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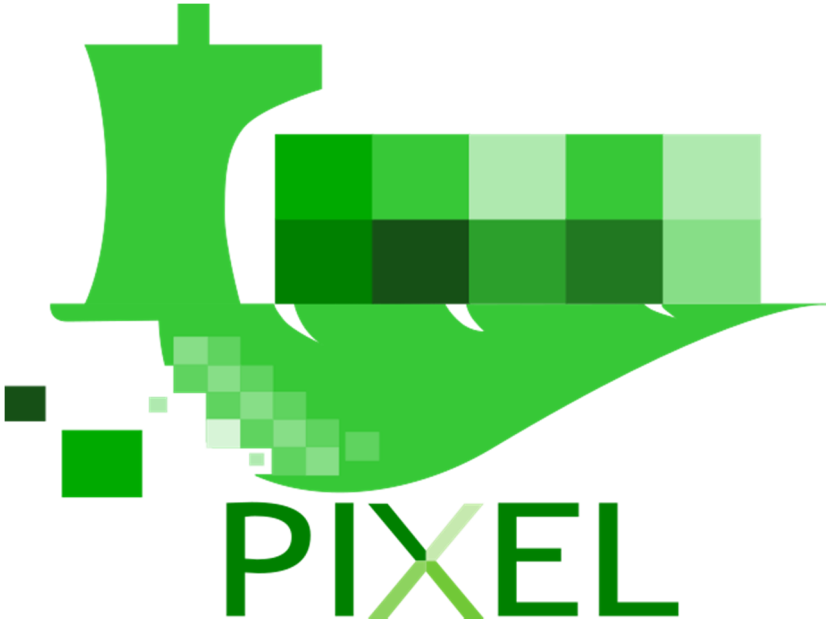

D2.5 – Project Management Report v1

Deliverable No.	D2.5	**Due Date**	31-OCT-2018
Type	Report	**Dissemination Level**	Confidential
Version	1.0	**Status**	Final
Description	This deliverable reflects the advances of the project in the different WP; completion of objectives; impacts and use of resources.		
Work Package	WP2		

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History

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12-OCT-2018	0.1	ToC and first draft
19-OCT-2018	0.2	Whole structure and content added in all sections
23-OCT-2018	0.3	Contributions received from partners
30-OCT-2018	0.4	Integrated version
31-OCT-2018	1.0	Version ready for submission

Key Data

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Abstract

This deliverable has been created in the context of the Work Package 2 (*Work Plan, coordination and document management*) of the H2020-funded project PIXEL (Grant No. 769355).

This is the first PIXEL project internal reporting. The present document provides the Project Management Report (PMR) for the first period of 6 months of the project. This report includes all the activities and advances performed from M1 to M6 of PIXEL. All WP have already started except WP7 and WP8.

The document provides an overview of the work done and the actions performed to achieve the goals proposed and included in the GA. The document includes use of resources section in addition to the technical and impact aspects.

The document is structured in four blocks, starting with a brief introduction about the project and its main challenges. The four blocks provide the description of the work performed by the members of the consortium during the period under review. First block analyses the actions taken to accomplish the specific objectives listed in the DoA. Second block describes with more detail the main results and achievements per WP. The third block provides an overview of the impact achieved so far, including the different actions at industrial, scientific, academic and communication levels. In this period is worth to remark that only the first steps and the creation of supporting communication and dissemination material has been performed. So it is not an update of the impact but a basis-establishment for the next reporting periods. Ending the report with an overview of an explanation of the use of resources, clarifying the efforts done by the entities to achieve the objectives.

Statement of originality

Table of contents

List of tables

List of figures

List of acronyms

Acronym	Explanation
AB	Advisory Board
CA	Consortium Agreement
CCS	Cargo Community System
CSA	Coordination and Support Action
DPO	Data Protection Officer
DX.Y	Deliverable nº Y from work package X
EC	European Commission
EU	European Union
FAL	Convention on Facilitation of International Maritime Traffic
FVG	Friuli-Venezia-Giulia
GA	Grant Agreement
GDPR	Global Data Protection Regulation
HMI	Human-Machine Interface
ICT	Information and Communication Technologies
IM	Innovation Manager
IoT	Internet of Things
IPR	Intellectual Property Rights
ISO	International Standardisation Organisation
KPI	Key Performance Indicator
PEI	Port Environmental Index
PIXEL	Port IoT for Environmental Leverage
PMS	Port Management System
PMIS	Port Management Information System
PO	Project Officer
SILI	Sistema Informativo Logistico Integrato (Integrated Logistic Informated System), a system provided by Regione Friuli Venezia Giulia and managed by Insiel to monitor and authorize entries to the Ports of Monfalcone and Trieste; it also monitors dangerous goods flows along the regional motorway network
ToC	Table of Contents
DX.Y	Deliverable nº Y from work package X
WP	Work Package

1. About this document

The idea behind this deliverable is to provide to the EC the first report of the project. After 6 months of the project, 7 work packages have started and various meetings have taken place. The scope of this document is to summarize the advances of the project and the obtained results within this period. Furthermore, this first summary of work will serve as a template for future reporting, establishing a bare minimum and benchmark to be updated.

1.1. Deliverable context

Table 1. Deliverable context

Keywords	Description
Objectives	This deliverable does not serve particularly to any goal of the listed in the Grant Agreement. The technical purposes are well defined and are already being addressed by work packages WP4, WP5 and WP6. Nevertheless, this document plays a crucial role on the accomplishment of all the PIXEL objectives, indeed. Keeping track of current tasks, having an overview of the status of the project and planning the next steps for the forthcoming reporting period are the needed mechanisms to ensure to keep PIXEL in the right direction towards its goals.
Exploitable results	This deliverable does not generate any exploitable result.
Work plan	The Project Management Report involves, really, some activity from all the tasks in the project, as every one of them has been analysed and reported. Howver, this deliveable is framed in the WP2 structure and, particularly, it is assigned to T2.1, T2,2, T2.3 and T2.4. Particularly more to T2.1 than the rest of tasks in the work package.
Milestones	N/A
Deliverables	Similarly to the work plan, the Project Management Report involves all deliverables that have been submitted so far (and even some to be submitted soon). But, as it is mentioned several times throughout the document, this deliverable is especially tied to D9.3, D3.1, D3.3 and D9.6, as those have been the most relevant outcomes of the project until now.
Risks	**Risk Nº2 –** This deliverable will allow all the Consortium, as well as the EC funder to ensure that the quality of work documentation and processes is being kept preventing any entity from misunderstand (or avoid) timing or responsibility due to lack of awareness.
	Risk Nº3 - Coordination mechanisms, keeping track of the advance of the project, identifying deviations and planning corrective actions will enhance the capacity and good execution pace of the project, and they are depicted in this document.
	Additionally, this deliverable has a crucial importance for the Risk Management in PIXEL. Despite not including a thorough list of feasible risks, D3.1 establishes the methodology and tools to be used to deal with risks in PIXEL. Once a risk is about to happen, or it is identified, or it has occurred, any member must consult this reference to know how to proceed to write down the risk and decide the most suitable mitigation actions.

2. Introduction

2.1. Overview of PIXEL project

The available operational data in ports (resources tracking, container status, vessel operations, surface or berth available, air/water quality measurements, etc.) is constantly increasing and technology is getting inexpensive and widely available. However, the application of such systems is still single-entity centric, since the information is not shared, keeping the real potential of the Internet of Things (IoT) hidden. Furthermore, an effective integration of operational data is far from optimal in most ports, and especially so in medium or small ports, where budget is limited and IT services usually are outsourced.

PIXEL enables a two-way collaboration of ports, multimodal transport agents and cities for optimal use of internal and external resources, sustainable economic growth and environmental impact mitigation, towards the Port of the Future. PIXEL will leverage technological enablers to voluntary exchange data among ports and stakeholders, thus ensuring a measurable benefit in this process. The main outcome of this technology will be efficient use of resources in ports, sustainable development and green growth of ports and surrounding cities/regions.

"PIXEL: Port IoT for Environmental Leverage" (from now on, **PIXEL**) overall goal **is to close the gap between small and large ports by providing an easy-to-use open source smart platform for operational data interchange**

Built on top of the state-of-the art interoperability technologies, PIXEL centralises data from the different information silos where internal and external stakeholders store their operational information. PIXEL will enhance productivity and operational efficiency of resources in ports by the following features:

- Close the gap between small and large ports by providing an easy-to-use open source smart solution for operational data interchange
- Migrate from document-centric management systems to data-centric interoperable systems
- Reduce environmental impact in Port Cities and surrounding areas by improving the knowledge and control of the port operations, optimizing processes and improving management
- Focus on small-medium ports innovation
- Improve the energy efficiency of the ports, promote the use of clean energies, improve logistics processes, increase the environmental awareness of all the stakeholders involved and, in general, contribute to reduce the carbon footprint and the environmental impact of the ports and port-related activities

PIXEL objectives are:

- Enable the IoT-based connection of port resources, transport agents and city sensor networks
- Achieve an automatic aggregation, homogenization and semantic annotation of multi-source heterogeneous data from different internal and external actors
- Develop an operational management dashboard to enable a quicker, more accurate and in-depth knowledge of port operations
- Model and simulate port-operations processes for automated optimization
- Develop predictive algorithms
- Develop a methodology for quantifying, validating, interpreting and integrating all environmental impacts of port activities into a single metric called the Port Environmental Index (PEI).
- Develop guidelines for mitigating possible environmental and health effects of port activities and develop evidence-based, standardized and cost-effective procedures for environmental monitoring in port areas

PIXEL outcomes will contribute to the related impacts by targeting specifically the integration among all actors involved in ports' environmental impacts (Port Authorities, terminal operators, shipping companies, customs, security forces, city authorities, etc.) and facilitate critical decision-making supported on available data. Usage

of IoT platforms and legacy data will be instrumental in addressing complex problems that require the management of a multitude of heterogeneous smart objects, devices and systems and the successive fusion and mining of the produced heterogeneous data streams (PMS, SCADAs, environment, sensors, building, etc). Enabling IoT integration and interoperability and creating a platform which gathers all these components in a unique dashboard and DSS interface will spark new applications and business opportunities that will support the requirements to deploy the Port of the Future.

The outcome of this project is expected to provide a reduction on the impact due to climate change and the environment of port activities, their operational and infrastructural costs, improvement of logistics efficiency and better integration of the port in the surrounding socio-economic area, including city-port relations and the smart urban development of Port Cities. Furthermore, realisation of these activities and achieving this impact also will entail attention to environmental and climate-related concerns

PIXEL will provide interfaces, methods, and tools to further extend IoT usage and interoperability between different information sources and application domains. Outcomes of the project will address different data types and origins in order to extend the impact of the project results, trying to establish a robust solution for operational data integration within the port area and related transport and city services.

Another innovative initiative in PIXEL is to create and establish a standard for monitoring environmental impact metric for ports in Europe.

Thus, the expected PIXEL outcomes are completely in line with the strategic high level goals and impacts set by the EU strategic research in the area of Mobility Growth and the Ports of the Future

PIXEL aims to achieve its impact through the implementation of a IoT architecture based on the following components:

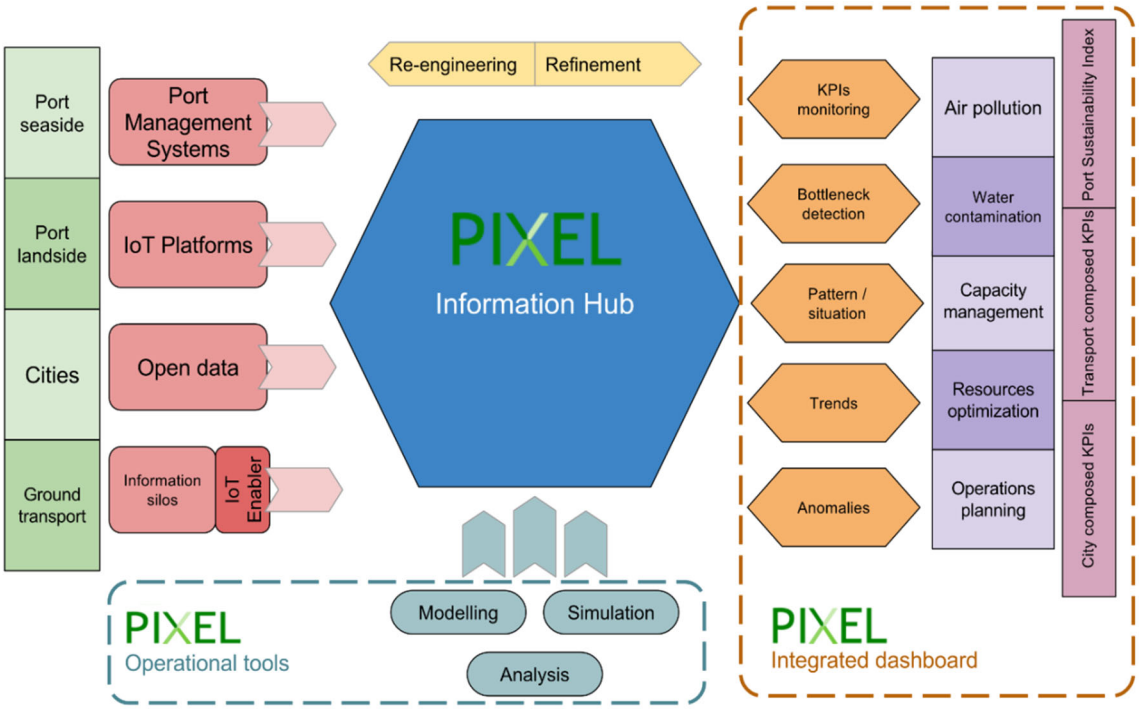

Figure 1. PIXEL ICT architecture

3. Explanation of the work carried out by the beneficiaries and Overview of the progress

3.1. Objectives

The overarching goal of PIXEL is: "*to enable a multilateral collaboration, multimodal transport agents and cities to allow an optimal use of internal and external resources, sustainable economic growth and environmental impact mitigation in all ports, regardless their size or volume of operations. Thus,* ***PIXEL*** *aims at bringing the* ***Port of the Future*** *paradigm to the complete spectrum of ports, with special focus in the small and medium sized. To do this,* ***PIXEL*** *will leverage an IoT based communication infrastructure to voluntarily exchange data among ports and stakeholders ensuring a measurable benefit in this process. The main outcome of this technology will be* ***an efficient use of resources in ports****, as well as the sustainable development and growth of ports and surrounding cities/regions.* ***PIXEL*** *is a use case driven action that focuses on the needs of the stakeholders in order to improve their performance by means of specific technology enablers and improved environmental and operational procedures*".

To ensure this, **PIXEL** will provide (i) a set of models and predictive algorithms on the most prominent areas regarding the ports environmental impact: port and city environmental management, port energy demand, hinterland multimodal transport and port environmental pollution, including air, water and noise; (ii) a methodology and tools to calculate KPIs and combine them in a Port Environmental Index, to enable proper quantification of the impact of Ports in cities and surrounding areas, correct assessment of mitigation measures, calculation of the return of investments in reduction of environmental impact and benchmarking with other similar ports; (iii) an open-source IoT-based technology enabler providing complete interoperability among existing port and city ICT systems and modern data-based systems (such as IoT platforms), to migrate from document-centric management systems to data-centric interoperable systems, enabling more and better collaboration among the different stakeholders and unleashing the potential of Industry 4.0 management to ports and port-city relations and (iv) operational and visualization tools to observe, analyse and make decisions over the new available data.

All the efforts carried out during this first period are in the line of accomplishing these global objective. At this point, the consortium has delivered all the promised deliverables timely and with an excellent level of quality. Technical activity is advancing and several developments are ongoing and dissemination and communication activities have been performed to maximize impact.

