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Project Acronym:	**SmartShip**
Project Full Title:	**A data analytics, decision support and circular economy – based multi-layer optimization platform towards a holistic energy efficiency, fuel consumption and emissions management of vessels**
Project Duration:	**48 months (01/04/2019 – 31/03/2023)**

Deliverable 1.1:

First year progress report including initial exploitation, dissemination and training plans

Work Package	**WP1 – Project management and secondments coordination**
Task	**T1.1 – Administrative project management**
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Executive Summary

This deliverable is in line with Article 19.1 of the Grant Agreement 823916 and provides the First year Progress Report of the SmartShip project funded by the Horizon 2020-MSCA-RISE-2018 Action.

The principal aim of SmartShip is to foster knowledge exchange between experts of complementary technology fields (IoT, Data Analytics, Visualization Tools, Optimization Algorithms) applied in the frameworks of Energy Efficiency & Emissions management, towards a holistic framework for energy efficiency and emissions control, thus materializing the next-generation paradigm for the maritime industry. In this context, by capitalizing on available COTS technologies and limited RTD, SmartShip 's overall objective is to deliver an ICT & IoT-enabled holistic cloud-based maritime performance & monitoring system, for the entire lifecycle of a ship, aimed to optimize energy efficiency, emissions reduction, fuel consumption, and at the same time include circular economy concepts in the maritime field.

The deliverable focuses on reporting the results achieved at the initial stage of the project, specifically until M12 of project timeline, as well as to provide a report regarding the progress achieved in the implementation of the secondments. This deliverable constitutes a consolidated record of all partners' effort for the successful delivery of project objectives in the respective reference period (M1-M12). It is beyond any doubt that progress so far is highlighting the high spirit of collaboration between partners as expressed by the solid synergies achieved for sound and safe rollout of project tasks. Some minor issues that have been identified during the first reporting period are duly documented and disclosed. Appropriate mitigation measures connected to already identified risks have been revised or materialized as well as new risks which have been registered and analysed.

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List of Acronyms and Abbreviations

Term	Description
PO	Project Officer
KPI	Key Performance Indicator
IoT	Internet of Things
ICT	Information and Communication Technology
ADM	Administrative
ESR	Early Stage Researcher
ER	Experienced Researcher
DoA	Description of Action
GPS	Global Positioning System
AIS	Automatic Identification System

Partners Short Name	
DANAOS	DANAOS SHIPPING COMPANY LIMITED
ITML	INFORMATION TECHNOLOGY FOR MARKET LEADERSHIP
EPS	EPSILON MALTA LIMITED
ENPC	ECOLE NATIONALE DES PONTS ET CHAUSSEES
BLS	BLUESOFT SPOLKA Z OGRANICZONA ODPOWIEDZIALNOSCIA
TUBS	TECHNISCHE UNIVERSITAET BRAUNSCHWEIG
HUA	HAROKOPIO UNIVERSITY

1. Introduction

1.1 Scope and objectives of the deliverable

SmartShip has reached the first year of scheduled project work-plan. This deliverable is recording results achieved considering technical implementation of the project and secondment implementation while summing up actions in project management and reporting progress on training, exploitation and communication plan.

Scope of this report, for the period between M1 and M12 of project time-plan, is to highlight:

- Progress and results of each project segmented work-section. (work packages)
- Any recorded deviation and issue per work package for the period in reference along with a work plan for the next reporting period.
- A consolidated overview of progress earned value, deliverable(s) completed, and milestone(s) achieved.
- Implementation of secondments including a report on percentage completion against the initial plan.
- A continuous identification and monitoring of risk factors.
- Activities for promoting and communicating project results.
- Updates in exploitation and training plan.

1.2 Structure of the deliverable

The deliverable consists of three main sections:

First section includes the reporting of progress as witnessed in each work package including any noted deviations and next steps to be followed along with a full report of completed and ongoing secondments for the respective reporting period. In the section, an overall picture of deliverables submitted, and milestones achieved until M12 is portrayed. Risk analysis is performed through revising and updating the provision of required remedy. Finally, ethical issues are assessed and presented throughout the deliverable.

In the **Second section,** a list of activities for the dissemination of project results are recorded, any promotion material (website, logo, etc.) is developed, and project's support and communication are presented.

The third section presents project's dissemination framework while SmartShip Training plan is projected and individual exploitation of partners are re-designed.

1.3 Relation to Other Tasks and Deliverables

This document is a sum up of results and progress across the first year of project implementation. By definition, it is taking feedback from work performed in active WPs (wp:1,2,3,4,5,7) and related tasks (t1.1, t1.2, t1.3, t2.1, t2.2, t2.3, t3.1, t3.2, t4.1, t4.2, t5.1, t5.2, t7.1, t7.2, t7.3) for the period in reference (1st year) and delivers a consolidated report for results achieved. The deliverable is projecting the work to be done by making a reference to the next in-schedule actions associated with each work package tasks.

2. SmartShip Progress and Reporting

2.1 Progress per WP

2.1.1 WP1 Progress

WP Name:	Project management and secondments coordination
WP Leader:	DANAOS

General Work Package Overview and activities:

- Direct Communication to PO, coordinating and forwarding any partner's request
- Managing secondment plan and secondment execution
- Coordinating physical or virtual (online) Communication between partners
- Tracking project progress
- Project's document and administrative management
- Quality checks, reporting, Risk identification, and monitoring

Task 1.1

Administrative project management (Task Leader: DANAOS)

- Consortium Agreement prepared and signed copies shared with each partner on time
- Preparation and structuring of a common online document repository and management tool. Google drive was selected and organized with special folders each associated with project demands in terms of administrative, reporting, project progress, and secondment tracking.
- Templates for WP progress report, deliverable layout, meeting notes, dissemination action recording, quality control checklist, secondment report, secondment plan tracking, and presentation layout (ppt) were prepared.
- Zoom as a meeting tool was selected for bilateral and consolidated consortium online communication.
- Reporting and Progress monitoring: Organization of monthly telcos with the participation of all partners for work progress updates, discussion for any issue or deviation recorded, and scheduling of action plan. A bi-monthly WP progress report document is prepared by WP leaders in liaison with task leaders for monitoring project rollout.
- Set-up, preparation, and management of physical meetings for technical coordination and project progress evaluation was conducted (refer to ANNEX I in the document for a presentation of SmartShip meetings).

Task 1.2

Secondment coordination (Task Leader: DANAOS)

- Keep track of secondments' progress and quality check on secondment reports
- Manage any request for change from partners in their initial individual secondment plan. Adjust and monitor overall secondment plan balancing individual request for amendment with the principal objective of an overall sound delivery of project tasks.
- Coordinate and facilitate arrangements between hosting and sending partners.

Task 1.3

Quality assurance and risk management (Task Leader: DANAOS)

- Ongoing assessment of project risks and identification of new hazards.
- Assigning of internal reviewers for each deliverable; review is done against a predefined quality checklist.
- Quality control on secondment reports; review is done against a predefined quality checklist
- Controlling, in direct communication with leaders, deliverable preparations and submission. Submission of Deliverable 7.1 and 2.1 on time

Deviations and Issues

- ✓ No major deviations and issues to be reported.

Next Steps:

- ✓ Ongoing Secondment management, project progress control and administrative coordination.
- ✓ Preparation of a contingency plan against possible implications to project progress as reflected by restrictions associated with COVID-19 measures around Europe.
- ✓ Managing preparation and safe submission of deliverable(s) scheduled for the next progress period.
- ✓ Preparation for mid-term project meeting and periodic report.

2.1.2 WP2 Progress

WP Name:	Requirements elicitation, use case scenarios, and roadmaps for integrated vessel management
WP Leader:	HUA

General Work Package Overview and activities:

As of M10, D2.1 has been delivered along with Scenarios and KPIs, while Requirements analysis has been completed.

Task 2.1

Requirements elicitation and analysis (Task Leader: HUA):

- For the completion of the use cases, several requirements have been taken into account. For the use cases regarding vessel routing, common pathways, deviations from predefined routes, and trajectory datasets need to be made available. Harokopio University collects vessel positions around the area of Attica and the Argosaronic Gulf, which will be made available throughout the consortium. Furthermore, weather data need to be examined and combined with the trajectory data for more accurate results and for the weather routing use case. There are two services that freely provide such data, the Copernicus Climate Change Service and the National Climatic Data Centre – NOAA. As far as the predictive maintenance is concerned, data about vessel engines and their characteristics as well as fuel consumptions need to be provided from DANAOS in order to make estimations of routine maintenance.
- The requirements have been formed and analysed and can be found in the deliverable 2.1 which has already been uploaded to the EC. This task has ended.

Task 2.2

Scenarios and KPIs definition (Task Leader: DANAOS)

- T2.2 goes hand in hand with Task 2.1 progress. Scenarios and KPI's have been documented in the deliverable 2.1 which has already been uploaded to the EC.

Task 2.3

Roadmaps for marine vessel management optimization (Task Leader: ENPC)

- Task 2.3 is the last task of WP2; it started in M10 and used as an input the scenarios and requirements provided by T2.1and T2.2.
- The project use cases were analysed with regards to Circular Economy concepts, criteria, and key enablers. Analysis was performed for enhancing the use case scenarios with circularity principles related to:
  - Energy efficiency
  - Fuel consumption
  - Emissions optimization
- Additional investigation was performed with respect to targeted reuse of ship-native data for predictive maintenance purposes, including:
  - Engine lifecycle data
  - Location, Condition, and Availability – related data produced from sensing devices on board the ship

- Aggregation of data in a cloud environment and application of data analytics.

All the above points were incorporated in the project deliverable D2.1, and a sketch of a roadmap for sustainable marine vessel management optimization in terms of energy efficiency, fuel consumption, and emissions control is presented in **Figure 1**. The roadmap will be updated according to the evolution of the task.

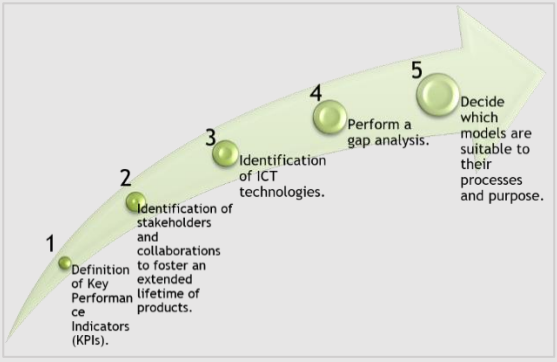


Figure 1: Sketch of the Roadmaps for Marine Vessel Management Optimization

Deviations and Issues

✓ No deviations and issues to be reported.

Next Steps

According to the sketch of the Roadmap for Sustainable Marine Vessel Management Optimization, next steps include the identification of the stakeholders to establish strong networks through collaboration (i) between the beneficiaries of the project and (ii) with academic and non-academic entities that are interested to understand and exploit the SmartShip outcomes in the future and possible collaborations to foster an extended life time of the products.

2.1.3 WP3 Progress

WP Name:	SmartShip Circular-Economy based functional architecture design
WP Leader:	ENPC

General Work Package Overview and activities:

WP3 started in M10. It aims to specify the SmartShip functional architecture, in terms of translation of the requirements into functions. The grouping of functions into functional blocks and specification of interfaces between blocks will enable to build the functional architecture. Moreover, Circular Economy principles will be incorporated on the architecture within WP3.

