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Final Report

**Project No:** 262584

**Project Acronym:** JERICO

**Project Full Name:** TOWARDS A JOINT EUROPEAN  
RESEARCH INFRASTRUCTURE NETWORK FOR COASTAL  
OBSERVATORIES

## Final Report

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# Final Report

## PROJECT FINAL REPORT

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# Final Report

Please note that the contents of the Final Report can be found in the attachment.

## 4.1 Final publishable summary report

### Executive Summary

Global warming and environmental pressures are endangering not only Europe's coasts but also the habitats and human development around them. For Europe to monitor its seas and coasts effectively and address these pressures, the continent's coastal observatories must join forces and work closely together.

The quality of the infrastructures available for marine research should contribute to the EU ambitious goals for the quality of the European Research Area performance, by providing quality control, validated information, inter-operability of the data and of course easy access to the whole research community.

This is the purpose of JERICO (Towards a joint European research infrastructure network for coastal observatories) project. It is bringing together European coastal observatories and is encouraging joint research initiatives and standardisation through a unified European organisation for data management.

In this overall context, the JERICO project aims at creating a solid and transparent organization towards an operational service for the timely, continuous and sustainable delivery of high quality environmental data and information products related to the marine environment in European coastal seas. It will promote joint research initiatives and standardisation, giving a boost to the industrial sector of coastal instrumentation and monitoring services.

Such a research infrastructure is innovative in the sense that, for the first time, there will be a common European organization that will consolidate and harmonize the currently fragmented coastal observing activities in a consistent, coherent framework to the benefit of data quality, availability and cost. This would in turn give generic support to monitoring the environment and biodiversity, to understanding climate change and to better prediction of related impacts, to facilitate the sustainable exploitation of marine resources and indirectly to increase employment through education, training and technological innovation.

The project team has defined a preliminary roadmap and documented existing observatories that would join the initiative. It has held best practice workshops on fixed platforms, ferryboxes and gliders, and ran two summer schools on relevant topics.

JERICO has produced best practice guides for several types of observation platform, as well as for calibration and antifouling. The team also focused on managing data and establishing an online platform for JERICO with relevant documents and links. Free trans-national access to the observatories was offered for specific experiments as diverse as inter-calibration of bio-geochemical sensors or a 3D study of an eddy in the Bay of Biscay.

These achievements and the actions that are expected to follow will improve environmental monitoring efforts and improve predictions of climate-related impacts. JERICO is certainly a step in the right direction for improving our understanding of the global climate.

### Summary description of project context and objectives

#### Scientific, technological and societal contexts

Coastal observations are important in the marine research because they help understanding marine processes at spatial-temporal scales by direct analysis, by feeding numerical models, also through assimilation. Moreover acquired data have applications in the domain of coastal engineering such as for instance in the design of coastal infrastructures, or in the prevention of extreme events (e.g. flooding). As a consequence, around European coastal seas, the number of marine observing systems has quickly increased under the pressure of both monitoring requirements and oceanographic

research. Present demands for such systems include reliable, high-quality and comprehensive observations, automated platforms and sensors systems, as well as autonomy over long time periods. In-situ data collected, combined with remote sensing and models output, contribute to detect, understand and forecast the most crucial coastal processes over extensive areas within the various national and regional marine environments.

Coastal observations are an important part of the marine research puzzle of activities and applications. However significant heterogeneity exists in Europe concerning technological design of observing systems, measured parameters, practices for maintenance and quality control, as well as quality standards for sensors and data exchange. This is because, up to now, the expansion of “coastal observatories” has been driven by domestic interests and mainly undertaken through short-term research projects. Therefore the main challenge for the research community now is to harmonise the technologies, increase the coherence and the sustainability of these dispersed infrastructures by sharing know-how through dedicated actions and experiments and by establishing a roadmap for the future of coastal observatories within a shared pan-European framework. These considerations led 27 institutions to gather in the JERICO project.

This is the main objective of JERICO, which proposes a Pan European approach for a European coastal marine observatory network, integrating infrastructure and technologies such as buoys, moorings, ferrybox and gliders. Networking activities will [S1] lead to the definitions of best practices for design, implementation, maintenance and distribution of data of coastal observing systems, as well as the definition of a quality standard. Harmonisation and strengthening coastal observation systems within EuroGOOS regions will be sought.

Joint research activities were conducted in order to identify new and strategic technologies to be implemented in the next generation European coastal observatories. Focus was given on emerging technologies and the biochemical compartment.

JERICO is clearly a process aiming at bringing together the representative European coastal Observatory operators, enhancing their coordination and promoting the cost-effective use of their facilities, in order to support the efficient provision of essential research and monitoring networks. In particular, it intends to contribute to the international and global effort on climate change research, to provide coastal data inputs for operational ocean observing and forecasting, and also to answer to some of the needs of the environmental research and societal communities.

#### Project characteristics and main objectives

JERICO ([www.jerico-fp7.eu](http://www.jerico-fp7.eu)) is a 4-year long infrastructure project co-funded by the European Commission in the 7th Framework Programme under the grant agreement n° 262584. JERICO has been developed by a consortium of 27 partners from 17 European countries under the coordination of IFREMER (Institut Français de Recherche pour l'Exploitation de la MER), the French national research centre in charge of sustainable management of the sea.

The main objective of JERICO ([www.jerico-fp7.eu](http://www.jerico-fp7.eu)), which proposes to establish a Pan European approach for a European coastal marine observatory network, is to integrate infrastructures and technologies such as fixed buoys, piles, moorings, , ferrybox and gliders. JERICO will address the challenge of observing the complexity and high variability of coastal areas at Pan-european level, in the framework established by European Directives (Water Framework Directive: WFD, Marine Strategy Framework Directive: MSFD) and the marine core service of the European Earth observation programme (Copernicus) by:

- # setting up an European Research Infrastructure for coastal observations based on existing systems in European coastal and shelf seas,
- # supporting standardization of methodologies for the benefit of data quality, data availability and cost efficiency,
- # promoting the cost-effective use of the facilities,
- # stimulating the development of new automated systems for the operational monitoring of the coastal marine environment, with focus on the biochemical compartment.[S2]

In order to reach this target JERICO is promoting: (i) networking activities for standardisation issues from the sensors to the data management, (ii) joint research initiatives, (iii) TransNational Access (TNA) to JERICO infrastructures and data access.

Networking activities has led to the definitions of best practices for design, implementation, maintenance and distribution of coastal observing systems, as well as the definition of quality standards. Harmonisation and strengthening coastal observation systems within the European Global Ocean Observing System (EuroGOOS) has being sought.

Opportunities of Trans-National Access experiments have been carried out in order to promote the potential of JERICO infrastructures used in synergy.

New joint researches have been conducted in order to identify new and strategic technologies to be implemented in the next generation European coastal observatories. Focus was given on emerging technologies and on the biochemical compartment.

In this overall context, the JERICO project aims at creating a solid and transparent organization towards an operational service for the timely, continuous and sustainable delivery of high quality environmental data and information products related to the marine environment in European coastal seas. It promoted joint research initiatives and standardization activities, giving a lift to the industrial sector of coastal instrumentation and monitoring services.

Such a research infrastructure is innovative in the sense that, for the first time, a common European organization worked jointly to consolidate and harmonize the currently fragmented coastal observing activities in a consistent, coherent framework to the benefit of data quality, availability and cost. This would in turn give generic support to monitor environment and biodiversity, to understand climate change and to better predict related impacts, to facilitate the sustainable exploitation of marine resources and indirectly to increase employment through education, training and technological innovation.

#### JERICO position in the international display

JERICO contributes to the international and global effort on Global Earth Observation System of Systems (GEOSS), and to the marine core service of the European Earth observation programme Copernicus (previously named GMES), by providing coastal data inputs for operational ocean observing and forecasting. JERICO also helps answering to some of the environmental and societal needs in the framework of the European Water Directive and of the Marine Strategy Framework Directive. This project has been conceived in the framework of the Marine ERA-NET (A Marine RTD Infrastructure Strategy for Member States - April 2009). JERICO is clearly a process aiming at bringing together the representative European coastal observatory operators, enhancing their coordination and promoting the cost-effective use of their facilities, in order to support the efficient provision of essential research and monitoring networks. JERICO is also built upon existing infrastructures and regional networks at European scale including EuroGOOS, the European Global Ocean Observation System.

JERICO is designing an infrastructure organisation devoted to the automated in-situ coastal and shelf-sea observations, completing observations from satellites (handled by Copernicus) and from the automated in-situ open ocean systems, such as FixO3 and those developed under the ERIC EURO-ARGO and ESFRI EMSO. The position of JERICO in the maze of EU marine projects and initiatives is illustrated in Figure 2.4. Data acquisition in the open sea has benefited meteorological and climate change studies in which a limited number of essential variables are monitored, namely temperature and salinity. The coastal component of this global network has been, up to JERICO birth, far less coordinated. It requires datasets comprising many more variables acquired at higher frequencies. The JERICO project has been developed in this perspective to coordinate actions for coastal observatories.

The project has strengthened a community of 27 partners, mainly research institutes and laboratories from European Union but also associated country as Norway. These partners are:

IFREMER /France, SYKE/Finland, IBWPAN/Poland, DMI/Denmark, NIVA/Norway, IMR/Norway, DELTARES/Netherlands, OGS/Italy, CNR/Italy, UOM/Malta, HCMR/Greece, NERC/United Kingdom, INGV/Italy, HZG/Germany, MUMM/Belgium, CEFAS/United Kingdom, SMHI/Sweden,

CSIC/Spain, NIOZ/Netherlands, MI/Ireland, BL/United Kingdom, TECNALIA-AZTI/Spain, INSU/CNRS/France, IH/Portugal, IO-BAS/Bulgaria, PUERTOS/Spain, CMCC/Italy.

Industrial companies and SME's were involved in JERICO through the FCT, Forum for Coastal Technology. Two forums were organised to work together on how to do the convergence from the needs of the science community and the capacity of providing the most suitable sensors, calibration technology, bio-fouling protection, quality control methodology, ...[S3]

Two calibration exercises were done within JERICO to provide the best practices for calibration and to have positive feedback with the sensor providers.

JERICO overall budget was around 9 M€, of which 6.5M€ were funded for 4 years by the European Commission under the FP7 Infrastructure programme.

### Description of main S & T results/foregrounds

In order to reach its ambitious objectives, JERICO refers to standard I3 structure to define the coordinated activities (i.e. NA, TNA and JRA) embedding 10 work packages, under a coordinated management scheme (WP11):

# 6 Networking actions (WP 1 to 6)

- WP 1 A common strategy,
- WP 2 Strengthening regional and trans-regional activities,
- WP 3 Observing system technology aspects
- WP 4 Harmonization of operation and maintenance methods,
- WP 5 Data distribution
- WP 6 Public outreach and education.

# Two Trans-national Access and Service Access programs (WP 7 and 8):

- WP7/SA Data access & targeted operational phases
- WP8/TNA Trans-national access to coastal facilities.

Common modalities for access and enhanced services are developed in WP1 and WP5.

# Two Joint Research Activity actions (WP9 and 10).

- WP9 Observing system design
- WP10 Improve the system components.

JERICO aims are:

Networking Activities Enhanced structure and integration # Define a common strategic vision for coastal observatories

# Facilitate coordinated infrastructure access to European researchers to broaden services and facilities

# Establish a European Network Infrastructure

Enhanced sustainability # Facilitate optimal use, and inter-operability, for existing equipment

Sharing of knowledge # Advance training in modern equipment

# Intensify dialogue and interactions with industry and policy makers

# Promote interactions with other infrastructures and European projects (EuroArgo, SeaDataNet, MyOcean, ...)

Cooperation # Develop International cooperation including outside of Europe

Trans National Access

Wider access # To observatory infrastructure

# To mobile coastal observing systems (gliders, ...)

# To added value data and services

Joint Research Activities Joint development # Study on optimization of the coastal observing system of systems

# Innovative sensors or systems to enhance interoperability

# Innovative software for a better exploitation of mobile systems

Focus and priority areas

a) JERICO Observing platforms

Coastal observatories dotted along Europe's coastlines deliver a wealth of information on the parameters of the seas. JERICO strives to integrate existing infrastructures and to spearhead the definition of best practices for the design, implementation and maintenance of observing systems and the dissemination of data. It has also initiated research to advance the state of the art, and invited the

international scientific community to access key infrastructures. JERICO aims to structure each community related to the three following observation systems:

(i) "Gliders" are small autonomous underwater vehicles. Gliders collect data in the water column, about the temperature, the salinity, the oxygen content, pressure, chlorophyll content and so forth. To find out more about gliders visit the interactive web tool: [www.followtheglider.com](http://www.followtheglider.com).

(ii) "Fixed platforms" are fixed with respect to their position on or above the seafloor. These platforms host different types of sensors for making measurements related to marine environment and eventually to contaminants. The location of sensors on the seabed or in the water column favours the capability to sense large parts of the ocean which are not detectable from the surface. They include underwater moorings and surficial buoys.

(iii) "FerryBoxes" are automated instruments packages located on ships of opportunities such as ferry liners, ocean liners and cargo ships. These devices can also be carried by commercial and private boats, and yachts that are volunteer to participate in collecting measurements. Measurements are acquired in the upper surface layer. The core FerryBox parameters found in every system are Water temperature, Salinity, Chlorophyll-a fluorescence, Turbidity.

#### b) Observations and measurements

The coastal area is impacted by the effects of the global change. An effective observatory network allows us to know what the state of this area is and preferably the historic variability and change. The models are able to forecast how this state will move on in the next days, and produce scenarios for the coming season, year or decades based on climate projections. But, in order to initialise the models and the forecasts, it is necessary to know how the coastal ocean is changing and what its variability is: we need to have longest possible time series of ocean data and, of course, sustain the coastal observatories to reach that goal. Moreover, the rationale behind the collection of observations in our coastal seas is a better understanding of both natural and "anthropogenic" variability in biological, chemical and physical compartments. Such data are needed to better inform policy as well as science.

The JERICO consortium decided to focus on two sets of parameters. The first set is defined as the core parameters that are operationally observed from the existing JERICO platforms whatever the regional context is. It encompasses such parameters as temperature, conductivity/salinity, dissolved oxygen and chlorophyll (by fluorescence). These key parameters provide a general picture of the hydrology, circulation pattern and biochemical properties of the coastal environment.

The second set of parameters considers measurements of high interest for addressing specific scientific questions, but which were not still broadly implemented at the start of the JERICO projects or which had not reached a level of maturity to be broadly implemented. These set of parameters were defined as such: nutrients, carbon budget (pCO<sub>2</sub>, pH, Alkalinity), current, tide/sea-level, for understanding and predicting tidal cycles, turbidity, coloured dissolved organic matter (CDOM), contaminants, optical properties and sea states.

The JERICO in-situ data can be combined with remote sensing and modelling systems to contribute to detect, understand and forecast the most crucial coastal processes over extensive areas within the various national and regional marine environments.

JERICO advises coastal observatories to cover the above-mentioned shared list of core parameters. In addition, the JERICO team strongly encourages addressing also carbon budget and water quality through the measurement of acidity (pH), partial pressure of carbon dioxide (pCO<sub>2</sub>) and turbidity. These parameters tie in with environmental monitoring needs as well as with the Water Framework Directive and the Marine Strategy Framework Directive.

#### Networking activities results

### WP 1 – A COMMON STRATEGY

#### State of the art and Roadmap for the future

The background, state of the art on best practices and the main challenges to be answered have been established for the different types of platforms. Dedicated workshops on the future strategy are the first step towards the definition of the Roadmap for the future; three workshops have been held in Villefranche in October 2013, in Brussels in March 2014 and in Oslo in May 2014.

All the results and future strategy are available in the deliverable D1.11 "Future strategy for coastal

observatory”.

#### JERICO Label

The deliverable D1.4 JERICO Label Definition proved to be a rather difficult task mainly due to the wide variability between the different platforms in terms of operations and requirements. Moreover during the various meetings it was decided that a crucial component of the deliverable would be the various reports on Best Practices within WP4, which are scheduled towards the end of the project. The document is composed by two major parts; mandatory rules and recommendations to be applied at different levels of the entire JERICO observatory network while the document will be updated with the other platforms used in the coastal observations and not included. It provides recommendations on sensing technologies for each platform, operating issues and deployment - installation. It highlights the importance of performing tests before any long-term deployment at the demanding coastal sea environment. It gives guidelines to define and implement a test plan. As mentioned JERICO deliverables on Operation Best Practices, Biofouling and Calibration become a reference of the JERICO Label as soon as they are delivered.

#### Forum for Coastal Technologies (FCT)

After the first organisation of a metrology experiment, jointly with WP4 held in October 2012, in Ifremer Brest, a second interactive workshop to identify the best practices about DO calibration procedure has been realized during the 2nd FCT at Oceanology International 2014 in London (13th March).

The reports are in the deliverables D1.6 “First report of the FCT activity” and D1.8 “Second report of the FCT activity”.

#### Definition strategy and interfaces with monitoring of marine biodiversity

A study on the state and evolution of marine biodiversity in European coastal waters in regards of national and international legislation has been carried out to investigate the potential of existing coastal observatories to develop into observatories of biodiversity and to define interfaces with a future marine biodiversity network. Three types of potential strategies have been identified for JERICO: implementation of one or a few specific biodiversity related sensing techniques in existing and foreseen infrastructure of platforms to describe boundaries using semi-automated imaging techniques and passive acoustics, and promising genetic markers have been identified to have potentials for the future, linking JERICO to existing or developing pan-European initiatives of biodiversity observation and tune mutual activities (in terms of space and time resolutions) or finalize cooperation with initiatives such as EMBOS, ICES, and through optimization of biochemical sensors already present in the network to deliver explaining – or model parameters for biodiversity. The deliverable is D1.9 “Proposed strategy for biodiversity”.

#### User modality access for the TNA

JERICO has established concepts and procedures for the transnational access to coastal observatories, generally speaking a set of distributed infrastructures and facilities aiming at in-situ observation of the coastal oceans. Coastal observatories are quite complex, including different types of observing systems (e.g. ferryboxes, fixed platforms, gliders, among others) and supporting facilities (e.g. calibration laboratories). The main challenge consisted in defining a general scheme helpful for sharing the existing resources with a wide user community. To this purpose, JERICO has organized three Calls for proposals requesting Transnational Access to targeted facilities. Submitted proposals were selected by an independent Panel of Experts, and the related projects received support by JERICO.

1st Call closed on April 3rd, 2012. Thirteen proposals were received, 10 were approved but 9 have been done.

2nd Call closed on March 27, 2013. Six proposals were received, five of them were approved.

3rd Call closed on November 25, 2013. Five proposals were received, all were approved.

Totally the three TNA Calls received 24 proposals, 20 of them were approved and 19 were scheduled. All the user projects have completed the planned work plans; one of them was unsuccessful because of failure of the installed user equipment.