3.1.1. Research and innovation objectives

To meet this goal, the **PIXEL** project will focus on a set **of specific research and innovation objectives,** which compose the structure and leitmotiv of this proposal. These objectives are listed below. A review of the advances performed during this first report to achieve each of them is also depicted in this sub-section.

Obj.1: Enable the IoT-based connection of port resources, transport agents and city sensor networks

The project proposes a novel ICT based communication infrastructure to enable the integration of data produced by devices, sensors and systems into a full-fledged operational data hub operated by all actors (internal and external) involved in port operations. Every data generated by every of those components involved in port activities will be properly collected and stored in a unified information hub and it will be seen transparently as homogeneous string from the application and monitoring point of view. PMS/PCS of stakeholders must be connected and feeding the system. IoT and sensor networks from different stakeholders connected and interoperating. It provides methodology and tools for connecting isolated legacy systems such as SCADA/PLC based.

The actions taken to accomplish this objective during the first 6 months of the project have been:

- Definition of the use-cases and their scenario, reflected in. deliverable D3.3 where the first iteration of the use-cases manual has been successfully created.

- Gathering of information related to available technologies, equipment and legacy systems in the ports for the future integration
- Start of definition of the PIXEL ICT architecture
- Analysis of the data availability in each use-case
- Alignment of the needs from the technical team that will develop the ICT solution with the available data, systems and capabilities from the ports to obtain raw information from their premises
- Creation of a tool for communication of technical needs between the ports and the technical responsible of the core work packages for the development of the final solution: WP4, WP5 and WP6
- Kick-off of the requirements gathering, process definition and specification of JIRA as support tool for both the ports and technical team to establish the requirements for PIXEL
- Interviews on-site with stakeholders within the project
- Plan definition and organization of the Deliverable D3.3 document

Obj.2: Achieve an automatic aggregation, homogenization and semantic annotation of multi-source heterogeneous data from different internal and external actors

As part of the IT solution, the project will provide a methodology and tools for unifying the data coming from heterogeneous, multi-tenant sources. PIXEL will offer a comprehensible acquisition, processing and interchange of heterogeneous data coming from different sources present in a port-operations environment: sensors, isolated IoT components, legacy systems and documentation. A methodology and supporting tool will be released to support the data fusion, based on semantic annotation and mediation. As a consequence of this objective, PIXEL will achieve semantic-level interoperability among different actors, with capability to choose the ontological domain of the reports view.

The actions taken to accomplish this objective during the first 6 months of the project have been:

- Initial definition of a process and methodology to gather relevant parameters from port to create a single unified metric for environmental impact assessment
- First approach to definition of process operations (scenarios) under a common notation to create proper models (which will enable simulation and optimization later on).
- Definition of the use-cases and their scenarios. Writing of the deliverable D3.3 where the first iteration of the use-cases manual has been successfully created.
- Start of definition of the PIXEL ICT architecture
- Re-visit of the naming of concepts (PIXEL concept, PIXEL framework, PIXEL solution, PIXEL ICT enabling infrastructure) to establish a common ontology among the Consortium partners (and the PIXEL communication channels as well) in order to create the first approach to a clearly defined methodology within the project.

Obj.3: Develop an operational management dashboard to enable a quicker, more accurate and in-depth knowledge of port operations

It will support computing of indicators and multi-role views to enable better support to decision-making and optimisation of port/city specific needs. Platform will have an associated interface (HMI) with which responsible personnel of entities holding the pilots will be able to interact, measure and compare several operational data. As a result of achieving this objective, PIXEL will provide a dashboard validated by project members and independent stakeholders through a well-defined validation process.

The actions taken to accomplish this objective during the first 6 months of the project have been:

- Definition of the use-cases and their scenario, reflected in. deliverable D3.3 where the first iteration of the use-cases manual has been successfully created.

- Alignment of the needs from the technical team that will develop the ICT solution with the available data, systems and capabilities from the ports to obtain raw information from their premises
- Kick-off of the requirements gathering, through the JIRA tool for both the ports and technical team to establish the requirements for PIXEL
- Interviews on-site with stakeholders within the project
- Analysis of the common technologies used in the ports through a market-state of the art conducted while elaborating deliverable D3.1.
- Identification of the trends on the ports' business in order to align the future PIXEL image (dashboard) and functionalities (operational tools) to the latest wills of ports.
- Definition of the visual image (corporate identity) for the project: colours, common visual features, logo and its derivates, etc.
- Clarification (after a participation & voting process) of the PIXEL slogan and pitch, that will be incorporated to the HMI of the solution.

Obj.4: Model and simulate port-operations processes for automated optimisation

A structured, formalized, consistent and useful modelling will be undergone over port-operations processes to parameterize both the environmental impact caused by them and the process itself in pursuit of finding optimal resource consumption. PIXEL will leverage a set of standardized and inter-related specifications of port processes regarding energy demand, port and city environmental management, hinterland multimodal transport in ports, and generic environmental pollution affecting ports and surrounding areas. Developed models will be tested by comparing its validity against real conditions in four different ports, with different businesses interests (freight, passengers, short sea shipping), different size (small, medium, large) and schedule diversity (second and third years of execution of the action).

The actions taken to accomplish this objective during the first 6 months of the project have been:

- Kick-off and first three months of execution of the key work package to accomplish this objective: WP4. In this work package the information already gathered from ports regarding operational processes, needs, scenarios, etc. is being compiled, processed and structured to create common strategy, to choose methods and to enable their simulation and optimization.
- Proposition of an execution plan for the modelling and processing of port operations, maintaining a continuous bidirectional communication with the rest of technical activity of the project (PEI, ICT)
- Ensure a continuous relation with WP3 relating the description of the use cases and the technical requirements that must be carried out
- Creation of a tool with guidelines to detect (over D3.3) the lack of necessary information from ports to create the models and to process their associated data
- Provision of a questionnaire to the use-cases regarding Modelling and Data Analysis
- Kick-off of the requirements gathering, through the JIRA tool for both the ports and technical team to establish the requirements for PIXEL
- First approach to a solid state of the art of process modelling, define a first structure of what an energy model could look like

Obj.5: Develop predictive algorithms

In this project predictive algorithms will be developed devoted to selected port-operative process that will be modelled. Developed predictive algorithms that have the potential of significantly increase the efficiency in one or more of the following areas: energy demand, hinterland multimodal transport needs or anticipation of environmentally harmful actions. For verifying the achievement of this objective, the algorithms will be empirically tested and validated in the use-case scenarios. Additionally, it is planned an assessment of the increase in efficiency, confirming that is statistically significant.

The actions taken to accomplish this objective during the first 6 months of the project have been:

- Kick-off of the WP4 in M4 and definition of the WP execution plan, internal milestones and the methodology to be followed in the second plenary meeting in Valencia. This work has been done in interaction with task leaders.
- Initial requirements related to predictive algorithms have been analysed. A presentation of scope and plan of work for task T4.5 was performed in Valencia Plenary.
- Beginning of a state of the art about available models, current solutions and general port's operation knowledge.
- Initial state of the art regarding predictive algorithms and techniques within the scope of PIXEL project.
- Creation of a tool with guidelines to detect the lack of necessary information from ports to create the models and to process their associated data
- Interaction with ports in order to better understand the models needs and constraints.
- Interviews on-site with stakeholders within the project
- Several WP4 specialized teleconference have been organized
- Internal review of D3.3 with a close look at modelling and data analysis part.
- Beginning of a data mapping in ports.

Obj.6: Develop a methodology for quantifying, validating, interpreting and integrating all environmental impacts of port activities into a single metric called the Port Environmental Index (PEI).

The project will develop a Port Environmental Index (PEI) which will integrate all the relevant environmental aspects of port operations into a single metric framework. The index will enable ports to express their overall environmental impact as a single metric and use it for self-monitoring, appraisal of different mitigation measures as well as reporting issues (inter-port comparisons, benchmarking against best practices, etc.). The PEI will be validated through the use-cases and in a particular transversal trial where it be applied to each port to make proof of its scalability and portability, approved by the Stakeholders Policy Board and the method published in a relevant high-impact peer-reviewed journal.

The actions taken to accomplish this objective during the first 6 months of the project have been:

- Definition of the use-cases and their scenarios. Writing of the deliverable D3.3 where the first iteration of the use-cases manual has been successfully created.
- Gathering of information related to available technologies, equipment and legacy systems in the ports for the future integration
- Alignment of the needs from the environmental assessment perspective with the available data, systems and capabilities from the ports to obtain raw information from their premises
- Literature review of the existing approaches and start-of-the-art for constructing composite environmental indexes
- The first definition of framework and methodology for constructing the PEI
- Publication of a scientific paper with the theoretical basis that should guide the development of PEI during PIXEL
- Analysis of the existing approaches for addressing the environmental impact of ports: from the technical perspective (intensive work in WP5) and from the market/business point of view (D3.1).
- Inquiries on existing approaches for addressing the environmental impacts of ports. There are similar approaches in both the EU (EcoPorts environmental initiative initiative) and in North America (the Green Marine environmental initiative)
- Establishment of a good bilateral communication with Green Marine Initiative representatives to share knowledge regarding environmental impact assessment

- Virtual meetings with Green Marine Initiative and on-site visit to a successful use-case of this methodology: Port of Quebec.

Obj.7: Develop guidelines for mitigating possible environmental and health effects of port activities and develop evidence-based, standardized and cost-effective procedures for environmental monitoring in port areas

Based on all of the identified environmental and health impacts of port operations, the project will develop appropriate mitigation strategies. In addition, the temporal and spatial resolution of monitoring/sampling/measuring points and the integration, statistical analysis and visualization of the obtained data in a GIS environment will be addressed. Both forecasting and alerting of environmental-damaging situations will be enabled from a dashboard which will inform port (or any other body in charge) about environmental indicators and possible decisions to make. The PEI and the metrics that compose it will play a fundamental role in the achievement of this objective. As a consequence, there will be available mitigation suggestion in the operation tool of the PEI and there will exist geospatial representation of the environmental impact.

The actions taken to accomplish this objective during the first 6 months of the project have been:

- Interviews on-site with stakeholders within the project
- Start of definition of a process and methodology to gather relevant parameters from port to create a single unified metric for environmental impact assessment
- Alignment of the needs from the environmental assessment perspective with the available data, systems and capabilities from the ports to obtain raw information from their premises
- Establishment of a good bilateral communication with Green Marine Initiative representatives to share knowledge regarding environmental impact assessment

3.2. Explanation of the carried work by WP

3.2.1. Work Package 1 – Ethics Requirements

Universitat Politècnica de Valencia (UPV) as Project Coordinator (PC) was assigned as the partner leader (and in fact the only participant) for this mandatory Ethics Work Package. During this first period of the project, there has been considerable activity in this regard. UPV has focused on trying to comply with the Ethical requirements detected by the EC in the evaluation phase and creating the documentation and structures needed for this aim.

3.2.1.1. Progress

During the first 6 months of the project, the activity on WP1 has been intensive, as every procedure, template and strategy for future actions must have been defined, according to the proposed deliverable submission plan for the work package.

First of all, we addressed the definition, identification, cataloguing and ethics compliance analysis of the **participation of Humans** in PIXEL. PIXEL Consortium studied the different situations where Humans would participate in the project's research activities; they were explained, and the corresponding procedures to ensure alignment with ethics requirements were described. Furthermore, the documentation that must be stored and utilized for ethical purpose when any of those situations apply was also detailed and made available in the PIXEL secure repository (it will remain there until the end of the project). This action, if the procedures are properly followed, will guarantee the highest ethics compliance of the Humans participation in **PIXEL** to satisfy the Ethics Requirement about Humans that have been set from the EC for this project. In this sense, this action will serve for ensuring compliance with applicable law and regulations and providing and collecting the necessary documentation in each case. This action was performed under the writing of deliverable D1.1.

Secondly, the PIXEL Consortium undertook the definition, identification, cataloguing and ethics compliance analysis of the **protection of personal data** in PIXEL. The different situations in where personal data is collected, stored, processed, retained and destructed in the project's research activities were explained, and the corresponding procedures to ensure alignment with ethics requirements were described. Furthermore, the documentation that must be stored and utilized for ethical purpose when any of those situations apply was created and made available in the PIXEL secure repository. So, the protection of personal data is covered in PIXEL from the viewpoint of Ethics compliance for the whole duration of the research activity. This action was performed under the writing of deliverable D1.2.

In third place, D1.3 has included the the information to Ethically comply with safe and healthy procedures.

Additionally, PIXEL Ethics Mentor (Dr. Benjamín Molina, from UPV) was appointed and his tasks clearly defined. The EM's role in the most ethical-sensitive part of the project (*trial execution and evaluation*) was particularly analysed, and he was summoned (through this document) to report his specific activities focused on the pilots' preparation

Finally, D1.5 has been completed during the first 6 months as well. D1.5 contains a Data Management Plan for specific personal-protection subject data. This information has been elaborated from the whole Data Management Plan (deliverable D2.2). Actually, D1.5 can be considered a subset of D2.2, particularizing the plan for s**pecific Ethics-related raw data.** This document will be crucial for the execution of the Ethical compliance from now on in the project, as a lot of technical data-related tasks are already being executed and several sensitive situations will occur.

3.2.1.2. Results

- Establishment and formalization of the procedure for ethics compliance about Humans participation in the project
- Creation of a template for Ethical issue identification by any partner
- Creation of a Participant Information Sheet for Humans that participate in the project, compiling their related information
- Creation of an Informed consent form for Humans that participate in the project. This sheet will be distributed to be signed by the external participants of PIXEL.
- Detailed strategy and procedure for personal data (subject to pass Ethics control) protection
- Creation of an Informed Consent procedure for personal data processing
- Creation of a Certificate of consent per personal data to be processed. This sheet will be distributed to be signed by the corresponding responsible
- Creation of a template specific for pilot trials to specify information about the data to be processed, framed into the context of Ethics compliance.
- Appointment of a Data Protection Officer from within the project Consortium
- Deliverables D1.1, D1.2, D1.3, D1.4 and D1.5.

3.2.1.3. Deviations

So far no deviations have been detected.

3.2.1.4. Corrective actions

No corrective actions have been required

3.2.2. Work Package 2 – Work plan, coordination and document management

Universitat Politècnica de Valencia (UPV) as Project Coordinator (PC) has been leading work package 2 (WP2), and the five tasks in which the WP is divided. As a project coordinator, UPV has carried out the majority of the activities within the task. As it is usual at the beginning of research projects, the management work has been one of the most time-consuming and effort-spending items in the day-to-day work. Most remarkable actions have been to organize the 1st and 2nd project Plenaries (hosting the last one) and managing the Grant Agreement request with which we are dealing currently. The project consortium has generated six deliverables, associated with WP1 (2), WP2 (1), WP3 (1) and WP9 (2), whose quality control has been performed following the project handbook procedures. By the date of submission of this very document (D2.5), other six deliverables are going to be submitted, associated with WP1 (2), WP2 (1), WP3 (1) and WP9 (2).

3.2.2.1. Progress

Progress by task

Task2.1: Work plan, coordination and document management

The right functioning of a project often relies on a balanced coordination, taking into account the text of the proposal that has been funded and the daily activities that occur within it. In this regard, UPV is the Coordinator and UPV and, as WP2 leader, is the main executor of this task for PIXEL. Supported by other partners, if requested, UPV holds the responsibility of aligning the technical and social scope of PIXEL (according to the GA) with the day-to-day execution of the several tasks that take place simultaneously. At the same time, all the "logistic" of the project: enabling internal communication tools, being the interface for every request, etc. is covered within task T2.1.