Task 3.1

Design and specification of the SmartShip architecture (Task Leader: ITML)

This task started in M10 of the project (January 2020) and will end in M18 (September 2020). The purpose is to define and specify (i) the general SmartShip architecture; (ii) the SmartShip functions in terms of requirements towards the definition of functional blocks and (iii) the interfaces between blocks and specific interactions. Until now, SmartShip consortium have agreed that the overall framework and architecture will consist of 5 building blocks:

Building Blocks	Description	Build on top of below existing tools
1 – The IoT Backbone	Includes: (i) existing, already installed sensing devices in vessels that gather several types of information related to the operation of the engines and the environment (emissions level, fuel consumption, engines' fatigue, engine components' status, energy consumption *etc.*); (ii) any other data that may be exploited by the data analytics and the decision support modules (such as weather	**Use Case #1 Weather Routing Optimization:** This use case will be a built-in exercise on top of an existing tool

	forecasts) and (iii) historical data stored in databases, related to previous operations and decisions of the system in specific contexts.	used by DANAOS Shipping for weather routing optimization, developed under the framework of ORISMA [9] a company legacy of applied research for shipping operation efficiency **Use Case #2 Route Monitoring:** SmartShip will extend capabilities of DANAOS weather routing tool applied in DANAOS fleet by triggering an alerting system to generate warnings to the captain for performance deviation against predefined indicators due to his actual navigation decision deployment, or /and possible claims for under-performance. **Use Case #3 Condition based (Predictive) Maintenance:** This use case will capitalize on the technology-driven fleet performance monitoring framework of DANAOS
2 - Data analytics	The collected data will be processed, refined, and analysed. The obtained information will continuously feed and update a deep-neural predictive model of the vessel allowing the evaluation of the vessel's performance under different voyage scenarios and vessel settings. This will enable the real-time detection of complex events (*e.g.*, identifying that in the current weather conditions, a reduction in engine power improves energy efficiency). The collected data will be utilized in predicting malfunctions that may cause pollution or increased emissions, enabling pro-active action.	
3 - Optimization algorithms	Based on (1) data gathered and (2) the analysis carried out in the data analytics module, specific optimization algorithms will be tested and applied, focusing on a multi-layer optimization that comprises (i) energy efficiency maximization; (ii) emissions minimization and (iii) fuel consumption minimization. An additional factor that will be used in these algorithms refers to the overall Life Cycle of engines' components, focusing on circular economy – based guidelines.	
4 - Decision support module	Decision support tools will enable decision-making for the navigational and operational aspects, with the goal to optimize the vessel's productive energy efficiency. This toolset includes trim optimization and optimal weather routing, whilst incorporating various aspects of waterborne navigation, such as anisotropic areas, environmental sensitive regions, and weather conditions. Further, it includes an expert system that suggests course and engine power readjustments in real-time for optimal energy consumption. The tools will utilize the deep-neural vessel model which allows assessing the ship's performance correlated with the given weather and operational conditions. In addition, circular economy aspects are taken into consideration.	
5 - Cloud-based platform and an interoperable IoT/ICT framework	A cloud-based platform will host the *SmartShip* tools and services, accommodating the related high data volume and computational needs. An integrated dashboard ("DashOnBoard") ,with advanced visualization tools, will act as the single point of interaction of the user with the incorporated systems, services and tools, *e.g.*, supporting decision making of the navigational officer (Captain Tips), of the centre of operations at shore (Company Tips) and of the various other stakeholders (Custom Tips).	

Task 3.2

Supporting functionalities for SmartShip (Task Leader: EPS)

Task 3.2 started in M10 (January 2020). Scope is to demonstrate the holistic platform capabilities, basis SmartShip Circular Economy principles, as defined in T3.1. The functions of IoT technologies on vessels, Big Data Analytics for the maritime, specific Life Cycle Optimization mathematics formulae, Decision Support integrated modules and the Cloud-based system platform, all contribute to optimum utilization of Smart Technologies through SmartShip in the maritime industry.

- Through, IoT the near real-time data monitoring & input directly from the source (vessel) will be enabled to the users.
- The Data Analytics functioning block serves as the "manager" contributing, updating and reviewing continuously and effortless the database feeding the platform all necessary requirements for the sequential workflow steps.

- Algorithms with optimization as key objective, derive to the excelling final solution requested for the continuous operational cost and environmental impact restricting functions high sought after by key stakeholders.
- Additional Decision Support capabilities locked in the workflow process, guide user to the leading solutions adjusting output to consider key elements of saving costs, energy, emissions while maintaining optimal operations.
- Lastly, the system's end platform blends all above significantly contributing aspects to a straightforward, targeted, and accessible package which satisfies under the present data and restrictions and support functions in a complete manner for the end user in the maritime sector.

As aforementioned processes have been applied and tested in a comprehensive system factoring in, the foremost solutions towards maximization of Technology capabilities targeted towards operational excellence assessing key requirements towards Circular Economy benefits in shipping industry.

Task 3.3

Circular Economy principles in SmartShip architecture (Task Leader: ENPC)

Task 3.3 will start in M19. The main objective of this task is to adjust and customize the SmartShip Architecture as developed based on functional requirements and existing standards in T3.1, to incorporate the main principles of Circular Economy in the maritime field. The main focus will be on exploiting energy efficiency, fuel consumption, and emission control optimization procedures in terms of applying such principles regarding the engines' components operation and reuse.

Next Steps:

- The pairing of Circular Economy and Smart ICT-enhanced maritime fleet management provides a fertile ground for innovation and value creation. The solution to be supplied by SmartShip will incorporate Circular Economy principles.
- Energy efficiency, fuel consumption, and emissions optimization will be combined with data related to the Life Cycle of engines' components to ensure that the management of these components is based on CE principles and guidelines.
- Task 3.3 will take advantage of state of the art in the areas of Circular Economy as applicable to Maritime through external desk research involving the collection of relevant information. The research includes online desk research and government published data.

2.1.4 WP4 Progress

WP Name:	SmartShip Baseline framework: IoT and advanced data analytics
WP Leader:	ITML

General Work Package Overview and activities:

The main objectives and activities of WP4 are:

- To organize the knowledge exchange between academic and non-academic experts in the fields of IoT and Advanced Data analytics.
- To identify and report of any market-ready tool and technology already applied in the maritime industry, related to IoT-based advanced data analytics.
- To design and development of the IoT-based data analytics module of SmartShip, which will be the core of the multi-level optimization of the vessels' operation and management in terms of fuel consumption, energy efficiency, emissions and circular economy principles.

Task 4.1

State of the art in Advanced data analytics and IoT Technologies (Task Leader: HUA)

Several studies of related work have been conducted regarding the Advanced Data Analytics and IoT Technologies. Below are several techniques that have been identified so far.

Today's industries face with problem of aggregating and analysing data consumed from multiple heterogeneous data sources. Such data sources could be any (Internet of Things) IoT device, from Raspberry PIs to sensors on board a moving object. In the maritime domain, things are no different as most

of the vessels carry AIS transponders and GPS devices. Furthermore, vessels are also equipped with sensors attached to their engines and other main functionality components. Considering the total number of vessels globally, the problem of data aggregation and consumption becomes even harder to tackle.

To this end, several works have focused on the domain of data streams aggregation. Authors in [1], in order to tackle problems posed with centralized approaches, present a novel resource-aware network-partitioning algorithm which is able to partition and distribute data based on the load of each node over the network and the change of data stream rates. The developed Distributed Stream Management Infrastructure (DSMI) supports a n SQL-like query language to describe the process of aggregations for producing a new aggregated data stream from existing data streams. Similar to [1], authors in [2] present a novel stream join model, called join-biclique. Based on this novel model which treats an entire cluster as a bipartite graph, a distributed stream join system is developed, called BiStream. This system supports efficient full-history joins, window-based joins, online data aggregation, and resource management for scaling. On the other hand, Babcock et al**.** [3] developed algorithms able to determine at what points in a query plan, load-shedding should be performed and the amount of load to be shed. The main idea behind this approach is when the system resources cannot deal with the amount of data being consumed at a given time, system load must be reduced by dropping unnecessary data tuples. Similarly, authors in [4] present storage-efficient algorithms for decay functions which determine the relative contribution of each data to the aggregate. The contribution is highly related to the time passed from the moment the data was generated.

Another approach in stream aggregation and consumption is to treat each IoT device as a microservice. Butzin et al. [5] investigate different patterns and aspects in the microservices approach and examine how these practices can be integrated in the IoT. In the microservice architecture, individual distributed interconnected services are designed to work together and structure an application. The interoperability of IoT services and the creation of value-added applications could benefit by employing the same architectural design. The aspects compared relate to self-containment, monitoring, and fault handling. Self-containment property focuses on separation of the functionality and enforces isolation via independently deployable units. By adopting this property in IoT, several benefits arise such as independent evolution of services, easier deployment, and better decoupling between services. Monitoring is a process of reporting, gathering, and storing information. Each service should provide an interface about its health status in order to prevent other services to call a broken one. Microservices and IoT employ the concept of circuit breaker in conjunction with the load balancer pattern. The circuit breaker prevents messages delivered to broken services and enables the load balancer to distribute the workload only on "healthy" services. In conclusion, this research work supports that architectural goals of microservices and IoT are quite similar and IoT could benefit from aspects used in the microservices approach.

Following this direction, [6] presents a vision of applying microservice architecture in an IoT system. Several challenges concerning IoT systems have been already addressed and the Internet consists the backbone for the IoT. However, existing IoT systems are facing several well-known problems including interoperability, security flaws, heterogeneity of technologies, protocols used, power limitations, etc. In this research, "things" are not treated as atomic elements of the system but rather follow the SOA approach where IoT is a network of services. An IoT node is a smart object that provides services over the network. Thus, the focus is shifted to the level of data and services rather on devices and communication. However, the SOA approach is heavyweight and consists of centralized service models. As a solution, the microservice pattern is applied to IoT systems where each component is independently developed and deployed. Because IoT systems have important differences with cloud-or web-centric patterns, the microservice pattern is combined with complementary patterns which are able to solve several issues concerning the Internet of Things. These patterns include API Gateway, distribution, service discovery, containers and access control. Two case studies are employed, and the results show that in order to successfully apply microservices in IoT systems, many trade-offs should be considered and open questions to be addressed.

Task 4.2

IoT-based data analytics tools and technologies applied in the maritime industry (Task Leader: EPS)
Industry will derive numerous benefits using big data. In a sector which generates roughly 100-120 million data points every day, from different sources such as ports and vessel movements., data management for large applications is crucial. Stakeholders analyse captured data points to identify efficiencies such as faster routes or ideal ports. Nevertheless, big data remains untapped in the shipping industry, therefore there are

vast opportunities towards: innovation, usage, driving optimal performance and leveraging assets better. The following table presents a snapshot of application areas for big data in the maritime industry:

Role	Function	Example of Big Data Application
Charterer / Operator	Operations	➢ Energy saving operation ➢ Safe operation ➢ Schedule management
	Fleet planning	➢ Fleet allocation ➢ Service planning ➢ Chartering
Ship Owner	Technical Management	➢ Safe operation ➢ Condition monitoring & maintenance ➢ Environmental regulation compliance ➢ Hull and propeller cleaning ➢ Retrofit and modification
	New building	➢ Design optimization

- IoT and Big Data functions optimize the key elements, volume, velocity, variety of information to produce quantifiable management and decision support in the majority of current standard processes of shipping.
- In summary, subject applications and tools may produce essential solutions towards Chartering, Ship Operations, Voyage Planning, Vessel Vetting, among others.