The operators of the targeted facilities have contributed to these projects by providing all the logistical, technological and scientific support as well as specific training, when needed.



Calls were widely publicized (Partners' webpages: CNR DTA and ISMAR, CEFAS, MI, IBW PAN, IMR, Puertos del Estado; other projects and organizations' webpages: Euroris-net, Euroceans; mailing lists: EUROFLEETS, PERSEUS, Marine Ripple Effect, MONGOOS, NEXOS). TNA webpage (<http://www.jerico-fp7.eu/tna>) was constantly updated including information on the on-going experiments in form of web-articles and outcomes (project reports, presentations to conferences and publication in peer-reviewed papers).

#### WP 8 – TRANS NATIONAL ACCESS

The primary objective of the JERICO Transnational Access (TNA) activity was to enable scientists and engineers to freely access coastal infrastructures not available in their own countries. The JERICO Consortium includes research infrastructures such as Ferryboxes, Fixed Platforms, Gliders, and associated support facilities, i.e. Calibration Laboratories.

Access to these facilities will contribute to

- build a long-term collaboration between users and JERICO partners, facilitating staff exchange and scientific cooperation;
- build an European facility for science dedicated to innovation (new sensors, new automated platforms), open to Europe and also to countries of common regional interest (South Mediterranean, Black Sea, Baltic Sea);
- promote the infrastructure by transferring know-how from the partners to users, with a view to future expansion that will include new partners (possibly also from non-European countries).

Nineteen out of twenty-four proposals submitted to the three Calls were evaluated and selected by the Selection Panel. Related projects (Table 1) have received support by JERICO. The operators of the targeted facilities (Fig.1) have contributed to these projects by providing all the logistical, technological and scientific support as well as specific training, when needed.

Org.	Short name	Country	Installation	TNA User Project	Acronym	Start date	End date
NIVA	Norway	Color Fantasy	o-DGTSPOCME			16/09/2013	03/11/2013
OGS	Italy	OGS-CTO	RTC			25/02/2013	01/03/2013
CNR	Italy	ACQUA ALTA	MAPOM			05/05/2014	26/09/2014

						ACQUA ALTA	RAD	12/03/2014	27/06/2014
						MPLS	METRO	18/10/2013	08/11/2014
						MPLS	ECCECs	02/04/2014	28/06/2014
						MPLS	MOSC	02/04/2014	08/11/2014
						MPLC	OXY-COR	20/11/2012	25/11/2014
						MPL	Genoa SESAM	01/07/2013	12/12/2014
HCMR	Greece	POSEIDON	BUOYS (1&2)	MEDACID				04/03/2013	15/10/2014
						POSEIDON	CAL		
						POSEIDON	CAL TOFU	19/07/2014	02/08/2014
						POSEIDON	CAL CIEBIO	26/11/2012	30/11/2012
NERC	United Kingdom	COBS 4	POL/MARS	GLIDERS	GLISS			02/09/2013	21/10/2013
HZG	Germany	COSYNA_1 (FB)	ECCECs					30/09/2014	27/10/2014
						COSYNA_1 (FB)	FITO MicroLFA	16/07/2014	25/09/2014
						COSYNA_2 (PILE)	o-DGTSPOCME	19/09/2013	29/10/2013

COSYNA\_2 (PILE) FITO MicroLFA 09/05/2014 04/07/2014  
CSIC  
Spain  
CSIC-Glider ABACUS 01/09/2014 19/12/2014  
  
CSIC-Glider FRIPP 25/05/2014 30/05/2014  
  
CSIC-Glider GABS 23/10/2012 29/11/2013  
INSU France CETSM MUSICS 15/08/2014 23/09/2014  
  
GESEBB 23/07/2013 24/09/2013

Results are summarised in the deliverables D1.7 “First report of the access activity” and D1.10 “Second report of the access activity”.

## WP 2 – STRENGTHENING REGIONAL AND TRANS-REGIONAL ACTIVITIES

The JERICO-consortium represents the institutes, which have national responsibilities for operating and maintaining existing in situ monitoring networks as well as development of efficient data gathering to fulfil future information needs.

At the regional level, the main findings are summarised here:

Common elements of the analysis from the overview of the Regional alliances (ROOS) leads to central issues gathered under Nutrients, Physical oceanology, Phytoplankton and zooplankton. More regional specific:

- Attention to functioning of present Artic Ocean ecosystem and with respect to climate change and expected change in productivity, human activities (Artic region)
- Attention to fresh water inflow and validation of forecasting models; sustainability of existing observational system and development towards to eco-system approach and MSFD-indicator needs and assessments (North Sea Region).
- Attention for the monitoring the climate variability, improvement of LT stability for T&S and oxygen along the water column (Baltic Sea Region)
- Attention to growth, and impact from extraction use of natural marine resources (Atlantic front of Europe IBIROOS–region)
- Attention to lack of data from African Coast, NRT biochemical data and integration of gliders in the common vision of the Mediterranean observations (Mediterranean Sea-MONGOOS)
- Attention to the overall lack of observation continues monitoring programs and system behavior studies. Building and maintaining a Basin scale in situ observing system based on best practices in other Regions has key priority (Black Sea GOOS region).

As results the focus can be Integration: Coastal observational systems are designed at National level based on state of the art in technology and knowledge of the coastal and marine processes.

More detailed description in D2.2 “Report on recommendations” and D2.5 “Integrated Pan European Atlas report”.

At the trans-regional level, we demonstrate the feasibility of the trans-regional product production on transport as well as on E-HYPE model (transport of water masses as well as for river runoff). This deliverable D2.4 “Demonstration of the feasibility of Joint trans-regional production” summarises the development and setup of an operational hydrological forecast tool for delivering high-resolution real-time and forecast fluxes of water and nutrients to European Seas and demonstrates a possible approach to a pan-European transport product.

## WP 3 – HARMONIZING TECHNOLOGICAL ASPECTS

In WP3 it was generally perceived that harmonization and dissemination of best practices in operation, maintenance and calibration is an important task and so it was intensively addressed in WP3. It is, however, still on different levels depending on the platform type; further effort is

necessary. The evaluation of the state-of-art of existing ocean observation systems has been the starting point of WP3. The development of new sensor types and the improvement of existing ones is closely related to best practice as sensors need to (and already getting) more robust and reliable to serve the need of expansion of automated observation to manifold parameters.

The WP3 and WP4 were working closely together. Some results of WP3 activities may have been completed in WP4 deliverables. As example, the bests practices for “ferrybox” are partly in D3.1 and also in D4.4 for operation and maintenance

The main results of best practices for Ferrybox, in D3.1 “Report on current status of Ferrybox” and D4.4 “Report on best practise in operation and maintenance” are:

1. The optimal operation practises and the maintenance routines are essential for a successful operating of a FerryBox system. There is considerable expertise among European partners who run FerryBox systems since more than a decade. Some useful advises have been brought together in the JERICO deliverables D3.1 and D4.4.
2. In D3.4, an overview has been given about the status of sensor developments for offshore observing platforms. Several new promising developments are deployed on platforms in a test mode; some sensors are already in pre-operational mode.
  - There has been considerable development of new sensors that measure components of the carbonate system, thus research addressing ocean acidification and eutrophication will benefit from this progress.
  - New sensors for pH monitoring are established on FerryBox routes. They provide better accuracy, higher salinity range (important for Baltic Sea monitoring) and more compact designs for easier installation on autonomous systems.
  - A pCO<sub>2</sub> sensor with a new detection principle (ceramic solid state detector) has been described.
  - A Total Alkalinity sensor will be available soon, which could then be combined with pH measurement devices for better understanding of carbonate system in the oceans. It will be possible to measure the Total Alkalinity directly with the described device.

For glider, the deliverable D3.2 “Report on current status of gliders observatories within Europe” was coordinated with the GROOM project.

The D3.2 is structured in four main sections:

- Introduction to European Glider Observatories: in terms of staff, glider fleet, sensors and vehicles available.
- Operational activity analysis: overview of missions undertaken in 2010 and 2011 (zones of presence, typology and driving objectives); key findings obtained with gliders; and how these missions were supported in terms of (a) planning, (b) prevention, (c) piloting and (d) scientific calibration, amongst others.
- Data management strategies: review of the current situation followed by three representative examples of processing systems and discussion including a specific proposal for glider data management in Europe;
- Compilation of costs related to the glider activity: quantification of the personnel; the operations; the investments derived from the purchase of gliders and related goods (in coordination with WP4).

This report reflects the present status of glider operation in Europe and is mostly centred on infrastructures, operations, data management and costs. Besides different origins and drivers in the different teams, there are evidences of an evolution towards similar approaches to common infrastructure and operation procedures.

With respect to infrastructures, human resources seem to be limited when compared with the size of the fleets to be managed. Considering that the intentions of fleet growth are close to 25%, fully dedicated personnel will be needed to sustain the number of missions planned in forthcoming years.

For fixed platforms, the deliverable D3.3 “Review of current marine fixed instrumentation” reports about all fixed platforms within Europe.

This JERICO report describes the current status of fixed platform observing systems in the seas around Europe. Fixed platforms are fixed with respect to their position on or above the seafloor and they are a part of a coastal network, or they may be located offshore. The resolution of processes at time scales from seconds to years gives fixed platforms a unique role in the global ocean observing

network, providing an unparalleled ability to detect processes which otherwise may be missed. Moored and fixed systems are usually unmanned and compared to drifting platforms such as Argo floats or gliders can carry a greater range of sensors. Power to the platform can be derived from renewable sources such as solar panels, or from large battery packs. Newly developed cabled observatories will have additional capability to transmit high volumes of data in real time, as well as the ability to support more powerful instruments. So, these platforms are an ideal base for the testing of new developed sensors.

The report clusters a collection of similar measurements (often made by the same institute) as a distinct system. According to this classification, Europe has 80 identifiable marine observing systems. Systems have an average of 11 nodes or measuring stations. The observing systems are predominantly located in the shallow coastal zone where the seabed is less than 50 m deep. 33 (39%) of the 80 systems belong to organizations who are partners in the JERICO project.

Deliverable D3.4 “Report on new sensor developments” addresses also sensor developments which are designed for use on fixed platforms. Due to their eulerian form of observation, fixed platforms provide a high temporal resolution of measurements for coastal positions and they are able to carry a higher load of sensors than e.g. floats. Thus, they are capable of accommodating spacious observing systems such as passive samplers, which also can be deployed on FerryBox systems.

In a further step, several calibration best practise advices have been formulated, partly depending on sensor type. Some advices are valid for all sensor types. These advices are documented in deliverable D4.2 “Report on calibration”

The most important points of the calibration of sensors are in general:

- Experience of personnel
- Regular training of personnel
- Sensitive and careful handling of sensor calibration facilities
- Regular sensor calibration before (and after) deployment.

All these results are summarised in the deliverable D3.5 “Conclusion report”

## WP 4 – HARMONIZING OPERATION AND MAINTENANCE METHODS

The main results of that work package are described in 5 deliverables:

D4.1 Report on existing facilities

D4.2 Report on calibration best practices

D4.3 Report on biofouling prevention methods

D4.4 Report on best practice in operation and maintaining

D4.5 Report on running costs of observing systems

The improvement of performance in regard to observatories and the overall quality of products, which are delivered by project partners. The first step consisted on a survey of the existing calibration facilities amongst JERICO partners to evaluate common practises depending on measuring platforms, financial and personnel possibilities. Differences between the facilities are outlined and discussed as well as possible future steps. Close cooperation towards harmonisation between calibration facilities is needed even more, as calibration costs are a significant part of the regular platform maintenance.

calibration best practices

Several calibration best practise advices have been formulated, partly depending on sensor type. Some advices are valid for all sensor types. These advices are documented in deliverable D4.2.

The sensor calibration is a sensitive task and strongly dependent on the sensor type. Thus, we distinguish explicitly between different types, i.e.

- Physical sensors,
- Optical sensors,
- Chemical sensors,
- Oxygen sensors.

However, the calibration of sensors needs in general a high level of

- Experience of personnel

- Regular training of personnel
- Sensitive and careful handling of sensor calibration facilities
- Regular sensor calibration before (and after) deployment

Going into detail, the different sensor types demand different best practises of sensor calibration. In the previous chapters, several advices for each sensor type have been formulated. The most important features are:

- As temperature sensors cannot be calibrated in the field, it is even more important to perform a thorough calibration routine in the lab.
- It is well acknowledged that FChla measurements do not reflect true analytically measured [Chla], due to various reasons. Linear calibration, setting the ratio between FChla and [Chla] as constant is the most often used method when converting measured FChla to [Chla]. In some cases the use of additional fluorescence channels, directed to measure accessory pigments may improve the fit.
- For the controlling of chemical sensors, standard solutions are prepared before the calibration process in the lab. The accuracy of the preparation of the standard solution is critical.

For getting best results, the use of (artificial) seawater standards with comparable salinity is recommended.

For the preparation of reagent solutions, it is recommended to record when and from what source each batch of reagent was prepared and the time and date when its use begun.

The stability of colour forming reagents often varies greatly. It depends on the reagent itself, the observation location and other surroundings like the temperature stability, light exposure and contact with oxygen (air). Thus, it is recommended to store the reagents in constant tempered and tightly closed bottles in the dark.

The largest errors of sample analysis occur in poor choice of sample container and inappropriate storage.

The best way is to analyse immediately bottled nutrient samples. However, if the storage time does not exceed a time interval of more than three days, only cooling of the sample is possible.

- Depending on the scientific uncertainty requirements, different calibration or adjustment protocols can be used from the simplest one to the more complete. However, in the present document, we will focus on the up-to-date protocol recommended to reach the best uncertainties: this protocol is composed of a multi-point calibration.

Originally developed by Winkler, this method has been adopted by the oceanographic community and is recognized as the most accurate technique to determine dissolved oxygen in seawater. Over time the Winkler protocol has been largely described and improved.

Some general advices for calibration, which are independent from the sensor type, can be formulated:

- The proper calibration of sensors requires expertise, specialized equipment and procedures, dedicated staff, and most of all experience. If these resources are lacking in-house, it is better to send the sensors to the manufacturer for calibration or avail of an external provider of similar services.
- All the elements of the reference measuring systems must be maintained to within declared specifications by monitoring their performances regularly, adhering to recommended usage and upkeep practices, and scheduling servicing with a manufacturer immediately when laboratory quality assurance procedures indicate a developing problem.

#### biofouling prevention methods

The most interesting and promising approach to developing novel sustainable solutions to biofouling is known as biomimetic design. This involves the study, characterization and transfer of natural antifouling mechanisms (surface topography and surface chemistry) utilized by aquatic organisms into artificial antifouling materials or solutions.

From the application point of view, this biomimetic antifouling approach, based on physical and mechanical principles, seems to be particularly suitable in specialized markets such as the marine sensors one, thanks to the small surface area to be protected and the kind of materials utilized in the construction of these instruments.

Currently, just a small number of lab/pilot applications of biomimetic surfaces exists, and it is quite hard to think that such technology will be used widely in the next years, mainly due to cost and scaling-up related issues, even though they remain extremely promising.

On the other side, as it shows the survey performed among Jerico partners, there is a strong need for antifouling technologies which could make sensor deployment and maintenance (and, therefore, data acquisition) less expensive, guarantying the quality of collected data during long-term deployments.

Such solutions should be reliable, cost-effective, and environmentally friendly and should require a reduced maintenance. All these things are in an extreme environment as the open ocean one. Answering this need is a hard challenge, which requires both basic researches on biology, material science, engineering, chemistry (and other fields) and, at the same time, a strong technology transfer to and collaboration with private companies.

#### Best practice in operation and maintaining

The harmonisation and Best Practices needs depend greatly on the platform. From the three platforms examined in the framework of JERICO project the whole range was covered. In other words Gliders are the platform where a lot of work is already in place for three main reasons:

- There is relatively very small variability among the different types of Gliders in the market. This is because custom made Gliders cannot be build and all the users rely on market products.
- All available products are built upon the same principle and utilise very similar technology
- Activities during GROOM project funded very early in the life of Gliders significantly contributed in bringing together the Gliders community. In this framework operators formed a coherent group inside which, practices and experiences were exchanged.

Moving one level up, the FerryBox is found. Although there is a common starting point FerryBoxes permit a significant level of customisation but since they are designed for ships and monitoring the surface ocean the amount of customisation is limited. As with Gliders the FerryBox community in the very early steps benefited from the FerryBox FP6 project and judging from the work described in the deliverables and the strong connection between partners remained in the years after it has been a key step. Although variations on the standard FerryBox approach have been done in the last years (sailing and fishing boats) the practices and protocols largely remain the same.

Higher in the complexity as expected are the Fixed Platforms with many different designs across Europe employing significantly variable techniques of operation and maintenance. Great variability is also found both in the observing methods as well as in the part of the environment monitored. The main reasons for the great variation found are:

- Many different designs produced both as off the shelf products as well as custom builds.
- In most cases, designs follow a fit-for-purpose approach adopted for the environment in which they are placed
- The environmental constraints in the coastal environment are high
- The variability of sensors that can be placed on board Fixed Platforms is very high

It is the first time that Best Practices for Fixed Platforms are defined and as such it is of paramount importance. Although there have been previous efforts regarding Gliders and FerryBoxes the fast evolving sensor market dictates a dynamic approach. Thus documents of this kind must be reviewed frequently following the available state of the art technology as well as the new techniques.

#### Running costs of observing systems

Long term sustained marine observing systems are required to help understand and predict changes in the world's seas and oceans. The cost of setting up and operating such systems can be significant. The report examines the costs associated with setting up and running fixed platforms, Ferrybox systems, gliders and calibration laboratories, compiled using questionnaire replies returned from JERICO partners. The costs for gliders are taken directly from a report compiled through a joint exercise with GROOM.

There was a large variability in costs between laboratories reflecting the different types of platforms and parameters being measured. Initial investment costs are greater for glider fleets (€222,545 in 2011) and Ferrybox systems (€110,298) than for fixed platforms (€86,526). Ongoing total annual running costs for a glider fleet (€184,014 excluding investment in 2011) and fixed platforms (€139,358) exceed those of Ferrybox systems (€90,529). This analysis of costs has shown that a large proportion of the total annual running costs (27%) of fixed platforms is associated with boat charter. Collaborative working such as under the Eurofleets project (<http://www.eurofleets.eu/np4/63>) may give the opportunity to reduce these costs and maximize efficiency.

## WP 5 – DATA MANAGEMENT AND DISTRIBUTION

The JERICO network's approach to handling its data was strongly based on the use of, and integration with, already available data management infrastructure through mutually beneficial partnerships. This strategy was consistent with the policy behind SeaDataNet (SDN) and MyOcean

(MyO), which were then the major ongoing European initiatives for the establishment and coordination of infrastructures for the management and distribution of marine data and products. Thus, there was no development of a specific data management structure for JERICO. The JERICO data management framework for delayed-mode data used the SDN infrastructure while real-time data were handled through MyO. There was continuous interaction with SDN, MyO, EuroGOOS and EMODnet-PP to facilitate seamless integration with all these established infrastructures for managing the JERICO data stream.