This task has been continuously performed during the whole reporting period. Regarding pure Coordination, in this task a lot of activities have been undertaken, such as organising plenary telcos, creating specific mailing lists, supervising the whole work execution, uploading documentation (deliverables) to the EC, ensuring a good communication among the partners and keeping track of the work plan, ensuring the proper pace of work looking for the sake of the project and having 2 Plenary Meetings:

- 1st Plenary Meeting: Kick-Off at Brussels on 3rd and 4th of May. ALL partners attended the meeting.
- 2nd Plenary at Valencia on 11th and 12th of September. ALL partners attended the meeting.

Biweekly management telcos are organised in alternative Thursdays, in order to solve any management issues, and every two telcos perform risk management activities.

With regards to the documentation, from M1 to M6 the common documentation repository has been populated by all partners, while being created and maintained by UPV. Instructions for uploading, naming, placing and modifying the various document in the private server have also been outlined and shared among the partners.

In the context of this task, one deliverable has been delivered in this period. Particularly, in M1 was submitted the document *D2.1 – Project management and quality handbook*. This deliverable was successfully submitted on time and format and contained the following information relevant for the work package and for the whole project:

Project Governance: Definition of Consortium management structures, roles and responsibilities of project bodies, decision making and conflict resolution, key project contact, formal procedures to be followed.

- Meeting organisation, execution and tracking
- Work space and documentation: tool, procedures, etc.
- Communication tools (both internal and external, brief reference prior to the creation of external dissemination channels)
- Quality assurance and process for release of deliverables

- Innovation management
- Risk management
- Software development first approaches to procedures and tools

Additionally, UPV as T2.1 leader, has acted as a proxy between partners and the European Commission after every particular request.

Task 2.2.: Administrative and financial management

Related with the last point of the T2.1 report, and linking both tasks, in T2.2 the Administrative issues generated and specially those related with the EC have been addressed. In particular, three points are highlighted:

- Distribution of pre-financing was executed during the first month of the project.
- Fluent communication with the PO of the project (Mr. Sergio Escriba) has been conducted through this task.
- In this regard, we are in the middle of the process of submitting an Amendment of the Grant Agreement. During the 2nd Plenary in Valencia several request for changing some items from the GA were received by the Coordination, and a process of Amendment has already started. At the moment of submission of this deliverable (D2.5), the Amendment has not been effectively concluded yet, since several administrative data is lacking and some justifications are being explained to the Project Officer.

Besides this, in the context of T2.2 several internal reporting actions have been conducted. Both technical and financial reporting was request to all partners to keep track of a proper use of resources since the very first stages of the project.

Task 2.3: Advisory Board Management

During this first 6 months of the project the activity has been intensive with regards to the Advisory Board composition and management.

First of all, both the Coordination of the project and Technical Coordination, altogether with opinion of every partner decided which profiles should be addressed for selecting PIXEL's Advisory Board members. In this sense, the conclusion was to search for a total of 5/6 total members for the AB covering the following realms:

1. Port environmental index (experts in environment for ports, maritime environmental impact, or similar)
2. Industrial sector - IoT
3. Experience/knowledge on EU procedures/policies
4. Technology-driven corporations addressing ports sector

Then, all partners were requested to come up with propositions people/corporation that could fit those profiles. After several rounds of calls and first contacts, a total number of 10 persons were pre-chosen. Afterwards, this point was fairly discussed in the 2nd Plenary of the project in Valencia. There, with all partners present, several names arose as the most suitable for being part of the AB and, after a show of hands discussion and election, it was decided to finally conform the board with 5 people.

In Table 2 there is the list of identified (all) and pre-selected (yellow) people to possibly form part of PIXEL's Advisory Board and their field of expertise:

Table 2. Advisory Board pre-selected members

Person	Organisation	Field of expertise
David BOLDUC	Alliance Verte (Green Marine)	PEI
Marie-Eve LEMIEUX	Port of Québec	PEI - Environment in ports
Igor Kegalj	School of Maritme Studies of Rijeka	PEI
Jose Luis Gonzalez Gomez	FERROVIAL	Transport, ITS

Rafael C. Socorro Hernández	ACCIONA	Innovation, Construction, IoT
Ivano Di Santo	Port of Trieste	ICT, Innovation, Ports, Transport
Levent Gürgen	CEA LETI	IoT, ICT
Lucija Kolar	Complementarium (NGO)	environmental issues related to marine environments
Dr. Charalampos Platias	Ministry of Maritime Affairs & Insular Policy	EU policies expert
Jose Manuel García de Laguía	Port of Valencia	Transport, ICT, Ports

The last stages of this process are being still conducted by the Consortium, and are consisting on contacting the selected persons, asking particularly for formal commitment, followed by clear explanations about what is going to be their role and the expectations from PIXEL Consortium.

It is expected to finish this process and close the Advisory Board final composition in the next few weeks. Thereupon, a carefully designed planning will be outlined and meetings, actions and results will be finally defined.

Task 2.4: Risk management and Quality Assurance

This task, same as the others in work package 2, will last for the whole period of the project. Thus, some actions have been undertaken during its first 6 months.

Particularly, the identification of risks has been slightly enhanced through the analysis of the first tasks of the project (documentation procedures, communication strategy, etc). Particularly, all this has been materialized in a section in deliverable D2.1, in which a summary of the initial risks and its update has been reflected.

Furthermore, some mitigation actions that were previously designed have been implemented. For instance, several efforts have been done to maintain the work plan without major deviations, both in duration and in number of partners involved. (Annex 1 includes

Finally, regarding quality assurance, the procedure for Deliverable quality review and final acceptance was clearly defined. For the deliverable D2.1, this process was discussed among the Consortium and aftermath written down in one of the sections of the document. Several deliverables have been submitted during these first 6 months. This process for the quality review has been followed in all those deliverables that have been elaborated since the agreement on the procedure. Particularly, deliverables D9.2, D3.3, D3.1, D9.3, D2.2 and D9.6 have passed through the quality assurance process (Internal + Innovation Review, meeting certain timing). This is an action for quality and also for risk mitigation.

Task 2.5: Data and ethical management, planning and assessment

This task, to be executed during the whole project length, is somehow embedded into the first work package (WP1), and its activity within the scope of WP2 of PIXEL has been the following from M1 to M6.

The identification of data subject to protection, personal data and sensitive information from different points of view (Humans, environmental…) has been conducted in the first months of the project. In this regard, we have included a specific field into the Requirement definition template to indicate whether a particular requirement (piece of needed feature for the project: data, development, outcome, process, etc.) applies in some sense to the Ethical observance.

National and European legislation has been approached in a first iteration. Here, we have considered that we are in a very initial stage of the project, and probably we will be finding more types of data issues, ethical questions and particular situations during the execution of the action that will force us to re-visit this action to establish a definitive Data and Ethical document.

Finally, the most important action in has been to start defining the first version of the keystone documentation of this task: the Data Management Plan. Framed on deliverable D2.2, the Data Management Plan.

Table 3. WP2 Partner contribution summary table

Partner	Contribution

P01 UPV	• Coordination of the project.
	• Administrative tasks
	• Leading management (WP2) and taking care of the coordination of the project, with definition of all procedures, setting up of the repository and other necessary day-to-day resources
	• Complete writing of D2.1:
	  ○ Formal specification of Work structures and mechanisms
	  ○ Specification of management tools
	  ○ Establishment and hosting of the document repository
	  ○ Creation of blank webpage and hosting of the site
	  ○ Definition of deliverable writing and evaluation process
	  ○ Analysis of the risks of the project that can be overseen in M1
	  ○ Creation of project templates
	• Advisory Board candidates observation and management of contacts with selected people (still on-going)
	• Preparation of the Grant Agreement amendment, which is currently open
	• Management of all requests for GA amendment
	• Act as the intermediary for all communications between the beneficiaries and the EC
	• Implement quality procedures for the project
	• Administration of project resources including budget-related issues
	• Financial management including distribution of payments to the beneficiaries
	• Facilitate communication within the consortium on administrative matters
	• Consolidate project's deliverables and reports and maintain Quality Assurance including submission to the EC
	• Create, update and maintain the WP2 To-Do sheet in the common repository, thus enabling a tool for keeping track of the WP activity
	• Organisation and attendance to the Kick-Off Meeting at Brussels on May 2018
	• Organisation, hosting and attendance to the Plenary Meeting at Valencia on September 2018
	• Organisation of bi-weekly Plenary Telcos

P02 PRO	• Supporting Coordination in its majority of tasks from their position of Technical Coordinator • Search of suitable members for the Advisory Board focused on ports business, industrial port sector and ICT-ports junction • Supporting Coordination specially in Risk detection, mitigation and taking actions
P03 XLAB[1]	• Search of a suitable member for the Advisory Board focused on environmental issues related to marine environments • Hosting and providing ISL Service for teleconferences tool

[1] No manpower in this WP, however some associated activities have been performed.

P04 INSIEL[2]	• Search of a suitable member for the Advisory Board focused on ICT, Innovation, Ports, Transport
P05 CATIE	• CATIE proposed Levent Gürgen, CEA LETI, who has expertise on IoT and ICT, as a member of the advisory board. Finally he was discarded by Coordination. • CATIE aims to reduce the risks of WP4 kick-off (which is largely related to the description of the use cases). So CATIE has participated actively in the risk detection and management task during this period.
P06 ORANGE	• Supporting Coordination specially in Risk detection, mitigation and taking actions
P08 MEDRI	• Search of a suitable member for the Advisory Board focused on Environmental issues. • Supporting Coordination specially in Risk detection, mitigation and taking actions
P13 GPMB[3]	• Submitting to the Project Leader two possible members of the Advisory Board (port of Québec and Green Marine Association) that have strong expertise in environmental matters
P14 IPEOPLE	• Supporting Coordination specially in Risk detection, mitigation and taking actions
P15 CERTH	• Supporting Coordination specially in Risk detection, mitigation and taking actions • Supporting Coordination in management of relation with ports specially

3.2.2.2. Results

Main results associated with the execution of the WP is the adequate coordination of the activities organised in WP that required an intercommunication between them. Main achievements:

- Definition and assurance of compliance with administrative, documentation and internal communication procedures
- Execution of the different administrative and financial activities as required by the project.
- Deployment of the different collaborative tools in order to manage the execution of the project.
- Submission of the deliverables in due date. Re-submission of deliverables was successfully conducted after particular requests from the PO due to formatting and/or impact-less mistakes.
- Quality control of the deliverables and results of the project.
- Advances on the establishment of the AB composition.
- Amendment requested, in process of fine-tuning and submission
- Deliverables in this WP successfully submitted:
    - D2.1 - Project management and quality handbook
    - D2.5 – Project Management Report v1

3.2.2.3. Deviations

No significant deviations have been produced, apart from the extra work needed to undertake the creation and management of the amendment request by Consortium partners.

Some potential Advisory Board members have not accepted so additional members have been contacted. The final invitation letters will be sent in the following weeks.

3.2.2.4. Corrective actions

No additional corrective actions have been required.

[2] No manpower in this WP, however some associated activities have been performed.
[3] No manpower in this WP, however some associated activities have been performed.

3.2.3.Work Package 3 – Requirements and Use Cases

WP3 is in charge of gathering and defining the set of technical requirements for the development of PIXEL solution and for each of its core components and use-cases scenarios. For this purpose, the specific objectives are to analyse the market of current port, environment and operational data integration, -related technological enablers and describe thoroughly scenarios for the three use cases that will take place, involving all the relevant actors, goals and processes. The specific objectives of the WP are: (i) to provide a state of the art and market analysis in the areas targeted in the project, especially on environmental factors and impact in multi-modal transport models in present-day ports, (ii) to identify and analyse ports, agents, stakeholders and different actors involved in each use-case addressed in the project: Monfalcone, Bordeaux and Piraeus-Thessaloniki, (iii) to adequately formulate, gather and analyse requirements from targeted pilots, and other involved actors to characterise PIXEL, (iv) to track requirements through different stages of the process, (v) to identify and design suitable business models for the PIXEL solution, (vi) to establish knowledge sources, representation, management, and potential to each tool and outcome, (vii) to analyse legal and regulatory requirements that will be relevant to PIXEL pilot deployments and (viii) to propose PIXEL architecture and accompanying specifications.

WP3 activity started at the very beginning of the project. All ports were very soon encouraged to analyse their own scenarios, their goals and expectations (after the text submitted in the proposal) and to start gathering as most information as possible to enrich the input to be provided to the other technical work packages.

In the first 6 months of the project, all the tasks within WP3 have started and have given tangible results to the project. In the next subsection the advance of each one of them is described:

3.2.3.1. Progress

Progress by task

Task 3.1: Market study with stakeholders

This task provides an insight to the current and emerging situation of port-related solutions focused on the interoperability between agents (cities, transportation companies, port agencies, etc.), the communication and storage of data of port activities, exploitation of this information and optimization of those operations from different points of view (namely environmentally).

This task, aligned with the work on Innovation Management regarding the description of business models, the deployment, interoperability and operational strategies that will be validated by ports, end users and operators. Started to perform an initial analysis of the Ports that participate in the PIXEL project, by the creation and dissemination of a Questionnaire that was requesting information about the Management Systems and Standards that PIXEL ports are following during their operations

First of all, meeting with PPA's experts to further research in this regard were conducted, since the geographical presence of the two partners enabled a more close collaboration. During these meetings the operations of the port, were analyzed, the various stakeholders were identified and an analysis of the Vendors that provide services to PPA and the companies that are part of the Piraeus shipping cluster, took place. The blue print that was the result of this analysis, was the base for the creation of a second version of the questionnaire that was shared via e-mail with the rest of the Ports of the consortium.

Secondly, and in parallel with the latter, an analysis was performed about the previous and current research Projects (FP7 & H2020) that have similar focus and objectives with PIXEL. This analysis contained 21 project that were examined in terms of the technology that the used, the IoT solutions that they developed and the contribution to the Environmental dimension that they had. A final list with the more closely related projects was also provided to the report with recommendations and possible gaps that the PIXEL solution could fill.

Then, various other ports that have similar characteristics with the PIXEL ports (Medium and small) were analysed. A final list of 16 ports was used, for the identification of the most important trends that affect the Port Operations, namely in the area of port efficiency and connected logistics. The most important vendors in the European Port's Industry were described along with their relevant solutions. Due to the limitation sometimes in the available data, we focused in the Container Industry and the systems that improve the value chain efficiency

and the greening of the ports operations. During the 2nd plenary meeting in Valencia during September 2018, the Table of Contents, was presented and agreed with the Consortium Partners.

The main result of this task is the deliverable D3.1. During this period, several versions of the document have been elaborated and given for Internal Review. A delay in this procedure occurred, since the project team has struggled to cover the parts that were not finalized in the analysis, because of the difficulties in obtaining the necessary data from the various sources that were decided to be used to elaborate the deliverable. This has also occurred due to the technical difficulty of this task. The scope of PIXEL is vast, and the heterogeneity of the ports, partners and potential stakeholders of the final product have become huge barriers to create the very good deliverable that the Consortium is willing to accept.

Task 3.2: Regulation, Policies and Recommendations

The Task 3.2 aims to examine the legal aspects, compile local and national information on the project area, establish strong connection with regulatory bodies and data protection authorities approach national data protection authorities. The task Deliverable is D3.5 – *PIXEL legal, regulatory and ethical report* that will be submitted on M9.

The actions executed within the task are being addressed to elaborate a document devoted to gather every regulatory aspect related to the ports regarding the scope of the project, especially those referring to the pilots.

For achieving this, a questionnaire has been elaborated and distributed among the partners to gather the proper information. This questionnaire was uploaded to the common repository of the project, and several inputs have been already received.