Task 4.3

Design and Development of Advanced Data analytics module (Task Leader: ITML)

- Starts M20 (November 2020)

Deviations and Issues

- ✓ No deviations and issues to be reported

Next Steps:

- ✓ Report knowledge exchange in the fields of IoT and Advanced Data analytics
- ✓ Report market-ready tool and technology already applied in the maritime industry
- ✓ Identify specifications, technical requirements and data accessibility towards the design and development of the Advanced Data Analytics Module

2.1.5 WP5 Progress

WP Name:	SmartShip Decision Support and multi-layer optimization module
WP Leader:	BLS

General Work Package Overview and activities:

The main objectives and activities of WP5 are:

- To organize the knowledge exchange between academic and non-academic experts in the fields of decision support and optimization in terms of energy efficiency and emission control in the maritime field.
- To identify and report any market-ready tool and technology already applied in the maritime industry, related to decision support and optimization in terms of energy efficiency and emission control in the maritime field. The report will include the potential customization required for the aforementioned tools, to meet requirements of SmartShip as defined in WP2
- Design and development of the decision support module of SmartShip, that will be the core of multi-level optimization of the vessels' operation and management in terms of fuel consumption, energy efficiency, emission, and circular economy principles

Task 5.1

State of the art in Decision Support and multi-layer optimization Technologies (Task Leader: ENPC)
T5.1 started in M10. It aims to organize the knowledge exchange between academic and non-academic experts in the fields of decision support and optimization in terms of energy efficiency and emissions control in the maritime field. State of the art reports are being prepared to be delivered, to summarize all recent advances in the fields mentioned above, implemented explicitly in the maritime industry, and based on the technical details defined during the requirements elicitation and analysis phase.

Task 5.2

Decision support and optimization tools and technologies applied in the maritime industry (Task Leader: BLS)
T5.2 started in M10, the table of content of the report have been prepared. The research arena has been assigned to the partners involved in the task. The management workflow has been established. The first research tasks are in progress. The emphases of the report have been put on the weather route optimization, data visualization, and usage of artificial intelligence in the maritime sector.

Task 5.3

Design and Development of Data analytics and Decision Support module (Task Leader: BLS)
- Starts M20 (November 2020)

Deviations and Issues

- ✓ No deviations and issues to be reported

Next Steps:

- ✓ Report market-ready tool and technology already applied in the maritime industry.
- ✓ Start the design and development of data analytics and decision support module.

2.1.6 WP6 Progress

WP6 starts in M25 of project timeline

2.1.7 WP7 Progress

WP Name:	Dissemination, exploitation and training management
WP Leader:	ENPC

General Work Package Overview and activities:

WP7 is responsible for the coordination, management, and execution of the dissemination, exploitation, and training activities for efficient binding of the maritime industry with ICT-oriented industrial and research beneficiaries. It manages the necessary networking and knowledge–sharing activities of SmartShip. The objective of this subsection is to report the first-year progress of WP7.

Task 7.1

Dissemination management (Task Leader: ENPC)
Dissemination management is being conducted at the level of intra- and inter-partner cooperation. Task 7.1 developed the planning and implementation of the project's dissemination activities. During this period, Task 7.1 defined and analysed target audiences as:

- ✓ Researchers and innovation managers from the European maritime industry,
- ✓ Representatives of national regulators, and General public,

The task also selected the appropriate online and offline communication channels for the action. Twitter and LinkedIn accounts were created.

Task 7.2

Exploitation management (Task Leader: ENPC)

Task 7.2 provides an overview of the relevant exploitation activities and is promoting the exploitation potential of the individual partners since M01. The different individual exploitation plans are presented in section XX of this document.

Task 7.3

Training management & material development (Task Leader: HUA)

- During T7.3, the project organized the 1st Progress Meeting initiating the coordination for future training activities.
- The direct interactive channel of dissemination is expected to be the most efficient channel for community building and developing awareness about the concept of Circular Economy, ICT, and IoT, and the project outcomes to enable exploitation.
- The design of the banner for the project was finalized.

Deviations and Issues

✓ No deviations nor issues are reported for the reporting period.

Next Steps:

✓ Refer to section 4 for overall dissemination plan

2.2 Secondment Reporting

Considering rollout of secondments for the first year of project implementation, a consolidated list of actual secondments is displayed below (**Table 2**) against the planned order of secondments (**Table 1**) as set in DoA. In table 2, all differences and deviation from initial secondment plan are marked in red for easy reference. A report on secondment progress would be presented in 2.3

Table 1: SmartShip Total Secondments according the DOA (M1 – M12)

Sec. No.	Res. No.	Researcher Category	Sending Partner	Sending Country	Seconded to Partner	Seconded to Country	Starting Month	Duration	Work Package
1	20	ADM	4. ENPC	France	2. ITML	Greece	1	4	2
2	28	ER	6. TUBS	Germany	2. ITML	Greece	1	6	2
3	35	ESR	7. HUA	Greece	1. DANAOS	Cyprus	4	6	2
4	2	ER	1. DANAOS	Cyprus	4. ENPC	France	5	5	2
5	18	ESR	4. ENPC	France	2. ITML	Greece	1	2	2
6	14	ER	4. ENPC	France	2. ITML	Greece	3	4	2
7	3	ER	1. DANAOS	Cyprus	7. HUA	Greece	5	5	2
8	14	ER	4. ENPC	France	5. BLS	Poland	10	3	2
11	5	ER	2. ITML	Greece	4. ENPC	France	10	6	3
14	7	ESR	2. ITML	Greece	4. ENPC	France	10	6	3
15	19	ESR	4. ENPC	France	3. EPS	Malta	11	4	3
20	15	ER	4. ENPC	France	2. ITML	Greece	10	5	4
23	11	ER	3. EPS	Malta	7. HUA	Greece	10	3	4
24	8	ESR	2. ITML	Greece	4. ENPC	France	12	5	4
32	16	ER	4. ENPC	France	1. DANAOS	Cyprus	10	4	5
35	21	ER	5. BLS	Poland	4. ENPC	France	10	6	5
36	17	ESR	4. ENPC	France	2. ITML	Greece	12	4	5

64	11	ER	3. EPS	Malta	7. HUA	Greece	4	3	7
65	27	ESR	5. BLS	Poland	7. HUA	Greece	10	6	7

Table 2: Updated-Actual SmartShip Secondment Plan (M1 – M12)

Sec. No.	Res. No.	Researcher Category	Sending Partner	Sending Country	Seconded to Partner	Seconded to Country	Starting Month	Duration	WP	Status
1	20	Mr Hernan Ruiz- ADM	4. ENPC	France	2. ITML	Greece	8	4	2	**Completed**
4	6	Mr Marinos Tsantekidis - ER	6. TUBS	Germany	2. ITML	Greece	1	1	2	**Completed**
17	6	Mr Marinos Tsantekidis -ER	6. TUBS	Germany	2. ITML	Greece	9	1	2	**Completed**
16	4	Mr Vasilis Prevelakis- ER	6. TUBS	Germany	2. ITML	Greece	9	1	2	**Completed**
4	18	Mr George Alexandris —ESR	4. ENPC	France	2. ITML	Greece	8	2	2	**Completed**
5	14	Ms. Vlatka Katusic-ER	4. ENPC	France	2. ITML	Greece	8	4	2	**Completed**
10	35	Mr Ioannis Kontopoulos –ESR	7. HUA	Greece	1. DANAOS	Cyprus	10	5	2	Ongoing
11	36	Mr Antonis Makris- ESR	7. HUA	Greece	3. EPS	Malta	4	5	2	**Competed**
14	20	ADM	4. ENPC	France	2. ITML	Greece	9	3	3	**Completed**
15	7	Mr. Antonis Tarantilis- ESR	2. ITML	Greece	4. ENPC	France	10	6	4	Ongoing
16	12	Ms Despina Kallidromitou-ESR	3. EPS	Malta	4. ENPC	France	10	6	3	Ongoing
24	8	Ms Aristi Kontaloni- ESR	2. ITML	Greece	4. ENPC	France	10	6	3	Ongoing
50	9	Ms Evi Chavele- ADM	2. ITML	Greece	4. ENPC	France	10	4	7	Ongoing
70	11	Mr Markos Bonazountas-ER	3. EPS	Malta	7. HUA	Greece	1	1	7	**Completed**
71	21	Mr. Jakub Rola –ESR	5. BLS	Poland	7. HUA	Greece	4	3	7	**Completed**
72	27	Mr. Piotr Kowalski- ESR	5. BLS	Poland	7. HUA	Greece	4	3	7	**Completed**
81	11	Mr Markos Bonazountas-ER	3. EPS	Malta	7. HUA	Greece	7	3	7	**Completed**

Following, individual reports (in a common given template) of all completed and ongoing secondments per partner are presented reflecting, within the first year of project implementation, all research performed by the secondees as well as records of the knowledge transfer as derived from the interaction of secondees with the host party.

Table 3: ITML Secondments

<table>
<tr><td>Sending Partner</td><td colspan="5">ITML</td></tr>
<tr><td>Seconded to Partner</td><td colspan="5">ENPC</td></tr>
<tr><td rowspan="3">Researchers:</td><td>Ms Evangelia Chavele</td><td rowspan="3">Start date – end date</td><td>20/01/2020 – 19/05/2020</td><td rowspan="3">Relevant WPs</td><td>WP7</td></tr>
<tr><td>Ms Aristi Kontaloni</td><td>20/01/2020 – 23/07/2020</td><td>WP3</td></tr>
<tr><td>Mr Antonis Tarantilis</td><td>20/01/2020 – 23/07/2020</td><td>WP4</td></tr>
<tr><td>Description:</td><td colspan="5">Ms Evangelia Chavele, Ms Aristi Kontaloni and Mr Antonis Tarantilis from ITML officially started their secondments on 20th of January in ENPC, France. Their secondments are linked with WP7, WP3, and WP4, respectively. More specifically, Ms Evangelia Chavele is involved in dissemination and exploitation activities, Ms Aristi Kontaloni with the support of ENPC, and DANAOS is actively involved in the design and specification of the SmartShip architecture based on the system requirements described in WP2, while Mr Antonis Tarantilis is involved in WP4 activities and specifically on the research, identification and reporting of any market-ready tool and technology already applied in the maritime industry, related to IoT-based advanced data analytics. Moreover, ITML seconded researchers are presenting the relevant WP progress and next steps to SmartShip partners from ENPC periodically.</td></tr>
<tr><td>Researcher Declaration:</td><td colspan="5"> 
</td></tr>
<tr><td>Photos</td><td colspan="5"> 