Acknowledging that the success of the networking activity in JERICO would depend on the use of common data management standards and distribution procedures, two Data Management Handbooks, one for delayed-mode data and the other for real-time data, were prepared for providing practical advice on delivering data. The documents took into account the lessons learnt from SDN and MyO, and contained all the references and links to the basic and most important online documents that data providers would need to successfully manage their data within JERICO. They also presented the guidelines to be followed by Partners during the JERICO Service Data Access period that began in January 2013.

Furthermore, some concrete actions were taken to help data providers in submitting data: dataset indexing procedures were developed to help ensure compatibility with MyO Thematic Assembly Center (TAC) requirements and assist non-NODC data providers in using the SDN infrastructure. A specific indexing and data distribution scheme was created. An appropriate tag (a JERICO index) was designed to easily recognize and select JERICO data from larger archives. Procedures using the OGC's SWE suite and SensorML format were set up to implement descriptions of the different elements of the JERICO observing infrastructure in a standardized, accessible way to help users. The descriptions were structured to hold technical specifications of platforms and sensors, details of instrument settings, calibrations and performances, and some information on data processing procedures. However, difficulties remained, especially in relation to parameters and data types that were not being considered in SDN and/or in MyO. The nRT data coming from partners involved in Work Package 7 (Services and Data Access) were routed to the French CORIOLIS Data Assembly Center through the MyO in situ TACs.

Acknowledging the value of data to science, society and economy, JERICO adopted an open access data policy (see figure below), in line with relevant European policy. The flow of data from JERICO partners to the community of users was driven by a synergic action of three Work Packages: WP7 collected data from partners, WP5 defined the rules for data management and distribution, and WP6 provided the platform and tools for distributing data.

Figure. Outline of the JERICO data management scheme, featuring the driving actions and main information flows.

- # The main results of the activities carried out in WP5 can be summarized as follows:
- # Fully functional partnerships with SeaDataNet and MyOcean, supporting the “open & free” data policy paradigm # this has ensured compatibility, interoperability, and the implementation of common data handling practices for coastal marine data in the European context;
- # Added impetus to the contribution of coastal marine data to SeaDataNet and MyOcean # this has enhanced the general availability and circulation of European coastal marine data;
- # Establishment of a proactive approach to address “in-house” data issues # the cooperation with SeaDataNet and MyOcean has allowed JERICO to participate actively in establishing Europe's database and management infrastructure for coastal marine data.

## WP 6 – OUTREACH

The aim of this work package was help to maximize the impact and promote uptake of the Jerico infrastructure. The objectives were:

- To develop a Jerico Community Hub and Jerico Datatool for engagement of diverse end-user groups.
- To provide educational and informational resources for identified user groups.
- To provide opportunities for targeted training in topics related to Jerico.

The development of a range of end-user products and services were carried out. The Jerico Community Hub (T6.1.1), hosted at (<http://www.jerico-fp7.eu>), has links to Trans National Access, the Forum for Coastal Technology, descriptions of the work packages, the Jerico OceanBoard, workshops and meeting documents. Since the website was launched in January 2012 it has had 29,144 visits from 171 countries. The countries with the most users of the Community Hub are Italy, UK, France, Spain, United States, Greece and Malta.

Users were given access to integrated data products and datasets via a user interface as part of the Jerico Datatool. Data are being fed in directly from MyOcean. The Datatools were fully launched in March 2014 with the data that are available via Service Access from 1st May 2014 and have already been visited over 1,700 times

A new capability (T6.1.3) to display data to the public from a FerryBox was developed (<http://www.jerico-fp7.eu/live-ferrybox-data>). The developed version has been tested and is publically available for wider use.

The Jerico web site i.e. the Jerico Community Hub, and the Jerico Datatool have been supported throughout the life of the Jerico programme.

As part of the communication strategy the Jerico OceanBoard was developed and incorporated into the Jerico Community Hub. It has provided a conduit for written articles from the Jerico scientific community aimed at non scientific audiences (OceanBoard PUB) and scientific/technical audiences (OceanBoard PROF).

To engage younger audiences with operational oceanography and in particular new observing technologies a web tool, 'Follow the Glider' (<http://followtheglider.socib.es/>) was developed. It has real-time data visualisation, with specific and adapted explanations for children on why we measure these data and why it is important to do ocean monitoring. There are sections with easy to follow text and graphics about the glider parts, sensors, navigation systems, piloting, etc. Also there is a specific section for teachers with adapted outreach material to explain to students how to "Follow the Glider...".

To contribute to the skills base of the next generation of ocean scientist two summer schools have been devised and carried out. The first summer school was on Operational Oceanography in the 21st Century – The Coastal Seas. It focused on technologies and the use of sensors and was held at University of Malta (UoM) in July 2013. There were 84 applicants from 28 different countries and 35 participants were selected by a committee. The final report, including an analysis of participants' feedback, is available on the Community Hub:

<http://www.jerico-fp7.eu/deliverables/d63-jerico-malta-summer-school-2013-final-report>.

The second summer school was held at Deltares from 14–20th June 2014. The summer school "From data to decisions" covered the entire marine and coastal information cycle from data gathering via data management, data dissemination, data analysis, data assimilation to data-based policy decisions. Information about the summer school is available on the Community Hub:

<http://www.jerico-fp7.eu/jerico-public/international-general/237-deltares-summer-school>.

Both summer schools scored extremely well based on formal feedback from students and can be regarded as successful examples of educational outreach activities.

This entire work package was devoted to dissemination activities. The Jerico web-site, called the Jerico Community Hub (JCH), was developed, implemented and then hosted for the life of the programme ([www.jerico-fp7.eu](http://www.jerico-fp7.eu)). The JCH continues to be available after the project. As indicated in the previous section the JCH provided access to key project documents (e.g. describing work packages, reports on progress), disseminated information regarded key Jerico activities including Transnational Access (WP8), the Forum for Coastal Technology and the summer schools. It provided



the means to disseminate written articles from Jerico partners targeted at public and educational sectors, and at scientific and policy users. These articles were subject to internal editorial review by the Jerico OceanBoard and then distributed via the appropriate part of the web site i.e. OceanBoard PUB or OceanBoard PROF for public or professional audiences respectively. The web site also provided links to the Jerico Datatool (<http://www.jerico-fp7.eu/datatool/>), a web service providing access to Jerico data and information through an easy to use portal.

## WP 9 – NEW METHODS TO ASSESS THE IMPACT OF COASTAL OBSERVING SYSTEMS

WP9 results indicate the impact of the different observing platforms on the quality of products, considering both analyses and forecasts. The significant results for each platform are:

### Tide gauges

Albeit tide gauges are the most traditional measurement type for the coastal sea level, the assimilation of tide gauge sea level has advanced only recently. In Jerico WP9 the importance of such coastal measuring system is analyzed in terms of increased skill for the 6, 12 and 24 hours forecast of sea level at the coasts.

It is found that the forecast skill is increased in time if tide gauge sea level is assimilated nearby the forecast target area but also using upstream data from the direction of prevalent propagation of tidal waves.

Since sea level is an essential variable in the coastal areas of the world ocean, JERICO OSE results show that tide gauge is an essential component of the coastal observing system and that international real time exchange of data is fundamental for each single Member State forecasting system.

### Fishing vessels opportunity measurements

The RECOPECA and Fishery Observing System (FOS) consider profiles or single depths measurements of temperature and/or salinity from fishing vessels.

The high sampling rate associated with temperature observations only is shown by OSE to have a positive and relevant impact on the analysis quality in both the Bay of Biscay and Adriatic Sea. The sampling scheme of the vessels is also to be considered carefully and clustering of data in fishing areas should be avoided.

The addition of salinity single point depth measurements to the FOS in the Adriatic Sea shows however very little impact on the analysis quality with respect to the simple temperature measurement assimilation. This is probably due to the fact that salinity has a high modal vertical structure and one point in depth is not capable to capture properly the vertical variability.

### Ferrybox

Ferrybox measurements of sea surface temperature (SST) have been used as focus measurements together with other platforms in the English Channel and Aegean Sea. Results show the extreme relevance of such measurement in terms of resolution of the SST daily cycle and the impact in far field areas due to eddy dynamics.

Since the measurement is high frequency the daily cycle is better reproduced from assimilation of such data set than from gliders, even along the same route. For the Aegean Sea the positive impact is due to the fact that large SST frontal structure are better resolved and the far field influenced by advection.

Weakeness of the used Ferrybox system in the Aegean Sea was the systematic malfunctioning of the conductivity sensor that led us to exclude SSS measurements from the OSE experiments. In addition, even for the most most mature sensors (Temperature and conductivity) it is necessary to consider periodic insitu validation mechanism.

### Fixed platform profiles

Fixed platforms profiles have been studied in two regions: the Bay of Biscay off an estuary and the North Sea. For the former area, the fixed platform measurement is much less impacting the analysis quality than the glider data. On the other hands, in the North Sea the distribution of stations should be carefully designed in order to have a positive impact from assimilation. Non homogeneous distributions of the buoys could hamper the possibility to take advantage of the measurements.

### Gliders

Glider assimilation impact has been studied in the Bay of Biscay offshore an estuary and in the Baltic Sea. It is found that gliders have a positive impact on the analysis quality considering a mission organization and an overall sampling scheme compatible with the main current flow directions. From assimilation of glider temperature and salinity profiles, both the estuary offshore areas and the Baltic Sea show improvements in the quality of the analyses.

#### HF radars

HF radar measurements have been tested in the German Bight and in the Aegean Sea in two very different current regimes, the tidal one for the North Sea and the Dardanelles outflow for the other. It is shown that in both cases assimilation of the surface current field improves the quality of the analysis provided that a careful quality control of the measurements is carried out.

A major problem for HF radar is still the suboptimal operation of the system. In many situations the data are sparse and noisy especially near the coast. Robust techniques for filtering and interpolation (reconstruction) of raw data and advanced quality control are needed before the data are ready for usage in operational models. Through the relevant OSE experiment we performed, we realized that the assimilation of the meridional component of the measured surface currents was problematic and had to be excluded from the assimilation exercise. This can be related to the geographical orientation (north – south) of the two sites used for the reconstruction of the total velocity component or to the overall quality of the measured signal calling for a further improvement of the system.

Again another critical error present in HF radar data, e.g. the interference with radio stations and with ships, can be removed using suitable data processing tools but it requires careful pre-processing of the data.

For the HF radar it would be desirable to have standardised validation procedures. At the moment different groups use various approaches, e.g., different types of ADCPs or drifters, which can lead to results, which are hard to compare.

#### What are the lessons learned?

By now it is clear, from Copernicus Marine Service Monitoring and Forecasting Centres and JERICO, that the assimilation of broad coverage satellite observations (SSH and SST) is capable to control a large part of the model state despite the fact that there are complicated coastlines and the cloud cover could produce several spatial and temporal gaps.

However for an efficient monitoring strategy it is necessary to have subsurface data that will complement the satellite observations. In particular in the coastal and shelf areas we should plan to employ different and complementary observing platforms strategically positioned in areas of high variability and with as much as possible an homogeneous sampling scheme (see for example the case of the North Sea where the buoy station network was overlapping and gappy).

From all OSE experiments performed the additional assimilation of in situ data further improved the SSH estimation due to the direct assimilation of satellite altimetry. The assimilation of FerryBox SST and glider observations introduced a significant change in the sea surface height, sea surface temperature and the correct reproduction of the SST daily cycle. The HF Radar systems have extended effects in space as the currents can reach remote areas correcting locally the dynamics.

As far as the HF radar is concerned the most important lessons learned are as follows:

- HF radar can be used to improved short term forecasts of surface currents in an operational fashion
- It is desirable to combine HF radar data with other measurements (e.g. tide gauges, altimeter) in the assimilation
- There should be common validation procedures for HF radar

Even if there are significant differences between the southern, eastern and northern European shelves some critical platforms are shown to be beneficial for analysis and forecasting. FerryBox data are one case, giving improvements from the English Channel to the Aegean Sea. Gliders are another case that gives very positive impacts in estuarine shelf areas. Additionally gliders and Ferrybox are measurement platforms readily extended to biological measurements.

It is furthermore important to notice that a critical coastal monitoring component is sea level and that tide gauge data have shown to give improvements in the local sea level forecasts. However, a European wide coordination among the real time platforms is missing thus limiting coastal

forecasting and modelling capabilities. Other essential variables for coastal monitoring systems are the wave and sediment fluxes which hopefully will be available and used in future current-wave coupled models and sediment transport. A coastal observatory needs to consider the integration of these measurements in the multi-platform multi disciplinary monitoring system.

## WP 10 – IMPROVED EXISTING AND EMERGING TECHNOLOGIES

This WP is a R & D one. All the results are described in the deliverables D10.1 to D10.4.

The main results are:

Development of new tools and strategies for the monitoring of key biological compartments and processes.

The idea behind this deliverable is to harness existing imaging and biology expertise within different fields to develop and test new software designed to process the following data:

### 1. Sediment Profile Images.

SpiArcBase provides an excellent tool for the analysis of Sediment Profile Images (SPI).

The spiArcBase software, developed in the frame of Jerico, allows enhancement of the interpretation of features observed on SPIs. Image analysis, coupled with use of database and learning processes facilitate image management and structures visualization, as well as inter-calibration of profiles coming from different areas.

Key features when analyzing sediment profile images are the drawings of the sediment-water interface and a RPD, and the assessment of biogenic structures. For each of these 3 features, SpiArcBase is aiming at providing an integrated set of tools allowing for: (1) carrying out the (often manual) currently most often used procedures, and (2) using new automated tools in view of facilitating and enhancing the objectivity of SPI processing.

Besides all the most often currently used procedures, it includes significant innovations such as: (1) possible automation of the drawing of sediment-water interfaces, (2) a new based on knowledge procedure for the drawing of aRPDs, and (3) the storage of SPIs variables within a database. By doing so, SpiArcBase is aiming at: (1) improving and standardizing the procedures used for SPI processing, and (2) enhancing the test and development of new SPI derived benthic habitat ecological quality indices. SpiArcBase will also hopefully contribute to the emergence of a wide community of users of Sediment profile Imaging, which may for example contribute: (1) to the creation of a “universal” learning set for the assessment of aRPDs, and (2) to the improvement of existing or to the development of new procedures through tight interactions with the software developing team.

### 2. Mobile platform recorded video.

AviExplore fixed module has been specifically developed within the frame of Jerico to allow the survey of recruitment on substrates, as well as the growth characteristics of fouling organisms. Image analysis is also used to track the animals settling on the substrate, measure their interactions and growth rates. The key feature of this module is image subtraction that can be combined with the selection of areas to analyse. Based on our experience, and due to the fact that AviExplore has been optimised for fast image extraction, image subtraction can be first used to identify the regions where there is the most activity and a second time for more detailed information on those regions.

AviExplore allows the treatment of video imaging of the water sediment interface acquired using a ROV (or other mobile carriers) in order to infer the abundance of epibenthos (suprabenthos).

AviExplore provides a unique environment to analyse videos. AviExplore presents a user-friendly interface developed for dynamic image analysis on fast moving environments as well as long-time series of images. AviExplore can work with images generated by any image acquisition system though its performance depends on the size of the images, the acquisition speed, and the characteristics of the acquisition frame.

One of the key features of AviExplore is the possibility of doing a fast image extraction from a video that leads to a straightforward image comparison. Image comparison is the core of AviExplore mobile module.

### 3. Fixed platform recorded video.

AviExplore mobile module has been specifically developed within the frame of Jerico to analyse films coming from underwater mobile vehicles like ROVs, AUVs, etc. The Script editor module allows building adapted scripts to analyse video and count not only epibenthos organisms but other objects present on or around the sea floor. One of these objects can be garbage.

Filters, coupled with geo-localisation and image segmentation help extracting information on the presence of organisms and structures present on the sediment. AviExplore is also used to analyse video imaging by fixed cameras. The main purpose is to allow the survey of recruitment on substrates, as well as the growth characteristics of fouling organisms. Image analysis is used to track the animals settling on the substrate, measure their interactions and growth rates.

It is to be noted that for the convenience of final users, a single software (AviExplore) is proposed for video data originating from fixed and mobile platforms giving access to the different modules depending on the desired analysis.

#### 4. Phytoplankton and Zooplankton images.

Zooprocess: an integrated analysis system for acquisition and classification of digital zooplankton images from preserved zooplankton and phytoplankton samples.

The Zooprocess Image analysis tool which has been in development over a number of years has been enhanced for zooscan and zooplankton analysis, adapted specifically to FlowCAM and Microplankton analysis and adapted to any kind of imaging device e.g. Inverted microscopy tested and UVP tested. The software has facilitated a more holistic sampling strategy to get appropriate samples to test and a Holistic analysis of plankton dynamics based on zooprocess and combining 3 imaging instruments. There are currently ongoing collaborations around imaging and the zooprocess software. We have built an agreement with the French MPA to analyse the zooplankton samples from their marine protected area. We build a community of users ([http://www.obs-vlfr.fr/Rade/RadeZoo/RadZoo/Plankton\\_of\\_the\\_world/Plankton\\_of\\_the\\_world.html](http://www.obs-vlfr.fr/Rade/RadeZoo/RadZoo/Plankton_of_the_world/Plankton_of_the_world.html)) and organised training courses with the EU FP7 PERSEUS project to educate European scientists in the use of sampling protocols and Flowcam and Zooscan ([http://www.obs-vlfr.fr/Rade/RadeZoo/RadZoo/Plankton\\_of\\_the\\_world/Plankton\\_of\\_the\\_world.html](http://www.obs-vlfr.fr/Rade/RadeZoo/RadZoo/Plankton_of_the_world/Plankton_of_the_world.html)).

#### Development of new physico-chemical sensors

Generic sensor technology elements by NERC

Most of the sensors developed at Southampton by NERC use a common set of components and are based around our platform technology that uses microfluidics and reagent based analytical assays with spectrophotometric or fluorescence readout. This is known as our in situ lab-on-chip platform. The common elements (see Figure 1) include:

- 1) an optofluidic (microfluidic) chip [2, 3] which forms the endcap of the sensor and in which reagents are mixed with sample (usually seawater), standards or blanks, and the optical signal read using LED light sources and optical detectors (typically glued into the chip)
- 2) pressure tolerant electronics that control and interrogate the sensor and log data;
- 3) solenoid valves that mount onto the chip for controlling fluid routing; and
- 4) a syringe pump that consists of a frame with a sliding plate that drives multiple plungers (pistons) inside cylindrical barrels to enable precision dosed pumping of fluids to, from and inside the chip.