The questionnaire consists of 3 sections: Section 1: (Legislation, policies and regulations at National Level), Section 2: (Legislation, policies and regulations at local port pilot Level) and Section 3 on regulatory/supervisory bodies (Ministries, National, regional and local organizations) relevant to the project activities in the port pilot areas. The participating partners are expected to complete the templates provided by PPA and will then be integrated them into the deliverable D3.5.

Task 3.3: Use cases and scenarios definition for port environmental issues

The task 3.3 is dedicated to the use cases and scenarios definition for port environmental issues.

The first step performed was to define the structure of the first deliverable (D3.3 - "use cases and scenarios manual v1"). The use case template was defined by working with WP4 (modelling, process analysis and predictive algorithms) and WP5 (Port Environmental Index Development) leaders concerning the technical part, with T3.2 leader for the section "regulation", and with the Project Coordinator (UPV) to give a consistent document in the frame of the whole project.

Then, ports have been asked to be describe their use-case following the template and to explain their current situation in terms of ICT systems, sensors, and environmental maturity thanks to questionnaires provided by CATIE (WP4 leader) and MEDRI (WP5).

After quality checks performed by XLAB and UPV, the final version of the first deliverable (D3.3) has been submitted on time (M4). It includes the description of the further works to be accomplished to deliver the second and last expected document (D3.4 - "use cases and scenarios manual v2") on M9.

Currently, the works are focused on identifying with technical WP leaders the best way to describe with the appropriate detail the processes that will be modelled and the existing ICT systems and sensors that must be integrated to PIXEL platform.

Task 3.4: Requirements specification

The task 3.4 Requirements specification started in month 2 and will be closed in month 12.

The first activity within the task has been the identification of the methodology to apply to collect and manage the functional and not functional requirements to design and develop the PIXEL products based on the scenario and use cases of the Ports pilot described in the Deliverable D3.3 related to task 3.3 Use cases and scenario definition for port environmental issue.

VOLERE is the methodology selected. VOLERE has been used by thousands organizations around the world in order to discover, define, communicate and manage all the necessary requirements for any type of system development (e.g. software, hardware, commodities, services, organizational, etc.). VOLERE can be applied in almost all kinds of development environments, with any other development methods or with most requirements tools and modelling techniques. To produce accurate and unambiguous requirements, the VOLERE methodology uses techniques that are based on experience from worldwide business analysis projects, and are continually improved.

The VOLERE methodology provides several templates to deal with the different techniques and activities that it includes, so VOLERE fits the context of the PIXEL consortium in terms of skills, knowledge and project objectives. In addition to VOLERE methodology has been selected a method to prioritize the requirements that is MoSCoW. MoSCoW was developed by Dai Clegg of Oracle UK in 1994 and it gained popularity in the DSDM methodology (Dynamic Software Development Method). MoSCoW is a fairly simple way to sort features into priority order – a way to help teams quickly understand from the customer's view what is essential for launching product and what is not.

The term MoSCoW itself is an acronym derived from the first letter of each of four prioritization categories (Must have, Should have, Could have, and Won't have).

Concerning the tool to gather and manage the requirements has been adopted JIRA software of ATLASSIAN provided to all partners by INSIEL and hosted in the Datacenter of INSIEL. The JIRA tool is accessible by HTTPS protocols. Each partners identified 2 users of JIRA that have been authorized to access to PIXEL project on JIRA.

The VOLERE template and MoSCoW method have been set up on JIRA. Moreover a workflow to manage and monitor the status of the requirements, with the possibility to create some macro categories of the requirements status.

Table 4. WP3 Partner contribution summary table

Partner	Contribution
P01 UPV	• Attendance to different WP3 specialized telcos • Internal Review of D3.1 • Provision of a template for D3.3 tracking • Suggestion of D3.3. ToC • Writing of D3.3 sections • Assistance to all ports in defining their scenarios and use-cases for creating consistency in deliverable D3.3 and create a solid basis for technical developments later on in WPs 4, 5 and 6. • Completion of the final version of D3.3 altogether with the Deliverable leader (GPMB) • Creation of Requirement template altogether with XLAB and INSIEL • Huge assistance and guidance on particularizing VOLERE methodology for requirements • Testing of JIRA tool and definition of procedure for requirements gathering with it • Attendance to a physical meeting in Monfalcone that Coordination and XLAB made to align the use-case with PIXEL status in June 2018
P02 PRO	• Attendance to several WP3 specialized telcos • Supervision of the writing process of deliverable D3.3 • Writing to deliverable D3.3. final version • Assistance on requirement methodologies
P03 XLAB	• Attendance to several WP3 specialized telcos

	• Supported the tasks leader in the Kick-Off of this task by proposing and reviewing the VOLERE methodology and drafting the requirements gathering process. . • Huge assistance and guidance on particularizing VOLERE methodology for requirements • Supporting Task Leader and Coordination in choosing and setting up the tool for requirements gathering: JIRA • Provision of general guidelines related to market studies (D3.1) to the task leader. Suggestions to the ToC & templates of the deliverable. • Inputs about innovation, technical requirements, support the port of Monfalcone scenarios. • Visit to the Italian pilot site to make a survey of existing ICT systems and business processes in place. Dealing with innovation management related to this task. • Innovation Review of D3.1 • Inputs about innovation, technical requirements, support the port of Monfalcone scenarios for D3.3 • Support to methodology drafting, tools selection for D3.4
P04 INSIEL	• Attendance to several WP3 specialized telcos • Leadership of T3.4. Main actions within it have been: o Analysis and proposition the methodology and the tool to collect and manage the requirements, that will be followed by Insiel and all partners involved. o Selection for requirements gathering tool: JIRA o Hosting of JIRA service o Creation of Requirement template altogether with XLAB and Coordination • Provision of data and information related to market solution implemented and integrated in the Regional Ports of Monfalcone and their relation to Trieste Port • Contribution to the definition of the scenario and use case of Monfalcone Port and its interrelation with SDAG. • Definition with ASPM and SDAG the current scenario, in terms of flows, processes and information system adopted, and designed the use case to implement PIXEL solution.
P05 CATIE	• Attendance to several WP3 specialized telcos • Assistance to GPMB in defining their needs for sensor and IoT and the availability of solutions giving answer to these needs. This thinking will continue. • Set up of a questionnaire to helps ports in the description of their use-cases to better identify the needs and expectations of the ports on the modelling and data analysis part (as leader of the WP4). • Discussion and work with GPMB on the definition of its use-case on energy management. • Provision of comments and improvements on the D3.3 deliverable • Assistance to GPMB to start defining requirements • Internal Review of D3.1 • T3.4: Interaction with INSIEL in order to work one the requirements for modelling and data analysis
P08 MEDRI	• Creation and forwarding of a questionnaire to gather environmental-related information of the different PIXEL use-cases.

P09 SDAG	• Take part of the TelCos referring the activity and kept updated about the progress of the activity, in charge in particular to IPEOPLE in this first stage • Preparation of a list with all technological devices and equipment that can be used for Monfalcone use case (while waiting to receive from IPEOPLE a template/questionnaire in which reporting the data required for the development of the activities) • Collection of the main technical sheets referring to technologies for fleet and route monitoring, dangerous goods recognition and automated control at parking areas. • In T3.2, examination of legal aspects involved in the development of Hinterland multimodal transport use case. The attention has been focused in particular to data protection, in compliance with what required by the General Data Protection Regulation (GDPR). In fact, Friuli Venezia Giulia use case processes many personal data, such as the truck plates, driver telephone number. SDAG personnel will be helped in the following periods by a legal expert. • In T3.3, analysis of the scenario of Friuli Venezia Giulia use case, also referring to the context deriving from T3.1 and T3.2. • Attended the physical meeting in Monfalcone that Coordination and XLAB made to align the use-case with PIXEL status in June 2018. • Cooperation with GPMB, ASPM and INSIEL in the writing of the first and second version of D3.3.
P10 THPA	• Attendance to several WP3 specialized telcos • Writing Use Case Description of Deliverable 3.3
P11 PPA	Attendance to several specialized telcos Contribution to the D3.1 Market Study deliverable Preparation of the port of Piraeus Use Case Description of Deliverable 3.3 Preparation of the task 3.2 Questionnaire template
P12 ASPM	• Attendance to several WP3 specialized telcos • Description of technological devices and equipment that can be used for the FVG use case • In T3.2, ASPM, in conjunction with the company's DPO, has evaluated the data protection system involved with the SILI System with reference to the General Data Protection Regulation (GDPR) as well as how the recent Decree of the President of the Italian Republic n. 57/2018 that merged the Port of Monfalcone with the Port of Trieste inside the Port Authority System of the Eastern Adriatic Sea can affect the project activities • In T3.3, analysis (in collaboration with INSIEL and SDAG) of the scenario of Friuli Venezia Giulia use case, also referring to the context deriving from T3.1 and T3.2. • Hosted the physical meeting in Monfalcone that Coordination and XLAB made to align the use-case with PIXEL status in June 2018 • Cooperation with with GPMB, SDAG and INSIEL in the writing of the first and second version of D3.3. • Fulfilment of the questionnaires provided by IPEOPLE about the technologies applicable to ports/inland ports focused on interoperability between agents, communication and storage of port/inland port activities, exploitation of this information and optimization of the operations. • Writing of deliverable D3.3 in its final version
P13 GPMB	• Attendance to several WP3 specialized telcos or workshops

	• As leader of D3.3: coordination of the partners involved in the drafting of the deliverable, definition of D3.3 ToC, definition of use-cases description template, assistance to all ports, integration of the questionnaires released by CATIE (modelling and data analysis) and by MEDRI (environmental), drafting the different versions of D3.3 including the final version that was written with the help of UPV • As a port involved in D3.3: description of the use case of port of Bordeaux especially the integration to PIXEL (with the help of CATIE), the assessment of the Green Marine program, and the design of a new beta version of VIGIEsip, the PCS of GPMB
P14 IPEOPLE	• Attendance to WP3 specialized telcos • Writing in collaboration with PPA the respective Use Case of D3.3 in its final version • In T3.3, assistance to the analysis and drafting of the scenario of PPA use case • Being responsible of D3.1: o Creation of the ToC o Creation of the first version of the deliverable, assigning section o Gathering contributions o Fine-tuning the document after Internal and Innovation Review • Cooperation with UPV, XLAB and CATIE in the writing of the first and second version of D3.1 • Writing of D3.1 in its final version • Creation and forwarding of a questionnaire to gather details for D3.1, about the Use Cases Port Management Systems in relation to the environmental dimension of the ddifferent PIXEL use-cases.
P15 CERTH	• Review of the KPIs for the ports planned in the proposal • Discussion with ports about the KPIs to be assessed in PIXEL • Internal Review of D3.3

3.2.3.2. Results

The main results that we have obtained in the first 6 months of the project in the context of WP3 are the following:

- First approach to the use-cases manual
- Template for the creation of a requirement
- Process of creation, refinement and approval of a requirement
- IT tool for managing requirements
- Workplan to reach que most quality as possible for the second iteration of use-cases manual .
- Training video for PIXEL partners so that everybody is able to insert/correct/accept the requirements; depending on the stage of the requirements process that they must act.
- Creation of an on-line repository for the requirements and their associated actions: create, enhance, assign, check quality, accept.
- Market Analysis document created. The result here has been a document gathering the state of the art of similar solutions in the market, the competitor of PIXEL, which are the latest trends in the Port of Future and other business/market ¡-related aspects. This result will become a very important asset in the project while developing the final solution of PIXEL.
- Deliverable *D3.1 – Stakeholders and market analysis report.* - Not submitted at the time of this report due to changes required by the quality check. The deliverable will be submitted with minimum delay.
- Deliverable *D3.3 – Use cases and scenarios manual v1*

3.2.3.3. Deviations

So far no deviations have been detected. A part of the delay in submitting D3.1. The quality check has detected some mistakes that have to be corrected and some content amended.

3.2.3.4. Corrective actions

No corrective actions were needed.

3.2.4. Work Package 4 – Modelling, process analysis and predictive algorithms

WP4 goal is to provide several Pixel Modelling Tools to Pixel Hub. Indeed, WP4 will propose models, data analysis and algorithms in order to manage port efficiently and adapted to the environmental stakes. To do this WP4 will consider the environmental impacts identified in WP5 as necessary to the Port Environmental Index in order to provide metrics. Then in WP6 (especially in T6.4 Pixel Operational Tools) those models, data analysis and algorithms will be implemented in the software operational tools. Thus, WP4 propose a clear and validated model adapted to the need of ports define in WP3.

Together those operational modelling (WP4) and operational (WP6) tools constitute a decision support tool providing a useful and transversal knowledge for cargo operational management. It will allow operators to evaluate the environmental impact of any activity scenario, and to compare them for an optimal choice regarding environment.

WP4 considers cargoes (liquid/dry bulk, breakbulk, container or passengers) transitions between areas (from sea to hinterland) through transition operations (i.e. unload, load and transport) by machines (e.g. crane, truck etc.). A specific composition of cargo's transition operations (involving different machines and operators) will be referred as a supply chain.

For each cargo, there are several ways to arrange transition operations between areas. A hypothetical combination of those transition operations (for one or more cargo) is called a scenario. This scenario will be design by port operators and the end-users of modelling and data analysis tools.

WP4 will provide the ability to get environmental impact metrics for any scenarios, and to compare it with alternative scenario. Thus, PIXEL modelling tools will order scenarios according to an optimization metrics
A special attention has been given to identify and manage main risks for WP4's achievement. Four main risks have been targeted:

1. WP4 is limited to the input data quality, about which some difficulties may rise.
2. Confusion should be avoiding between Environmental Impact Assessment Models and other tools in demand by uses cases.
3. There may be a lack of degree of freedom about modification of port processes schedule or organization for environmental impact optimization.
4. A nice balance has to be found between high model's customization to perfectly answer a use-case, and a more general scope of the model in order to be easily transposed to most of the small ports.

3.2.4.1. Progress

WP4 has been managed as a whole without a distinction between the different tasks. In this regard, this work package only has been being executed for three months, so it is in its very first stages. During months M4 to M6, WP4 undertook the following actions:

- Kick-off of the WP4 in M4 and definition of the WP execution plan, internal milestones and the methodology to be followed in the second plenary meeting in Valencia. This work has been done in interaction with task leaders.
- Several WP4 specialized teleconference have been organized
- Interaction with ports in order to better understand the models needs and constraints.

- Beginning of a state of the art about available models, current solutions and general port's operation knowledge.
- Internal review of D3.3 with a close look at modelling and data analysis part.
- Beginning of a data mapping in ports.
- Production of knowledge, internal documents and proposals for the project.

WP4 provide quantitative metrics for scenario's environmental impacts, dispatch on three fields:

- Energy requirements
- Pollutants emissions
- Load on the transport network
- Port and city environmental management

These quantitative measures models will be referred as environmental impact assessment models. They may be use in "real-time" condition (monitoring) or in a "prospective" way (calculated from future activity simulation).

WP4 has already interacted with other WPs. WP4 has worked closely (and will keep it that way) with:

- with WP3 to provide guidance on ports needs and constraints definition for model's development (e.g. "User's stories" method proposal and modelling interview forms template);
- with WP5 for environmental impacts metrics definition;
- with WP6 for model's requirements definition (e.g. technical proposals for data management and WP4 underlying general architecture).

Four tasks have started their activity and, despite being separately executed by specific teams, the report on the advance and conclusions extracted till now can be described together. In this sense, this is how we can summarize what we have been dealing with during the first months of tasks T4.1, T4.2, T4.3 and T4.4:

Quality issues with data

WP4 models and analyses activity's data. That is why WP4 is limited to the input data quality. This is a major risk for modelling tools final utility.