 </td></tr>
</table>

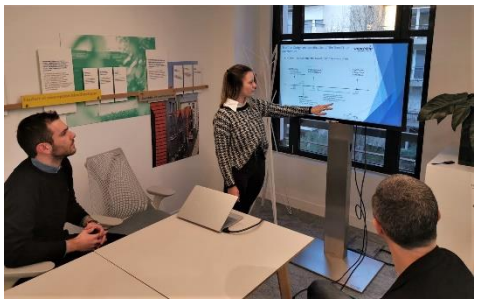
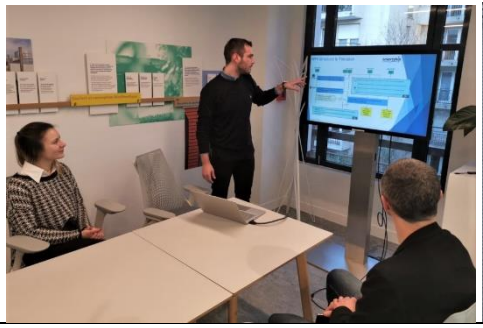
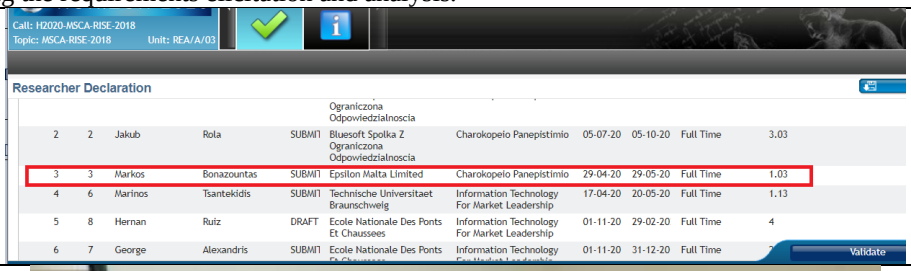
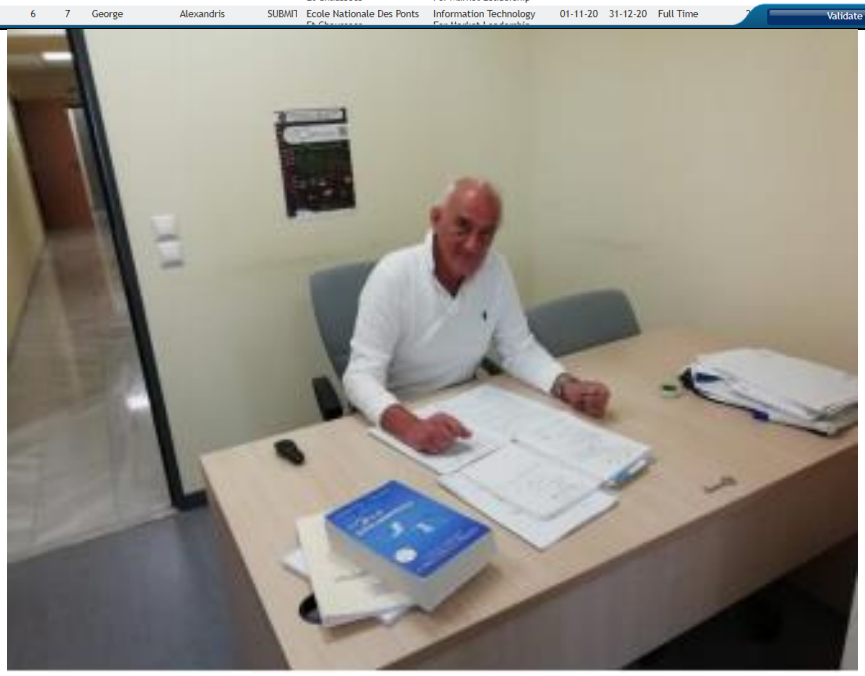
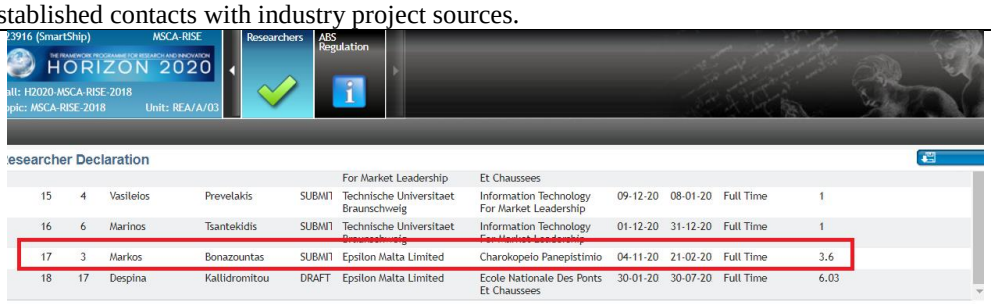
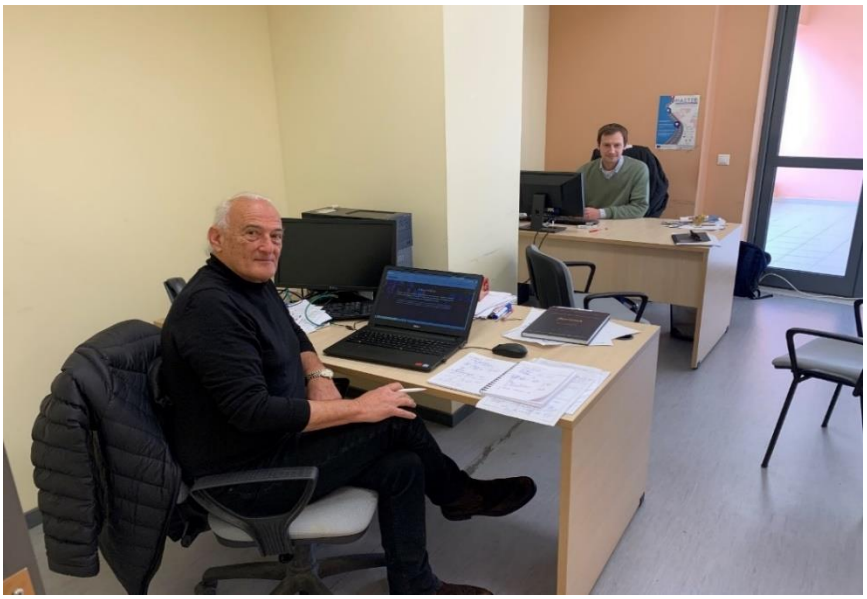
	       
URLs:	• https://smartship2020.eu/news/Secondments-from-ITML-to-ENPC • https://smartship2020.eu/news/Secondments-from-ITML-to-ENPC-%282nd-report%29

Table 4: EPSILON Secondments

Sending Partner	EPS				
Seconded to Partner	HUA				
Researchers:	Markos Bonazountas	**Start date – end date**	29/04/2019 – 29/05/2019	**Relevant WPs**	WP7
Description:	The main objective of this task is to organize the knowledge exchange between academic and non-academic experts in the fields of IoT and Advanced Data analytics. In more detail, state of the art reports will be delivered, to summarize all recent advances in the aforementioned fields,				

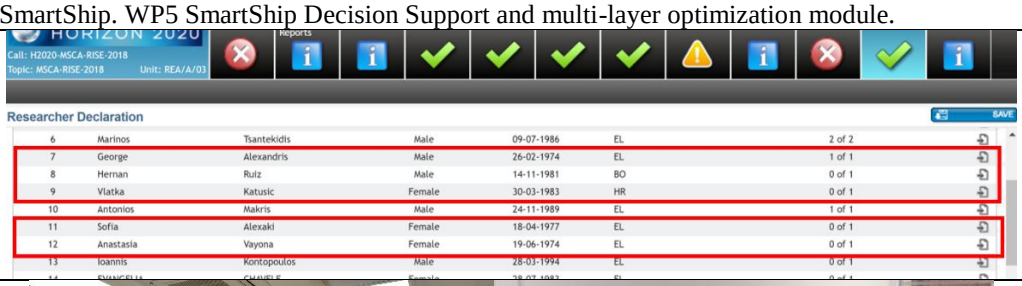
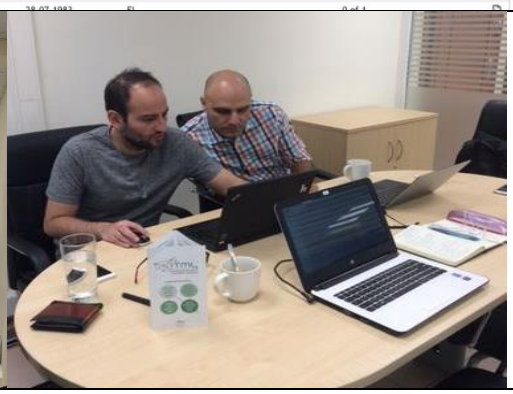
	specifically implemented in the maritime industry, and based on the technical details defined during the requirements elicitation and analysis.
Researcher Declaration:	
Photos	 
URL:	https://smartship2020.eu/news/1st-Secondment-from-EPSILON-to-HUA

Sending Partner	EPS
Seconded to Partner	HUA

Researchers:	Mr. Markos Bonazountas	**Start date – end date**	04/11/2019 – 21/02/2020	**Relevant WPs**	WP7
Description:	The secondment of this period is linked to WP7 Dissemination, exploitation, and training management. In specific, with T7.1 Dissemination management. During the secondment, researcher exchanged, applied and promoted knowledge transfer through a variety of dissemination channels. In particular, reviewed academic literature of visiting partners access, cross-fertilize knowledge with the entire project team on a one-to-one basis meeting, as well as established contacts with industry project sources.				
Researcher Declaration:					
Photos	 				
URL:	smartship2020.eu/news/2nd-Secondment-from-EPSILON-to-HUA				

Sending Partner	EPS				
Seconded to Partner	ENPC				
Researchers:	Ms. Despina Kallidromitou	**Start date – end date**	30/01/2020 – 30/07/2020	**Relevant WPs**	WP3
Description:	The secondment for this period is linked to WP3 SmartShip Circular Economy based architecture design				
Researcher Declaration:	N/A				
Photos	N/A				
URL:	N/A				

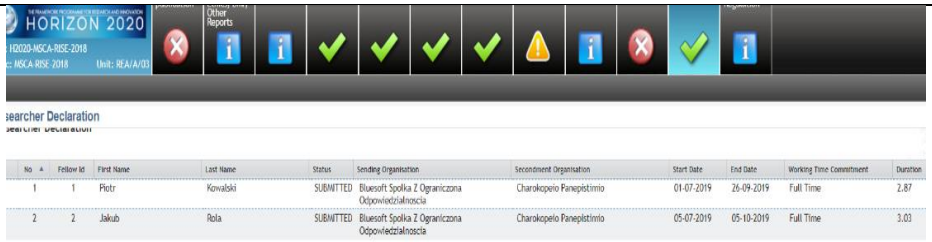
Table 5: ENPC Secondments

Sending Partner	ENPC				
Seconded to Partner	ITML and DANAOS				
Researchers:	Hernan Ruiz	**Start date – end date**	01/11/2019 – 29/02/2020	**Relevant WPs**	WP2
	George Alexandris		01/11/2019 – 31/12/2020		WP2
	Vlatka Katusic		01/11/2019 – 29/02/2020		WP2
	Sofia Alexaki		15/12/2019 – 15/03/2020		WP3
	Anastasia Vayona		09/02/2020 – 09/06/2020		WP5
Description:	The secondments for this period are linked with WP2 and WP3. WP2 Requirements elicitation, use case scenarios, and roadmaps for integrated vessel management presents a sketch of a roadmap for sustainable marine vessel management optimization in terms of energy efficiency, fuel consumption, and emissions control. WP3 SmartShip Circular-Economy based functional architecture design. Incorporation of Circular Economy principles on the architecture of SmartShip. WP5 SmartShip Decision Support and multi-layer optimization module.				
Researcher Declaration:					
Photos	 				

	   
URL:	• https://smartship2020.eu/news/Secondments-from-ENPC-to-ITML • https://smartship2020.eu/news/Secondments-from-ENPC-to-DANAOS

Table 6: BLS Secondments

Sending Partner	BLS				
Seconded to Partner	HUA				
Researchers:	Mr. Jakub Rola	**Start date – end date**	05/07/2019 – 05/10/2019	**Relevant WPs**	WP7
	Mr. Piotr Kowalski		01/07/2019 – 26/09/2019		WP7
Description:	Jakub Rola and Piotr Kowalski were on secondment at Harakopio University for 3 months, from July to September. The secondment was linked with WP7, and in particular with Task 7.3. During the secondment, Piotr and Jakub got knowledge about the maritime industry, existing solutions, and algorithms that will help develop software for planning vessel routes and cost optimization on the next stage of the SmartShip project. Konstantinos Tserpes, Antonios Makris, and Ioannis Kontopoulos organized pieces of training about machine learning techniques and predictive trajectory of vessel routes based on data collected by Harakopio University from Piraeus port. They have also participated in meetings in the Danaos office where SmartShip use case scenarios were discussed.				

