This project has received funding from the European's Union Horizon 2020 research innovation program under grant agreement No. 769355

Where IoT meets the Port of the Future

1st NEWSLETTER

MAY 2019

This project has received funding from the European's Union Horizon 2020 research innovation program under grant agreement No. 769355

Presentation

Welcome to the first PIXEL newsletter,

We are pleased to present the first of a series of newsletters aimed at summarising the main results of our H2020 exciting PIXEL project.

We are a consortium of 15 partners from across 7 different countries coordinated by the Universitat Politecnica de Valencia. If you are concerned about environmental issues at ports, this is definitely your project to follow. Leveraging the most modern IoT concepts and technologies, we are defining a quantitative parameter, called PEI (Port Environmental Index) able to provide a clear view of the environmental impact. If you are a port authority or just a port member participating in the supply chain, you may find our project really interesting as we are tackling energy transition, transportation and environmental models, as well as predictive algorithms to be considered as a valuable input to optimize port operations.

Our trials will encompass small, medium and big ports in different use cases, but we would be glad if you want to join us as external partner and let our results be transferred and tested in your port premises to widen and consolidate the scope of our project.

The PIXEL team

This project has received funding from the European's Union Horizon 2020 research innovation program under grant agreement No. 769355

PIXEL at a glance

The available operational data in ports (resources tracking, container status, vessel operations, surface or berth available, air/water quality measurements...) 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 is 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 Ports 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.

Built on top of the state-of-the art **interoperability** technologies, PIXEL will centralise data from the different information silos where internal and external stakeholders store their operational information. PIXEL leverages an **IoT based communication infrastructure** to voluntarily exchange data among ports and stakeholders to achieve an efficient use of resources in ports by the following points:

- **Close the gap between small and large ports** by providing an easy-to-use open source smart platform 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
- Focused 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

This project has received funding from the European's Union Horizon 2020 research innovation program under grant agreement No. 769355

Objectives and Impact

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

The PIXEL results will contribute to the following **impacts** as follows:

- Reduction of impact on **climate change and the environment of port activities**
- Reduction of **operational and infrastructural costs**
- Improvement of **logistics efficiency**
- **Better integration** of the port in the surrounding socio-economic area, including city-port relations and the smart urban development of Port Cities
- **Large scale adoption** of the PIXEL solution and approach

PIXEL will be tested in four different ports with **four different use cases:**

- **Energy Management:** the port of Bordeaux will investigate the use of energy models for energy creation and production in order to promote in a cost-effective way the energy transition.
- **Intermodal Transport:** the port of Monfalcone will investigate intermodal transport challenges by means of developing algorithms to simulate the impact of different freight policies and therefore improve the efficiency and reduce congestion.
- **Port-city Integration**: both the Port of Piraeus and Thessaloniki in Greece will promote the concept of ports as key agents for cities in terms of sharing information by means of online platforms for environmental monitoring. This will lead to synergies and development of new strategies.

Port Environmental Index (PEI): this is a transversal use cases for all four ports. Here the concept of PEI, as a quantitative composite indicator for the overall environmental performance of a port , will be deployed and analysed.

Technical achievements

During the first year of the project, following **achievements** have been performed:

- Definition of the **use-cases and scenarios**
- Design of the PIXEL **technical architecture**
- Analysis of **data availability**
- **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
- **Interviews** on-site with stakeholders within the project
- Initial definition of a **process and methodology** to gather relevant parameters from port to create a single unified metric for environmental impact assessment
- **Formalization of port activities** (process operations-scenarios) under a common notation to create proper models (which will enable simulation and optimization later on).
- Analysis of the common technologies used in the ports through a **market-state of the art**
- 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.
- 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
- Establishment of a **good bilateral communication with Green Marine Initiative** representatives (including virtual meetings) to share knowledge regarding environmental impact assessment
- Full definition of set of **functional and non-functional requirements** of PIXEL
- Closure of a **full list of components** for each module of the PIXEL ICT architecture
- **List of data sources** to integrate into PIXEL infrastructure to develop models and predictive algorithms
- **Knowledge generation and documentation** creation about: (i) use of AIS open data, (ii) prediction of vessel call data from FAL forms and other sources, (iii) use of satellite imagery, (iv) prediction of road traffic data, (v) prediction of renewable energy production.
- **Mapping of environmental aspects** with respect to their significance to the PIXEL ports
- Establishment of a **clarified methodology** for algorithms behind PEI which will include: data imputation methods, normalization methods, weighing methods, data aggregation and finally uncertainty and sensitivity analysis of the PEI model
- A list and an **understanding of the significant environmental aspects** of port operations
- **Website** of the project: **https://pixel-ports.eu**
- Social media accounts of PIXEL in: **Twitter, Facebook, LinkedIn and ResearchGate**
- PIXEL official **YouTube** channel
- **Promotional and descriptive videos** of the project
- Supporting **material for dissemination**: Leaflet, poster and sticker designs.
- **Joint Dissemination Action** and several liaison activities with the "Port of the Future Network" projects: the CSA DocksTheFuture and RIAs COREALIS and PortForward.
- Official PIXEL **slogan and pitch**

Events

During this first year PIXEL was present and represented by some of our consortium partners.

16/17-May-2019. European Maritime Days. Lisbon, Portugal

Joao Costa (XLAB) attended on behalf of PIXEL as presenter in the workshop. He presented PIXEL mainly from an environmental perspective, showing the impact of our project for ports, as well as establishing contacts and strengthen the port related network.

15/18-April-2019. IEEE 5th World Forum on Internet of Things. Limerick, Ireland

IEEE 5th World Forum on Internet of Things included as remarked work our project, PIXEL. Particularly, addressing ports needs through data spaces and IoT technology will be the core items that Prof. Palau (UPV) presented on behalf of PIXEL.

3/4-April-2019. CSA Mid-Term Conference. Trieste, Italy

The CSA invited all the 3 RIA projects to present their projects. Benjamin Molina (UPV), presented the main ideas and objectives behind PIXEL, as well as the obtained results so far. Other PIXEL partners attended: Joao, Flavio and Dejan (XLAB), Stefano (ASPM), Tamara (SDAG) and Manuel (Insiel).

6/7-March-2019. TEN-T Atlantic Corridor Working Group meeting. Lisbon, Portugal

Michel LE VAN KIEM (GPMB) presented the energy transition strategy of GPMB in which the LNG dredge and the PIXEL project have an important role, whereas Ignacio Lacalle (UPV) presented PIXEL focussed on alternative fuels and green energies strategies with IoT.

10-15 Dec-2018. Annual Faculty of Medicine Celebration Days

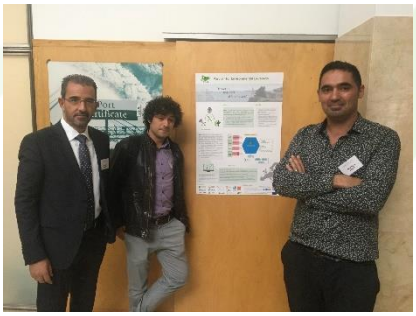
MEDRI participated in the Annual Celebration Days of the Faculty of Medicine. Our colleague Luka Traven presented PIXEL considering the fact that our project is addressing environmental challenges with an indirect impact on health.

27/28-Nov-2018. FIWARE Global Summit. Malaga, Spain

Orange, PRO and UPV attended the 5th FIWARE summit to discuss and further the knowledge of the adoption of de-facto standards of open source. Our colleague Marc presented PIXEL in the context of how the project is addressing energy transition.

6-Nov-2018. CID ALICE - New Global Routes: OBOR. Athens

UPV was present at the Collaborative Innovation Days were users, transport and technology development perspectives were shared. Our colleague Nacho highlighted the use of IoT for logistics to share data and optimize operations.



29/30-Oct-2018. Docks The Future Workshops with Experts. Port of Leixões, Oporto

XLAB, PRO and CERTH attended the event organized by the CSA DocksTheFuture in order to share knowledge and ideas about the Port of the Future. The participants were from different sectors of the maritime and port industry.