Four main data issues type have been identified.

- Lack of data: To use statistical tools, build adapted models or train predictive machine learning algorithms, the starting dataset should be large enough. Currently the provided datasets seem to be rather small to give a good confidence on activity's data representation.
- Incomplete data: For a given cargo's supply chain, there will be probably some unavailable data (e.g. no date for cargo take away by carrier, no information about a specific engine, etc.). This should not result on model crash but should rather lead to a warning to the user. One answer to this issue may be to complete the supply chain's missing data with simulated data (statistical inference, see T4.5 description).
- Fluctuating data: The data describing activities will probably be frequently updated (e.g. an arrival date, a machine assignment, etc.). Modification "on the fly" should not lead to long recalculation for a minor data's update. This means avoiding whole recalculation when possible, by isolating recalculation on initial and updated data's difference.
- Fuzzy data: For some data, there is probably a noticeable uncertainty which varies across time (e.g. uncertainty about a vehicle's arrival hour should decrease with time). At first, pertinent safety margin should be determined for such data input. In a second time, a "fuzzy logic" approach may be required for handling such inputs with uncertainty function of time.

Joint data sources inventory

The fundamental questions about data are:

- What are the available data?
- When are they created?

- Who owns them? Is there any legal issue sharing and using them?
- How to get them?

After some initial bibliography, a first draft of "standard data map" can be drawn, with the following four data clusters.

- Sea to dock**:** Such data can be provided by FAL forms, Port Management Information System (PMIS) and port's policy regarding ship announcement. They can bring information about expected & effective arrival/departure time, cargo's type & quantity (to handle, not total inside ship) or berth allocation.
- Dock, warehouse, yard & multimodal platform**:** Those data seem to be owned by terminals operators. Those data concern cargo supply chain allocation, machines specifications and their availabilities. However, some ports are equipped with CCS (Cargo Community Systems) which aggregate data from different ports stakeholders (terminal operators, freight forwarders, customs, …). It is the case in the port of Bordeaux.
- Hinterland gates**:** Currently the data's owner is unclear. Those data concern all information about truck drayage (transporter's expected & effective arrival/departure time, cargo's type & quantity).
- Transportation network: For roads, the most probable access to data seems to be governments open data strategies. For railroad and rivers, administrator and captaincy seem to be the respective data's providers. That information is relative to the transportation network (traffic density, speed, legal or size's constraints).

Table 5. WP4 Partner contribution summary table

Partner	Contribution
P01 UPV	• Assistance to specialized telcos • Analysis of D3.3. and detection of incomplete and lacking information from ports in order to create the models and their associated processing • Contribution to the document WP4 strategy from CATIE
P02 PRO	• Assistance to specialized telcos • Analysis of D3.3. and detection of incomplete and lacking information from ports in order to create the models and their associated processing • Contribution to the document WP4 strategy from CATIE
P03 XLAB	• Assistance to specialized telcos • Contribution to the document WP4 strategy from CATIE • Presentation of scope and plan of work for task T4.5 in Valencia Plenary (XLAB leaders of task T4.5)
P04 INSIEL	• Assistance to specialized telcos • Presentation of scope and plan of work for task T4.3 in Valencia Plenary (INSIEL leaders of task T4.3) • Leadership of the first two months of execution of task T4.3 • Contribution to the document WP4 strategy from CATIE • Analysis of D3.3. and detection of incomplete and lacking information from port in the use-case of Hinterland multimodal transport models
P05 CATIE	• Leadership of the first 3 months of WP4, all points below are in that context. • Definition of the WP execution plan, internal milestones and the methodology to be followed. For this CATIE has interacted with task leaders and made several proposals. • Presentation of scope and plan of work for task T4.2 in Valencia Plenary (CATIE leaders of task T4.2)

	• Proposition of an execution plan for WP4, and continuous contact with the rest of task leaders of WP4 • Ensure a continuous relation with WP3 relating the description of the use cases and the technical requirements that must be carried out • Organization of WP4 specialized telcos • Creation of a tool (spreadsheet) with guidelines to detect (over D3.3) the lacking necessary information from ports to create the models and to process their associated data • Provision of a questionnaire to the use-cases regarding Modelling and Data Analysis • Create, update and maintain the WP4 To-Do sheet in the common repository, thus enabling a tool for keeping track of the WP activity • Create and submit to WP4 partners the document for WP4 strategy • T4.2: first state of the art, define a first structure of what an energy model could look like
P08 MEDRI	• Attendance to specialized telcos • Contribution to the document WP4 strategy from CATIE • Presentation of scope and plan of work for task T4.4 in Valencia Plenary (MEDRI leaders of task T4.4)
P09 SDAG	• Fulfilment of the questionnaire provided by CATIE regarding Modelling and Data Analysis particularized for T4.3 of FVG use-case. • Writing and commenting CATIE documents about WP4 Strategy • Participation to all specialized telcos.
P10 THPA	• Attendance to specialized telcos
P11 PPA	• Attendance to specialized telcos
P13 GPMB	• Attendance to specialized telcos • Contribution to T4.2: telcos with CATIE to explain the current situation of GPMB and the objectives targeted in the frame of the use-case • Writing and commenting CATIE documents
P14 IPEOPLE	• Assistance to specialized telcos • Initial Preparation of the State of the art review of the Model and algorithms that will be used for the Modelling and Data Analysis

3.2.4.2. Results

- Definition of a WP4 technical roadmap and execution strategy
- Definition of the whole workplan, internal milestones and the methodology to be followed. Every sub-task has its corresponding plan and first approach to the technologies to be used

3.2.4.3. Deviations

So far no deviations have been detected

3.2.4.4. Corrective actions

No corrective actions have been required.

3.2.5.Work Package 5 – Port Environmental Index Development

In the months M1 to M6 the following activities have been carried on in WP5: Port Environmental Index (PEI) development.

Literature review of the existing approaches and start-of-the-art for constructing composite environmental indexes

A literature review has been conducted identifying the currently published data on the assessment of environmental impact in ports using a composite environmental index approach. To that aim several scientific journals and technical reports have been reviewed and analysed. To our knowledge, no peer-reviewed scientific paper has been published specifically published on the issue. However, several papers and technical documents have reported on the usage of composite indexes in other sectors including specifying the methodology for aggregating multi-dimensional environmental variables into a single metric.

Analysis of the existing approaches for addressing the environmental impact of ports

We have performed an inquiry on existing approaches for addressing the environmental impacts of ports. There are similar approaches in both the EU (EcoPorts environmental initiative initiative) and in North America (the Green Marine environmental initiative). We have established a contact and had an online discussion with the GreenMarine representative on the ways that they are approaching the problem of estimating the environmental impacts of ports. They have several different indexes for ship owners, port authorities and terminal operators. However, their approach is qualitative. We feel that this is a major drawback of the initiative and we believe this to be the main and an extremely important differentiating point between PEI and other approaches: PEI is quantitative and result-based whereas other approaches are qualitative and process based (including the EcoPorts initiative). Although qualitative approaches are much easier to implement this comes at a cost of accuracy and can lead to false positive results - a port obtaining a certification whereas its environmental preface is not satisfactory). Among the partners we have discussed several EMAS (Environmental Management Systems) approaches including ISO14001. We have concluded that the drawbacks are that those approaches are very demanding in terms of resources (time, finances, etc.).

In addition, a major drawback is that the targets to be achieved are usually set by the ports themselves which means that the port can implement an EMAS system but that says little about their true environmental performance.

PIXEL Consortium firmly believe that PEI will be able to successfully address most of those problems.

Publications

During the reporting period we have published a paper in the journal Environmental monitoring and assessment. The title of the paper is „Model of calculating a composite environmental index for assessing the impact of port processes on environment: a case study of container terminal“.

Re-visit common concept and terminology of PIXEL

- CERTH suggested during the 2nd Plenary of the project in Valencia to re-visit the PIXEL concept for:
  - Unifying terminology
  - Aligning ports and technical partners
  - To align the content of all our channel
  - Create a common vision
  - Generate new visual concept

In this regard, this clarification covers several work packages, but it has had a special relevance for the WP5 as the role and spot of the environmental solution within the PIXEL framework and solution has been widely discussed.

It means that, despite the fact of partners not having effort allocated specifically to WP5, they have been contributing to directly through the participation in a more transversal task.

3.2.5.1. Progress

Progress by task

Task 5.1: Methodology definition

To define the framework and methodology for constructing and deploying PEI several discussions project partners in general and ports in particular have been conducted. The main issue which was discussed is whether to construct PEI as an indicator which addresses only the operation of terminals and port authorities or it should be more extensive and include ship owners as well. According to the literature ships contribute extensively to the overall environmental impact of a port (Marmer et al., 2009; Song, 2014; Tzannatos, 2010) so we have decided to include ships impacts in the PEI as well.

Overall, it has been concluded that the best approach is to build three different indexes: an environmental index for the ships, a separate one for terminals and a third one for the port authorities. Most of the environmental impact will be related to terminal operators and ships, so our primary focus will be on those actors.

With respect to building emission inventories, a prerequisite for PEI, we were confronted with the issue of data availability. Concerns have been raised whether terminal operators and/or ship owners will be reluctant to provide access to the data they collect. There is a possibility that some of the data which will be needed to deploy PEI will be missing whereas other data exist, but it is still not clear if the data will be available. To further investigate the issue MEDRI and CREOCEAN have conducted a series of online meetings and are working on developing an online questionnaire to be filled by the port authorities and terminal operators to establish data availability including the following: type of data which is collected, willingness to share the data including circumstances under which data will be shared, investigating the need of signing a disclosure agreement in case data will be provided, etc.

In the case data will be lacking or port authorities and terminal operators will not be willing to share data we are considering to just develop the PEI without a deployment to all of the port actors. Whether this will be an issue remains to be resolved and will be one of the main points of discussion in the technical workshop which will be held in Bordeaux, France (12^{th} to 14^{th} of November 2018.).

There are several other issues regarding the framework and methodological approaches that were discussed and problematized during this period such as the problem related to different types of cargo. As the PEI must be normalized per unit cargo the fact that ports handle several types of cargo will present a challenge. On way of addressing this is to build separate PEIs for separate types of cargos. However, data collection is done in the aggregate which means that a way should be found to allocate aggregated environmental data to different types of cargo. There are some general ideas on how to approach the problem, but no conclusion has yet been reached on the most suitable approach.

Additionally, issues regarding choosing the exact indicators for PEI construction as well as how to assign them weights have been discussed and problematized. Weighing in particular will be a tough problem to address, but we are considering some soft methodological approaches that could yield results.

Task 5.2: KPI Definition

Task T5.2 is only being executed since M5 of the project. This means that, at the moment of writing this report, just one month and a half of activity can be reported. In this regard, a specific questionnaire has been created in order to obtain valuable information about the environmental status (and possibilities) of PIXEL ports. This questionnaire consists of a series of questions related to EMAS, data available, metrics that can be measured currently, accessibility to environmental-related values, etc.

The information that will be obtained out of the questionnaires answered by the ports will be used, altogether with the objectives and KPIs established in the GA, to elaborate a detailed first approach of specification of KPIs for our Port Environmental Index.

Task 5.3 (PEI development) will start just after this management reporting period.

Table 6. WP5 Partner contribution summary table

Partner	Contribution
P01 UPV	• Participation in the re-visit concept discussion • Initial definition of KPIs and response to questionnaires.
P02 PRO	• Participation in the re-visit concept discussion • Initial definition of KPIs and response to questionnaires.
P03 XLAB	• Participation in the re-visit concept discussion • Initial definition of KPIs and response to questionnaires.
P05 CATIE	• Participation in the re-visit concept discussion • Initial definition of KPIs and response to questionnaires.
P08 MEDRI	• Participation in the re-visit concept discussion • Provision to the partners of a questionnaire with environmental-related questions to gain an overview of the status of data available, policies applying, etc. to prepare the strategy for PEI design and implementation
P09 SDAG	• Report of environmental-related data for Monfalcone use-case through questionnaire provided by MEDRI. From the environmental point of view, SDAG has collected data referring to the monitoring of environmental aspects at its truck terminal, trying to identify parameters that can be measured in terms of improvement/reduction thanks to the application of the use case
P11 PPA	• Environmental data and KPI definition in relation to the PPA use case definition
P13 GPMB	• Work sessions in Québec (Canada) and in Bordeaux (France) with the port of Québec to learn the concepts of the Green Marine program • Presentation of Green Marine Indicators to PIXEL partners • Organising a telco with Port of Québec and PIXEL partners involved in PEI definition • Report of environmental-related data for Bordeaux through questionnaire provided by MEDRI
P14 IPEOPLE	• Participation in the re-visit concept discussion • Initial definition of KPIs and response to questionnaires.
P15 CERTH	• Kick-start of the concept and vision discussion • Manages the re-visit concept discussion • Initial definition of KPIs and response to questionnaires.

3.2.5.2. Results

The WP5 is one of the most important work packages of the project, as it embeds the core of the environmental impact assessment tool action. At the end of this work package, a single metric for measuring the environmental impact of a port will be obtained as its outcome. So, the main result that this WP will bring to the project will be the PEI itself, accompanied by a set of guidelines on “how to use” and “how to adapt to” it. In the meanwhile, some partial results are expected to be reached, that will thus guarantee the proper advance of the activity. In this regard, the results provided by this WP in the first 6 months of the project are:

- Report of the different approaches addressing the environmental impact of ports. This benchmarking is a very useful result of the first stages of this work package.
- Environmental questionnaire to identify sizes, data available and other interesting information within the ports to establish the KPIs for the PEI.

- First draft for the strategy of PEI elaboration, including the first weighing method approach.
- Agreed document on the common terminology for PIXEL. This clarification covers several work packages, but it has had a special relevance for the WP5 as the role and spot of the environmental solution within the PIXEL framework and solution has been widely discussed.
- Publication of a paper in a specialized journal that depicts the basis on which the PIXEL's PEI will be built.

3.2.5.3. Deviations

So far no deviations have been detected.

3.2.5.4. Corrective actions

Since there have not yet been any deviations, not a single corrective action has been undertaken.

3.2.6.Work Package 6 – Enabling ICT infrastructure framework

Work package 6 comprises of the tasks that will provide as outcome the ICT enabling infrastructure for PIXEL solution. This means that every piece coming from previous activities will be put together under the umbrella of IoT technology. Because of that, the work in this work package will be intensive during a considerable part of the project. Particularly, this WP will last a total of 21 months; having started on M4 and finishing on M25.

In this regard, this work package only has been being executed for three months, so it is in its very first stages. In this moment, the Consortium is defining the draft of the architecture to be followed by all the tasks further on, to establish the basis of the future PIXEL tools and dashboard.

3.2.6.1. Progress

Progress by task

Task 6.1: PIXEL information system design and architecture

The work in WP6 started in August, when technical leaders of the project (ORANGE and PRO) initialized the architecture definition plan, development tools and guidelines that we will use to define the conception of the Information Hub. Partners also kicked-off some reflections about FIWARE (technology that is being seriously considered to serve as basis for certain developments in PIXEL) and how it could help PIXEL to solve issues around interoperability and connectivity with the exiting data sources.

Several meetings are being conducted to initialize a first a working framework for the whole work package ab, in particular, for the macro design architecture of the solution that will be evaluated to build the information hub. The definition of this macro design architecture will allow PIXEL partners to elaborate a more accurate plan for all the tasks of the WP6. The choice of the technical solution to implement the Information Hub have impacts for example on the work of the Data Acquisition solutions.

Task 6.2 (PIXEL Data Acquisition), task 6.3 (PIXEL Information Hub) and task 6.6 (PIXEL Security and Privacy) will start just after this management reporting period.