Researcher Declaration:	 No. ▲ | Fellow Id | First Name | Last Name | Status | Sending Organisation | Secondment Organisation | Start Date | End Date | Working Time Commitment | Duration 1 | 1 | Piotr | Kowalski | SUBMITTED | Bluesoft Spolka Z Ograniczona Odpowiedzialnoscia | Charokopeio Panepistimio | 01-07-2019 | 26-09-2019 | Full Time | 2.87 2 | 2 | Jakub | Rola | SUBMITTED | Bluesoft Spolka Z Ograniczona Odpowiedzialnoscia | Charokopeio Panepistimio | 05-07-2019 | 05-10-2019 | Full Time | 3.03
Photos	 

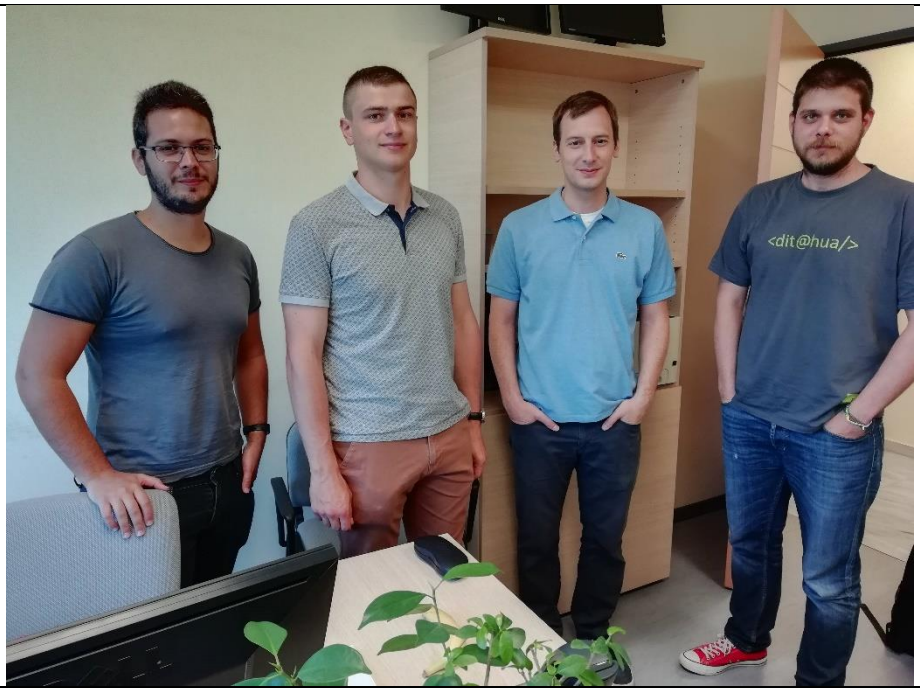
	
URL:	https://smartship2020.eu/news/Secondments-from-BLS-to-HUA

Table 7: TUBS Secondments

Sending Partner	TUBS				
Seconded to Partner	ITML				
Researchers:	Prevelakis Vassilis	**Start date – end date**	09/12/2019 - 08/01/2020	**Relevant WPs**	WP2
	Tsantekidis Marinos		17/04/2019 - 20/05/2019		WP2
	Tsantekidis Marinos		01/12/2019 - 31/12/2019		WP2
Description:	Prof. Prevelakis Vassilis and Mr. Tsantekidis Marinos have successfully completed their secondments (one month and two months respectively) from TUBS to ITML. These secondments are linked with Task 2.1: Requirements elicitation and analysis in which TUBS is closely cooperating with HUA and Danaos. The work carried out was part of the deliverable "D2.1: SmartShip requirements analysis, scenarios, and KPIs definition" that describes specific types of requirements essential for the design and development of the SmartShip framework. Moreover, the deliverable describes use cases of the framework, actors who will interact with the system, and their roles. For each use case, user requirements are defined along with the methodology and the procedures with which requirements will be tracked and prioritized. This deliverable identifies marine market needs in energy efficiency, emissions control, vessel surveillance, and how SmartShip contributes to the aforementioned fields.				
Researcher Declaration:					
Photos					

Researcher Declaration

Add Declaration

No	Fellow Id	First Name	Last Name	Status	Sending Organisation	Secondment Organisation	Start Date	End Date	Working Time Commitme	Duration	Actions
3	3	Markos	Bonazountas	SUBMITTED	Epsilon Malta Limited	Charokopeio Panepistimio	29-04-2019	29-05-2019	Full Time	1.03	
4	6	Marinos	Tsantekidis	SUBMITTED	Technische Universitaet Braunschweig	Information Technology For Market Leadership	17-04-2019	20-05-2019	Full Time	1.13	
5	8	Hernan	Ruiz	DRAFT	Ecole Nationale Des Ponts Et Chaussees	Information Technology For Market Leadership	01-11-2019	29-02-2020	Full Time	4	
6	7	George	Alexandris	SUBMITTED	Ecole Nationale Des Ponts Et Chaussees	Information Technology For Market Leadership	01-11-2019	31-12-2019	Full Time	2	
7	9	Vlatka	Katusic	DRAFT	Ecole Nationale Des Ponts Et Chaussees	Information Technology For Market Leadership	01-11-2019	29-02-2020	Full Time	4	
8	10	Antonios	Makris	SUBMITTED	Charokopeio Panepistimio	Epsilon Malta Limited	19-07-2019	18-12-2019	Full Time	5	
9	11	Sofia	Alexaki	DRAFT	Ecole Nationale Des Ponts Et Chaussees	Information Technology For Market Leadership	15-12-2019	15-03-2020	Full Time	3.03	
10	12	Anastasia	Vayona	DRAFT	Ecole Nationale Des Ponts Et Chaussees	Danaos Shipping Company Limited	09-02-2020	09-06-2020	Full Time	4.03	
11	13	Ioannis	Kontopoulos	DRAFT	Charokopeio Panepistimio	Danaos Shipping Company Limited	09-01-2020	08-06-2020	Full Time	5	
12	14	EVANGELIA	CHAVELE	DRAFT	Information Technology For Market Leadership	Ecole Nationale Des Ponts Et Chaussees	20-01-2020	24-04-2020	Full Time	3.17	
13	16	ANTONIOS	TARANTILIS	DRAFT	Information Technology For Market Leadership	Ecole Nationale Des Ponts Et Chaussees	20-01-2020	23-07-2020	Full Time	6.13	
14	15	ARISTEA	KONTALONI	DRAFT	Information Technology For Market Leadership	Ecole Nationale Des Ponts Et Chaussees	20-01-2020	23-07-2020	Full Time	6.13	
15	17	Urszula	Stawicka	DRAFT	Bluesoft Spolka Z Ograniczona Odpowiedzialnoscia	Ecole Nationale Des Ponts Et Chaussees	28-02-2020	02-06-2020	Full Time	3.2	
16	4	Vasileios	Prevelakis	DRAFT	Technische Universitaet Braunschweig	Information Technology For Market Leadership	09-12-2019	08-01-2020	Full Time	1	
17	6	Marinos	Tsantekidis	DRAFT	Technische Universitaet Braunschweig	Information Technology For Market Leadership	01-12-2019	31-12-2019	Full Time	1	

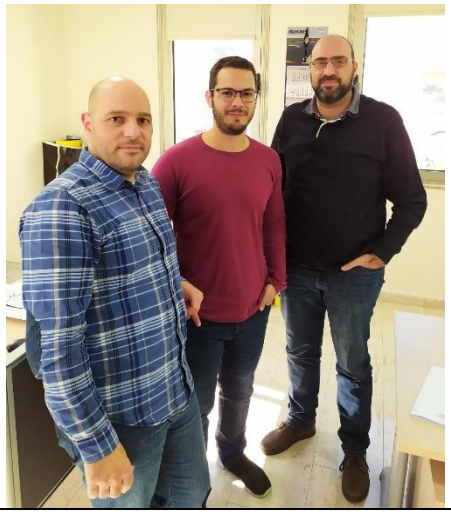
	 
URL:	• https://smartship2020.eu/news/Secondment-from-TUBS-to-ITML • https://smartship2020.eu/news/2nd-Secondment-from-TUBS-to-ITML

Table 8: HUA Secondments

Sending Partner	HUA				
Seconded to Partner	EPSILON				
Researchers:	Antonis Makris	**Start date – end date**	19/07/2019 – 18/12/2019	**Relevant WPs**	WP2
Description:	Mr Antonios Makris from HUA has successfully completed the secondment (5 PMs) in EPS, Malta from the 19th of July 2019 to the 18th of December 2019. The secondment was linked with WP2 and specifically with T2.1: Requirements elicitation and analysis. The purpose of the secondment was to provide a detailed description of specifications and requirements from both the maritime field and the technology field, which will be essential for the design and development of the SmartShip framework.				

Researcher Declaration:	Secondment id: 8 Secondee id: 10
Photos	 
URL:	https://smartship2020.eu/news/Secondment-from-HUA-to-EPSILON

Sending Partner	HUA				
Seconded to Partner	DANAOS Shipping				
Researchers:	Ioannis Kontopoulos	**Start date – end date**	09/01/2020 – 08/06/2020	**Relevant WPs**	WP2
Description:	Mr Ioannis Kontopoulos from HUA officially started his secondment on the 9th of January in Danaos Shipping Limited, Cyprus. His secondment is linked with WP2 and WP4. Mr Ioannis Kontopoulos with the support of ENPC and DANAOS will be involved in sketching the roadmaps for sustainable marine vessel management optimization in the last Task of WP2. At the same time, regarding WP4 (Task 4.1), he will be organizing the knowledge exchange between academic and non-academic experts and he will be responsible for creating state of the art reports in the fields of IoT and Advanced Data Analytics.			
Researcher Declaration:	Secondment id: 11 Secondee id: 13				

Photos	    
URL:	https://smartship2020.eu/news/Secondment-from-HUA-to-DANAOS

2.3 Deliverables, Project and Secondment Progress

2.3.1 List of Deliverables

In below **Table 9**, a list of deliverables due by M12 is presented. Any issue or deviation observed is recorded.

Table 9: List of Deliverable (M1-M12)

Deliverable No.	Description	Lead Partner	Type	Dissemination Level	Due Date	Submission Date	Comments
7.1	Data Management Plan	ENPC	ORDP: Open Research Data Pilot	Confidential, only for members of the consortium (including the Commission Services)	30/9/2019	1/10/2019	A non-critical delay of 1 day in official submission of final version to EU portal occurred
2.1	SmartShip requirements analysis, scenarios and KPIs definition	HUA	Report	Public	31/12/2019	29/12/2019	On time delivery

2.3.2 Project Technical Progress

Given that no issues or deviations on WP progress or any delay on deliverables' submission have been noticed so far, it is concluded that actual technical progress is aligned with planned for the first 12 months of the project. Project is on schedule against work-plan baseline. In percentage, approximately 27% of project work is completed which is equal to ¼ of overall technical effort as projected to be consumed in the first year of SmartShip (48 Months duration). Below **Table 10** is quantifying completion percentage by each task giving an aggregated average per WP.