Wet chemical Lab on chip nutrient sensors: Nitrate, nitrite, phosphate, ammonia and silicate

These in situ lab-on-chip sensors use the common components listed above. Nitrate, nitrite, phosphate and silicate all use colourimetric assays (either Greiss or Molybdenum Blue method) whereas the ammonia sensor uses the OPA fluorescence method.

The nitrate/nitrite sensor is the most mature (TRL 7 for mooring applications) as it is now being used routinely to deliver data in field campaigns and has delivered high quality data for third party (GEOMAR) scientists without any of our technical team present. Phosphate is at TRL 5/6 as whilst components and previous versions have operated in coastal waters, the current version remains unproven in an operational environment (though we expect to do this in the next six months). The silicate sensor is almost indistinguishable from the phosphate sensor, but uses a variant of the same assay which we have only run in the lab. Hence the silicate sensor is currently at TRL4/5 though we expect to progress to TRL 6. The ammonia sensor has been demonstrated on the bench top and is therefore at TRL 4 we plan to reach TRL 6.

#### Wet chemical Lab on chip trace metal sensors: Fe/Mn

These in situ lab-on-chip sensors also use the common components listed above. However, the previous versions did not use all of the common components, the differences were particularly in the housings and the geometry and the channel widths of the microfluidic chip. The Mn analyser uses the PAN (1-(2-pyridylazo)-2-naphthol) assay and the Fe analyser Ferrozine for the direct measurement of Fe(II) and with an additional reagent (ascorbic acid) to reduce Fe(III) to Fe(II) is able to measure Fe(II) plus Fe(III).

The Fe sensor is the most mature (TRL 7 for river / coastal applications) as it has been being used for a field study in both the Baltic and UK rivers. The manganese analyser is TRL 6 and has had limited deployments.

#### Wet chemical Lab on carbonate system sensors: pH, Total Alkalinity (TA) and DIC

These in situ lab-on-chip sensors also use the common components listed above. pH is measured with the spectrophotometric method, typically with the dye Thymol Blue or Meta Cresol Purple (MCP). Total alkalinity is measured by observing pH after acid addition to the sample (with the pH indicator Bromocresol Green), DIC is measured by acidification of the sample to drive CO<sub>2</sub> into a sodium hydroxide solution where conductivity detection is used.

The pH sensor is the most mature (TRL 7 for FB applications) as it has been repeatedly used on FB / underway applications and has been developed as an in situ sensor for the Wendy Schmidt Foundation “X-Prize” and for parallel science and industry projects. TA is currently a benchtop system (TRL 4) as is DIC (i.e. TRL 4).

#### Optodes: pH and pCO<sub>2</sub>

These sensors use pH and pCO<sub>2</sub> sensitive optical foils purchased from Presens GmbH. Similar technology is in development (TU Graz), or available from Pyroscience (Germany). The foils are fluorescent with a decay (or luminescence lifetime) that is perturbed by the target. Our contribution has been to develop optoelectronics that interrogates the optical foils and produces a readout and to use this system to perform high accuracy characterisations of the foil's behavior. The unique aspect of our system is the use of dual luminophore referencing [10], very low light levels for illumination, and time domain analysis of the luminescence lifetime. This feature gives us immunity to photo-bleaching of the optical foils, which is otherwise problematic.

Both systems are benchtop / underway systems with deployments limited to FB / underway operations. The sensor produced by the combination of optoelectronics and optical foils is often termed an optode. Optodes for oxygen sensing are now widely available and commercially successful in a wide range of applications.

#### Lab on chip micro flow cytometer

These lab-on-chip sensors are currently research devices in the laboratory but have been designed for eventual deployment in situ. The principle of microflow cytometry is to pass cells one at a time through a measurement region where multiple parameters such as optical fluorescence and scatter are measured. There are numerous commercial benchtop microflow cytometers, but our innovations are to 1) design for eventual in situ deployment and 2) to include measure both optical properties (multiple fluorescence and scatter parameters) and the impedance of single cells in the measurement region. These innovations mean that we can provide accurate cell size measurements and detailed fingerprinting of up to 5000 cells per second in a miniature device that with development could be deployed in situ.

Because the device is currently an early benchtop prototype it is TRL 4 in FB / ship based applications and TRL 3 for all other platforms.

#### Lab on chip Nucliec acid analysis

This lab-on-chip sensor is in transition from using bespoke components (developed in the EU project Labonfoil) to using the common components listed above. This will take the device from a benchtop / laboratory instrument to an in situ device. The device analyses nucleic acids (RNA and DNA) from (micro)organisms that can be collected on a filter substrate. The device includes a module for the lysis of cells and the extraction of nucleic acids which feeds sample into the analytical device that uses nucleic acid amplification and fluorescence detection to quantify the concentration of nucleic acid targets. Typically gene or species specific primers and molecular beacons are used to amplify and detect only very specific targets, however mixtures of primers / beacons or those coding for

sequences common to many species can be used to broaden the number of targets detected. The significant differences with the nutrient sensors include: Multiple wavelength detection, multiple single use detection cells, and reagents that are stored in a gel or dry state on the chip. The latter is required as when fully hydrated the reagents have a short useable lifetime, one hour is not uncommon. With dehydration we have achieved reagent lifetimes of 6 months. The reagents are also too expensive to be stored in large reagent stores.

The labonfoil platform has only one reaction (with up to two targets) per chip. A repeat measurement requires the user to manually change the chip in a “reader”. The new platform has multiple measurements before requiring a chip change. The new analyser is currently at TRL 3 whereas the labofoil platform is at TRL 7.

#### Miniature / low cost CT (salinity) and dissolved oxygen sensor

These sensors do not contain fluidic channels, but are manufactured using microfabrication techniques. They consist of a platinum resistance thermometer, a four electrode conductivity cell (platinum) and an array of recessed microelectrodes for the measurement of dissolved oxygen concentration. These sensors are all formed on a glass substrate to form a sensor chip which is interfaced with electronics and a commercial pressure sensor to create a miniature CTD-DO (Conductivity, Temperature, Depth and Dissolved Oxygen) sensor (approx 200 mL in volume with pressure case, 15 mL with potted electronics). The current specification is an accuracy of 0.003 mK, 0.01 mS/cm, and 5 microM O<sub>2</sub>. The device is being evaluated for manufacture by a company.

#### LED fluorometers for phycobilins and CDOM

Phycobilin fluorometers are used to measure distribution of phycobilin pigments, which are found in some taxonomic phytoplankton classes. CDOM (Coloured Dissolved Organic Matter) fluorometers track the fluorescent fraction of the dissolved organic matter. In principle, the technology used in both applications is identical to Chlorophyll a fluorometry, which is widely used in various platforms, but the excitation and emission wavelengths and spectral bandwidths of the instruments are tuned based on the optical properties of the phycobilin pigments or CDOM studied.

#### Technology Spectral fluorometers for phytoplankton taxonomy

Several manufacturers provide instrument packages, which include several fluorometers e.g. for Chlorophyll a, phycocyanin and phycoerythrin, to be used in various platforms. Integrated spectral fluorometers for taxonomic phytoplankton studies are, however, available only from few companies. The technique uses several excitation LEDs to excite various accessory pigments and measure the subsequent Chlorophyll a emission. The obtained fluorescence spectra can be decomposed into known taxonomic spectral signals or analysed statistically.

#### Fast-repetition rate fluorometry in autonomous monitoring systems

Primary production measurements of marine phytoplankton using the benchmark technique of <sup>14</sup>C uptake are increasingly less common due to the necessity for sea-going laboratories, cost of consumables and trained technicians, and increasing legislative obstacles in using radioisotopes in several countries. Methods to assess photosynthetic parameters and contributing to modelled primary production, which are based in optics are increasingly sought. Examples of such methods are pulsed-amplitude fluorometry (PAM) and fast-repetition rate fluorometry (FRRf). These methods do not generate waste, can be automated, and without the need for supervision they offer significant cost-reductions and increased spatiotemporal coverage. FRRf instruments are more costly than PAM but offer a stricter interpretation of photosynthetic parameters. FRRf uses inducible fluorescence to infer electron transport rate for photochemistry at a high time-resolution. It is now believed that a quantum-calibrated FRRf can be used to directly assess gross primary production in terms of fixed Carbon, provided that samples are first acclimated to darkness which allows their full capacity for photochemistry to be measured with the fluorometer.

#### Use of emerging Profiling technologies in coastal seas.

The new EOL buoy has been deployed in March 29th 2013 in the Villefranche bay. The new version is larger and bigger than the previous one: 4 tons & 8m height & 3.6 diameter. The CTD profiler has been integrated in the buoy which provides one T&S profile every day (0-100m) with an autonomous profiler (down to 100m depth) equipped with an anti-biofouling system (chlorination by electrolysis) was developed. This concept has been tested for 4 years: buoyancy, winch, energy and software have

been validated as well as data transmission system (GMS and wireless). The robustness of the chlorination system has been also validated through the test of the conductivity accuracy (post calibration slope around 1.0001454 after 5 years deployment).

Additionally a cytometer has been also integrated for picoplankton & bacteria analysis - Concerning the cytometer (Cytosense) there is a web link on the instrument deployed on EOL buoy:

<http://www.cytobuoy.com/company/news/show/article/cytosense-on-leobuoy-marseille/>  
<http://www.cytobuoy.com/company/news/show/article/cytosense-on-leobuoy-marseille/>

An experiment was planned to use a tethered mooring ARVOR-C profiling float alongside the MAMBO buoy in the Northern Adriatic and compare with ship based CTD systems.

The tethering frame bearing the ARVOR-C float was to be moored close to the chosen Mambo profiling buoy - the float was to be programmed to profile once an hour so as to be able to provide data in concomitance with the transmissions of the profiles from the buoy which took place every three hours. The data from the two systems were to be supplemented with those from intermittent CTD casts that were to be carried out whenever possible during the period of the deployment. Due to storm and controller failure, the report is not yet available.

### Use of Ships/vessels of opportunity in coastal oceanographic measurements

#### Fishing Vessels - Next Generation fishing vessel probes

Considerable progress was reported for the Italian Fisheries Operational Oceanographic System (FOOS) where equipping fishing vessels with sensors (e.g. temperature, salinity, catch weight and net drum rotations) is becoming a mature and well understood technology. The focus is shifting towards making useful products for fishermen from the data collected from sensors on board fishing vessels.

Among the most important characteristic for the sensors to be used on fishing gears there are size and robustness; in fact the probes should not represent a problem during the fishing operations and must be robust enough to resist to impacts especially during the deployment and recovery of the gears. The sensors used with the FOS ("Star-Oddi DST centi-TD" probes) and the FOOS ("NKE RECOPECA" probes) share the common characteristic to be small enough to be easily mounted on different parts of the fishing gears.

The Star-Oddi probes have been designed for other purposes (e.g. tagging; Grabowski et al 2014) and then they need to be adapted to use with fishing vessels. In particular, they should be equipped with ad hoc protections against shocks (rubber and steel case). They are implemented only for measuring depth and temperature.

On the other hand, the NKE sensors were specifically developed for use on fishing gears, so they are already provided by the manufacturer with a rubber protection. The only additional precaution was to protect them with a nylon case that, on the contrary of steel cases, allows radio link. There are several options for measured parameters with this brand of probes; in particular they can record physical parameters such as depth, temperature and salinity.

#### Other ships of opportunity

An overview of unmanned surface vehicles (USV) was presented at one dedicated workshop to highlight some of the developments and emerging technologies that have taken place in that regard. During the dedicated workshop, four categories of USV platforms have been presented:

- USV for shallow water.
- ASMV (Autonomous Self Mooring Vehicle).
- Coastal USV.
- UOV (Unmanned Ocean Vessel).

USV for shallow water are dedicated to Hydrographic survey, most of the time their specific specification is a compact size and a reasonable weight that allows handling by one or two persons. Quite rapid, this kind of USV allows fast survey mapping with few sensors on board and real time telemetry. Commonly, echo sounders, GPS and camera are part of the set up. There is very little feed back on chemical sensors in the literature. In this category, we can mention the Z-Boat 1800 from ocean science group.

ASM (Autonomous Self Mooring Vehicle) is a very specific category in which there are not many candidates. We can mention the C endure platform from ASV Limited (UK). It consists of a medium size platform that can hold various kinds of sensors (passive acoustic, meteocean, seismic and

environmental). The idea is to get 3 months autonomy with the help of solar panels and windmill. The platform can remain in a stationary position and has still some possibilities to move at low speed (4 knots) over a 4000 miles range.

Coastal USV and UOV (Unmanned Ocean Vessel) are two categories that overlap and which are actually developing quickly. The main purpose of these systems is to perform environmental survey over a specific area, or around an oceanographic vessel or for some quite still very specific campaign along transects across large areas. Commonly, these systems are designed in order to be able to use environmental oceanographic sensors, to transmit data in pseudo real time via satellite and offer a large autonomy. Some systems are noticeable in terms of energy harvesting. The most common one is an automatic sailing boat (Vaimos) equipped with a windmill that consequently can theoretically navigates without any limit. Another very promising system is the Wave Glider from liquid robotic which uses the movement of the surface wave to animate some underwater parts which make the system to move on. This US Company is very engaged in this technology since they are the only one to offer to customers the possibility to control and manage the wave gliders at sea from a central office from their company. Finally, the Mobesens USV which is the only one to offer the possibility to perform vertical profiles with the on board sensor pack and with the water withdraw unit.

#### Ferry-box Quality Control algorithm development

In general, all FerryBox systems employ a similar design. There are differences in the design of the flow-through system, the degree of automation and biofouling prevention as well as the possibilities of supervision and remote control.

However, continuous operation of FerryBox lines creates a large volume of data and requires appropriate data management. A reliable quality assessment is mandatory. Within the European project MyOcean ([www.myocean.eu](http://www.myocean.eu)), a subset of most of the FerryBox data within Europe (temperature, salinity, chlorophyll-a fluorescence) is delivered to NIVA, undergoes distinct automatic quality checks and is available as netCDF files from the MyOcean FTP server.

This report addresses the challenge of real-time quality control, which should be performed on board of the FerryBox systems and in the data bases of the FerryBox operators. It was enquired which tests are performed and examples of the data quality flow will be shown.

Real time quality controls (RTQC) for FerryBoxes are based on those for time series in general; however, there are some specialties that are valid only for FerryBoxes. In Table 3 the FerryBox specific quality tests are summarized. The tests that are valid for all platforms are

- Platform metadata test
- Impossible date test
- Impossible location test
- Global/regional test.

The data processing process is often split up in parts that are done directly on board and parts that are performed at the data base at land. The second part is done in some cases by central data centres. The delayed mode quality control is more complex and time demanding than the real-time quality control. For the delayed mode, sampling of water probes is an important task. Water samples should be analysed as quickly as possible. Validation protocols compare the results of certain sensors installed on a FerryBox system to bottle samples taken during the ship passage (salinity, turbidity, chlorophyll-a, nutrients) by a cooled automated water sampler or manually in the harbour (oxygen, total alkalinity, inorganic carbon).

Automation of delayed mode quality control is much more difficult than the real-time mode. First attempts of semi-automated data quality control are done by e.g. SMHI, HZG and NOCS. However, expert judgement is still needed for these steps.

#### Remote Sensing on suspended particulate matter

The dynamics of suspended particulate matter (SPM) control processes such as sediment transport, deposition, re-suspension, primary production and benthic communities. Automated tripods or other platforms allow recording of continuous time series of SPM concentration near the bottom at specific sites and are the only method to detect the effects of extreme events (storms) on the SPM dynamics. On the other hand, large synoptic scenes of surface SPM concentrations may be retrieved from satellites. Time series of in situ SPM concentration and satellite imagery are valuable data sources for the analysis of suspended sediment transport in coastal areas. Still, shortcomings remain, with satellite imagery suffering from a low temporal resolution and only related to surface data, whilst in



situ measurements have a limited spatial resolution.

Both data can be combined when the vertical variation and the temporal SPM concentration heterogeneity is known.

The overall conclusion of the first trial is that an optical backscatter sensor instrumented on a surface buoy is a valuable tool towards better understanding SPM dynamics in the high-turbidity area in front of the Belgian coast. Continuous time-series of suspended particulate matter (SPM) concentration near the surface covers a wide range of hydro-meteo conditions.

## Potential impact and main dissemination activities and exploitation results

### JERICO in the European framework

The ocean is critical to the Earth's global systems by regulating weather and climate. At the same time there are mounting threats to, coastal areas: increases in coastal population, degradation of coastal habitats, increased pollution, greater demand for non-living resources (renewable energy), over-fishing that result in declines in ecosystem health and biodiversity.

Europe is reacting by promoting a large cooperation for the global ocean by funding major infrastructure projects such as EURO-ARGO and EMSO and proposing a Blue Growth policy.

One of the key objectives is to create a large international cooperation for observing systems in the global ocean, while the idea of a European Ocean Observing System (EOOS) both in open and coastal ocean has been already formulated (Navigating the Future IV).

The rationale for improved observations of coastal seas is to gain a better understanding of variability of biological, chemical and physical processes and to attribute measured changes to causes; natural, anthropogenic or climatic. To strengthen this understanding of the coastal areas processes, to better inform policy makers as well as to contribute to science, we need sustained comprehensive and consistent data on physical, chemical and biological parameters collected at appropriate time and space scales. Part of this integrative approach is the observational systems implemented within the EuroGOOS regional alliances for the European waters. Over the last years several European wide projects has been conducted to integrate the in-situ observations towards a system that can serve all the need from the different users. Based on the EuroGOOS ROOSes these different projects such as the MyOcean for mostly Real Time data and the SeaDataNet for historical data, are supporting the long-term EMODnet initiative on data gathering and access.

The exploitation of research-driven marine technologies and data for innovation, wealth creation and business development is an increasing demand from policy-makers in Europe. This is a crucial driver for decision-making and this is giving an explicit framework, in addition to scientific and environmental concerns, for developing a strategy for coastal observation in Europe.

### State of the art at the end of JERICO

A pan European Research Infrastructure of coastal observatories has been implementing with the aim of serving the European research needs, legislation and directives addressing the governance of the coastal zone and providing opportunities for innovation and business development. The Marine Strategy Framework Directive is therefore a driven force in the implementation and further development of JERICO as a network of coastal observing systems.

The JERICO RI is based in the integration of nationally funded RIs, which therefore firstly address national priorities and aiming at answering specific scientific questions of interest. Investment on research infrastructure is a way for the nations to take position in the competitive research market in Europe. It is therefore a non-negligible asset for the nations.

Through JERICO a major effort has been pursued on the integration, harmonisation (hardware, software and quality), accessibility and further development on these national RIs, with the objective of increasing significantly the added-value for Europe in terms of research position, monitoring capability and innovation.

One of the main challenges for JERICO has been to integrate the network of observations and to gather enough knowledge and information in order to enabling the recommendation of sensible investments in such a way that it becomes a cost-efficient source of data and information for managing European coastal seas, contributing to:

- the assessment of the environmental status,
- the operational provision of information to stakeholders, and more specifically to models,
- the support to decision-making.

