

Where IoT meets the Port of the Future

*3rd NEWSLETTER
JULY 2020*





Summary

Welcome to the **third** PIXEL newsletter,

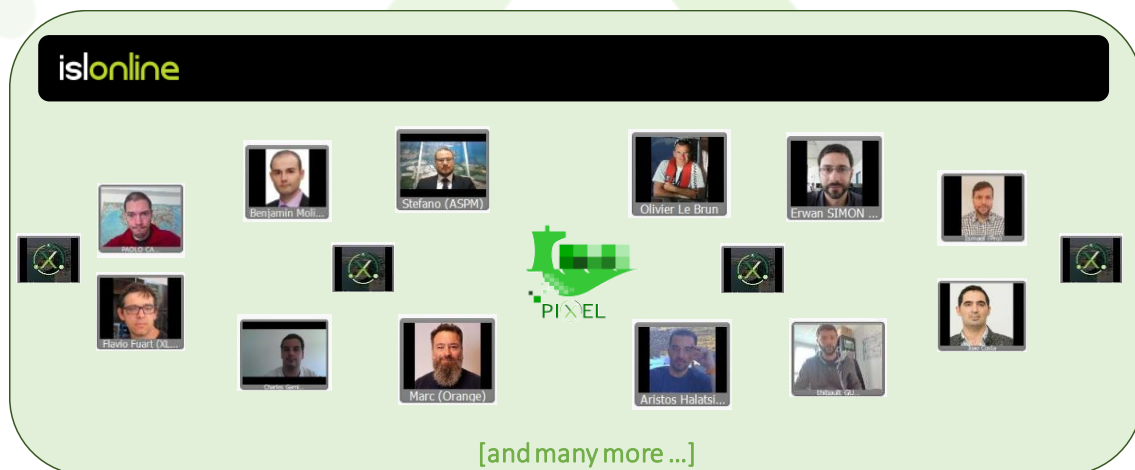
We are delighted to present our third **newsletter** aimed to provide an **update** on the activities carried out since the second release (February 2020). The PIXEL partners have shown their **resilience** during the pandemic situation and have been able to **reach the expected milestones** during these hard times.

During the last five months there has been one single main issue, called **COVID-19**, that has affected all dimensions of our society around the world, with clear impact on individuals, institutions and organizations. Activity at ports, being considered many of them as **critical infrastructure**, did not stop, but experienced a clear reduction. Therefore, the PIXEL Consortium turned to **integration and installations** tasks rather than starting an early pilot within an abnormal behaviour which could probably bias the expected results, as models and predictive algorithms could not anticipate this pandemic and its worldwide impact. This approach was in fact aligned with the overall project plan to provide a **PIXEL platform**, with deliverables describing the **final architecture** as well as **online documentation** for the core modules.

The **Port Environmental Index (PEI) algorithm** has also been specified and implemented, and will be soon tested as part of the **transversal use case** in our four PIXEL ports. We are really proud and happy about it, and some **external entities** have already shown interest about it, which will allow further collaboration in terms of feedback and potential testing.

COVID-19 and its lockdown opened a time for **challenges and opportunities**, and the PIXEL team exerted special effort to keep the quality of the work by means of **continuous online interactions, virtual meetings, participations in webinars and other activities**, some of them carried out by the CSA DocksTheFuture.

The PIXEL team



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Technical achievements and deliverables

During the last months of the project, following **achievements** have been performed:

- **Finalization of WP4** with the delivery of deliverable **D4.4** representing **milestone MS5** (together with deliverable D4.2).
- Specification of the final version of the **PEI algorithm** included in deliverable **D5.3** and available online. This maps to **milestone MS6**.
- Implementation of the PEI algorithm already **drafted**, but due to its multiple dependencies (e.g. input data sources) it requires extra effort and adaptation.
- **Finalization of WP6** with the delivery of deliverables **D6.4** and **D6.5**, available online. This represents **milestone MS7**. They have also been ported not only to our PIXEL website, but also to a general-purpose online documentation page. You can visit it at <https://pixel-ports.readthedocs.io/en/latest/>
- **Integration of the core modules** of the architecture **within a pilot** use case. Such core modules have been mainly implemented as **Docker containers** in order to modularize and facilitate the installation and management of software.
- The code is already available under an internal **GIT repository** and will be released soon under **GitHub** (public repository) after the pilot tests - and a thorough IP review to be able to correct any encountered bug and release a tested version in a real environment.
- Several **NGSI agents** have already been **implemented** and need to be integrated with the **DAL orchestrator**.
- Some data formats, as extension of **FIWARE data models**, have been proposed. For example, the PEI model works with adapted versions of the FIWARE's **KeyPerformanceIndicator** data model.
- Contacts with **external ports** for **Proof-of-Concept** testing has already been launched, with some of them already **engaged**.
- **Acknowledgement** of external bodies to the work carried out in PIXEL. **WPSP** included PIXEL as one of its **collaborative project portfolio**, and FIWARE proceeded similarly characterizing PIXEL as one project using FIWARE tools to **fight climate change**.
- Participation in **webinars** and **scientific dissemination** due to the blocking situation of face-to-face events being cancelled during these months. Three research papers have been published and other two have been submitted.