Table 10: Percentage Completion per Task

Task	Mst	Mend	Duration	Completion %M12
1.1	1	48	48	25%
1.2	1	48	48	25%
1.3	1	48	48	25%
2.1	1	9	9	100%
2.2	1	9	9	100%
2.3	10	18	9	33%
3.1	10	18	9	33%
3.2	10	18	9	33%
3.3	19	24	6	0%
4.1	10	19	10	30%
4.2	10	19	10	30%
4.3	20	36	17	0%
5.1	10	19	10	30%
5.2	10	19	10	30%
5.3	20	36	17	0%
6.1	25	42	18	0%
6.2	30	44	15	0%
6.3	25	29	5	0%
6.4	30	48	19	0%
7.1	1	48	48	25%
7.2	1	48	48	25%
7.3	1	48	48	25%

2.3.3 Project Secondment Plan Progress

By aggregating number of man month (MM) spent per partner for secondments (refer to **Table 2**), we come up with below picture (**Table 11**) which portrays a comparison of actual research effort in secondments of each partner dedicated to each WP versus estimated as stated in the DoA. Specifically, actual total number of MMs spent is measured and recorded both in reference to each partner and each work package. Completion percentage of effort planned for secondments for the first year of the project is given again per WP and per partner.

Table 11: Actual Vs Planned Secondments (M1-M12)

Initial Secondment plan. Effort (MM) per partner									
	Partners							**Total/WP**	
WP No	DANAOS	ITML	EPS	ENPC	BLS	TUBS	HUA		
2	10			13		6	6	35	
3		6		2				8	
4		1	3	3				7	
5				4	3			7	
6	0	0	0	0	0	0	0	0	
7			3		3			6	
Total/Partner	10	7	6	22	6	6	6		
							SUM:	63	
Actual Secondment plan. Effort (MM) per partner									
	Partners							**Total/WP**	
WP No	DANAOS	ITML	EPS	ENPC	BLS	TUBS	HUA		**DEV/WP**
2	0			10		3	8	21	60%
3		3	3	3				9	113%
4		3		0				3	43%
5				0				0	0%
6	0	0		0		0	0	0	N.A
7		3	4		6			13	217%
Total/Partner	0	9	7	15	6	3	8		
DEV/Partner	0%	129%	117%	59%	100%	50%	133%		
							SUM:	46	73%

It is noted that the actual secondment plan is **not significantly** lagging behind from initial plan (Done 73% of what was planned). This is mostly due to the reallocation of DANAOS secondments dedicated to WP2 to a later stage of WP progression. DANAOS has not performed any secondment as planned and reasoning behind this decision is that respective partner is assuming that most of his research effort should be allocated to T2.3 (M10-18). This change is reflecting an aggregated deviation of minus 40% of actual versus planned secondments dedicated to WP2. On the other hand, this deviation did not have any negative impact to sound and successful delivery of work planned for T2.1 and T2.2 both completed in the first year of project timeline. On top of that, DANAOS contributed significantly to the technical implementation of both tasks.

The small percentage of actual MMs against initially planned for secondments with respect to WP4 and WP5 should also be noted. However, both WPs started in M10 and secondments will catch up with estimated numbers at later stage. Effort spent in secondments for WP7 (2 times more MMs than planned) reflecting the attention that consortium gives in the dissemination and exploitation of project's results even from the beginning of project. Concluding, we should highlight the fact that, with the exception of DANAOS and TUBS, all other partners have performed secondments with minor or moderate deviation

from what was anticipated in their initial individual plan. As far as TUBS is concerned, there was a re-allocation of 50% of MM for secondments, as planned until M12, to a later stage of project plan, by taking out half of MMs assigned to WP2 and allocate them to other packages so to balance research effort across project work plan. Finally, it should be noted that secondments planned to start late M11 (February2020) and M12 (March2020) have been in a "standby mode" or in other words put off at a later time due to travelling restrictions attributed to COVID-19 outbreak thus causing deviations in secondment plan (especially for WP4 and WP5).

2.4 Risk Analysis and Corrective Measurements

Following, we display a list of risks and mitigation actions as identified in DoA (**Table 12**). Where necessary we provide a revised corrective plan and we indicate if any corrective action has been materialized along project development until M12.

Table 12: Risk Analysis as per DoA

Risk Number	Description of Risk	Mitigation Measures as DOA	Revised Mitigation Measured	Risk Materialized
1.	Underperforming partner	All consortium partners are highly committed to the project and it is unlikely to expect this situation. If it occurs, the flexible project management structure and Consortium Agreement allow a quick shift of resources to alternative project partners.	Not Revised	Not Materialized
2.	Partner leaving the project	In this unlikely case, it would only have a temporarily disruptive effect, as the consortium is well-balanced, and the affected tasks can be allocated to another partner. Otherwise, the flexible management structure allows quick inclusion of new partners in the consortium if necessary	Not Revised	Not Materialized
3.	Keyperson left or is temporarily not available	Consortium partners are involved in the related areas with more than one staff member, ensuring an immediate substitution. Furthermore, the project as whole has technical excellence in related disciplines spread across the partners, providing additional substitution possibilities.	Not Revised	Not Materialized
4.	Needed partners' resources are underestimated	In this case, the project management bodies will analyse the following possibilities to ensure that planned work can be completed: (i) rearranging resources among the partners as needed, (ii) committing further internal resources of organizations in project activities (if possible), and (iii) re-planning work on the activities in accordance with previous measures	Not Revised	Not Materialized
5.	Project schedule is partly not appropriate	The project management structure and measures continuously monitor performed work vs. project plan and are entitled to perform corrective actions – change of the project plan – if necessary, which also apply for this case. In crucial cases, the PM will work on the plan adaptation in close cooperation with EC.	Not Revised	Not Materialized
6.	Project milestones or deliverables are delayed	In the scope of project management monitoring activities, detailed analysis will be done on both global project and lower (WP/Task) project implementation levels. Thus, it will be ensured that such cases are recognized in early stages, ensuring timely and effective implementation of necessary corrections in the work plan.	Not Revised	Not Materialized
7.	Agreement among partners is difficult to achieve	The collaboration spirit in the consortium targets to achieve consensus among all partners on the open issues and the project management bodies will work in this direction. However, in order to avoid a lengthy consensus making processes, which might affect the project plan, the	Not Revised	Not Materialized

		related management procedures for decision making and conflict resolution will be timely applied.		
8.	Not satisfactory interaction among WP's and tasks	The regular synchronization of work among WP's will be performed in the scope of project management activities, so these cases should not occur or are timely recognized allowing implementation of corrective actions without impact on the project plan. If the problems continue, the PM together with WP leaders will analyse problems and propose procedures for interactions improvement	Not Revised	Not Materialized
9.	Necessary coordination level in secondment is not achieved	Similar as it will be done for monitoring of the technical project activities, including analysis of work done and implementation of the corrective actions, the project coordination and management will be observed as well. Thus, if necessary, the responsible management bodies will propose the corrective actions improving overall project coordination. If needed, management of the Coordinator organization will be involved to solve the problems.	Not Revised	Not Materialized
10.	Problems in integrating components in once platform	An agile approach has been proposed for the SmartShip implementation lifecycle to ensure efficient integration; SmartShip technical partners have significant expertise in platforms' integration	Not Revised	Not Materialized
11.	Low technical quality of deliverables	Addressed through regular quality reviews and assignment of peer reviews for each deliverable.	Not Revised	Not Materialized
12.	Underperformance of technologies and optimisation tools delivered	The Agile approach in the design and development phase, as described before, will ensure that the final developments meet the requirements defined in WP2 and the relevant KPIs.	Not Revised	Not Materialized
13.	Not enough external parties reached to SmartShip knowledge	Several different/ complementary activities have been planned (training sessions, workshops, conferences etc.) to ensure that the wider public is efficiently reached and the SmartShip knowledge is disseminated.	Not Revised	Not Materialized
14.	Delays in participants administrative achievements	A workplan and guidelines, including a set of procedures and templates, will become available for all partners within the consortium at the beginning of the project.	Not Revised	Not Materialized
15.	Staff turnover	All participants will identify additional personnel with the necessary experience - not initially intended to be seconded in the project work - so that the risk is minimized.	Not Revised	Not Materialized
16.	Delay in the implementation of secondments	The consortium has allocated a partner organisation as secondments manager (SM) (ENPC), which will closely monitor secondments' implementation in terms of the accuracy and efficiency of the planned and implemented actions. In addition to this, each partner will have a designated person at the level of each participant to ensure smooth implementation of secondments. The SM will organise Skype meeting every 2 months with the Project Coordinator and the designated persons to discuss the monitoring of the secondments and collect any	Not Revised	**Materialized:** There have been noticed rearrangement of initial secondment plan for all partners. SM and Project coordinator

		information about possible identified delays at the participant level. Each Participant takes responsibility that the secondments will take place as planned and reports within 2 months prior to the scheduled secondment to the SM. Once a potential delay is identified, action plans will be agreed at Consortium level and the Coordinator will inform the REA about the solution found. A chapter specifically dedicated to this risk and the methods to implement upfront monitoring and continuous reporting will be included in the Consortium Agreement and in the Partnership Agreement accordingly.		assured and keep securing that all these amendments are in line with the safe execution of work-plan.

Below a table (**Table 13**) is portraying new risks not recorded in DoA but identified across project progress so far (until M12) together with corrective measurements applied.

Table 13: Risks Identified until M12

Risk Number	Description of risk	Corrective Measure	Risk Materialized
17.	Due to unforeseen emergency associated with COVID-19 outbreak in Europe there will be significant delays or changes in secondment plan rollout due to applied restrictions in travelling imposed by authorities. This will also cause significant delays in smooth delivery of anticipated project results.	Corrective Measures of Risk No16 (see table 12.) are applied. On top of that and given the extent of this force majeure issue and the degree of severity of implications to project progress, an extension to project time-plan will be considered by the consortium.	Not Materialized

2.5 Ethical issues

As per Grant Agreement (Article 34.2), SmartShip does not present any of the Ethics Issues listed in the Ethics Issues. All beneficiaries confirm that classified information, materials, or techniques as well as the research results of SmartShip will not be inappropriately disseminated. The consortium will set up a control process of the dissemination and exploitation strategy of the SmartShip results with regards to the above identified issues. This process will define the condition of dissemination (dissemination level for each deliverable). The result of this action will be part of the report at the end of each reporting period.

3. Dissemination activities performed during the First Year

3.1 Participation in events

3.1.1 Scientific Conferences.

During the reporting period, representatives of the partners assisted to the following scientific conferences:

- ✓ ECML PKDD - European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases. (*16/09/2019, Würzburg, Germany*)

3.1.2 Events.

SmartShip participated in the following external events:

- ✓ Researchers' Night at ESPCI (Espace des Sciences Pierre-Gilles de Gennes), (*27/09/2019, Paris, France*)
- ✓ Circular Economy Symposium at Harvard University, Boston, (*06/03/2020, Boston, USA*)
- ✓ Publicity Partner at Circular City Week New York.

