same time, promoting services for different sectors, scanning gaps or new potential services, especially working with traditional and emerging users of the sea, finding compatibilities and synergies.
- *Sustainable:* To find new ways to increase and make more efficient use of European funds (structural investment funds, the European fund for strategic investments, InnovFin – EU Finance for Innovators programme) or innovative instruments (public or private) to leverage funds to support testing; pilot projects in collaboration with industry or promote demonstration flagship initiatives, especially for SME technological developers and other users.
- *Cost-efficient.* To strengthen external support, by working together with other public and private institutions that can provide on-time resources and services when speeding up the efficiency of PLOCAN activity is required, while keeping in-house the core added value and knowledge.
- *Adaptive culture:* To keep the organisation in a continuously improving and learning mode, working together with stakeholders and communities of users, always looking for the innovative approach, rewarding innovative ideas, flexibility and adaptability to unique circumstances and opportunities.
- *Literacy engaged:* To enlarge the diffusion, dissemination and general knowledge of results, approach and socio-economic impact, propitiating an increase of national and international outreach of services and added value among the scientific community, marine and maritime stakeholders, policymakers and the public and citizens. Scientific infrastructures have an inherent value for training, clustering, supporting entrepreneurship, or using them as flagships for European science policy that it is not yet fully developed.

4.3. Strategy implementation (Planned actions)

ID	Action title	KPI[7]
4.1	**Consolidate test-site and coastal observatory services:** Installation of cable observatory in the coastal test site and the installation of new devices such as LIDAR and new sensors (e.g., acoustic sensors able to measure underwater ambient noise, track soniferous species like marine mammals, and measure underwater sound from ships). Improve integration into the regional node of European Research Infrastructures (EMSO ERIC and JERICO RI). - OE1.1.1	*No. of new sensors and communication capabilities installed*

[7] Key Performance Indicator

4.2	**Provide new services, capabilities, and sensors at the ESTOC oceanic station:** Installation of a new surface and submarine modules at the ESTOC mooring that can monitor new variables and communication between the surface and underwater sensors, transmitting data in real-time and providing new capabilities. Furthermore, the installation of new sensors to observe EOVs, atmospheric variables, noise or seismic variables will extend the services, and the scientific activities supported by the ESTOC station. - OE1.1.2	*No. of new capabilities installed and operational real-time data flow from water column*
4.3	**Extend oceanic observation in the Atlantic area:** Increasing unnamed missions in the Macaronesia and North Africa Upwelling system, collaborating with national and international initiatives following EU and global initiatives. Moreover, it will continue increasing regional collaboration providing cooperation to SDGs[8] in the central Atlantic area. PLOCAN will also promote specific actions to promote international cooperation in this area, including training and capacity building. - OE1.1.3	*No. of users, and projects operating the facility and accomplishment of the work*
4.4	**Provide new testing positions and services to host MRE devices:** including the capacity of testing grid-connected devices to harness offshore renewable energy, hybrid, multipurpose or co-using the space at sea should efficiently and sustainably (including combination of emerging blue growth activities with traditional ones, e.g., fishing, shipping, or leisure). - OE1.2.1	*No. of devices tested, users involved, resources leveraged*
4.5	**Storage and energy vectors:** Implementing projects to test energy storage and generation of energy vectors onshore and offshore using MRE. Several options will be studied using the platform, new storage system offshore or onshore production using MRE. - OE1.2.2	*No. of users and projects operating the facility and accomplishment of the work*
4.6	**Provide services to capture CO_2:** Several users and projects are demanding oceanic space to study nature-based solutions and technologies to capture CO_2, such as alkaline neutralization or artificial upwelling. PLOCAN will provide new capabilities and services around those topics, including the facilities to carry out the experiments, and tailoring the facilities to provide the best solutions or additional equipment required (e.g., pumping system to upwell deep water), and delimit their potential environmental impact. - OE1.2.3	*No. of users, and projects operating the facility and accomplishment of the work*
4.7	**Provide new capacities, technologies, and instruments for unmanned marine and aerial vehicles**: New robotics systems, including aerial, surface, or underwater robotic systems, will be offered as observational or operational platforms for new sensors or technologies. Particular attention will be provided to low-cost swarms of smart drones operating innovative missions in the marine environments (e.g., emerging, or traditional activities in the blue economy). They will also allow training and educational services, to maintain the educational leadership and the international reference position (e.g., the glider school). - OE1.2.4	*No. of users, and projects operating the facility and accomplishment of the work*
4.8	**Provide offshore smart grid services and new capabilities in the offshore platform:** The platform itself will be used for testing, demonstration, or implementation of innovative projects to improve functionalities of smart offshore grids, the supply of electricity offshore or to transform it into other energy vectors, including chemical storage as water, hydrogen, ammonia, or other viable industrial products. *OE-2.1*	*No. of users, and projects operating the smart grid and accomplishment of the work*
4.9	**Develop a new testing area (PLOCAN-SUR)**. Develop a new testing area for +10MW offshore turbines and associated services, including floating devices or substructures. The social, environmental and regulatory issues are also a priority associated with the technology. Collaborate with authorities and public-private initiatives, industrial projects to exchange knowledge and best practices. - *OE-2.2*	*No. of users, and projects operating the facility and accomplishment of the work*