In order to sample the coastal seas, we need to measure physical, chemical and biological parameters from the surface to the bottom, from the shore to the shelf,. We need fixed point observatories as

buoy or pile, lagrangian-like observatories as profilers, AUV/gliders, FerryBoxes, ships of opportunity, sailing or fishing vessels, but also data from sea-bottom observatories, coastal radars, and airborne and spaceborne vehicles (Planes, satellites, unmanned airbornes vehicles / drones). Moreover it required integrating the observations in for the different platforms and from different sensors, following sampling strategies that ensure optimal support to research on key scientific and/or societal challenges.

One of the key-issue to be addressed is the trans-boundary dimension of environmental health of the coastal zone. This encompasses trans-boundary pollution, identification, mapping and quantification of pollution sources, transport of harmful chemical and/or biological compounds (e.g. harmful algae, heavy metals, emerging contaminants, invasive species) impacting the environmental status of coastal seas downstream.

#### The JERICO network sampling

By the end of JERICO most of the major coastal observatories in Europe seas, encompassing Ferrybox lines, glider fleets and fixed platforms have been harmonised, integrated and upgraded to a level that secure consistency and quality of the data provided, and following the JERICO label framework.

The integration has been pursued especially at regional level, following the ROOS organisation. Status, gaps analysis and recommendations for further development of the regional observing networks have been consensually agreed with the scientific community represented by the JERICO consortium.

The ocean, especially the water column, continues to be severely under-sampled. Efforts, such as the integrated ocean observing system (IOOS) and the global ocean observing system (GOOS) and its regional programs, are evolving to provide international coordination. However, gathering the required data in the field can prove costly. Recent efforts have shown great promise in reducing this cost by taking advantage of ships of opportunity (SOOP's) or volunteer observing ships (VOS's) as mobile platforms for environmental data collection. The installed systems can integrate data from water quality and meteorological sensors with GPS information into a data stream that is automatically transferred from ship to shore. The strengths of SOOP program are many: no ship operation costs, no energy restrictions, regular maintenance, transects sampled repeatedly and bio-fouling can be better controlled. The potential for data coverage by ferry and cargo ships cruising on the same route on a regular basis is large, especially in coastal regions.

Different applications, such as OSSE simulations reveal the usefulness of FerryBox measurements not only for monitoring purposes but for answering key scientific questions and to support ocean modelling and forecasting services as well. Due to the large amount of data a suitable data management has to be established including quality control in both real-time and delayed modes. The quality assessment especially has to be harmonized and standardized according to international accepted standards in order to make the data comparable and exchangeable. The possibilities to combine different transects and their partial overlap allows a comprehensive overview for a certain area and for a specific parameter. Further, the linkage of such transect data with spatially distributed data from models or satellites can lead to synergistic effects in terms of validation or even improvement of the quality of products in the case of data assimilation. Especially data assimilation needs a sufficient spatial coverage which is as yet reached only in specific areas.

#### Value adding, synergies

There is still a particular lack of robust biogeochemical observations in the oceans and especially in the coastal regions with their high biological activities due to the lack of available instruments and suitable platforms. Parameters such as dissolved oxygen, chlorophyll-a, pH, nutrients and turbidity are not collected to the same extent as parameters such as salinity. This situation makes it difficult or even impossible to validate and provide boundary data for ecosystem models, or to understand and be able to parameterize the underlying biological processes better. There are recently a lot of promising technologies under development, or even in a mature stage, for better automated measurements of different biologically relevant parameters. There are ongoing developments by European funded projects such as NEXOS or EnviGuard. FerryBox systems are an ideal platform to integrate such systems, even if they are in the development stage, since they offer a protected environment and easy access for maintenance etc.. The systems offer the opportunity to collect important data sets at the appropriate temporal and spatial scales across all European sea areas and can contribute to the challenges of the Marine Strategy (MSFD) requiring more biogeochemical data such as eutrophication, algal dynamics including HABs etc.. One example which could be cost effectively investigated by FerryBox systems is the impact of coastal areas to climate changes. The

budget of climate-relevant gases in shelf seas and estuaries and its contribution to global climate development is still not quite clear, and in particular, the contribution of the shelf seas to the carbon budget is particularly difficult to predict from existing models. There exist mainly only sporadic field campaigns with measurements of pCO<sub>2</sub>/carbonate, CH<sub>4</sub>, N<sub>2</sub>O and halogenated hydrocarbons. Since FBs are only covering surface waters (with the exception of ADCP measurements) the surface water measurements should be complemented by profiling platforms such gliders, AUVs and other profiling instruments. Together Remote sensed data can fill the gaps between transect for certain parameters (chl-a, SPM, yellow substances). At least all monitored data need to be integrated (assimilated) by suitable ecosystem models in order to obtain a holistic view of the entire coastal areas

#### Gaps, practical bottlenecks and priorities assessed by JERICO

Gaps and bottlenecks have been assessed for both the Hardware (technologies) and Software (procedures, analysis, quality) of the JERICO infrastructure.

On the technology side, the following challenges have to be prioritized:

- The sustainability of the existing observational system, through long-term commitment from the European states
- The consolidation of specific observing systems, such as:
  - implementation of glider repeated sections in all the ROOS regions,
  - how to ensure long-term ferrybox lines?

On the software part, JERICO has made major advancements in terms of harmonisation of national observatories, as it is the backbone of the future network. The work has still to be consolidated in the JERICO label, providing guidelines and best practice for the scientific community for optimising the value of the data and its potential for innovation. It must ensure a coordinated approach on data provision in terms of parameters, quality, sampling and distribution.

The role of coastal modelling (Transport, forecast) to address specific regional processes is of a tremendous value. JERICO data (calibration, assimilation, validation, etc...) contribute to this effort. The roles of moving observatories of transboundary nature (Ferrybox, glider, regular transect) have proven of high value for supporting the modelling activity at regional level. Adding-value could be obtained by harmonizing further national observatories (buoys, fixed platform) that are deployed upstream and downstream at regional level, in order to ensure the consistency of observations and of data.

Moreover the gap between maturation of new technologies, which is market and industry driven, and the needs for observations for answering societal and scientific questions are to be addressed.

The JERICO network is also to be reinforced by integrating the biological component, which was not the focus of the FP7-JERICO project. The objective is to contribute in implement the ecosystem-based management of the Sea and answering better the gap of knowledge about biodiversity, eutrophication, harmful algae events, and invasive species issue in the coastal seas.

A real need for future forecast modelling: Today, the forecast models are global and have a relatively (but not satisfactory) high resolution. These models are now nested with more local and coastal models, but they need more and more in-situ data in known format and quality near the coast for evaluation and assimilation. As we have to acquire more parameters, we need to have a shared approach in the coastal observatories around Europe. No single body has leading expertise on all required parameters; so we share this expertise based in the expert laboratories with the whole European community.

The JERICO community emphasizes that we cannot understand the complexity of the coastal ocean if we do not understand the coupling between physics, biogeochemistry and biology. Reaching such an understanding clearly requires new technological developments allowing for the continuous monitoring of a larger set of parameter. It also clearly requires an a priori definition of the optimal deployment strategy in view of coupling diverse data monitored over very different spatial and temporal scales.

#### Alliance, Clusters and economical sustainability

The marine science community, represented by the academia and research institutes needs to provide clear and harmonized recommendations to their respective government in order to maximize the added value for Europe based on national investment on research infrastructure Mechanisms for optimizing the spreading of these recommendations in member states and the joint assessment of

priorities by decision-makers is to be reinforced. Agreement at regional level between countries sharing common environmental challenges and economic opportunities may become a key element of the future European governance on marine RI.

The agreement upon priorities on investment on coastal observatories within a scientific community as the JERICO partnership should be such that it would influence priorities on the submission of the future national RI proposals. In addition it should strongly influence international funding mechanisms provided by coordinated actions such as JPI-Oceans.

The JERICO approach is very close to that of EURO-ARGO and EMSO which are respectively ERIC and ESFRI infrastructures. As global and coastal models may converge to one overall system, the tendency could be that deep sea and coastal observatories will converge into one integrated infrastructure network too. As a consequence, JERICO intends to share its approach with the FixO3 community for fixed platforms, but also will promote a better cooperation within the ferrybox and the GROOM/glider communities.

We propose to have a common approach on the quality and the label definition and management between all the marine research infrastructures under the umbrella of EuroGOOS

It is essential that future work supported by the EU rationalises activity across the different EU directorates supporting marine observations. Future structure has to work more closely with the data providers and data users and recognise that a key requirement is data/information products that provide information on the status and changes in ecosystem health.

#### Economical sustainability

Observing systems are nationally funded, answering to national focus and to specific scientific focus. This leads to disparity in instruments, parameter measurements, sampling/observation strategies between infrastructures in Europe.

A regional approach may be an efficient manner for raising funds dedicated to common scientific and/or environmental challenges between a limited number of neighbouring countries.

However, if scientific needs and data collection are coordinated at regional level through the ROOSes, no financial incentives are available through EuroGOOS to support the provision of coastal observations to Europe.

The use of gathering of European research councils as non EC-driven initiatives gives the potentiality to:

- focus on the scientific and societal challenges to be addressed
- transboundary issues addressed at the adequate level
- take advantage of the European region policy
- link to regional fundings
- create value added and possibly economical growth shared by neighbouring countries with established tight links.

A partnership with industry, not limited to manufacturers of observing systems but including end-users exploiting marine resources, is needed to ensure long-term financing of the running-costs of the infrastructure, the delivery of data, as well as innovation.

The Forum for Coastal Technology is part of the JERICO project. It promotes greater interaction between the scientific requirements and related market for marine sensors and equipment, including better feedback from users to makers on improved design for ease of use. Ultimately it should help to bring closer the industry and the research communities with the objective to allow a substantial progression of research in public and academic institutes to products and services. The Terms of Reference ([www.jerico-fp7.eu/coastal-technologies](http://www.jerico-fp7.eu/coastal-technologies)) describe in details the aims as well as the main content and strategic issues raised by the FCT.

We provided 2 forums and also 2 calibration experiments. All partners and SMEs participating to the FCT, agreed that a dedicated 'calibration workshop' would give opportunity for a better exchange about 'know-how' between manufacturers and sensors users. Strong interaction with the industry is necessary to maintain sensors at a good level of performance.

Industry financing can be expected if the RI or some of its components become an essential part of the business development. Link is thru improving safety at sea, minimizing environmental impacts of the marine economy, and on supporting industry thru lifecycle of operations, from site selection, build, operation and decommissioning.

We started the process of creating and enduring dialogue between data collector, data managers and

data users' to ensure the availability of measurements, the fit for purpose and data useable for many purposes. It is one way to ensure value form investment in our observing systems.

An open access to the infrastructures for a large European community.

During its lifetime JERICO offered Trans-national Access to a number of unique European Coastal Observatories and Calibration Facilities for international research and technology development. The objective of the JERICO Trans-national Access activity was to enable scientists and engineers to freely access coastal infrastructures not available in their own countries. The JERICO Consortium includes research structures such as Ferryboxes, Fixed Platforms, Gliders, and associated support facilities, i.e. Calibration Laboratories.

Access to these facilities have contributed to

- building a long-term collaboration between users and JERICO partners, facilitating staff exchange and scientific cooperation;
- building an European facility for science dedicated to innovation (new sensors, new automated platforms), open to Europe and also to countries of common regional interest (South Mediterranean, Black Sea, Baltic Sea);
- promoting the infrastructure by transferring know-how from the partners to users, with a view to future expansion that will include new partners (possibly also from non-European countries).

Through the Trans-national Access, single researchers or research teams (from a single organisation or from a group of organisations) have developed their own project with any charge from the facility providers and with a support from the JERICO funds. The operators of the targeted facilities have contributed actively to the user project developments by providing to visiting scientists and technical personnel, all the logistical, technological and scientific support as well as specific training, when needed.

Coastal observatories are quite complex, including different types of observing systems (e.g. ferryboxes, fixed platforms, gliders, among others) and supporting facilities (e.g. calibration laboratories). The main result of the Trans National Access activity in JERICO consisted in defining a general scheme of concepts and procedures helpful for sharing the existing resources with a wide user community. This scheme is used as a reference by other projects, as for instance FixO3. The main dissemination activities and exploitation of results.

The work package 6 (Outreach) was devoted to dissemination activities through the web site with following tools:

The Jerico web-site, called the Jerico Community Hub (JCH), was developed, implemented and then hosted for the life of the programme. The JCH continues to be available after the project. The JCH provided access to key project documents as deliverables, disseminated information regarding Transnational Access (WP8), the Forum for Coastal Technology reports and the summer schools. It provided the means to disseminate written articles from Jerico partners targeted at public and educational sectors, and at scientific and policy users: JERICO OceanBoard PUB for public or JERICO OceanBoard PROF for professional audiences.

The web site also provided links to the Jerico Datatool (<http://www.jerico-fp7.eu/datatool/>), a web service providing access to Jerico data and information through an easy to use portal.

Finally, the summer schools contributes to raise student sensibility and to contribute to the skills base of the next generation of ocean scientist

All the results are available in the deliverables in open access on the JERICO website.

### **Address of project public website and relevant contact details**

The Jerico public website is accessible through the main domain:  
[www.jerico-fp7.eu](http://www.jerico-fp7.eu)

This website gives access to all the deliverables of JERICO at the address:

<http://www.jerico-fp7.eu/deliverables>

It gives also access to the dissemination platform OCEANBOARD, specifically developed by JERICO:

<http://www.jerico-fp7.eu/oceanboard>

A dedicated Web page was developed on the JERICO website

[www.jerico-fp7.eu/tna](http://www.jerico-fp7.eu/tna)

where the relevant information was published, including detailed description of the facilities open to TNA ([www.jerico-fp7.eu/tna/accessible-facilities](http://www.jerico-fp7.eu/tna/accessible-facilities)), eligibility and access modality

([www.jerico-fp7.eu/tna/access-rules](http://www.jerico-fp7.eu/tna/access-rules)), schedule of the calls and procedure of selection, including the composition of the Selection Panel ([www.jerico-fp7.eu/tna/calls-and-selection](http://www.jerico-fp7.eu/tna/calls-and-selection)). The text of the Calls had a special section, containing also a downloadable version of the application form and guidelines for application (<http://www.jerico-fp7.eu/tna/calls-and-selection/first-call>,

<http://www.jerico-fp7.eu/tna/calls-and-selection/second-call>,

<http://www.jerico-fp7.eu/tna/calls-and-selection/third-call>).

Within the consortium, the TNA calls have been promoted, as well as on the JERICO newsletters published in May and in September 2013. Furthermore, the opportunities for access open to research teams throughout Europe were publicised in the institutional webpages of partners (CEFAS, CNR DTA and ISMAR, IBW PAN, IFREMER, IMR, MI, Puertos del Estado), in the webpages of other projects and organizations (Euroris-net, Euroceans, University of Gothenborg, NKE) and diffuse through mailing lists of other projects and organizations (EUROFLEETS, PERSEUS, Marine Ripple Effect, MONGOOS, NOOS, NEXOS MedCLIVAR).

Outcomes from the user projects, including project reports, scientific (peer reviewed) publications and presentations have been regularly published in a dedicated page in the JERICO Website

<http://www.jerico-fp7.eu/tna/tna-outcomes>.

Furthermore, project logo, diagrams or photographs illustrating and promoting the work of the project (including videos, etc...), as well as the list of all beneficiaries with the corresponding contact names can be submitted without any restriction.

## 4.2 Use and dissemination of foreground

### Section A (public)

#### Publications

LIST OF SCIENTIFIC PUBLICATIONS, STARTING WITH THE MOST IMPORTANT ONES

No.	Title / DOI	Main author	Title of the periodical or the series	Number, date or frequency	Publisher	Place of publication	Date of publication	Relevant pages	Is open access provided to this publication ?	Type
1	Seasonal and latitudinal variability of the CO <sub>2</sub> system in the western English Channel based on Voluntary Observing Ship (VOS) measurements 10.1016/j.marchem.2013.05.014	P. Marrec , T. Cariou , E. Collin , A. Durand , M. Latimier , E. Macé , P. Morin , S. Raimund , M. Vernet , Y. Bozec	Marine Chemistry	Vol. 155	Elsevier	Netherlands	01/09/2013	29-41	Yes	Peer reviewed
2	Spatio-temporal dynamics of biogeochemical processes and air-sea CO <sub>2</sub> fluxes in the Western English Channel based on two years of FerryBox deployment 10.1016/j.jmarsys.2014.05.010	P. Marrec , T. Cariou , M. Latimier , E. Macé , P. Morin , M. Vernet , Y. Bozec	Journal of Marine Systems	Vol. 140	Elsevier	Netherlands	01/12/2014	26-38	Yes	Peer reviewed
3	Observing mixed layer depth, nitrate and chlorophyll concentrations in the north western Mediterranean: A combined satellite and NO <sub>3</sub> profiling floats experiment 10.1002/2014GL061020	Fabrizio D'Ortenzio , H��lo��se Lavigne , Florent Besson , Herv�� Claustra , Laurent Coppola , Nicole Garcia , Ag	Geophysical Research Letters	Vol. 41/Issue 18	American Geophysical Union	United States	28/09/2014	6443-6451	Yes	Peer reviewed

		athe Laës-Huon, Serge Le Reste, Damien Malardé, Christophe Migon, Pascal Morin, Laurent Mortier, Antoine Poteau, Louis Prieur, Patrick Raimbault, Pierre Testor								
4	Dynamics of air-sea CO <sub>2</sub> fluxes in the North-West European Shelf based on Voluntary Observing Ship (VOS) and satellite observations 10.5194/bgd-12-5641-2015	P. Marrec, T. Cariou, E. Macé, P. Morin, L. A. Salt, M. Vernet, B. Taylor, K. Paxman, Y. Bozec	Biogeosciences Discussions	Vol. 12/Issue 7	European Geosciences Union	Germany	01/01/2015	5641-5695	Yes	Peer reviewed
5	FerryBox systems: State-of-the-art in Europe and future development 10.1016/j.jmarsys.2014.07.003	Wilhelm Petersen	Journal of Marine Systems	Vol. 140	Elsevier	Netherlands	01/12/2014	4-12	No	Peer reviewed
6	Evaluation of numerical models by FerryBox and Fixed Platform in-situ data in the southern North Sea 10.5194/osd-12-355-2015	M. Haller, F. Janssen, J. Siddorn, W. Petersen, S. Dick	Ocean Science Discussions	Vol. 12/Issue 1	European Geosciences Union	Germany	01/01/2015	355-401	Yes	Peer reviewed
7	Introduction to Special Issue: 5th ferrybox workshop — Celebrating 20years of the Alg@line 10.1016/j.jmarsys.2014.10.001	Seppo Kaitala, Juhani Keittunen, Jukka Seppälä	Journal of Marine Systems	Vol. 140	Elsevier	Netherlands	01/12/2014	1-3	Yes	Peer reviewed
8	MERIS Case II water processor comparison on coastal sites of the northern Baltic Sea 10.1016/j.rse.2012.07.009	Jenni Attila, Sampsa Koponen, Kari Kallio, Antti Lindfors, Seppo Kaitala, Pasi Ylöstalo	Remote Sensing of Environment	Vol. 128	Elsevier Inc.	United States	01/01/2013	138-149	Yes	Peer reviewed
9	Assimilating Ferry Box data into the Aegean Sea model	G. Korres, M. Ntoumas, M.	Journal of Marine Systems	Vol. 140	Elsevier	Netherlands	01/12/2014	59-72	Yes	Peer reviewed