New **deliverables** have been released since Feb 2020 and are available in our PIXEL website:

- **D2.7**: Project Management Report
- **D4.4**: Predictive Algorithms v2
- **D5.3**: PEI Definition and Algorithms v2
- **D6.4**: PIXEL data acquisition, information hub and data representation v2
- **D6.5**: APIs and documentation for software extension





Meetings and Ports of the Future (PoF) network

Several face-to-face **meetings** took place since May 2019 in order to coordinate and advance on the project, as well as prepare the **mid-term review** and sync with the **PoF network**.



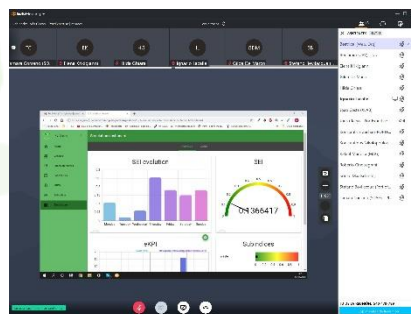
30 March – 3 April 2020, Technical meeting, Online

A technical meeting took place online (originally planned in Rijeka) to move on with the tasks according with the **reviewer comments** in January. A **parallel session** was also scheduled to focus on specific technical matters dealing with the **PIXEL platform**.



7/8 July 2020, Plenary meeting, Online

A plenary meeting was held online to track the status of the project, short after **milestones MS6** (PEI Algorithm finished) and **MS7** (PIXEL platform availability) had been reached, in order to plan properly next actions considering holidays and increasing normal activity in ports to start pilots.



4/5 June, CSA DocksTheFuture RIA webinar

This webinar in June was intended exclusively for the 3 RIAs (Corealis, PortForward and PIXEL), invited to fill in feedback information about their projects in order to check and understand the tools provided by the CSA. Nacho (PIXEL Coordination) made a first attempt and presented the PEI (Port Environmental Index) as a PIXEL product and how it can be applied/scored with the CSA DtF tools).



23 June, the Future of the Ports: a vision for 2030' at TRA 2020 Helsinki (online webinar)

The **CSA DocksTheFuture** altogether with **ETP-ALICE** organised a special event to cover the round-table session that was supposed to take place at TRA2020 event at Helsinki in April. **UPV** represented PIXEL presenting the outstanding solutions (especially the PEI) to 60+ people audience. The presentation was recorded and can be consulted in the **PIXEL YouTube channel**.



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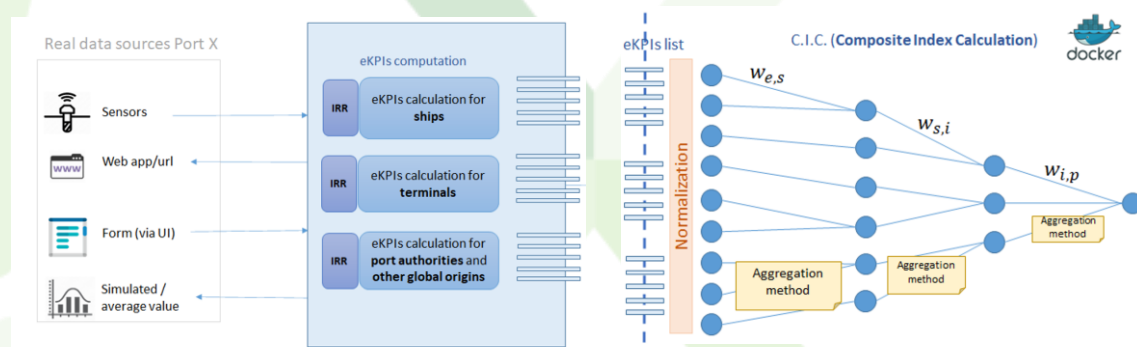
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PEI algorithm (MS6)