[8] Sustainable Development Goals

4.10	**Develop onshore and harbour facilities**: Invest in Virtual Research Environments (VREs), observatory data and instrumentation management, laboratories for analysis and validation and conditioning of harbour facilities to extend capabilities. Boost collaboration with other institutions to create synergies and joint initiatives. - *OE-2.3*	*No. of actions, initiatives and projects prepared and successfully accomplished*
4.11	**New boat and support to the sea operations**: Public-Private initiative to operate a new, medium-size boat and services to access present and future test sites, offshore platform, and to deploy/decommission devices and instrumentation in the ocean. It will be essential to have capabilities to dealt with standard 20-foot containers. - *OE-2.3*	*New Boat, no. of users, and projects operating the facility and accomplishment of the work*
4.12	**Improve the organisational system to new reality, safety, security, and funds available:** Update procedures to digital transformation and on-line activities, maintaining accounting, safety, security, and quality management. Update and extend equipment, hardware, and software to fulfil those requirements. Simplify and expedite bureaucracy. Implementation of analytical cost models. - *OE-2.4*	*No. of cost model and safety and security procedures. Positive evaluation on security and safety evaluations.*
4.13	**Attract talented, train personnel**: improve salaries and professional career to attract highly qualified personnel, by applying standards of the European Research Area of excellence. Improve the working and employment conditions of R&D&I in line with "*Human resources strategy for researchers*". - *OE-2.4*	*No. of actions implemented, and new hiring procedures implemented or ameliorated.*
4.14	**Progress on digital transformation:** All services and operations, from the internal work and knowledge flow to monitoring processes and services and to the relations with users by cloud-computing interactions or new web interactive service applications. Training personal, learning from good practices. - *OE-2.4*	*No. of procedures, tools and new applications implemented.*
4.15	**Collaborate and connect.** Creation of the media lab, an initiative to create joint research initiatives and collaborative projects. Enlarge participation, engagement, and networking with nets, public and private, research facilities and other infrastructures. - *OE-3.1*	*User maps, users, nets engaged in the dialogs*
4.16	**Communicate and spread outputs:** Update communication and diffusion policies and strategies to the post-COVID reality, extending social media, webinars, audio-visual media production, training staff, promoting scientific culture, and rewarding online interactions. All actions will be affected and should include a specific contribution to diffusion and communication policy. - *OE-3.3*	*No. of actions and output,; policies and strategies implemented.*
4.17	**Create technology transfer and knowledge management unit:** Accelerate knowledge management, interactions with quadruple helix, in cooperation with national and international institutions. - *OE-3.2*	*Creation of the unit, nº knowledge outputs and users.*
4.18	**Create live open communities with users, stakeholders, and society:** Map and create communities. Develop a permanent and structured dialogue to capture users' experience, detect needs and opportunities, diffuse information, improve services and detect gaps and areas to improve quality. To enlarge potential users. - *OE-3.3*	*No. of user maps, number of users engaged in structured dialogs and number of new users*
4.19	**Deliver an innovation hub**: Refurbishing land facilities to offer shared space for enterprises, providing support to users and service-oriented spaces with new capacities and interactions (e.g., labs and workshops, but also ICT connectivity, services to entrepreneurs or venues for events, etc.). - *OE-3.4*	*No. of users, and accomplishment of the work*

4.20	**Update orientated training programmes**: Enhance training programs offering focused training to personnel, users, and the public. Collaboration with Universities and Research Centres to host internships, PhD thesis or final project-like experimental work. It will also promote training positions and thematic courses (e.g., Glider School). A specific training program will be addressed to young students to motivate technological careers, providing training and competition activities. - *OE-3.4*	*No. of users, and projects operating the facility and accomplishment of the work*
4.21	**Create a collaborative space for blue economy:** Create a platform for interactions with stakeholders to apply and transfer knowledge. Collaboration with clusters, technological platforms, associations, and entities to measure and follow-up impact, follow up spill-over and monitor return of investment. - *OE-3.4*	*No. of actions performed to boost Blue Economy*