	10.1016/j.jmarsys.2014.03.013	Potiris , G. Petihakis								
10	Observations of a phytoplankton spring bloom onset triggered by a density front in NW Mediterranean 10.5194/os-10-657-2014	A. Olita , S. Sarnocchio , S. Cusí , L. Fazioli , R. Sorgente , J. Tintoré , A. Ribotti	Ocean Science	Vol. 10/Issue 4	European Geosciences Union	Germany	01/01/2014	657-666	Yes	Peer reviewed
11	Innovative biological approaches for metal conservation 10.1002/maco.201408168	M. Albin , L. Comensoli , L. Brambilla , E. Domonbeuret , W. Kooli , L. Mathys , P. Letardi , E. Joseph	Materials and Corrosion - Werkstoffe und Korrosion	August 2015	John Wiley and Sons Ltd		01/07/2015	1-10	No	Peer reviewed
12	Spectrophotometric high-precision seawater pH determination for use in underway measuring systems 10.5194/os-7-597-2011	S. Altmann , C. Frank , A. Körtzinger	Ocean Science	Vol. 7/Issue 5	European Geosciences Union	Germany	01/01/2011	597-607	Yes	Peer reviewed
13	Assessing biases in computing size spectra of automatically classified zooplankton from imaging systems: A case study with the ZooScan integrated system 10.1016/j.mio.2012.06.001	Pieter Vandromme , Lars Stemmann , Carmen García-Comas , Léo Berline , Xiaoxia Sun , Gaby Gorsky	Methods in Oceanography	Vol. 1-2	Elsevier	Netherlands	01/04/2012	3-21	Yes	Peer reviewed
14	Comprehensive Model of Annual Plankton Succession Based on the Whole-Plankton Time Series Approach 10.1371/journal.pone.0119219	Jean-Baptiste Romagnan , Louis Legendre , Lionel Guidi , Jean-Louis Jamet , Dominique Jamet , Laure Mousseau , Maria-Luiza Pedrotti , Marc Picheral , Gabriel Gorsky , Christian Sardet , Lars	PLoS One	Vol. 10/Issue 3	Public Library of Science	United States	17/03/2015	e0119219	Yes	Peer reviewed

		Stemmann								
15	Blending Surface Currents from HF Radar Observations and Numerical Modeling: Tidal Hindcasts and Forecasts <a href="http://dx.doi.org/10.1175/JTECH-D-13-00164.1">http://dx.doi.org/10.1175/JTECH-D-13-00164.1</a>	E. V. Stanev , F. Ziemer , J. Schulz-Stellenfl eth , J. Seemann , J. Staneva , K. -W. Gurgel	Journal of Atmospheric and Oceanic Technology	Vol. 32/Issue 2	American Meteorological Society	United States	01/02/2015	256-281	Yes	Peer reviewed
	PREVIMER: A contribution to in situ observing systems	G. Charria, M. Repecaud , L. Quemener , A. Ménesguen , P. Rimmelin -Maury, S. L. Helguede , L. Beaumont , A. Jolivet, P. Morin, E. Macé, P. Lazure, R. Le Gendre, F. Jacqueline, R. Verney, L. Marié, P. Jegou, S. Le Reste, X. André, V. Dutreuil, J.-P. Regnault, H. Jestin, H. Lintanf, P. Pichavant, M. Retho, J.-A. Allenou, J.-Y. Stanisère, A. Bonnat, L. Nonnotte, W. Duros, S. Tarot, T. Charval, P. Le Hir, F. Dumas, F. Vandermeersch, F. Lecornu	Mercator Ocean Newsletter	49			01/04/2014	9-20	Yes	Article
	Assessing the spatial and temporal distribution of zooplankton and marine particles using the Underwater Vision Profiler	Lars Stemmann , Marc Picheral ,	Sensors for ecology: Towards integrated knowledge of ecosystems		CNRS		26/08/2014	119-138	Yes	Article

		Lionel Guidi, Fabien Lombard, Franck Prejger, Hervé Claustre, Gabriel Gorsky								
Integrated observation system for pelagic ecosystems and biogeochemical cycles in the oceans	Lars Stemmann, Hervé Claustre, Fabrizio D'Ortenzio	Sensors for ecology: Towards integrated knowledge of ecosystems		CNRS		26/08/2014	2-19	Yes	Article	
The trans-national access in FP7 and H2020: A tool for sensor testing, observing system validation and collaborative research 10.1109/SSCO.2014.7000381	Stefania Sparnocchia, Patrick Farcy, Eric Delory	2014 IEEE Sensor Systems for a Changing Ocean (SSCO).		IEEE		01/10/2014	1-3	No	Conference	
Assessment of a biological approach for the protection of copper alloys artefacts	E Joseph, P Letardi, L Comensoli, A Simon, P Junier, D Job, M Wörle	Conference Proceedings of Metal 2013. Interim Meeting of the ICOM-CC Metal WG		Historic Scotland and International Council of Museums	Edinburgh	26/10/2014	203-207	Yes	Conference	
BIOPATINAS: Innovative biological patinas for copper-based artefacts	Edith JOSEPH, Monica ALBINI, Paola LETARDI, Emmanuelle DOMONBEURET, Laura BRAMBILLA, Lidia MATHYS, Christian C EVEY, Régis BERTHOLOIN, Daniel JUNIER, Pilar JUNIER	Conference Proceedings of Outdoor Metallic Sculpture from the XIXth to the Beginning of the XXth Century: Identification, Conservation, Restoration		ICOMOS	Paris	15/12/2014	154-162	No	Conference	
An inter-linked Coastal Observatory Network for Europe	S Sparnocchia, R Nair, G Petihakis, A Aydo#du, S Dobricic, P Farcy, M. Martinelli, W	3rd Italian GNOO Conference on operational oceanography, innovative technologies and applications		JOO Special Issue		05/06/2013		Yes	Conference	

		Petersen and L Petit de la Villeon								
	Assimilation Experiments for the Fishery Observing System in the Adriatic Sea	ALI A YDOGDU, NADIA PINARDI, JENNY PISTOIA, MICAELA MARTINELLI, ANDREA BELARDINELLI, STEFANIA SPARNOCCHIA	47th International Liege Colloquium		Journal of Marine System		09/06/2015		Yes	Conference

LIST OF DISSEMINATION ACTIVITIES

No.	Type of activities	Main Leader	Title	Date	Place	Type of audience	Size of audience	Countries addressed
1	Oral presentation to a scientific event	CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE	Long term physico-chemical time in the southern part of the Western English Channel (1985-2010) : Comparison between low frequency and recent high frequency measurements obtained from in situ sensors	08/04/2011	European Geophysical Union Symposium, Vienna	Scientific community (higher education, Research)	2000	Europe, USA
2	Oral presentation to a scientific event	CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE	Scaling properties of high frequency biogeochemical data from ferry box	08/04/2011	European Geophysical Union Symposium, Vienna	Scientific community (higher education, Research)	2000	Europe, USA
3	Oral presentation to a scientific event	CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE	Monitoring of the Western Channel and Bay of Biscay from ferry boxes and fixed platforms	28/06/2011	Symposium "The Future of the 21st Century Ocean", Brest	Scientific community (higher education, Research)	40	France, USA, Europe
4	Oral presentation to a scientific event	INSTITUT FRANCAIS DE RECHERCHE POUR L'EXPLOITATION DE LA MER	Ferrybox in JERICO FP7 Programme	01/09/2011	FerryBox Workshop, Geesthacht	Scientific community (higher education, Research)	80	Europe
5	Oral presentation to a scientific event	NORSK INSTITUTT FOR VANNFORSKNING	JERICO Presentation (P. Jaccard)	01/09/2011	FerryBox Workshop, Geesthacht	Scientific community (higher education, Research)	80	Europe
6	Oral presentation to a scientific event	NORSK INSTITUTT FOR VANNFORSKNING	JERICO Presentation (K. Sorensen)	01/09/2011	FerryBox Workshop, Geesthacht	Scientific community (higher education, Research)	80	Europe
7	Oral presentation to a scientific event	SUOMEN YMPARISTOKESKUS	JERICO Presentation	01/09/2011	FerryBox Workshop, Geesthacht	Scientific community (higher education, Research)	80	Europe

8	Oral presentation to a scientific event	HELLENIC CENTRE FOR MARINE RESEARCH	JERICO Presentation (G. Petihakis)	01/09/2011	FerryBox Workshop, Geesthacht	Scientific community (higher education, Research)	20	Europe
9	Oral presentation to a scientific event	HELMHOLTZ-ZENTRUM GEESTHACHT ZENTRUM FÜR MATERIAL- UND KUSTENFORSCHUNG GMBH	JERICO Presentation (W. Petersen)	01/09/2011	FerryBox Workshop, Geesthacht	Scientific community (higher education, Research)	80	Europe
10	Oral presentation to a scientific event	CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE	High frequency measurements of hydrological and biological parameters in the Western English Channel: Evidence for a <i>Karenia mikimotoi</i> bloom in July 2010	01/09/2011	FerryBox Workshop, Geesthacht	Scientific community (higher education, Research)	150	Europe
11	Oral presentation to a scientific event	SVERIGES METEOROLOGISKA OCH HYDROLOGISKA INSTITUT	JERICO Presentation	19/09/2011	Annual Science Conference of Swedish Institute of Marine Environment, Stockholm	Scientific community (higher education, Research)	80	Sweden
12	Oral presentation to a scientific event	CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE	Phytoplankton monitoring in Roscoff (France) : The first 10 years of a long-term time-series on the French side of The Channel	22/09/2011	Plankton 2011 Symposium, Plymouth	Scientific community (higher education, Research)	100	Europe, USA
13	Oral presentation to a scientific event	HAVFORSKNINGSINSTITUTTET	Jerico – A joint European Research infrastructure network for Coastal Observatories	03/10/2011	EuroGOOS Conference, Sopot	Scientific community (higher education, Research)	50	Europe
14	Oral presentation to a scientific event	HAVFORSKNINGSINSTITUTTET	Jerico – Strengthening regional and transregional activities	28/10/2011	NOOS Annual meeting, Hamburg	Scientific community (higher education, Research)	25	Europe
15	Oral presentation to a scientific event	HAVFORSKNINGSINSTITUTTET	Jerico – Strengthening regional and transregional activities	02/11/2011	Arctic ROOS Annual meeting, Cambridge	Scientific community (higher education, Research)	20	Europe

16	Oral presentation to a scientific event	INSTITUT FRANCAIS DE RECHERCHE POUR L'EXPLOITATION DE LA MER	Gliders in JERICO FP7 Programme	14/11/2011	GROOM Kick-Off Meeting, Paris	Scientific community (higher education, Research)	35	Europe
17	Oral presentation to a scientific event	HAVFORSKNINGSINSTITUTTET	Jerico – Strengthening regional and transregional activities	15/11/2011	ICES Working Group WGOOFE, Exeter	Scientific community (higher education, Research)	15	Europe
18	Oral presentation to a scientific event	SVERIGES METEOROLOGISKA OCH HYDROLOGISKA INSTITUT	JERICO Presentation	18/11/2011	Conference “Land-möter hav”, Stockholm	Scientific community (higher education, Research) - Policy makers	30	Sweden
19	Web sites/Applications	BLUE LOBSTER IT LIMITED	JERICO Community Hub	01/01/2012	World	Scientific community (higher education, Research) - Industry - Civil society - Policy makers - Medias		Global
20	Oral presentation to a scientific event	CONSIGLIO NAZIONALE DELLE RICERCHE	A new EU initiative relevant to EMODNET PP	09/02/2012	EMODNET, Rome	Scientific community (higher education, Research)	30	Europe
21	Oral presentation to a scientific event	HAVFORSKNINGSINSTITUTTET	Jerico – Strengthening regional and transregional activities	14/02/2012	IBIROOS Annual Meeting, Santander	Scientific community (higher education, Research)	30	Europe
22	Oral presentation to a scientific event	SVERIGES METEOROLOGISKA OCH HYDROLOGISKA INSTITUT	JERICO Presentation	01/03/2012	Marine observations and technology, Sweden	Scientific community (higher education, Research)	60	Sweden
23	Exhibitions	HELMHOLTZ-ZENTRUM GEESTHACHT ZENTRUM FÜR MATERIAL- UND KUSTENFORSCHUNG GMBH	JERICO - Oceanology	01/03/2012	OI, London	Industry		Europe
24	Press releases	CONSIGLIO NAZIONALE DELLE RICERCHE	Osservatori marini in rete	28/03/2012	CNR, Italy	Civil society	200	Europe
25	Oral presentation to a scientific event	CENTRE NATIONAL DE LA	Mesures en continu et temps réel de para	28/03/2012	Atelier Expérimentation et Instrumentation	Scientific community (higher education, Research)	90	France

		RECHERCHE SCIENTIFIQUE	mètres océanographiques et météorologiques sur une bouée d'opportunité en Manche Occidentale		ntation, Paris	ion, Research)		
26	Oral presentation to a scientific event	CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE	Mesures automatisées en continu de surface de paramètres océanographiques sur des navires d'opportunité (ferries) en Manche occidentale, mer Celtique et golfe de Gascogne. Description des systèmes de mesures embarqués et exemples de résultats	28/03/2012	Atelier Expérimentation et Instrumentation, Paris	Scientific community (higher education, Research)	90	France
27	Oral presentation to a scientific event	HELMHOLTZ-ZENTRUM GEESTHACHT ZENTRUM FÜR MATERIAL- UND KUSTENFORSCHUNG GMBH	JERICO presentation (W. Petersen)	01/04/2012	European Geophysical Union Symposium, Vienna	Scientific community (higher education, Research)	200	Europe
28	Posters	CONSIGLIO NAZIONALE DELLE RICERCHE	JERICO Presentation (S. Sparnocchia)	07/05/2012	6th GEO European Projects' Workshop, Rome	Scientific community (higher education, Research) - Policy makers - Medias	200	Europe
29	Oral presentation to a scientific event	HAVFORSKNINGSINSTITUTTET	Jerico – Strengthening regional and transregional activities	15/05/2012	BOOS Annual meeting, Helsinki	Scientific community (higher education, Research)	25	Europe
30	Oral presentation to a scientific event	CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE	High frequency study of correlations of temperature measurements in the English Channel, for two stations in the eastern and the western area	20/06/2012	7th Argo Meeting, Brest	Scientific community (higher education, Research)	50	Europe
31	Posters	CONSIGLIO	JERICO Presenta	26/06/2012	International W	Scientific comm	60	Global



		NAZIONALE DELLE RICERCHE	tion (S. Sparnocchia)		orkshop to Develop an Ocean Acidification Observing Network, Seattle	unity (higher education, Research)		
32	Press releases	HELLENIC CENTRE FOR MARINE RESEARCH	Aegean Sea FerryBox system	01/09/2012	HCMR	Civil society - Media		Greece
33	Posters	THE SECRETARY OF STATE FOR ENVIRONMENT, FOOD AND RURAL AFFAIRS	JERICO Presentation (J. Foden)	10/09/2012	Oceans of Potential, Plymouth	Scientific community (higher education, Research)	150	UK, Global
34	Oral presentation to a scientific event	CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE	Time-series analysis of the CO2 system in the English Channel/North Atlantic continental shelf using pCO2 sensors on fixed buoys and Voluntary Observing Ships (VOS)	17/09/2012	Conference "Time-series analysis in marine science and applications for industry", Logonna Daoulas	Scientific community (higher education, Research)	100	France, UK, Germany, Norway
35	Posters	SVERIGES METEOROLOGISKA OCH HYDROLOGISKA INSTITUT	JERICO Presentation	24/09/2012	International Symposium on the Ocean in a High-CO2 world, Monterey	Scientific community (higher education, Research) - Policy makers	400	Global
36	Oral presentation to a scientific event	SUOMEN YMPÄRISTÖTUTKIMUSKESKUS	JERICO Presentation	01/10/2012	Alg@line meeting, Gothenburg	Scientific community (higher education, Research)	20	Europe
37	Oral presentation to a scientific event	INSTITUT FRANÇAIS DE RECHERCHE POUR L'EXPLOITATION DE LA MER	The JERICO FP7 Project	09/10/2012	SeaTechWeek, Brest	Scientific community (higher education, Research) - Industry - Civil society	80	Europe
38	Oral presentation to a scientific event	INSTITUT FRANÇAIS DE RECHERCHE POUR L'EXPLOITATION DE LA MER	The JERICO FP7 Project	23/10/2012	RESORMAR, Marseille	Scientific community (higher education, Research)	70	France

39	Flyers	CONSIGLIO NAZIONALE DELLE RICERCHE	Calibration and inter-calibration exercise of bio-geochemical sensors - CIE BIO	01/11/2012	Italy	Civil society		Europe
40	Oral presentation to a scientific event	INSTITUT FRANCAIS DE RECHERCHE POUR L'EXPLOITATION DE LA MER	The JERICO FP7 Project	13/11/2012	MSI Conference, Toulon	Scientific community (higher education, Research) - Civil society	50	Europe, US, China
41	Oral presentation to a scientific event	INSTITUT FRANCAIS DE RECHERCHE POUR L'EXPLOITATION DE LA MER	The JERICO FP7 Project	21/11/2012	EuroGOOS Conference, Brussels	Scientific community (higher education, Research)	40	Europe
42	Oral presentation to a scientific event	INSTITUT FRANCAIS DE RECHERCHE POUR L'EXPLOITATION DE LA MER	The JERICO FP7 Project	24/11/2012	RESOMAR Conference, Bordeaux	Scientific community (higher education, Research)	60	France
43	Interviews	INSTITUT FRANCAIS DE RECHERCHE POUR L'EXPLOITATION DE LA MER	Connecting European Coasts	26/11/2012	International Innovation	Civil society - Media		Europe
44	Flyers	CONSIGLIO NAZIONALE DELLE RICERCHE	Bio-geochemical sensors calibration and intercalibration exercise at POSEIDON calibration Laboratory of HCMR	26/11/2012	JERICO Website	Civil society		Europe
45	Oral presentation to a scientific event	THE SECRETARY OF STATE FOR ENVIRONMENT, FOOD AND RURAL AFFAIRS	JERICO Presentation (J. Foden, D. Mills)	27/11/2012	UK-IMON workshop, Plymouth	Scientific community (higher education, Research)	200	UK, Global
46	Flyers	CONSIGLIO NAZIONALE	JERICO TNA Dissolved Oxygen me	01/12/2012	JERICO Website	Civil society		Europe