Task 6.4 (PIXEL Operational Tools) and task 6.5 (PIXEL Integrated Dashboard and notification) will start later on, concretely on month M9.

Table 7. WP6 Partner contribution summary table

Partner	Contribution
P01 UPV	• Assigned to be part of the team for the design of the PIXEL architecture. First tasks carried out in this regard. • Presentation of scope and plan of work for task T6.4 in Valencia Plenary (UPV leaders of task T6.4)

	• Anticipation of the start of technical work packages by starting to work on several points to align the scope and pace of the project between port needs and technical forthcoming development
P02 PRO	• Assigned to be part of the team for the design of the PIXEL architecture. Leadership of the first two months of this task. • Presentation of scope and plan of work for task T6.1 in Valencia Plenary (PRO leaders of task T6.1) • Presentation of scope and plan of work for task T6.5 in Valencia Plenary (PRO leaders of task T6.5)
P03 XLAB	• Assigned to be part of the team for the design of the PIXEL architecture. First tasks carried out in this regard.
P06 ORANGE	• Assigned to be part of the team for the design of the PIXEL architecture. First tasks carried out in this regard. • Presentation of the global scope of the WP and work plan in 2nd PIXEL Plenary. • Presentation of scope and plan of work for task T6.3 in Valencia Plenary (ORANGE leaders of task T6.3) • Presentation of scope and plan of work for task T6.6 in Valencia Plenary (ORANGE leaders of task T6.6)

3.2.6.2. Results

During the first 3 months of activity of the work package, the results obtained can be listed as the following:

- Definition of the WP execution plan, internal milestones and the methodology to be followed.
- Definition of every sub-task of the corresponding plan and first approach to the technologies to be used.
- Initial state of the art and technology selection.
- Links with WP3, WP4, and WP5 regarding requirements.
- Influence in the market analysis.

3.2.6.3. Deviations

So far no deviations have been detected.

3.2.6.4. Corrective actions

Since there have not yet been any deviations, corrective actions have not been needed yet

3.2.7. Work Package 7 – Pilot trials integration, deployment and evaluation

This Work Package has not started yet. No previous activity has been undertaken apart from the definition of use-cases and requirements (tasks included in WP3).

3.2.8. Work Package 8 – Assessment and expansion plan

This work package is not planned to start till month M15 of the project. Nevertheless, CERTH initiated the work on the formulation of the Evaluation Plan, by identifying relevant methods and criteria to be used for the evaluation and by structuring a first idea on the components of the PIXEL concept. Furthermore, a spreadsheet has been created and uploaded to our common repository so that the ports can appoint their KPIs for validation

and assessment of PIXEL. This action has been undertaken in order to take advantage of the intensive work on use-case definition and requirements gathering within the scope of other work packages (WP3 mostly).

3.2.9. Work Package 9 – Exploitation, dissemination and communication

Dissemination and Communication:

The first Management Reporting period has coincided with the first "Dissemination reporting" period. On M6 the Consortium has elaborated the first version of the Dissemination report of communication and dissemination actions taken place on this first six months of the project. This report has been also submitted through D9.3. In this document, the Dissemination Plan for the whole PIXEL project is depicted as well, where the Consortium has defined the type, pace and goals of actions to be taken from M1 to M36 in this work package.

The first dissemination reporting period of the project has been marked by the creation of initial content and definition of goals and scope rather than executing on-field actions. It is highly due to the fact of the moment of the project itself. In the month 6 of its execution, the main actions that have been carried out are related with use-cases definition, requirements specification, market study and setup of the whole working environment. Only the last month of the project has been devoted to technical activities and, by far, it is still too early to have substantial content to be spread (from academic and business point of view). Only one paper was published about the conceptual basis that will be considered to develop our PEI. Additionally, few industrial activities were observed and attended in the first months, representing an advance of the events attendance that will be performed later during the project.

Nonetheless, it has been a very busy period for Dissemination and Communication **team:**

On the one hand, D9.3 was agreed upon. This is not a minor thing, as D9.3 is intended to be a reference deliverable throughout the project, providing guidelines and timelines to the partners when tackling Dissemination action in every regard.

On the other hand, the Virtual Presence of the project has been considerably boosted by creating and enriching both our social media accounts and our website. All the PIXEL Consortium has worked together in establishing a common baseline and message to transmit through all our channels, that will be re-visited periodically as the project will be advancing. At the same time, several multimedia content such as presentation videos, dissemination supporting material (poster, leaflet…) were created to enhance the future PIXEL impact and extent. Looking at the report on Virtual Presence, and taking into account the moment of the project, the performance can be catalogued as successful, creating a good image among different communities and continuously generating content in several spaces.

Finally, one of the most important activities in this regard has been the interaction and joint work with the CSA DocksTheFuture and the other EC-funded projects (Ports of the Future Projects Network). A joint dissemination action has been established and common events and activities will be carried out looking forward a thriving collaboration among all the projects.

Exploitation:

On the other hand, the first activities related to Exploitation have also been conducted by the Consortium. A detailed explanation of the advance of this action is described further on in the task T9.4 text. Nonetheless, the summary of those activities is that PIXEL Consortium has invest efforts in establishing a very solid Exploitation plan considering all the sub-parts that compose a business-level myriad of components (Canvas, Exploitable results, Intelectual Property Background, market audience, expected results, etc.).

In the context of this action we have also framed the Innovation management of the outcomes (and execution as well) of the project.

To sum up, WP9 activity of the first 6 months of the project has established the basis for a successful forthcoming Dissemination, Communication and Exploitation. There are two more planned Dissemination

reports and two more Exploitation reports during the lifetime of the project (M18 and M36) that will follow/update this strategy. Thus, based on the present report, related activities will be assessed and improved for the sake of PIXEL.

3.2.9.1. Progress

Progress by task:

Task 9.1: Communication and impact creation

The first task of the work package 9 is intended to control and ensure the impact creation through virtual channels of the advances and goods of PIXEL. In this first 6 months, the activity within this task can be considered as intensive, as everything has been setup and content is beginning to be transmitted through them. A formal Dissemination Report has been elaborated and submitted (deliverable D9.3 –M6), but a summary of the actions undertaken in the context of T9.1 from M1 to M6 is described in the next few paragraphs:

The PIXEL public website was developed to act as an information hub about the project's aims, goals, activities and results. The website was launched in July 2018 and can be found at https://pixel-ports.eu . A plan for the contents, periodicity of updates, guidelines on its use and KPIs to assess its usefulness and impact have also been established. Continuous changes are being suggested for the website and the activity is always ongoing in this regard.

The Twitter account was created. This channel is being used (and will be) to follow key accounts, create engagement, generate quick and attractive content and to tell important things happening within the project scope. A continuous tracking of Twitter KPI has been performed. A LinkedIn, Facebook and ResearchGate accounts were create and are being used addressing different audience and communication goals. A solid plan for the use of these social media channels and their expected impact has been also elaborated and is part of the Communication Strategy of PIXEL.

As part of project's media channels, a YouTube channel for PIXEL was opened This channel will contain videos demonstrating the project in action. Up to this day, two videos have been already created and uploaded to PIXEL channel, presenting the project with two different approaches addressing different goals.

Also in the context of this task, supporting material for the dissemination and communication of the project have been created. Particularly, and how it can be checked in deliverable D9.2, several designs for PIXEL communication elements was agreed upon and is being used in the different actions undertaken: (i) an official poster, (ii) a more commercial-focused leaflet to bring to fairs and similar events, (iii) the first promotional video of the project and (iv) stickers for laptops, ideal for workshops and codecamps.

Task 9.2: Scientific dissemination

The scientific dissemination (task T9.2) has been taking place since the very beginning of the project. It is an important task within the project, considering that PIXEL is a Research and Innovation Action and we are expecting to obtain outstanding academic outcomes out of it. To achieve this goal, it has been necessary to create a plan and to establish a common framework for all partners to disseminate PIXEL advances.

In the first stage of the task execution, the assigned team undertook a depth analysis in order to identify the best fora and audiences that us (from a scientific project point of view) should be addressing with the actions to perform. In this context, several dissemination channels were analysed: scientific publication companies, papers to address, social media communities (ResearchGate…), seminars, conferences, etc. This activity was performed based on the division of addressed fields established by the Consortium: (i) Information and Communications Technology (ICT) & Internet of Things (IoT), (ii) Transport & Logistics, (iii) and Environmental & Port Environmental Index (PEI).

Afterwards, a list of interesting events (scientific/academic related with any of the just listed realms) was elaborated based on inputs from the partners, from previous experiences and from the latest trends in the sector. In this list, partners were assigned to keep track of each one depending on their activity and field of expertise, thus ensuring the right coverage of events and trends in the real world and to have better insights on the direction of research in activities similar to PIXEL.

Despite not having much content already generated from the technical action of the project (only 2 months executing tasks of technical work packages), one of the PIXEL partners (MEDRI) published a paper in the journal Environmental monitoring and assessment. The title of the paper is „Model of calculating a composite environmental index for assessing the impact of port processes on environment: a case study of container terminal".

Task 9.3: Industrial dissemination

The realization of the industrial dissemination Task (T9.3) begun with a reflection process on the PIXEL strategy (the modes of diffusion [web portal, booklet, press release, networks, newsletters, reports], the domains / themes concerned, the timing of dissemination, ..) that it was necessary to implement to effectively disseminate the results that will be produced by the PIXEL project to the large European community of port operators (within the port PIXEL partners and outside involving others port communities).

First of all, it was necessary to clarify the schedule of the expected PIXEL results produced by the tasks of the project, then to inventory the professional events and the other modes of information existing over the duration of the PIXEL project and related to this schedule, and to categorize them according to the three technical themes or result areas produced by the PIXEL project: i) Information and Communications Technology (ICT) & Internet of Things (IoT), ii) Transport & Logistics, iii) and Environmental & Port Environmental Index (PEI).

This inventory of events (symposium, congress, conferences, etc.) was filled in several times during this period (M1-M6) and then submitted twice to all scientific, technical and port PIXEL partners to test their interests and confirm that the results produced could be presented by some partners attending.

The last action was then to refine this inventory of events defining the priority targets and customers (users of the port domain) and intermediaries (port associations, industrial associations) whose we wanted to disseminate the PIXEL results. A final questionnaire was sent to all four port partners of the PIXEL project (Bordeaux, Monfalcone, Piraeus and Thessaloniki) asking everyone to specify the major customers in their port environment (terminal operators, shipping companies and manufacturers), and secondly to list the other small and medium-sized ports in their European countries with whom it would be easy to disseminate the results of the project.

Task 9.4: Exploitation and Business Plan

The exploitation activities of T9.4, as well as the Innovation Management (IM), started at the kick-off meeting with the Exploitation Workshop. We presented an early stage exploitation plan, the guidelines for IPR management and discussed concepts related with these, to familiarize all partners with the nature of these activities and get from them an initial contribution. We have also constituted the Innovation Team (IT) where all the partners are represented and started the discussion on the exploitation of PEI and what we would like to achieve beyond project lifetime. That vision is presented in Section 6 of D9.6.

This first physical meeting was followed by general and dedicated teleconferences and 1-to-1 teleconferences, and by joint and individual exploitation questionnaires, to enable the identification of partner expectations, intentions, and commitments towards the exploitation activities. We also had two additional physical meetings to define specific exploitation plans. One at MEDRI (XLAB, MEDRI, UPV) to elaborate PEI exploitation and one in Trieste (INSIEL, UPV, XLAB, SDAG, ASPM) to discuss about joint exploitation. This served us to build the global exploitation model presented in Section 3 of D9.6, based on existing and expected collaborative work and business opportunities. We have also provided to the T3.1 leader an early business model canvas (BMC) and SWOT analysis to guide them on their work, much as requested by them at the kick-off meeting.

We worked thoroughly on an exploitation plan and a set of guidelines for its implementation, also defining the IM. At the plenary meeting in Valencia we shared common ideas on the exploitation of PIXEL and results were synced. This resulted in a document that was approved by all the PIXEL partners, constituting Section 2 in D9.6, where we believe that all partners feel represented.

Moreover, together with the coordination, we proposed in June 2018 a list of tasks and respective deliverables of innovation interest (as discussed in Section 7 of D9.6). These tasks will have closer support from the IM and their deliverables will have an internal innovation review by the IM. Until now we have reviewed D3.1, D3.3, D9.3, and have reviewed and contributed to the materials presented at D9.1 and D9.3. We have also provided specific recommendations for T3.1, T9.1 and T9.3. Furthermore, we participated in building the requested fiche,

in the discussions and meetings with the CSA DocksTheFuture, in the construction of communication and dissemination content, marketing materials, and other needs of T9.1.

Table 8. WP9 Partner contribution summary table

Partner	Contribution
P01 UPV	• Organisation and attendance to periodic WP9 telcos • Creation of the ToC of D9.1 • Writing of deliverable D9.1, hugely supporting IPEOPLE in all the process • Creation of blank webpage and hosting of the site https://pixel-ports.eu/ • Update of Twitter in several occasions • Providing ideas and suggestions of posting in several channels of PIXEL Virtual Presence. • Being responsible of D9.2: o Creation of the ToC o Creation of the first version of poster, gathering of requests/comments and creation of final version o Creation of the first version of leaflet, gathering of requests/comments and creation of final version o Creating the promotional video that has been uploaded to the YouTube Channel o Complete writing of D9.2 o Submission of D9.2 • Design and printing of the PIXEL stickers • Conduction of all the relation and interaction with CSA DocksTheFuture and other EC funded projects: o Attendance to periodic telcos o Creating common dissemination action o Creating common material o Establishing a calendar for cross-dissemination action • Holding the responsibility of task T9.2 • Providing information for scientific dissemination procedures to GPMB and MEDRI • Being responsible of D9.3: o Creation of the ToC o Creation of the first version of the deliverable, assigning section o Writing full sections o Gathering contributions o Fine-tuning the document after Internal and Innovation Review • Providing suggestions/requests/recommendations for the website • Working closely with XLAB in the Innovation Strategy creation and gathering all needed information for T9.4 • Involved in supporting the task manager with the social media strategy and helped them kick off the communication strategy of the project. • Supporting XLAB in obtaining a slogan and pitch for PIXEL • Participation of COREALIS Kick-Off meeting presenting PIXEL

	• Creation of a presentation video for PIXEL from Project Coordinator, to establish a common basis for all partners to generate multimedia content for our channel • Provision of individual and joint exploitation plans planned for UPV
P02 PRO	• Internal Review of D9.3 • Involvement in the review of the project website and provided suggestions for improvements. • Provision of lots of ideas and suggestions of posting in several channels of PIXEL Virtual Presence. • Provision of suggestions/requests/recommendations for the website • Review of other dissemination material and provided feedback. • Provision of individual and joint exploitation plans planned for PRO

P03 XLAB	• Attendance to several WP9 specialized telcos
	• Organisation and attendance to Exploitation/Innovation specialized telcos
	• Formalization of an Innovation Strategy
	• Involvement in the review of the project website and provided suggestions for improvements.
	• Involved in supporting the task manager with the social media strategy and helped them kick off the communication strategy of the project.
	• Review of other dissemination material and provided feedback.
	• Provision of innovation recommendation for the construction of an appropriate communication strategy, including the sync with what should be included in D9.3.
	• Leadership of Task 9.4, within which the participation can be summarised in:
	  ○ Exploitation workshop organised at the project Kick-Off, where innovation management and exploitation were presented to project partners
	  ○ Most effort was provided to the drafting of the deliverable due in M6.
	  ○ Engagement of project partners in exploitation through organisation of regular innovation management and exploitation teleconferences
	  ○ One-to-one interviews to complete requested questionnaires from project partners to identify individual and joint exploitation plans
	  ○ Early business development and SWOT analysis
	• Leadership of D9.6
	• Successful creation and submission to internal review of D9.6
	• Creation of an early Business Model Canvas
	• Collection of all IPR Background information
	• Support to project social media setup and dissemination.
	• Added PIXEL info the corporate web site: https://www.xlab.si/rd/current-projects/pixel/?lang=en
	• Provision of feedback on final versions of D9.1 and D9.2
	• Innovation Review of D9.3
	• Innovation Review of D9.2

P04 INSIEL	• Attendance to several WP9 specialized telcos: communication/dissemination and exploitation/innovation • Provision of individual and joint exploitation plans planned for INSIEL • Contribution to the creation of the communication materials and tools.