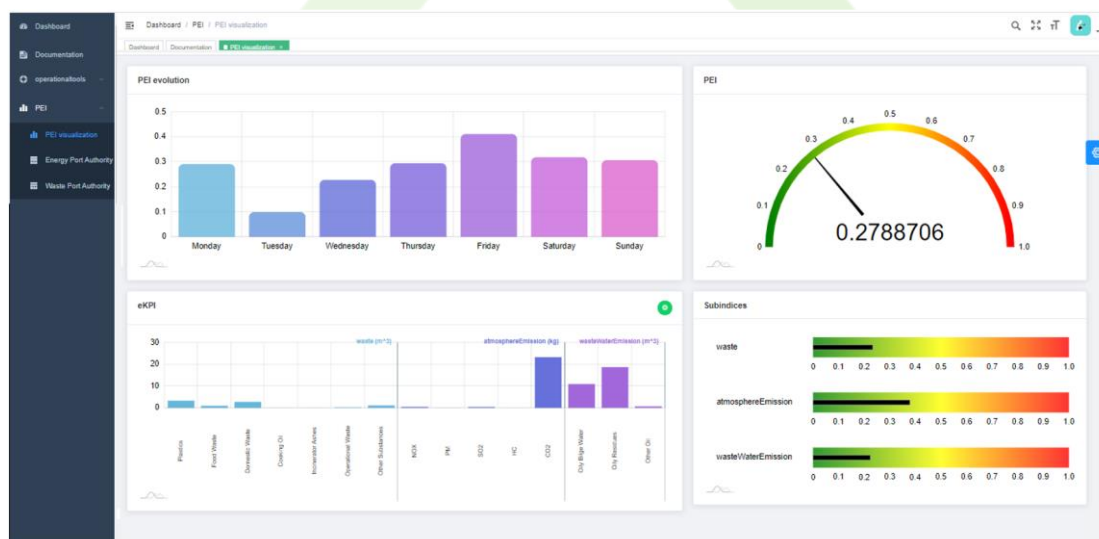
Last June an important milestone (MS6) was achieved: The **Port Environmental Index** was finally **defined** and **specified as algorithm**. Much work had already been performed before and presented in deliverable D5.2, but its ideas and conclusions were expanded. Furthermore, various means of the data retrieval mechanisms (web-based, sensors, web forms and external data) were presented and described in more detail. Likewise, an exhaustive review of the minimum data needed for the PEI calculation was laid out.

Considering the eKPIs listed and defined in previous work, they have been further **refined**, **modified** and **related** to the three origins of environmental impact in a port (**Ship**, **Terminal** and **Port Authority**). The eKPIs related to **noise**, **light** and **odour pollution** are now treated as eKPIs directly related to all origins and are not treated separately for each origin (unlike the eKPIs representing **air** and **water pollution** and **waste production**). Methods for estimating the eKPIs from data sources are presented for each of those eKPIs.

The **technological implementation** of the PEI has also been targeted. It presents an insight on how the technological basis of the PEI implementation was followed to obtain a working **PEI calculation tool**. The work done addresses the position of the PEI in the global PIXEL architecture and the process of the **development of the code** for the PEI computation.



Heterogeneous data gathering and PEI algorithm structure



PEI visualization in the PIXEL dashboard



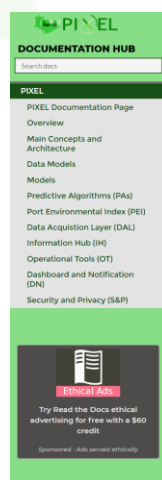
PIXEL ICT solution (MS7)

Last June an important milestone (MS7) was achieved: the **PIXEL platform** was released. This platform refers not only to the release of a set of software components building the **PIXEL architecture**, but also to the **successful integration** of such components as a platform as well as the assigned documentation in terms of **installation, user manual and developer's manual**.

Nearly all components within the PIXEL architecture have been developed in form of **Docker containers**, which facilitates the **installation and management** as library dependences and runtime executions are **isolated** among each other. **Docker compose** is a useful tool in order to **manage and configure** all Docker instances needed for the PIXEL platform. Therefore, the inherent complexity of the whole components and modules is significantly reduced, which will also **facilitate adoption** in other ports. Some of the core components, such as the Data Acquisition Layer and the Security modules are based on **FIWARE enablers**.

The usage of Docker containers has been adopted as part of an overall integration methodology and serves not only for core architecture modules but also for **NGSI agents**, responsible of retrieving heterogeneous data and feeding the system (fostering the concept of virtual sensors), **models** and **predictive algorithms**. It is in fact a common approach for deployment platforms in the cloud offering **PaaS** (Platform as a Service) and **SaaS** (Software as a Service) services to ports.