		DELLE RICERCHE	asurements in the Corsica Channel					
47	Oral presentation to a scientific event	THE SECRETARY OF STATE FOR ENVIRONMENT, FOOD AND RURAL AFFAIRS	JERICO Presentation (J. Foden, D. Mills)	16/01/2013	Operational Oceanography, Southampton	Scientific community (higher education, Research)	200	UK, Global
48	Flyers	AGENCIA ESTATAL CONSEJO SUPERIOR DE INVESTIGACIONES CIENTIFICAS	Jerico TNA First Glider Mission	31/01/2013	JERICO Website	Civil society		Europe
49	Videos	HELMHOLTZ-ZENTRUM GEESTHACHT ZENTRUM FUR MATERIAL- UND KUSTENFORSCHUNG GMBH	FerryBox – wenn Fähren zu Forschungsschiffen werden ( <a href="https://www.youtube.com/watch?v=plJXzyNe5ag">https://www.youtube.com/watch?v=plJXzyNe5ag</a> )	01/02/2013	HZG, Germany	Civil society - Media		Germany
50	Web sites/Applications	HELLENIC CENTRE FOR MARINE RESEARCH	Project website on reference temperature calibration	01/03/2013	HCMR	Civil society - Media		Greece, Global
51	Flyers	HELLENIC CENTRE FOR MARINE RESEARCH	JERICO TNA Reference Temperature Calibration (RTC) experiment at the “Centro di Taratura Oceanografica” (CTO) of the OGS	01/04/2013	JERICO Website	Civil society		Europe
52	Web sites/Applications	BLUE LOBSTER IT LIMITED	Development and implementation of suite of web-based interactive tools (Jerico Datatool)	01/04/2013	World	Scientific community (higher education, Research) - Policy makers		Global
53	Oral presentation to a scientific event	CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE	High frequency study of correlations of temperature measurements in the English Channel, for two stations in the eastern and the western area	07/04/2013	European Geophysical Union Symposium, Vienna	Scientific community (higher education, Research)	2000	Europe, USA

54	Posters	HELMHOLTZ-ZENTRUM GEESTHACHT ZENTRUM FUR MATERIAL- UND KUSTENFORSCHUNG GMBH	JERICO presentation (M. Haller)	07/04/2013	European Geophysical Union Symposium, Vienna	Scientific community (higher education, Research)	200	Europe
55	Oral presentation to a scientific event	INSTITUT FRANCAIS DE RECHERCHE POUR L'EXPLOITATION DE LA MER	Ferrybox in JERICO FP7 Programme	24/04/2013	FerryBox Workshop, Helsinki	Scientific community (higher education, Research)	60	Europe
56	Oral presentation to a scientific event	SUOMEN YMPARISTOKESKUS	JERICO Presentation (J. Kettunen)	24/04/2013	FerryBox Workshop, Helsinki	Scientific community (higher education, Research)	100	Europe
57	Oral presentation to a scientific event	HELMHOLTZ-ZENTRUM GEESTHACHT ZENTRUM FUR MATERIAL- UND KUSTENFORSCHUNG GMBH	JERICO presentation (M. Haller)	24/04/2013	FerryBox Workshop, Helsinki	Scientific community (higher education, Research)	100	Europe
58	Oral presentation to a scientific event	SUOMEN YMPARISTOKESKUS	JERICO Presentation (S. Kaitala)	24/04/2013	FerryBox Workshop, Helsinki	Scientific community (higher education, Research)	100	Europe
59	Oral presentation to a scientific event	SUOMEN YMPARISTOKESKUS	JERICO Presentation (J. Seppälä)	24/04/2013	FerryBox Workshop, Helsinki	Scientific community (higher education, Research)	100	Europe
60	Oral presentation to a scientific event	SUOMEN YMPARISTOKESKUS	JERICO presentation (J. Attila)	24/04/2013	FerryBox Workshop, Helsinki	Scientific community (higher education, Research)	100	Europe
61	Oral presentation to a scientific event	NORSK INSTITUTT FOR VANNFORSKNING	JERICO Presentation (K. Sorensen)	24/04/2013	FerryBox Workshop, Helsinki	Scientific community (higher education, Research)	50	Europe
62	Oral presentation to a scientific event	HELLENIC CENTRE FOR MARINE RESEARCH	Marine and biological sciences infrastructure interaction and collaboration workshop	28/05/2013	EMBRC, Heraklion	Scientific community (higher education, Research)	50	Europe

63	Oral presentation to a scientific event	CONSIGLIO NAZIONALE DELLE RICERCHE	The Joint European Research Infrastructure Network For Coastal Observatories	28/05/2013	EMBRC, Heraklion	Scientific community (higher education, Research)	50	Europe
64	Oral presentation to a scientific event	CONSIGLIO NAZIONALE DELLE RICERCHE	JERICO An inter-linked Coastal Observatory Network for Europe	04/06/2013	GNOO meeting, Oristano	Scientific community (higher education, Research)	100	Italy
65	Oral presentation to a scientific event	INSTITUT FRANCAIS DE RECHERCHE POUR L'EXPLOITATION DE LA MER	Gliders in JERICO FP7 Programme	04/06/2013	GROOM General Assembly, Trieste	Scientific community (higher education, Research)	35	Europe
66	Oral presentation to a scientific event	INSTITUT FRANCAIS DE RECHERCHE POUR L'EXPLOITATION DE LA MER	The possible contributions of JERICO to JPI Oceans	06/06/2013	JPI Meeting, Brest	Scientific community (higher education, Research)	25	Europe
67	Oral presentation to a scientific event	HAVFORSKNINGSINSTITUTTET	North West European Shelf Operational Oceanography System	12/06/2013	MTS/IEEC Oceans 2013, Bergen	Scientific community (higher education, Research)	150	Global
68	Organisation of Workshops	UNIVERSITA TA MALTA	Jerico Summer School 1: Operational Oceanography in the 21st Century	08/07/2013	Malta	Scientific community (higher education, Research)	35	Europe
69	Flyers	FUNDACION AZTI - AZTI FUNDAZIOA	GESEBB glider Mission of the First TNA call of JERICO	23/07/2013	JERICO Website	Civil society		Europe
70	Posters	INSTITUT FRANCAIS DE RECHERCHE POUR L'EXPLOITATION DE LA MER	Towards a Joint European Research Infrastructure network for Coastal Observatories	20/08/2013	World	Scientific community (higher education, Research) - Industry - Civil society - Policy makers - Medias		Europe
71	Posters	THE SECRETARY OF STATE FOR ENVIRONMENT,	JERICO presentation (D. Mills)	21/08/2013	Masts Annual Science Meeting, Edinburgh	Scientific community (higher education, Research)	200	UK

		FOOD AND R URAL AFFAIRS						
72	Oral presentation to a scientific event	THE SECRETARY OF STATE FOR ENVIRONMENT, FOOD AND RURAL AFFAIRS	JERICO Presentation (D. Mills)	21/08/2013	Masts Annual Science Meeting, Edinburgh	Scientific community (higher education, Research)	200	UK
73	Oral presentation to a scientific event	SVERIGES METEOROLOGISKA OCH HYDROLOGISKA INSTITUT	JERICO Presentation	04/09/2013	Swedish Environment Monitoring Days, Tällberg	Policy makers	50	Sweden
74	Oral presentation to a scientific event	INSTITUT FRANCAIS DE RECHERCHE POUR L'EXPLOITATION DE LA MER	Innovations in JERICO FP7 Project	10/09/2013	UK/IMON Conference, Southampton	Scientific community (higher education, Research) - Policy makers	80	UK, Europe
75	Oral presentation to a scientific event	SVERIGES METEOROLOGISKA OCH HYDROLOGISKA INSTITUT	JERICO Presentation	23/09/2013	ICES Annual Science Meeting, Reykjavik	Scientific community (higher education, Research) - Policy makers	50	Europe
76	Oral presentation to a scientific event	CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE	High frequency phytoplankton monitoring at the single cell level for a functional diversity resolution at the regional scale	01/10/2013	Marinexus Workshop, Plymouth	Scientific community (higher education, Research)	50	UK, France
77	Oral presentation to a scientific event	CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE	Monitoring of the Western Channel and Bay of Biscay from ferry boxes and fixed platforms	01/10/2013	Marinexus Workshop, Plymouth	Scientific community (higher education, Research)	50	UK, France
78	Oral presentation to a scientific event	CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE	Near real time in situ monitoring of phytoplankton by remote flow cytometry : evidence of sporadic events on the community structure and dynamics	01/10/2013	Marinexus Workshop, Plymouth	Scientific community (higher education, Research)	50	UK, France

79	Flyers	CONSIGLIO NAZIONALE DELLE RICERCHE	JERICO TNA sampling polar organic chemicals in marine water with organic-diffusive gradient in thin-film (o-DGT)	01/10/2013	JERICO Website	Civil society		Europe
80	Oral presentation to a scientific event	HAVFORSKNI NGSINSTITUTTET	The Jerico Atlas of Coastal Observing systems	02/10/2013	Mongoos Annual meeting, Madrid	Scientific community (higher education, Research)	25	Europe
81	Organisation of Workshops	ISTITUTO NAZIONALE DI GEOFISICA E VULCANOLOGIA	Assessment of Mediterranean Sea Coastal Observing Systems	02/10/2013	Mongoos Annual meeting, Madrid	Scientific community (higher education, Research)	30	Europe, North America
82	Oral presentation to a scientific event	HELLENIC CENTRE FOR MARINE RESEARCH	JERICO Presentation (G. Petihakis)	02/10/2013	Mongoos Annual meeting, Madrid	Scientific community (higher education, Research)	50	Europe
83	Oral presentation to a scientific event	CONSIGLIO NAZIONALE DELLE RICERCHE	The TransNational Access Program in Jerico	02/10/2013	Mongoos Annual meeting, Madrid	Scientific community (higher education, Research)	50	Europe
84	Oral presentation to a scientific event	FUNDACION AZTI - AZTI FUNDAZIOA	GESSEB MISSION Preliminary results	16/10/2013	EPIGRAM Workshop, Ile de Ré	Scientific community (higher education, Research)	25	France, Spain
85	Oral presentation to a scientific event	CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE	JERICO: Joint European Infrastructure Network for Coastal Observatories: Presentation and Perspectives	28/10/2013	Symposium Innovation and Blue Growth, Qingdao	Scientific community (higher education, Research)	150	China, Canada, USA, Germany, France
86	Oral presentation to a scientific event	INSTITUT FRANCAIS DE RECHERCHE POUR L'EXPLOITATION DE LA MER	JERICO: a Joint European Research Infrastructure network for Coastal Observatories supporting marine research in the Mediterranean Sea	28/10/2013	40th CIESM Congress, Marseille	Scientific community (higher education, Research)	800	Europe
87	Oral presentation to a scientific event	CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE	Monitoring plankton and particle size distributions in open and coastal seas. New opportunities using cameras on au	28/10/2013	OCOSS 2013, Nice	Scientific community (higher education, Research)	50	Europe

			tonomous vehicles					
88	Oral presentation to a scientific event	INSTITUT FRANCAIS DE RECHERCHE POUR L'EXPLOITATION DE LA MER	The JERICO FP7 Project	29/10/2013	NeXOS Kick-Off Meeting, Grande Canarie	Scientific community (higher education, Research) - Industry	45	Europe
89	Oral presentation to a scientific event	FUNDACION AZTI - AZTI FUNDAZIOA	Southeastern Bay of Biscay mesoscale structures and their role in the physics and biogeochemistry	06/11/2013	EUR-OCEANS Hot Topics Conference, Gran Canaria	Scientific community (higher education, Research)	90	Europe
90	Posters	CONSIGLIO NAZIONALE DELLE RICERCHE	JERICO Trans National Access Programme: overview and lesson learnt	13/11/2013	EMSO Ocean Observatories Challenges and Progress, Rome	Scientific community (higher education, Research)	200	Europe
91	Oral presentation to a scientific event	INSTITUT FRANCAIS DE RECHERCHE POUR L'EXPLOITATION DE LA MER	The JERICO technological developments and innovations	19/11/2013	EuroGOOS Conference, Brussels	Scientific community (higher education, Research)	40	Europe
92	Oral presentation to a scientific event	SVERIGES METEOROLOGISKA OCH HYDROLOGISKA INSTITUT	JERICO Presentation	23/01/2014	Swedish environmental Protection Agency, Stockholm	Scientific community (higher education, Research) - Policy makers	50	Sweden
93	Oral presentation to a wider public	HAVFORSKNINGSINSTITUTTET	Faste stasjoner I et operasjonell perspektive	01/02/2014	Bergen	Scientific community (higher education, Research)	25	Norway
94	Oral presentation to a scientific event	SUOMEN YMPARISTOKESKUS	JERICO Presentation	01/02/2014	Alg@line meeting, Helsinki	Scientific community (higher education, Research)	20	Europe
95	Videos	SUOMEN YMPARISTOKESKUS	Ferrybox, Alg@line automatic flow-through system ( <a href="https://www.youtube.com/watch?v=vfy-pjbyNCU0">https://www.youtube.com/watch?v=vfy-pjbyNCU0</a> )	12/02/2014	SYKE	Civil society - Medias		Global
96	Posters	HELMHOLTZ-ZENTRUM GEESTHACHT Z	JERICO presentation (M. Haller)	23/02/2014	Ocean Science Meeting, Hawaii	Scientific community (higher education, Research)	1000	Global



		ENTRUM FUR MATERIAL- UND KUSTENFORSCHUNG GMBH						
97	Oral presentation to a scientific event	CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE	Revisiting planktonic ecological succession using a novel whole plankton data series	23/02/2014	Ocean Science Meeting, Hawaii	Scientific community (higher education, Research)	1000	Global
98	Exhibitions	HELMHOLTZ-ZENTRUM GEESTHACHT Z ENTRUM FUR MATERIAL- UND KUSTENFORSCHUNG GMBH	JERICO - Oceanology	01/03/2014	OI, London	Industry		Europe
99	Exhibitions	HELLENIC CENTRE FOR MARINE RESEARCH	JERICO Exhibition	01/03/2014	OI, London	Scientific community (higher education, Research) - Industry		Europe
100	Oral presentation to a scientific event	SVERIGES METEOROLOGISKA OCH HYDROLOGISKA INSTITUT	JERICO Presentation	19/03/2014	Swedish Agency for Marine and Water Management, Sweden	Scientific community (higher education, Research) - Policy makers	50	Sweden
101	Flyers	INSTITUT FRANCAIS DE RECHERCHE POUR L'EXPLOITATION DE LA MER	JERICO TNA MOSC (Monitoring Oxygen in the Sicily Channel) project	02/04/2014	JERICO Website	Civil society		Europe
102	Flyers	CONSIGLIO NAZIONALE DELLE RICERCHE	JERICO TNA METRO (Mediterranean sediment TRap Observatory)	01/05/2014	JERICO Website	Civil society		Europe
103	Posters	HELMHOLTZ-ZENTRUM GEESTHACHT Z ENTRUM FUR MATERIAL- UND KUSTENFORSCHUNG GMBH	JERICO presentation (M. Haller)	05/05/2014	GHER, Liege	Scientific community (higher education, Research)	100	Europe
104	Oral presentation to	SUOMEN YMP	JERICO Presenta	26/05/2014	IEEE/OES Sympos	Scientific comm	100	Global

	a scientific event	ARISTOKESKUS	tion (J. Seppälä)		ium, Tallinn	unity (higher education, Research)		
105	Oral presentation to a scientific event	FUNDACION AZTI - AZTI FUNDAZIOA	Juvenile albacore distribution and oceanographic conditions in the northeastern Atlantic during the 2013 fishing campaign	11/06/2014	International Symposium of Marine Sciences, Gran Canaria	Scientific community (higher education, Research)	300	Spain
106	Oral presentation to a scientific event	FUNDACION AZTI - AZTI FUNDAZIOA	Glider campaign to estimate the 3d structure of an eddy in the southeastern bay of Biscay (GESEBB)	11/06/2014	International Symposium on Oceanography of the Bay of Biscay, Bordeaux	Scientific community (higher education, Research)	50	France, Spain
107	Organisation of Workshops	STICHTING DELTARES	Jerico Summer School 2: From data to decisions	14/06/2014	Kijkduin	Scientific community (higher education, Research)	16	Europe
108	Oral presentation to a scientific event	CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE	JERICO presentation (G. Many)	16/06/2014	EGO Meeting, Kiel	Scientific community (higher education, Research)	100	Europe
109	Oral presentation to a scientific event	FUNDACION AZTI - AZTI FUNDAZIOA	High resolution 4D oceanic measurements by gliders and process studies	16/06/2014	EGO Meeting, Kiel	Scientific community (higher education, Research)	70	Europe
110	Posters	HELMHOLTZ-ZENTRUM GEESTHACHT ZENTRUM FÜR MATERIAL- UND KUSTENFORSCHUNG GMBH	JERICO presentation (M. Haller)	23/06/2014	IMBER conference, Bergen	Scientific community (higher education, Research)	600	Global
111	Flyers	CONSIGLIO NAZIONALE DELLE RICERCHE	New Tools for Oxygen, Fluorescence and turbidity sensors testing and intercomparison	01/08/2014	Italy	Civil society		Europe
112	Oral presentation to a scientific event	HELMHOLTZ-ZENTRUM GEESTHACHT ZENTRUM FÜR	JERICO Presentation (W. Petersen, M. Haller)	08/09/2014	FerryBox Workshop, Tallinn	Scientific community (higher education, Research)	50	Europe