P05 CATIE	• Attendance to several WP9 specialized telcos: communication/dissemination and exploitation/innovation • Contribution to the creation of the communication materials and tools • Comments on the website (its form and content) as well as on all the communication media (leaflet, poster and video). • Participated in the internal review of deliverable D9.2. • Following all the social networks of the PIXEL project (Facebook, LinkedIn and Twitter) and participates in the creation of impact by relaying various information related to PIXEL: o 9 CATIE tweets, 4 retweets o 4 posts on LinkedIn o An article on the website of CATIE and a press release being finalized with French project partners o Press article about PIXEL: Press article about PIXEL https://t.co/iicd0nbKrE • Identification of business events and scientific events in which CATIE will participate. These are included in Deliverable 9.3. • Provision of the PIXEL individual and joint exploitation plan for CATIE and provide its IP background. • Provision of some comments on Innovation Strategy & Guidelines and PIXEL slogan
P06 ORANGE	• Attendance to several WP9 specialized telcos: communication/dissemination and exploitation/innovation • Internal review of deliverable D9.3
P07 CREO	• Attendance to several WP9 specialized telcos: communication/dissemination and exploitation/innovation • Acting as the leader of Industrial Dissemination (task T9.3), CREO prepared these questionnaires (CREO also: (i) asked for contribution, (ii) gathered the results, (iii) processed the answers and (iv) incorporated them into the D9.3): o Questionnaire to the PIXEL partners about interesting events to observe/attend o Questionnaire to PIXEL ports to define the potential target groups of customers and actors, end users of PIXEL developments and results • Development of the Industrial development plan including: i) identification of the targets audience for PIXEL results, ii) dissemination activities and relevant information to distribute (the three PIXEL domains), iii) the disseminations instruments and activities proposed for industrial dissemination (seminars, conferences, trade fairs and case study sites, papers, networking opportunities, others • Participation in writing deliverable D9.3: ToC, 3 full sections, lots of content.
P08 MEDRI	• Attendance to several WP9 specialized telcos • Participation in one section of D9.3 • Publishing of a paper entitled: “Model of calculating a composite environmental index for assessing the impact of port processes on environment: a case study of container terminal” in the journal Environmental Monitoring and Assessment (Q2) (Springer).
P09 SDAG	• Attendance to several WP9 specialized telcos • Analysis of the contents of the communication tools, in particular website, and the deliverable provided by the LP, trying to provide useful feedbacks to improve the contents.

	• Update of own communication tools (website) and social media (Facebook) providing information about the project and the participation of SDAG to the activities and meetings. Furthermore, specific information about the project have been provided to SDAG shareholder (Municipality of Gorizia). • Participation in the definition of the new pitch and slogan; • Internal Review of deliverable D9.6
P10 THPA	• Attendance to several WP9 specialized telcos: communication/dissemination and exploitation/in • Provision of an individual and joint exploitation plan • Contribution to Deliverable D9.6
P11 PPA	• Attendance to telcos • Implemented the Individual and joint exploitation plans • Provided input to the task dissemination plan (On site dissemination opportunities, Target groups identification)
P12 ASPM	• Attendance to several WP9 specialized telcos: communication/dissemination and exploitation/innovation • Provision of information about the major logistic exhibition useful for the dissemination of Pixel's results and activities. Furthermore, specific information about the project have been provided to the Port of Trieste as logistic partner interested in the topic • Analysis of the contents of the communication tools, in particular website, and the deliverable provided by the LP, trying to provide useful feedbacks to improve the contents
P13 GPMB	• Attendance to several WP9 specialized telcos: communication/dissemination and exploitation/innovation • Contributions to D9.3 by providing elements and suggestions to Dissemination Plan • Contributions to D9.6 by the provision of an individual and joint exploitation plan • Contributions to the press release dedicated to French PIXEL partners written by CATIE • Relaying social networks posts concerning PIXEL

P14 IPEOPLE	• Usual tasks as Communication Manager of the project
	• Attendance to several WP9 specialized telcos
	• Responsible for the creation of the Website of the project
	• Responsible for the creation and the update of the Twitter, Facebook, LinkedIn and Research Gate accounts
	• Being responsible of D9.1:
	  ○ Creation of the first version of the deliverable
	  ○ Writing full sections
	  ○ Gathering contributions
	  ○ Co-creation of final version of the document
	• Establishing a calendar for cross-dissemination action
	• Analysis of the contents of the communication tools.
	• Creating the first version of the common communication Strategy
	• Participation in three sections of D9.3

	• Establishing a calendar for cross-communication action
P15 CERTH	• Attendance to several WP9 specialized telcos: communication/dissemination and exploitation/innovation • Provision of an individual and joint exploitation plan • Provision of information about the major port industry & exhibition events useful for the dissemination of Pixel's results and activities. • Contribution in defining a slogan and pitch for PIXEL • CERTH acted as a liaison with the ALICE ETP and presented the project in the first discussion organised by ALICE with the participation of the other projects funded under the Port of the Future Call (DockstheFuture, COREALIS, Portforward). ALICE is interested to be connected and support the projects as they are value added to the implementation of ALICE roadmaps, in particular on Corridors, Hubs and Synchromodality but also for some roadmaps under development (i.e Physical Internet, Zero Emissions Logistics). In the subsequent months, an integrated document with an overview of the four projects, how they overlap and complement each other, will be developed and shared with ALICE. A common event is foreseen, as part of the ALICE Collaborative Innovation Days series, tentatively scheduled for Spring 2019 • Contribution to the 'DocksTheFuture: Workshops with Experts' event (Porto, Portugal), aiming at the validation of the Port of the Future concepts and topics • Contribution to 'D9.6 Draft Exploitation Plan' regarding existing initiatives related to the PEI idea and potential ways for exploiting the PEI

3.2.9.2. Results

- Website of the project: https://pixel-ports.eu
- Social media accounts of PIXEL in: Twitter, Facebook, LinkedIn and ResearchGate
- PIXEL official YouTube channel
- A first promotional video of the project
- A presentation video for PIXEL from Project Coordinator, to establish a common basis for all partners to generate multimedia content for our channel
- Supporting material for dissemination: Leaflet, poster and sticker designs.
- Joint Dissemination Action of the "Port of the Future Network" projects. A common document for joint dissemination guidelines and events with the CSA DocksTheFuture, COREALIS and PortForward.
- Official PIXEL slogan and pitch
- Deliverable *D9.1 – Virtual Presence*
- Deliverable *D9.2 - Supporting material for communication (leaflet, poster and video)*
- Deliverable *D9.3 – Dissemination Plan*
- Deliverable *D9.6 – Exploitation Plan*

3.2.9.3. Deviations

First version of the web was designed and depicted in the deliverable D9.1, with screenshots and their corresponding explanations. Current version of the website published in the url: https://pixel-ports.eu does not coincide with the first version delivered. This is a consequence of the review of design and functionality of the website after an iterative process of enhancement of Virtual Presence that is always on-going.

T9.3 has already started (from CREO side specially) due to the necessity of Industrial Dissemination information and strategy to be incorporated in D3.3. This is in contrast with the initially planned timeline, slotting the start of the task on M7. Budget assigned to this task does not change as every one of this actions was forecasted and included in the total figures granted.

3.2.9.4. Corrective actions

No corrective action has been needed during the first 6 months of the project.

4. Impact

4.1. Plan for exploitation and dissemination results

In future reports, this section will be used for reporting the impact achieved by the project based on the update of the dissemination report. This is the first reporting deliverable (D2.5) and it is being done prior to the effective definition of the Dissemination Plan and Exploitation Plan (D9.3 and D9.6, delivered at the same time as this one, in M6). Thus, in this document, section 4 is dedicated to explain briefly the Dissemination Plan basis and to show the impact actions undertaken so far.

Agreed plan:

There is no modification on the plan proposed in D9.3. Through the execution of the project the consortium will be updating this section if needed.

Impact results:

As described in Deliverable D9.3 dissemination activities aim to establish critical mass and long-term commitment from different selected target groups. Therefore, results from various project activities will be disseminated to the widest possible, though precisely selected, communities through a number of focused activities. The dissemination plan considered a continuous activity since the start of the project, but with flexibility and possibility of evolving during the lifetime of the project, is considered as crucial by the PIXEL Consortium as it will help our final product to reach as more potential interested stakeholders as possible.

It should be stressed that the dissemination activities have been continuous and that the plan of such activities will evolve throughout the lifetime of the project (plan just briefed). The evolution will be caused both by the growth of internal knowledge (e.g. discovery of new target group, like conferences, research cluster or as a result of the Open Call); as well as changes in the ecosystem of research in which PIXEL project will grow. The project partners have been working together in areas related with IoT interoperability and technological solution for ports for several years before the start of the project, so some “dissemination background” is being leverages in these first months of the project, as well as solid relationship among particular entities which will, hopefully, make the communication and exploitation activities more fluent.

5. Risk Management

Risk management is a task related with WP2. As this is the first project management report the consortium has decided to describe the risk management procedure. The next versions of the PMR will include an updated review of risk evolution. The approach taken is a simplification of PMBOK, simplified to be used in research projects, that has been used extensively in previous projects coordinated by UPV. The consortium is working with the list of risks identified in the grant agreement, however new risks are being considered to be monitored.

The following section provides a detailed description of the risk management procedure as it is an inherent content of the PMR. It will support the next versions of this deliverable. The content of the section extends the risk management procedures briefly described in the GA.

5.1. Introduction

According to PMBOK[4], a risk is an uncertain event or condition that, if occurs, has an effect on at least one project objective (objectives can include scope, schedule, cost and quality).The existence of risks is unavoidable in any project, as it is intrinsic to the development and implementation phase, whether those threats arise from external or internal causes.

Risk management is a proactive process that is invoked in an attempt to eliminate these potential problems before they occur, and therefore increase the likelihood of success of the project.

- The goals of risk management are the following:
- Proactively assess what could go wrong with the project,
- Determine which risks are important to deal with,
- Implement strategies to deal with those risks.

In a project with the complexity of PIXEL, it is impractical to rely on light analysis in order to determine where risks lie, which risks are acceptable and which require to apply mitigating actions. It is necessary to use a risk management structured approach or procedures in order to expose risks and address them objectively and consistently.

In the PIXEL project, the management approach provides mechanisms to identify and resolve various potential project risks, which can be considered as particular internal or external factors, ensuring efficient implementation of necessary corrective actions. Even if it is not possible to predict all possible risks, it is advisable to identify and assess a set of potential risks related to the project. In this respect, the general PIXEL philosophy includes the following pillars:

- **Effective project management**: The management structures and procedures ensure that project management can closely supervise the delivery of the expected results. The PIXEL Consortium is composed of organisations which have already successfully carried out several EU projects.
- **Contingency planning**: The work plan has been designed to allow for effective contingency planning in case of all major risks. For every risk a strategy will be developed considering the possibility to avoid the risk, the plan for reducing the probability of its occurrence and in the case of materialisation of the risk, the plan for minimizing the impact on the project overall objectives and compromises.
- **Multiple loosely coupled objectives**: Finally, even if the goal of the project is to demonstrate the full operation of the PIXEL framework, the remaining extensions and components can be decoupled and exploited independently.

With the use of risk management procedures, the project team is able to mitigate risks, which means that it can take steps to reduce them to a level that is acceptable for the project consortium. These steps may take the form of technical measures to reduce the probability or impact of a risk occurring, or they may take the form of non-technical measures, used to overcome technical limitations.

[4] http://www.pmi.org/pmbok-guide-standards/foundational/pmbok

The use of risk management procedures is very important. Without the use of risk management procedures, the project consortium can take insufficient steps to mitigate a risk and the consequences may include failure to meet the project objectives, commercial and financial harm to the project partners and project results users, loss of reputation and potential legal actions.

On the other hand, it is equally possible that the project consortium takes unnecessarily draconian steps to mitigate risks. The impact of such unnecessary steps and procedures may include incurring additional unnecessary management effort, and from the technical point of view, reducing system performance.

The PIXEL project tries to take the necessary steps for all the identified risks, and avoid unnecessary procedures. The next section describes the proposed risk management processes. PIXEL uses a traditional approach for risk management and uses well known and established procedures. So the following paragraphs do not include knowledge produced by the project but rather existing procedures that the PIXEL project chose to use for managing the risks within the project.

5.2. Risk Management Procedure

The risk management procedure which will be used in the PIXEL project is summarized in Figure 2 and consists of the following activities and steps:

- **Step 0** – Plan: Plan Risk Management is the process of defining how to conduct risk management activities for the PIXEL project, preparing all the other steps or processes and providing sufficient resources and time for risk management activities and establishing an agreed-upon basis for evaluating risks.
- **Step 1** - Identify: The project searches for possible risks and identifies the risks before they become problems.
- **Step 2** - Estimate: The project transforms each risk into useful information. This includes evaluating impact, probability, timeframe, classification and priority of every risk. This information can be used for making decisions.
- **Step 3** - Mitigate: The project creates mitigation actions both for the present and the future in order to prevent, reduce or eliminate negative results of the risk. In addition, the project creates implementation plans for these mitigation actions.
- **Step 4** - Monitor: Each partner responsible for a risk monitors the risk's indication and mitigation plan. If the risk for some reason is not mitigated correctly, according to the mitigation plan, or the risk information has changed, the project identifies it as a new risk and the procedure restarts from the Step 1.

Moreover, communication happens throughout all the activities of the risk management. Through the communication, project partners provide information and feedback, both internal and external to the project, relating to the risk activities, as well as identification and mitigation of current and emerging risks.

Figure 2. PIXEL Risk Management procedure

5.3. Risk Identification

Risk identification is an iterative process that has the aim of determining which risks may affect the project and documenting its characteristics. All PIXEL partners are concerned with risk detection and identification. When a risk is detected, it is reported to the Project Coordinator or to the concerned Work Package Leader depending on the context of the risk.

The Project Coordinator or the Work Package leader is responsible for cataloguing the risk according to a defined template, created in a Google sheet for the whole PIXEL project. The person responsible for cataloguing the risk is also on duty on performing the risk estimation, mitigation and monitoring processes. Each time a new risk is detected, the Project Coordinator, along with the Project Management Committee, shall manage it.

In order to help the identification process, project risks will be divided into classes listed below:

- **Project Management and Organisation**: Likelihood of failure to meet project milestones. This class of risks will be managed by the Project Coordinator,
- **Technical**: Likelihood of failure of development process. This class of risks will be managed by the Work Package Leader.

Each identified risk refers only to a single class type; nevertheless, the same cause may be at the origin of different risks (within the frame of the above classification).

In addition, the PIXEL risk management classifies the risks into the following categories:

- **Technology risks**: Risks derived from the software and hardware technologies, which are being used for developing the system.
- **Usability risks**: Risks that result from the tools, presentation, and use of features that may render the whole system less usable than envisaged or anticipated.
- **Organisation risks**: Risks associated with the people and partner's organisations comprising the project team.
- **Business risks**: Risks related to the market awareness about the project results, competition product acceptance and IPR handling.