3.1.3 Workshops

During the reporting period, representatives of the partners assisted to the following workshops:

- ✓ MSCA NPCs and Industry Workshop, Epsilon, Info Day (*03/07/2019, Valletta, Malta*)
- ✓ 2nd Workshop of EU Research & Innovation Maritime Projects, The Hellenic contribution.(*05/11/2019, Piraeus, Greece*)

3.2 Publications

3.2.1 Conference proceedings

Conference / Workshop	Title	Authors
First International Workshop MASTER 2019 on Multiple-Aspect Analysis of Semantic Trajectories, 19 September 2019, Würzburg, Germany.	Uncovering Hidden Concepts from AIS Data: A Network Abstraction of Maritime Traffic for Anomaly Detection	Ioannis Kontopoulos; Iraklis Varmalis; Konstantinos Tserpes

3.3 Project Website

This section presents the work performed by ***ITML*** within WP7 "Dissemination, exploitation, and training management" with respect to design and development of the ***SmartShip website*** to public use. In brief, the section provides an overview of the project's website and its structure.

The ***SmartShip website*** aims to act as a powerful tool for boosting information flow between all entities involved. It will also be used to disseminate targeted information to relevant interested parties. Several updates will be implemented as a result of adaptation to constantly effective online dissemination activity and emerging project results. To this end, revisions regarding the usability of the website with respect to the end-user will be made in addition to updates with contribution of content by all consortium members.

3.3.1 Overview, URL and Logo

The developing activities started in M1 (April 2019) and by the end of M2 (May 2019) it was ready for full operation, and since then it is updated in regular basis. The website consists of a public domain where users are able to gather information with respect to the project, dissemination material, deliverables, and SmartShip Consortium. The following URL has been acquired by the SmartShip consortium and is intended to be used by internet users for accessing the project website:

URL: https://smartship2020.eu/

The SmartShip website takes also full advantage of the project's logo color pallet.

Figure 2: The SmartShip Logo

3.3.2 Website Content

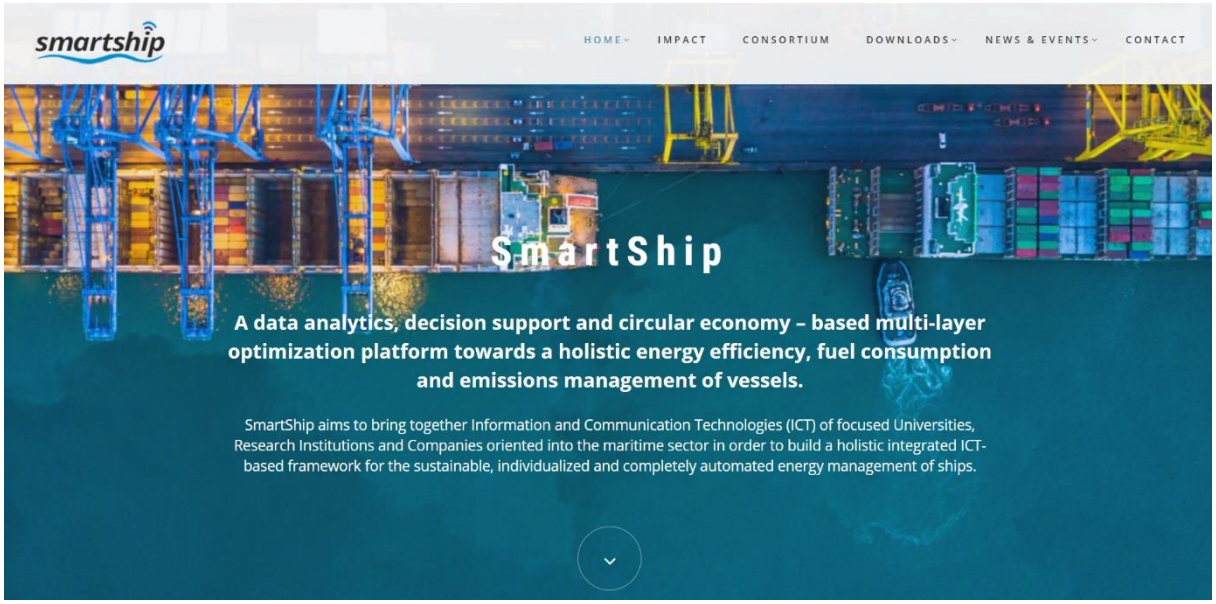
The SmartShip website is consisted of 6 main pages:

Table 14: SmartShip website main pages

Homepage	providing a concise description of the project at a glance;
Impact	providing information regarding the SmartShip impact in terms of Marie Skłodowska-Curie vision
Consortium	providing information about each partner of the SmartShip consortium
Downloads	where users can download SmartShip-related publications, public deliverables or project dissemination material
News & Events	Where users can be informed and kept updated regarding SmartShip meetings, events and ongoing secondments
Contact	where visitors can communicate with the website administrators

(i) The Home page

The homepage consists of 6 separate sections: (i) SmartShip Overview; (ii) SmartShip at a Glance; (iii) SmartShip Objectives; (iv) SmartShip Work Packages; (v) Partners Overview and (vi) contact information. The footer section of the homepage lists details about the received funding and SmartShip Key Facts. Snapshots of the SmartShip homepage are presented below.

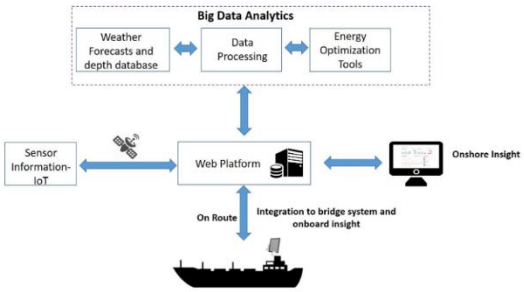


SmartShip at a Glance

SmartShip aims to offer a multi-layer optimization in the fields of fuel consumption, energy efficiency and emissions control management, in full respect to the implementation of the requirements of maritime sector regulations and taking into account applications of circular economy concepts in the maritime as well.

Knowledge exchange between the partners that are already involved in the maritime sector, the ICT technology industry partners and the academia partners is one of the major **SmartShip's** objectives and will be materialised through corresponding secondments during the whole project's timeplan.

SmartShip will capitalise on available COTS technologies and will deliver an ICT & IoT-enabled holistic cloud-based maritime performance & monitoring system, for the entire lifecycle of a ship, aimed to optimise energy efficiency, emissions reduction and fuel consumption, whist introducing circular economy concepts in the maritime field.



VIEW MORE

SmartShip Work Packages

WP1: Project Management and Secondments Coordination

WP2: Requirments elicitation, use case scenarios and roadmaps for integrated vessel management

WP3: SmartShip Circular-Economy based functional architecture design

WP4: SmartShip Baseline framework: IoT and advanced data analytics

WP5: SmartShip Decision Support System and multileayer optimization module

WP6: Integrated SmartShip Framework

WP7: Dissemination, exploitation and training management

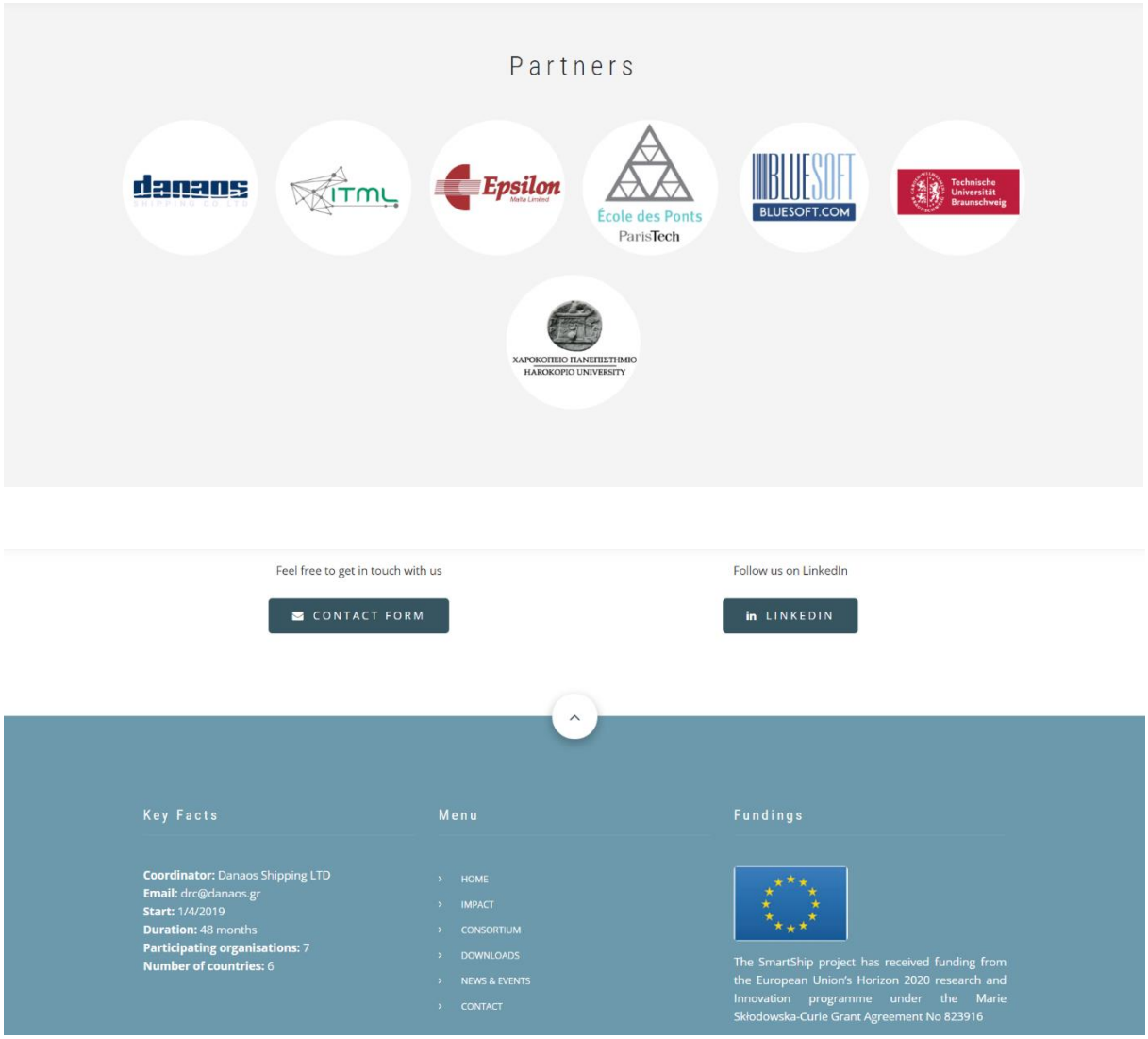
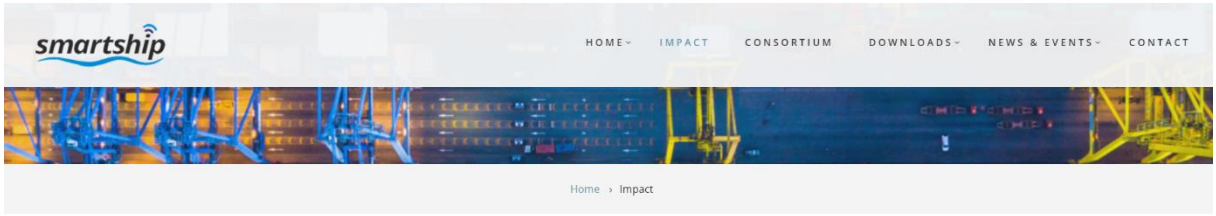


Figure 3: SmartShip homepage

(ii) The "Impact" page

In the "Impact" page; short-term, mid-term and long-term impacts are listed in terms of Marie Skłodowska-Curie vision.