		MATERIAL- UND KUSTENFORSCHUNG GMBH						
113	Oral presentation to a scientific event	SUOMEN YMPARISTOKESKUS	JERICO Presentation (S. Kaitala)	08/09/2014	FerryBox Workshop, Tallinn	Scientific community (higher education, Research)	50	Europe
114	Oral presentation to a scientific event	NORSK INSTITUTT FOR VANNFORSKNING	JERICO Presentation (K. Sorensen)	08/09/2014	FerryBox Workshop, Tallinn	Scientific community (higher education, Research)	50	Europe
115	Oral presentation to a scientific event	NORSK INSTITUTT FOR VANNFORSKNING	JERICO Presentation (P. Jaccard)	08/09/2014	FerryBox Workshop, Tallinn	Scientific community (higher education, Research)	50	Europe
116	Oral presentation to a scientific event	CONSIGLIO NAZIONALE DELLE RICERCHE	Field test of microLFA modules for on-line measurement of nutrients in Ship of Opportunity application	08/09/2014	FerryBox Workshop, Tallinn	Scientific community (higher education, Research) - Industry	25	Europe
117	Posters	THE SECRETARY OF STATE FOR ENVIRONMENT, FOOD AND RURAL AFFAIRS	JERICO Presentation (N. Greenwood)	08/09/2014	Challenger Society, Plymouth	Scientific community (higher education, Research)	200	UK, Europe
118	Oral presentation to a scientific event	CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE	JERICO presentation (G. Many)	07/10/2014	PIE, Denmark	Scientific community (higher education, Research)	50	Europe
119	Oral presentation to a scientific event	INSTITUT FRANCAIS DE RECHERCHE POUR L'EXPLOITATION DE LA MER	JERICO International cooperation	13/10/2014	SeaTechWeek, Brest	Scientific community (higher education, Research) - Industry - Civil society	40	Europe
120	Oral presentation to a scientific event	INSTITUT FRANCAIS DE RECHERCHE POUR L'EXPLOITATION DE LA MER	JERICO and the Trans-National Access in european projects	15/10/2014	SeaTechWeek, Brest	Scientific community (higher education, Research) - Industry - Civil society	30	Europe

121	Oral presentation to a scientific event	HELLENIC CENTRE FOR MARINE RESEARCH	JERICO Presentation (G. Petihakis)	28/10/2014	7th EuroGOOS Conference, Lisbon	Scientific community (higher education, Research)	100	Europe
122	Oral presentation to a scientific event	CONSIGLIO NAZIONALE DELLE RICERCHE	JERICO Presentation (S. Pensieri)	28/10/2014	7th EuroGOOS Conference, Lisbon	Scientific community (higher education, Research)	100	Europe
123	Oral presentation to a scientific event	HELMHOLTZ-ZENTRUM GESTHACHT ZENTRUM FÜR MATERIAL- UND KUSTENFORSCHUNG GMBH	JERICO Presentation (W. Petersen)	28/10/2014	7th EuroGOOS Conference, Lisbon	Scientific community (higher education, Research)	200	Europe
124	Posters	HELMHOLTZ-ZENTRUM GESTHACHT ZENTRUM FÜR MATERIAL- UND KUSTENFORSCHUNG GMBH	JERICO presentation (M. Haller)	28/10/2014	7th EuroGOOS Conference, Lisbon	Scientific community (higher education, Research)	200	Europe
125	Posters	SUOMEN YMPARISTOKESKUS	JERICO Presentation (J. Seppälä)	28/10/2014	7th EuroGOOS Conference, Lisbon	Scientific community (higher education, Research)	200	Europe
126	Oral presentation to a scientific event	HELLENIC CENTRE FOR MARINE RESEARCH	The HF radar system (CORI) for observing the surface currents at the northeastern Aegean Sea	28/10/2014	7th EuroGOOS Conference, Lisbon	Scientific community (higher education, Research)	200	Europe
127	Oral presentation to a scientific event	ISTITUTO NAZIONALE DI GEOFISICA E VULCANOLOGIA	Observing System Simulation Experiments for coastal observations: the JERICO results	28/10/2014	7th EuroGOOS Conference, Lisbon	Scientific community (higher education, Research)	20	Europe
128	Press releases	HELLENIC CENTRE FOR MARINE RESEARCH	Giant waves at the Cretan Sea	06/03/2015	Crete	Civil society - Media		Greece
129	Articles published in the popular press	INSTITUT FRANÇAIS DE RECHERCHE	Observation côtière : le programme européen Jerico poursuit	29/04/2015	Le Marin	Civil society - Media		France

		POUR L'EXPLOITATION DE LA MER	ses travaux					
130	Articles published in the popular press	INSTITUT FRANCAIS DE RECHERCHE POUR L'EXPLOITATION DE LA MER	La traque des microalgues en temps réel	30/04/2015	Le Marin	Civil society - Medias		France
131	Articles published in the popular press	INSTITUT FRANCAIS DE RECHERCHE POUR L'EXPLOITATION DE LA MER	Observation côtière Jerico poursuit sa lutte contre le biofouling	30/04/2015	Le Marin	Civil society - Medias		France
132	Articles published in the popular press	INSTITUT FRANCAIS DE RECHERCHE POUR L'EXPLOITATION DE LA MER	JERICO : l'observation côtière à l'échelle de l'Europe: innovations à la loupe	30/04/2015	Sea Bleue	Civil society - Medias		France

## Section B (Confidential or public: confidential information marked clearly)

LIST OF APPLICATIONS FOR PATENTS, TRADEMARKS, REGISTERED DESIGNS, UTILITY MODELS, ETC.					
Type of IP Rights	Confidential	Foreseen embargo date dd/mm/yyyy	Application reference(s) (e.g. EP123456)	Subject or title of application	Applicant(s) (as on the application)

OVERVIEW TABLE WITH EXPLOITABLE FOREGROUND								
Type of Exploitable Foreground	Description of Exploitable Foreground	Confidential	Foreseen embargo date dd/mm/yyyy	Exploitable product(s) or measure(s)	Sector(s) of application	Timetable for commercial use or any other use	Patents or other IPR exploitation (licences)	Owner and Other Beneficiary(s) involved
General advancement of knowledge	Guidelines for installing and operating scientific equipment (FerryBox) on board commercial ships	No		JERICO D3.1 Ferrybox Best Practices ; JERICO D4.4 Report on best practice in conducting operations and maintaining	Fishing and aquaculture, Manufacture of computer, electronic and optical products	2014	JERICO FP7	Scientific community, Shipping industry
General advancement of knowledge	Rules and recommendations for setting up a coastal observatory	No		JERICO D1.4 JERICO Label Definition	Fishing and aquaculture, Manufacture of computer, electronic and optical products	2014	JERICO FP7	Scientific community, Oil & Gas Industry, Sensor manufacturers, Marine observation and services community
General advancement of knowledge	Overview of existing observational efforts (report)	No		Report on existing observation network	Marine Observation	Unlimited	JERICO FP7	IMR and the JERICO WP2 participants
General advancement of knowledge	Description of recommended improvements for the monitoring system	No		Report on recommendations	Marine Observation	Unlimited	JERICO FP7	IMR and the JERICO WP2 participants
General advancement of knowledge	Overview of European coastal observation systems	No		Integrated Pan European Atlas	Marine Observation	Unlimited	JERICO FP7	IMR and the JERICO WP2 participants
General advancement of knowledge	Demonstration of the feasibility of Joint transregional production	No		Demonstration of the feasibility of Joint transregional production	Marine Observation	Unlimited	JERICO FP7	IMR and the JERICO WP2 participants
General advancement of knowledge	Web application to display overview of European coastal observation systems	No		Integrated Pan European Atlas	Marine Observation	Unlimited	JERICO FP7	IMR

ADDITIONAL TEMPLATE B2: OVERVIEW TABLE WITH EXPLOITABLE FOREGROUND	
Description of Exploitable	Explain of the Exploitable Foreground

Foreground	
Guidelines for installing and operating scientific equipment (FerryBox) on board commercial ships	The JERICO project deliverables D3.1 Ferrybox Best Practices and D4.4 Report on best practice in conducting operations and maintaining are providing a review of the present status of the 16 automated scientific measurement systems (FerryBoxes) currently operated by JERICO partners across the European seas. These reports also give a set of recommendations and guidance for setting up a new Ferrybox system, based on the experience of the current status of the Ferrybox systems operation. Considering the importance of observing systems and the substantial investment made until now, an important task is to describe best practices in all phases of the system (pre-deployment test, maintenance, calibration etc); to adopt common methodologies and protocols and to move towards the harmonisation of equipment and procedures which will help in reducing maintenance and calibration costs. These efforts are described and analysed in depth in these deliverables. All this information can be used by both scientific community and shipping industry in order to act as guideline when scientific or other type of measurement equipment is going to be installed and operated in different types of commercial vessels.
Rules and recommendations for setting up a coastal observatory	The JERICO Label definition deliverable D1.4 is an attempt to document several rules and recommendations that can be applied in setting up a coastal observatory. The JERICO Label is a set of criteria defined to ensure some standardisation and interoperability, and the quality of data for coastal observatories. It contains mandatory aspects, in point of view expressed and experienced in JERICO, as well as recommended solutions or options. This document is one of the main JERICO deliverables to be issued during the 4-year period and finalized towards the end of the project. It informs on the definition of the label and its implementation modalities, including rules, control and protection of the label. It includes recommendations and mandatory rules to be applied at different levels of the entire JERICO observatory network while the document will be updated with the other platforms used in the coastal observations and not included. It provides recommendations on sensing technologies for each platform, operating issues and deployment - installation. It highlights the importance of performing tests before any long-term deployment at the demanding coastal sea environment. It gives guidelines to define and implement a test plan. This document needs to be updated continuously with the evolution of technology, of gained experience and new needs.
Overview of existing observational efforts (report)	
Description of recommended improvements for the monitoring system	
Overview of European coastal observation systems	
Demonstration of the feasibility of Joint transregional production	
Web application to display overview of European coastal observation systems	



## 4.3 Report on societal implications

### B. Ethics

<b>1. Did your project undergo an Ethics Review (and/or Screening)?</b>	No
<b>If Yes: have you described the progress of compliance with the relevant Ethics Review/Screening Requirements in the frame of the periodic/final reports?</b>	
<b>2. Please indicate whether your project involved any of the following issues :</b>	
<b>RESEARCH ON HUMANS</b>	
<b>Did the project involve children?</b>	No
<b>Did the project involve patients?</b>	No
<b>Did the project involve persons not able to consent?</b>	No
<b>Did the project involve adult healthy volunteers?</b>	No
<b>Did the project involve Human genetic material?</b>	No
<b>Did the project involve Human biological samples?</b>	No
<b>Did the project involve Human data collection?</b>	No
<b>RESEARCH ON HUMAN EMBRYO/FOETUS</b>	
<b>Did the project involve Human Embryos?</b>	No
<b>Did the project involve Human Foetal Tissue / Cells?</b>	No
<b>Did the project involve Human Embryonic Stem Cells (hESCs)?</b>	No
<b>Did the project on human Embryonic Stem Cells involve cells in culture?</b>	No
<b>Did the project on human Embryonic Stem Cells involve the derivation of cells from Embryos?</b>	No
<b>PRIVACY</b>	
<b>Did the project involve processing of genetic information or personal data (eg. health, sexual lifestyle, ethnicity, political opinion, religious or philosophical conviction)?</b>	No
<b>Did the project involve tracking the location or observation of people?</b>	No
<b>RESEARCH ON ANIMALS</b>	

<b>Did the project involve research on animals?</b>	No
<b>Were those animals transgenic small laboratory animals?</b>	No
<b>Were those animals transgenic farm animals?</b>	No
<b>Were those animals cloned farm animals?</b>	No
<b>Were those animals non-human primates?</b>	No
<b>RESEARCH INVOLVING DEVELOPING COUNTRIES</b>	
<b>Did the project involve the use of local resources (genetic, animal, plant etc)?</b>	No
<b>Was the project of benefit to local community (capacity building, access to healthcare, education etc)?</b>	No
<b>DUAL USE</b>	
<b>Research having direct military use</b>	No
<b>Research having potential for terrorist abuse</b>	No

## C. Workforce Statistics

**3. Workforce statistics for the project: Please indicate in the table below the number of people who worked on the project (on a headcount basis).**

Type of Position	Number of Women	Number of Men
Scientific Coordinator	3	1
Work package leaders	2	9
Experienced researchers (i.e. PhD holders)	15	40
PhD student	5	2
Other	20	10

<b>4. How many additional researchers (in companies and universities) were recruited specifically for this project?</b>	0
<b>Of which, indicate the number of men:</b>	0

## D. Gender Aspects

<b>5. Did you carry out specific Gender Equality Actions under the project ?</b>	Yes
<b>6. Which of the following actions did you carry out and how effective were they?</b>	
<b>Design and implement an equal opportunity policy</b>	Effective
<b>Set targets to achieve a gender balance in the workforce</b>	Not effective
<b>Organise conferences and workshops on gender</b>	Not Applicable
<b>Actions to improve work-life balance</b>	Not effective
<b>Other:</b>	
<b>7. Was there a gender dimension associated with the research content - i.e. wherever people were the focus of the research as, for example, consumers, users, patients or in trials, was the issue of gender considered and addressed?</b>	No
<b>If yes, please specify:</b>	

## E. Synergies with Science Education

<b>8. Did your project involve working with students and/or school pupils (e.g. open days, participation in science festivals and events, prizes/competitions or joint projects)?</b>	Yes
<b>If yes, please specify:</b>	2 summer schools
<b>9. Did the project generate any science education material (e.g. kits, websites, explanatory booklets, DVDs)?</b>	Yes
<b>If yes, please specify:</b>	website "follow the glider"

## F. Interdisciplinarity

<b>10. Which disciplines (see list below) are involved in your project?</b>	
<b>Main discipline:</b>	1.4 Earth and related environmental sciences (geology, geophysics, mineralogy, physical geography and other geosciences, meteorology and other atmospheric sciences including climatic research, oceanography, vulcanology, palaeoecology, other allied sciences)
<b>Associated discipline:</b>	1.2 Physical sciences (astronomy and space sciences, physics and other allied subjects)
<b>Associated discipline:</b>	2.2 Electrical engineering, electronics [electrical

engineering, electronics, communication engineering and systems, computer engineering (hardware only) and other allied subjects]

## G. Engaging with Civil society and policy makers

<b>11a. Did your project engage with societal actors beyond the research community? (if 'No', go to Question 14)</b>	Yes
<b>11b. If yes, did you engage with citizens (citizens' panels / juries) or organised civil society (NGOs, patients' groups etc.)?</b>	No
<b>11c. In doing so, did your project involve actors whose role is mainly to organise the dialogue with citizens and organised civil society (e.g. professional mediator; communication company, science museums)?</b>	
<b>12. Did you engage with government / public bodies or policy makers (including international organisations)</b>	Yes, in communicating /disseminating / using the results of the project
<b>13a. Will the project generate outputs (expertise or scientific advice) which could be used by policy makers?</b>	Yes - as a secondary objective (please indicate areas below - multiple answer possible)
<b>13b. If Yes, in which fields?</b>	
<b>Agriculture</b>	No
<b>Audiovisual and Media</b>	No
<b>Budget</b>	No
<b>Competition</b>	No
<b>Consumers</b>	No
<b>Culture</b>	No
<b>Customs</b>	No
<b>Development Economic and Monetary Affairs</b>	No
<b>Education, Training, Youth</b>	No
<b>Employment and Social Affairs</b>	No
<b>Energy</b>	No
<b>Enlargement</b>	No
<b>Enterprise</b>	No
<b>Environment</b>	Yes
<b>External Relations</b>	No
<b>External Trade</b>	No
<b>Fisheries and Maritime Affairs</b>	Yes
<b>Food Safety</b>	No

<b>Foreign and Security Policy</b>	No
<b>Fraud</b>	No
<b>Humanitarian aid</b>	No
<b>Human rightsd</b>	No
<b>Information Society</b>	No
<b>Institutional affairs</b>	No
<b>Internal Market</b>	No
<b>Justice, freedom and security</b>	No
<b>Public Health</b>	No
<b>Regional Policy</b>	No
<b>Research and Innovation</b>	Yes
<b>Space</b>	No
<b>Taxation</b>	No
<b>Transport</b>	No
<b>13c. If Yes, at which level?</b>	European level

## H. Use and dissemination

<b>14. How many Articles were published/accepted for publication in peer-reviewed journals?</b>	23
<b>To how many of these is open access provided?</b>	19
<b>How many of these are published in open access journals?</b>	19
<b>How many of these are published in open repositories?</b>	19
<b>To how many of these is open access not provided?</b>	4
<b>Please check all applicable reasons for not providing open access:</b>	
<b>publisher's licensing agreement would not permit publishing in a repository</b>	No
<b>no suitable repository available</b>	No
<b>no suitable open access journal available</b>	No
<b>no funds available to publish in an open access journal</b>	No
<b>lack of time and resources</b>	No
<b>lack of information on open access</b>	No
<b>If other - please specify</b>	
<b>15. How many new patent applications ('priority filings') have been made?</b>	0

("Technologically unique": multiple applications for the same invention in different jurisdictions should be counted as just one application of grant).

16. Indicate how many of the following Intellectual Property Rights were applied for (give number in each box).

Trademark	0
Registered design	0
Other	0

17. How many spin-off companies were created / are planned as a direct result of the project?

0

Indicate the approximate number of additional jobs in these companies:

0

18. Please indicate whether your project has a potential impact on employment, in comparison with the situation before your project:

Difficult to estimate / not possible to quantify,  
In small and medium-sized enterprises

19. For your project partnership please estimate the employment effect resulting directly from your participation in Full Time Equivalent (FTE = one person working fulltime for a year) jobs:

0Difficult to estimate / not possible to quantify

## I. Media and Communication to the general public

20. As part of the project, were any of the beneficiaries professionals in communication or media relations?

No

21. As part of the project, have any beneficiaries received professional media / communication training / advice to improve communication with the general public?

No

22. Which of the following have been used to communicate information about your project to the general public, or have resulted from your project?

Press Release	Yes
Media briefing	No
TV coverage / report	No
Radio coverage / report	No
Brochures /posters / flyers	Yes
DVD /Film /Multimedia	Yes
Coverage in specialist press	Yes
Coverage in general (non-specialist) press	Yes

<b>Coverage in national press</b>	Yes
<b>Coverage in international press</b>	Yes
<b>Website for the general public / internet</b>	Yes
<b>Event targeting general public (festival, conference, exhibition, science café)</b>	Yes

**23. In which languages are the information products for the general public produced?**

<b>Language of the coordinator</b>	Yes
<b>Other language(s)</b>	Yes
<b>English</b>	Yes

<b>Attachments</b>	jerico factsheets.pdf, poster JERICO A1 (594x841).pdf, liste partenaires & mails.pdf, JERICO_fr.pdf, Articl Int Inov_Jerico.pdf, Bandeau-website.pdf, Presentation JERICO Recto-verso.pdf
<b>Grant Agreement number:</b>	262584
<b>Project acronym:</b>	JERICO
<b>Project title:</b>	TOWARDS A JOINT EUROPEAN RESEARCH INFRASTRUCTURE NETWORK FOR COASTAL OBSERVATORIES
<b>Funding Scheme:</b>	FP7-CP-CSA-Infra
<b>Project starting date:</b>	01/05/2011
<b>Project end date:</b>	30/04/2015
<b>Name of the scientific representative of the project's coordinator and organisation:</b>	Mr. Patrick Farcy INSTITUT FRANCAIS DE RECHERCHE POUR L'EXPLOITATION DE LA MER
<b>Name</b>	
<b>Date</b>	

This declaration was visaed electronically by Patrick FARCY (ECAS user name nfarcpya) on