4.4. Main risks of the actions

ID	Action title	Mitigation actions
1	Volatile financial and regulatory scenario create by COVID crisis	Consolidate a core budget during the period
2	Competition with other infrastructures including similar marine research services	Improve service quality Increase commercial visits
3	Structural damage produced by storms, harsh weather, or ships operations and elements	Include protection elements Increase preventive maintenance
4	Platform impact and/or losses in structural elements	Increase maintenance Improve monitoring system
5	Change of priorities in investment policies of founding institutions	Raising external resources Attracting users Modelling a singular organization
6	Lack of specialized providers and delays in supply chain	Edition of public tenders Equipment compatibility Specific tender procedure
7	Heavy bureaucratic management (administrative barriers) due to hindering agreements, contracts, and business opportunities	Legal adaptation and procedures improvement Staff expansion
8	Lack of incentives for hiring and maintaining specialised staff in the organisation	Improving the employment system Technical capacities analysis
9	Cybersecurity incidents in internal IT systems due to lack of corporate culture using ICT Tools	Improve the technology management internal procedures Integration with the National Cybersecurity System Improve the cybersecurity service
10	Restrictions due to safety and security risks in offshore operations	Staff training Increasing the maintenance
11	Uncertainties related with national and international collaborations due to high degree of dependence on partners	Update of the stakeholder engagement procedure Maintain the presence in international R&D&I actions

4.5. Resources

The highest priority action is to Increase the human resources available within the organization to reach the goals that have been described above. The human factor is the most valuable one of the organization resources, and its greatest strength, counting with universally recognized expertise, competence, and experience.

The Oceanic Platform of the Canary Islands is an ICTS co-financed by the Spanish National Government and the Regional Government of the Canary Islands; the main funding for PLOCAN comes primarily from contributions made by the central and the autonomous governments. The income forecast for the coming years has been set.

A first proposal under discussion is presented here:

Table 1 *Income forecast fixed by MINECO and CAC for the next few years*

	2021	2022	2023	2024	Total
MINECO	741.374,00	2.064.955,32	2.155.329,96	2.247.579,36	**7.209.238,64**
CAC	1.344.479,00	2.064.955,32	2.155.329,96	2.247.579,36	**7.812.343,64**
Total	**2.085.853,00**	**4.129.910,64**	**4.310.659,92**	**4.495.158,72**	**15.021.582,28**

These incomes must support the costs of operation, maintenance, and general expenses, which are estimated in 9.741M€ for personnel, and 5.281M€ for general expenses for the period 2021-2024.

PLOCAN also has a land-based headquarter, which was ceded by the Canarias government. It consists of office buildings, laboratories, workshops, conference halls, multipurpose rooms, container area, machinery park, etc. Also, it has a port area with berths for the operational vessels and storage warehouses.

5. Schedule and monitoring

5.1. Schedule

Action ID	Action title	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
		2021				2022				2023				2024			
4.1	Consolidate test-site and coastal observatory services					■	■	■	■	■	■	■	■	■	■	■	■
4.2	Provide new services, capabilities and sensors at the ESTOC oceanic station						■	■	■	■	■	■	■	■	■	■	■
4.3	Extend oceanic observation in the Atlantic area							■	■	■	■	■	■	■	■	■	■
4.4	Provide new testing positions and services to host MRE devices									■	■	■	■	■	■	■	■
4.5	Storage and energy vectors										■	■	■	■	■	■	■
4.6	Provide services to capture CO2													■	■	■	■
4.7	Provide new capacities, technologies, and instruments for unmanned marine and aerial vehicles	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
4.8	Provide offshore smart grid services and new capabilities in the offshore platform					■	■	■	■	■	■	■	■	■	■	■	■
4.9	Develop a new testing area (PLOCAN-SUR)													■	■	■	■
4.10	Develop onshore and harbour facilities										■	■	■	■	■	■	■
4.11	New boat and support to the sea operations													■	■	■	■
4.12	Improve the organisational system to new reality, safety, security, and funds available	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
4.13	Attract talented, train personnel					■	■	■	■	■	■	■					
4.14	Progress on digital transformation	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
4.15	Collaborate and connect	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
4.16	Communicate and spread outputs	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
4.17	Create technology transfer and knowledge management unit								■	■	■	■	■	■	■	■	■
4.18	Create live open communities with users, stakeholders and society									■	■	■	■	■	■	■	■
4.19	Deliver an innovation hub											■	■	■	■	■	■
4.20	Update orientated training programmes	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
4.21	Create a collaborative space for blue economy			■	■	■	■	■	■	■	■	■	■	■	■	■	■

Schedule of the planned actions

5.2. Monitoring indicators

Actions will be monitored using the KPIs described in section 4.3

Signed by:

HERNANDEZ BRITO JOSE JOAQUIN - 42163049R

Digitally signed by HERNANDEZ BRITO JOSE JOAQUIN - 42163049R
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