The above categories may be updated in the future according to project needs.

The risk identification process generates a risk catalogue that is being updated throughout all the project lifecycle. In the PIXEL project, we have used a shared spread sheet as an agile tool for keeping the risk catalogue up to date, being available for all work package leaders.

Each Work Package has its own sheet, being each Work Package leader responsible for managing the risks related to its Work Package. For each risk, a set of attributes are being used:

- ID (Risk coding will make reference to the WP it is associated with (e.g. first risk identified for WP1 will be coded as R1.1).
- Risk Name
- Description
- Consequences
- Likelihood
- Severity
- Impact
- Criticality
- Avoid/Minimize Likelihood Strategy
- Transfer Strategy
- Mitigate Severity Strategy
- Handler

- Status
- Creation Date
- Work Log

In the Risk Identification Process, the following risk attributes are registered:

Table 9. Attributes registered in the Risk Identification Process

ID	**Risk ID: RP.N, being P the WP number, e.g. R1.1 is the risk 1 of WP1.**
Risk Name	Short name of the risk.
Description	Full description of the risk, in terms of the situation that produces the risk, rather than the consequences.
Consequences	Description of the consequences that may happen if the risk would finally occur.
Handler	Responsible for handling the risk and implementing the appropriate strategies described for the risk.
Status	Pending (nothing done but identification and description), Managed (strategies being implemented), Closed (Risk won't occur).
Creation Date	Date when the risk was recorded.
Work Log	Comments about actions done about the risk.

5.4. Risk Estimation

After the risks are identified, they are assessed in terms of their likelihood, which is the subjective probability of their occurrence; and the risk severity, which is the expected impact the project will suffer if the risk happens. Each risk is classified by a risk level based on its likelihood and severity (with risks with higher likelihood and/or higher severity being on a higher level). For each risk level the PIXEL partners will undertake appropriate actions.

From the risk severity and likelihood we have determined two heuristic functions and we have calculated the impact and the criticality what has been used in order to be able to prioritize the risks.

Very low level risks are placed on a watch list or adding a contingency reserve, as they don’t deserve more attention because they don’t affect the project too much. These risks don’t require proactive management action (and are considered again only if their likelihood increases).

All the other risks need to be further considered and mitigation activities need to be planned. For these risks a structured description is formed with the risk description and its impact. The information recorded or updated at this process about each risk is the following:

Table 10. Attributes updated in the Risk Estimation Process

Description	Full description of the risk, in terms of the situation that produces the risk, rather than the consequences
Consequences	Description of the consequences that may happen if the risk would finally occurs
Likelihood	Probability of the risk to occur.

Severity	Level of impact that the project will suffer if the risk finally occur.
Impact	Calculated value on the basis of Likelihood and Severity.
Criticality	Impact categorization.
Handler	Responsible for handling the risk and implementing the appropriate strategies described for the risk
Status	Pending (nothing done but identification and description), Managed (strategies being implemented), Closed (Risk won't occur)
Work Log	Comments about actions done about the risk

The description of the likelihood, severity and impact is shown below.

5.4.1.Risk Likelihood

Risk likelihood is classified in one of the following possible values, attending to the probability of the risk to occur:

- **Very low** (occurrence probability 10%): The probability of the risk is very low or its occurrence is late in relation to the project lifetime.
- **Low** (occurrence probability 30%): The probability of the risk is low and there is a small opportunity to occur.
- **Moderate** (occurrence probability 50%): The risk will occur with a good probability.
- **High** (occurrence probability between 70%): The probability of the risk is high.
- **Very high** (occurrence probability 90%): The probability of the risk is very high or almost certain.

5.4.2.Risk Severity[5]

Risks are classified with respect to the level of impact that the project will suffer if the risk finally occur. Their seriousness is classified into the following categories:

- **Insignificant**: Impact of the risk for the project is very low and does not affect any of its objectives.
- **Tolerable**: Impact of the risk for the project is low and effects specific modules of the project without affecting its global objectives.
- **Moderate**: Impact of the risk for the project is medium, however the effects in different modules can have a high impact in the objectives of the project.
- **Serious**: The risk impacts the main contractual requirements of the project but without impact on or redefinition of the critical path.
- **Devastating**: The risk impacts the main objectives of the project on the critical path.

5.4.3.Risk Level

The risk level has been calculated using the following matrix, in order to provide the impact and the risk level. The impact is calculated as a product between the likelihood and the severity (catalogued from 1: insignificant to 5: devastating), and the impact is translated into the risk level. According to the Figure 2 each risk can be

[5] After the technical review and advise from the technical reviewers an assessment of the risk severity has increased the levels from four to five introducing a new severity level “Moderate”

classified into one of the following levels (for each of the five risks levels different actions must be taken by the project partners):

- **Risk Level 1** (very low level): These level risks are included in the risk report and reviewed by the Project Coordinator or Work Package Leader concerned, to check possible variation of its estimations. These risks remain in the report to be reviewed for any change in their level. Impact lower than 0,3.
- **Risk Level 2** (low level): A "risk handler" is assigned to the risk to monitor the risk evolution. The "risk handler" reports to the Project Coordinator or Work Package Leader concerned. Actions are evaluated in order to reduce the risk. Impact between 0,3 and 1.
- **Risk Level 3** (moderate level): Same actions as for Level 2. In addition, definitions of specific mitigation plans are created. The Project Coordinator or Work Package Leader concerned with the risk defines these plans and identifies also possible trigger events to start them. The risk handler monitors the risks and these trigger events. Impact between 1 and 2.
- **Risk Level 4** (high level): Same actions as for Level 3. In addition, the Project Coordinator and Work Package Leader concerned with the risk informs the Project Coordination Committee. The Project Coordination Committee is involved in the design of the mitigation plans and directly assigns the "risk handler". The defined mitigation plans start immediately. Impact between 2 and 3.
- **Risk Level 5** (critical level): Same actions as level 4. Due to the seriousness of these level risks, catastrophic for the project, the Project Coordination Committee plans an extraordinary meeting in a week in order to decide the status of the project and how the project will continue. Impact higher than 3.

The level of each risk is determined using the matrix in Table 3 which has as rows the risk likelihood and as columns the risk severity for the project.

Table 11. Impact/Value Matrix

Likelihood / Severity	1	2	3	4	5
10%	0.1	0.2	0.3	0.4	0.5
30%	0.3	0.6	0.9	1.2	1.5
50%	0.5	1	1.5	2	2.5
70%	0.7	1.4	2.1	2.8	3.5
90%	0.9	1.8	2.7	3.6	4.5

Using the cell values, we have classified the risk impact in the following groups; the impact matrix is depicted in figure 2:

- Very Low: 0.1 – 0.3
- Low: 0.4 - 1
- Moderate: 1.1 – 2
- High: 2.1 - 3
- Critical: >3

Table 12. Risk Levels – Impact/Value Matrix

Likelihood / Severity	Insignificant	Tolerable	Moderate	Serious	Devastating
Very Low	**Very Low**	**Very Low**	**Very Low**	**Low**	**Low**
Low	**Very Low**	**Low**	**Low**	**Moderate**	**Moderate**
Moderate	**Low**	**Low**	**Moderate**	**Moderate**	**High**
High	**Low**	**Moderate**	**High**	**High**	**Critical**
Very High	**Low**	**Moderate**	**High**	**Critical**	**Critical**

5.4.4.Risk Mitigation

Mitigation activities/strategies can be generally either characterised as prevention type activities/strategies or as correction type activities/strategies:

- The term *prevention type* refers to the mitigation activities/strategies, which have as a target the elimination of a possible risk before it occurs. This will also have as a result the elimination of the negative impact for the project.
- The term *correction type* refers to mitigation activities and strategies, which aim at the reduction of the negative results of a risk after it has occurred.

Several risk response strategies are available depending on the risk. The strategies for managing negative risks in the PIXEL project are the following:

- **Avoidance strategies** (prevention type): Avoidance strategies are targeting at avoiding the risk or reducing the likelihood that the risk will occur.
- **Transfer strategies** (prevention type): Transferring some or all of the negative impact of the risk to a third party if possible. Transferring a risk simply gives another party responsibility for its management, it does not eliminate the risk It may be empty in most situations in the project, as it's not easy to transfer risk responsibility..
- **Mitigate strategies** (correction type): Mitigation is the strategy for reducing the effects or impact of a risk if it occurs. Severity mitigation might target linkages that determine the severity. It also may contain the contingency strategies that are targeting at finding a back-up solution if the worst happen.

As the impact and consequently the risk level is the product of two factors (likelihood and severity), the strategies have to affect the two axis.

Unmanageable risks, that is, risks for which the Project Coordinator or concerned Work Package Leader is not able to deal with in a satisfactory way, shall be highlighted and a proper justification on the lack of mitigation actions should be provided.

Mitigation activity shall be followed-up by the Project Coordinator or Work Package Leader concerned, who supervises its accomplishment and verifies the effectiveness of the performed actions.

Risk Mitigation process is performed iteratively by the risk handler, who reports to the Work Package leader or Project Coordinator about changes in the strategies for mitigating risks as described above. This process updates the following risk attributes:

Table 13. Attributes updated in the Risk Mitigation Process

Avoid/Minize Likelihood Strategy	Description of the strategy for avoiding the risk or minimizing the likelihood that it will occur.

Transfer Strategy	Description of the strategy for transferring the risk to a third party if possible. It may be empty.
Mitigate Severity Strategy	Description of the strategy for mitigating the effects of a risk if it occurs
Handler	Responsible for handling the risk and implementing the appropriate strategies described for the risk
Status	Pending (nothing done but identification and description), Managed (strategies being implemented), Closed (Risk won't occur)
Work Log	Comments about actions done about the risk

5.4.5. Risk Monitoring

Each identified risk, other than Level 1 risks, shall have a handler. A risk handler is responsible for monitoring the risk and reporting about it. The Project Coordinator, Technology Director or Work Package Leader concerned, shall identify the handlers for all the risks that have been identified within Level 2 and Level 3.

The Project Coordination Committee shall identify the handlers for all the risks that have been identified within Level 4 and Level 5. In addition, for Level 5 risks, the Project General Assembly plans an extraordinary meeting in order to decide the status of the project and how the project will continue.

Each risk handler reports periodically to the Project Coordinator, Technology Director, Scientific Director or Work Package Leader concerned about the risks he/she is in charge of. The Project Coordination Committee and the Project General Assembly discuss during their meetings the risks of Level 4 and Level 5 respectively.

Risk management will be continuously handled by the partners. Every periodic telco will have a dedicated section in the agenda devoted to risk management, and at every plenary meeting there will be a session in order to manage and control risk management. Special emphasis is addressed at risks with higher impact. Additionally each risk handler may assess the risk and may take actions addressed to avoid/minimize likelihood and mitigate severity when an individual input related with the risk happens.

5.5. Risk definition and information table

The following table contains the same information present in the shared document used for management flexibility. The representation in table format is used to show the information in a more comprehensive way.

Table 14. Risk Information table

Risk subcategory			
<technology, usability, organisation, business>			
Risk Nº	**Risk Name**	**Risk Description**	**Consequences**
Rx.y	*<Risk Name>*	*Detailed description of the risk*	*Description of the consequences of the risk to become true, and not mitigating it.*
Likelihood	**Severity**	**Impact**	**Criticality**

<Very Low, Low, Moderate, High, Very High>	*<Insignificant, Tolerable, Moderate, Serious, Devastating>*	*<Likelihood x Severity>*	*<Following figure 2>*
Contingency plan			
Avoid/Minimize Likelihood Strategy		**Mitigate Severity Strategy**	
Describe how to avoid/minimize likelihood of the risk in order to decrease it in order to reduce the impact		*Describe how to affect the severity of the risk in order to decrease it in order to reduce the impact*	
Handler	**Current Status**	**Creation Date**	**Transfer Strategy**
<Identified person who handles the risk>	*<Identified, Managed, Closed>*	*<Risk Creation Date>*	*<description of the transfer strategy>*
Work Log			
Identification and date of associated events, which the handler of the risk tracks the relevant events associated with the risk, e.g. risk changes status from identified to managed or from managed to closed, or the description and handler of the risk changes.			

6. Deliverables and milestones

6.1. Deliverables

Table 15. Sent deliverables list

Del	Del.#	Del. Name	WP.	Lead Beneficiary	Nature	Dissemination Level	Delivery Date from Annex-I	Delivered Yes/No	Actual Delivery Date	Comments
D1.1	D1	H – Requirement No.1	1	UPV	Ethics	CO	31/05/2018	Yes	31/05/2018	None
D1.2	D2	POPD – Requirement No.2	1	UPV	Ethics	CO	31/05/2018	Yes	31/05/2018	This deliverable was requested to be corrected due to minor things. Re-sent on 26/07/2018
D1.3	D3	POPD – Requirement No.3	1	UPV	Ethics	CO	31/10/2018	Yes	31/10/2018	None
D1.4	D4	EPQ - Requirement No. 4	1	UPV	Ethics	CO	31/05/2018	Yes	31/05/2018	None
D1.5	D5	POPD – Requirement No.5	1	UPV	Ethics	CO	31/10/2018	Yes	31/10/2018	None
D2.1	D6	Project management and quality handbook	2	UPV	Report	CO	31/05/2018	Yes	31/05/2018	None
D2.2	D7	Data Management Plan	2	UPV	Report	PU	31/10/2018	Yes	31/10/2018	None
D2.5	D10	Project Management Report v1	2	UPV	Report	PU	31/10/2018	Yes	31/10/2018	None
D3.1	D14	Stakeholders and market analysis report	3	IPEOPLE	Report	PU	31/10/2018	No	-	Requested to be modified after Internal Review and Quality check.
D3.3	D16	Use cases and scenarios manual v1	3	GPMB	Report	PU	31/08/2018	Yes	31/08/2018	None
D9.1	D39	Virtual Presence	9	IPEOPLE	Other	PU	30/06/2018	Yes	30/06/2018	None
D9.2	D40	Communication support material (poster, leaflet and video)	9	UPV	Other	CO	31/07/2018	Yes	31/07/2018	This deliverable was requested to be corrected due to minor things. Re-sent on 04/09/2018
D9.3	D41	Dissemination Plan	9	UPV	Report	PU	31/10/2018	Yes	30/10/2018	None
D9.6	D44	Draft Exploitation Plan	9	XLAB	Report	CO	31/10/2018	Yes	31/10/2018	None

* Deliverables submitted at the same time than D2.5

6.2. Milestones

Table 16. Milestones

MS No	MS Name	WP.	Lead Beneficiary	Delivery date	Achieved Yes/No	Actual/Forecast Achievement date	Comments
D1	Kick-off Meeting	1	UPV	31/05/2018	Yes	04/05/2018	The kick off meeting took place in Brussels from 3rd May to 4th May 2018. Every partner attended the meeting.

7. Explanation on the Use of Resources

7.1. Use of resources

There are no significant deviations in any tasks, objectives or scheduled activities and no deviations are foreseen in the following. During the first 6 months of execution of the project one amendment is under preparation (being reviewed and discussed with the PO) that will have impact in the planning of the use of resources.

Currently minimum deviations (less than 20%) in the use of resources that will be corrected during the following semester are related with:

- The project started with some problems in hiring people and some attention had to be placed to the different regulations for hiring people within the different countries within the consortium.
- The kickoff date of the project (1st May) close to vacation period introduced some delay in hiring processes.
- Additionally there is an increasing problem in hiring adequate people in companies and in the universities due to an improvement in economic situation in Europe and in the ICT sector.
- Changes in management of three of the four ports involved in the project that will lead to request of extra subcontracting in the project amendment.