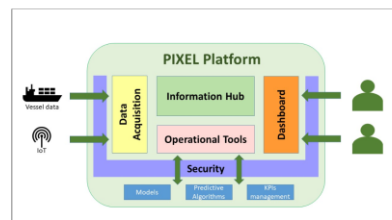
The PIXEL Consortium firmly believes that just releasing deliverables (**D6.4** and **D6.5**) is not the best way to provide updated and useful documentation. Therefore, a big effort has been placed to export this information to an online documentation repository, such as **readthedocs.org**, which can be easily updated, including video descriptions from our **YouTube channel**. Please stay tuned to our online repo at <https://pixel-ports.readthedocs.io/en/latest/>



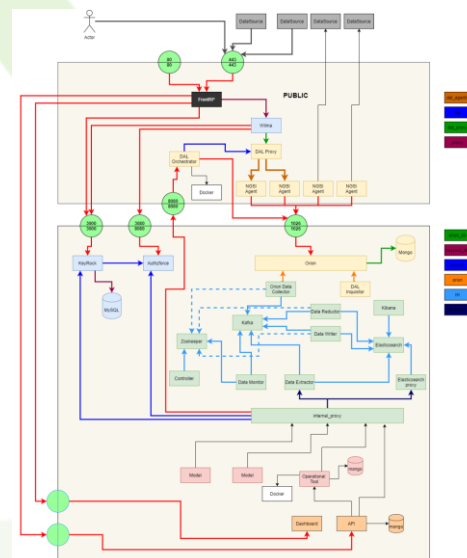
PIXEL online documentation (readthedocs.org)

MAIN CONCEPTS AND ARCHITECTURE

The PIXEL platform aims at covering various challenges and facilitating operations at ports. Heterogeneous data including IoT sensors must be gathered and exchanged across different stakeholders operating at ports. Typically these data are difficult to handle due to a lack of homogenization and tools to operate them. By using (extended) FIWARE data models, PIXEL brings clarity, homogeneity and common semantics to such data. Furthermore, these data are also treated and exploited by means of specific models and predictive algorithms (e.g. energy, pollution, traffic, etc.) which help defining environmental and operational KPIs at ports. Last but not least, data access and treatment is presented through a **powerful user-friendly dashboard** to port operators (and eventually other port stakeholders).



The PIXEL architecture is divided into several building blocks to cover a wide range of needs for small, medium and large ports. The approach is data-centric so that multiple stakeholders and applications can homogeneously access to the data and provide added value services on top of them.



PIXEL core Docker scheme





Events

Even though face-to-face events have been cancelled during these months due to the Covid19 pandemic, PIXEL partners have participated in different **events** since Feb 2020, and obtained some acknowledgment from relevant external entities including PIXEL as part of their project portfolio.



PIXEL is the first modular solution combining strong methodology and smart technology for small and medium port ecosystems enabling optimization of operations through Internet of Things (IoT) while reducing environmental impact.

There is a lack of tools for environmental impact assessment, and the integration of operational data in the majority of ports is not optimal. In addition, different levels of digitalization in ports differs and considerable gaps are identified between large and small ports. Built on state-of-the-art interoperability technologies, PIXEL centralizes data from 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. This is achieved through the provision of an easy-to-use, open source, smart platform for operational data interchange in ports and its surroundings.

April 2020, World Ports Sustainability program, Collaborative projects

On 12 May 2017 the International Association of Ports and Harbours decided to set up a **World Ports Sustainability Program**. Guided by the 17 UN SDGs the program wants to **enhance and coordinate future sustainability efforts of ports worldwide and foster international cooperation** with partners in the supply chain.

The portfolio encompasses port projects (being PIXEL one of them), partner projects and additional projects.



May 2020, Local media, Italy

The Gorizia autoporto is one of the seven logistics hubs of the Friuli Venezia Giulia platform which is divided into three sea ports (Trieste, Monfalcone and Proto Nogaro) and four autoports.

It is part of the PIXEL project represented by SDAG. In May they appeared on the local media showing its readiness for normal activity after the pandemic. The company highlighted the importance of participating in research projects such as PIXEL which enhances collaboration within the local hub, as well as among external stakeholders.



May 2020, FIWARE Fighting Climate Change with FIWARE Initiative

The FIWARE Community recognizes that climate change is impacting societies, economies, and especially humans' daily lives. Therefore, a wide portfolio of very concrete applications and solutions with a direct positive impact on climate change is presented.

The portfolio lists a series of FIWARE-based solutions, but also includes further climate initiatives with FIWARE as part of the booklet, being PIXEL one of them.



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19 May 2020, CSA DocksTheFuture expert webinar (I)

The CSA DocksTheFuture started a series of webinars during May to share their results and get expert feedback. One of the presented tools was the DSS for decision support. It allows learning from past experiences and reflect what ideas and projects could represent a valuable example to achieve its own targets and relevant strategic objectives. Other tools presented were the DtF Transferability Analysis and its PoF TA Methodology to obtain critical inputs on the DtF tools.



26 May, CSA DocksTheFuture expert webinar (II)

The CSA DocksTheFuture started a series of webinars during May to share their results and get expert feedback from port related stakeholders. This was the second open webinar for external ports and port related stakeholders to increase the open discussion and obtain more feedback on the DSS tools. PIXEL, as one of the 3 RIAs invited, attended the webinar (represented by UPV and XLAB) and exposed their view and feedback about the DSS.