Impact

SmartShip enhances the potential and future career prospects of the staff members

SmartShip fundamental goal is to bring together the ICT field, focusing on energy efficiency and emissions management within a Circular Economy concept for the maritime sector, thus, constitutes an interdisciplinary research initiative. As such, it will enhance the research skills of participants not only in a cross-sector way (academic vs non-academic), but also in a cross-domain way (ICT vs maritime), promoting knowledge in a threefold dimension spectrum, including CE principles. To do so, the project's activities have been designed in such a way so as to leverage the full potential of all individuals involved, providing novel career perspectives in both, the ICT and the maritime sector.

Figure 4: SmartShip "impact" page

(iii) The "Consortium" page

The current page provides information about each partner of the SmartShip consortium.

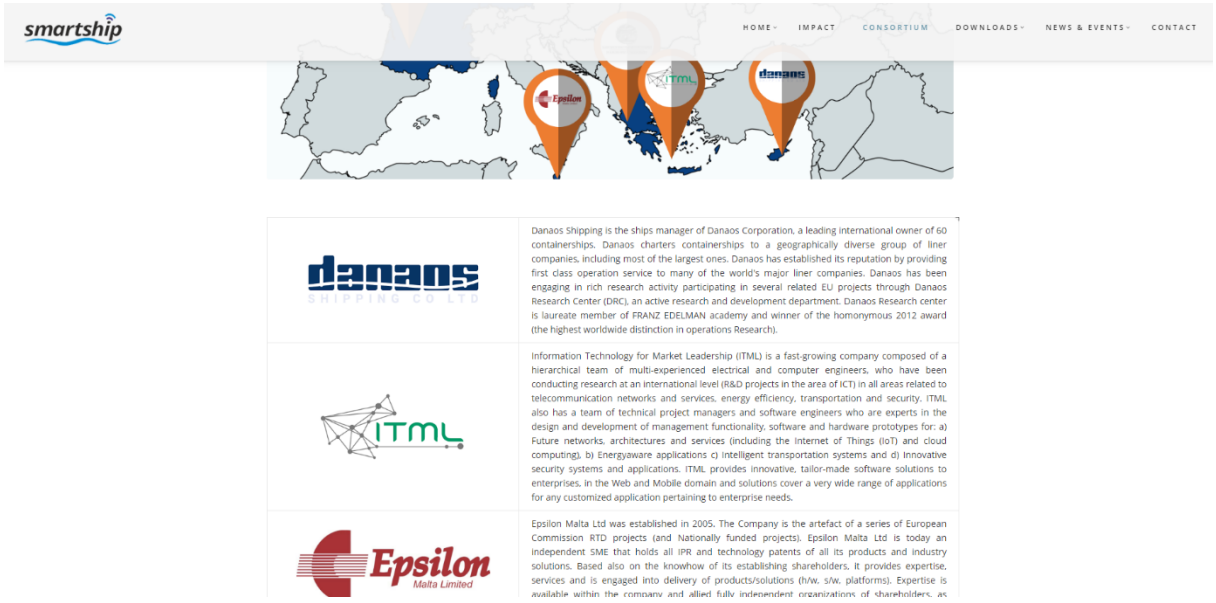


Figure 5: SmartShip "Consortium" page

(iv) The "Downloads" page

The current page is divided in four (4) tabs: Deliverables; Presentations; Publications, and Dissemination material. Website visitors can view and/or download corresponding content from each subpage.

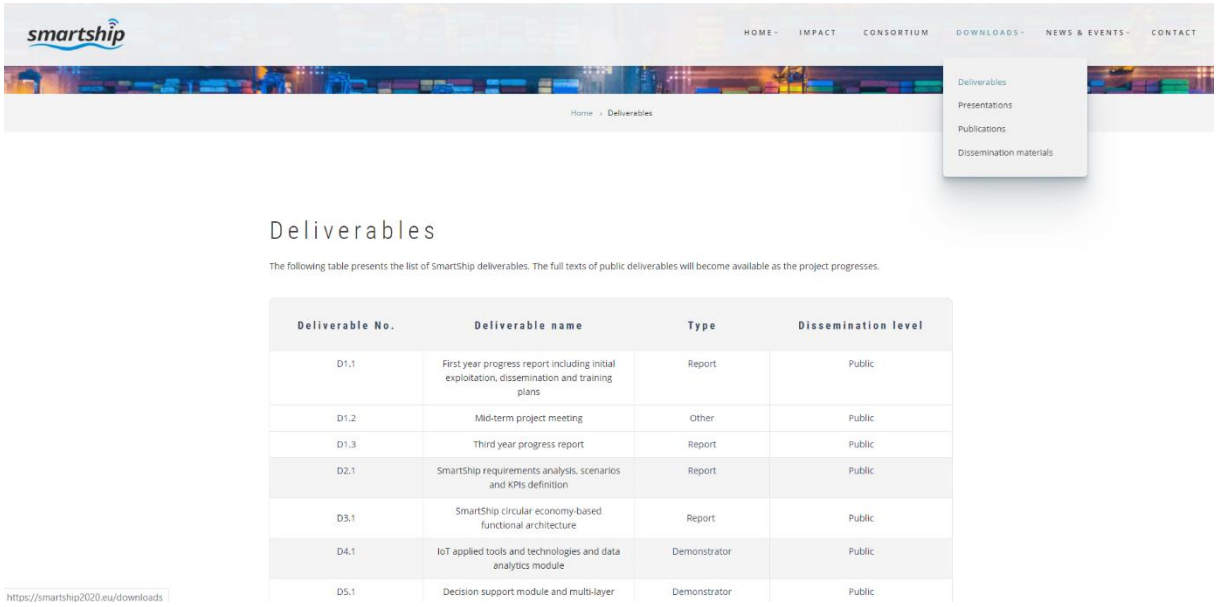


Figure 6: SmartShip "Downloads" Page

(v) The "News & Events" page

In the current page users can be informed and kept updated regarding SmartShip meetings, events and ongoing secondments.

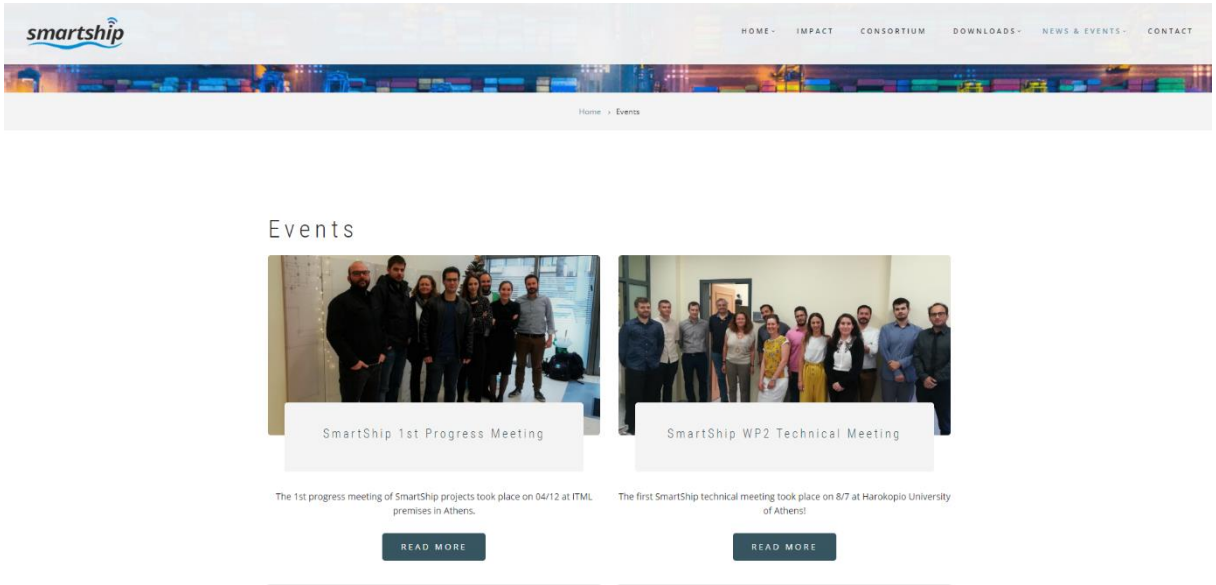


Figure 7: SmartShip "News & Events" Page

(vi) The "Contact" page

Web visitors can communicate with the website administrators using the contact form or send direct email to the project coordinator.

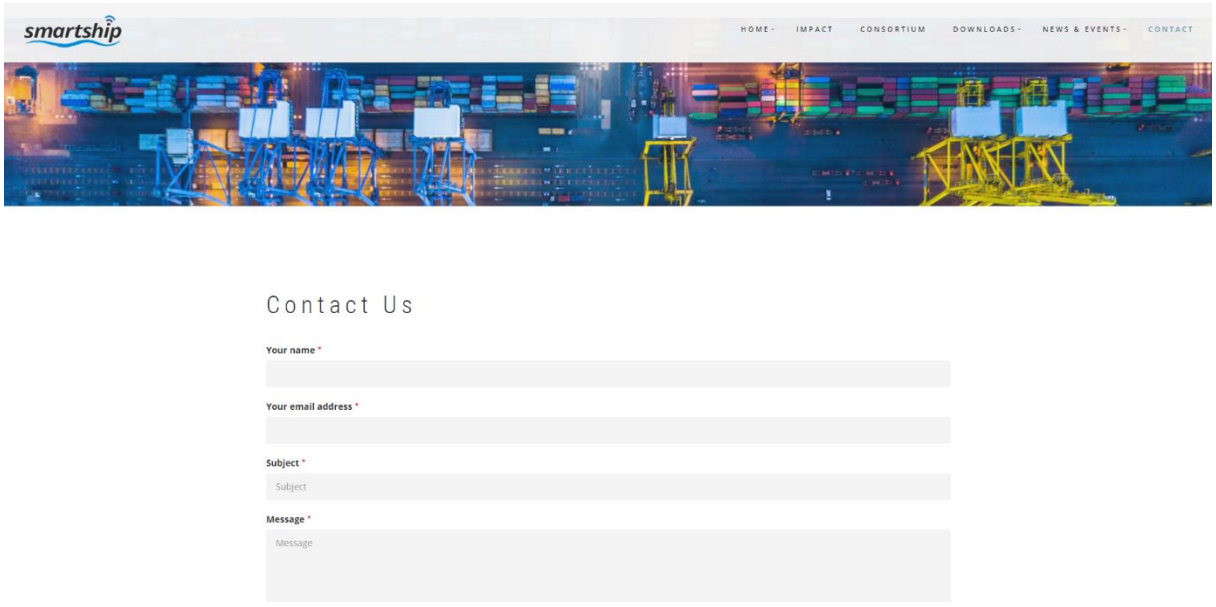


Figure 8: SmartShip "Contact" Page

3.3.3 Website Statistics

The SmartShip consortium utilizes the Google Analytics platform as a means to monitor activity of the project website and measure progress and impact. Google Analytics is an effective tool in terms of tracking web site traffic and get significant quantity of useful data with respect to dissemination impact in the sense of raise of public awareness. The SmartShip website has been registrant to Google Analytics Platform on M2, safe metrics on visits and visibility are quantifiable after the end of M8 and will be reported to future deliverables.

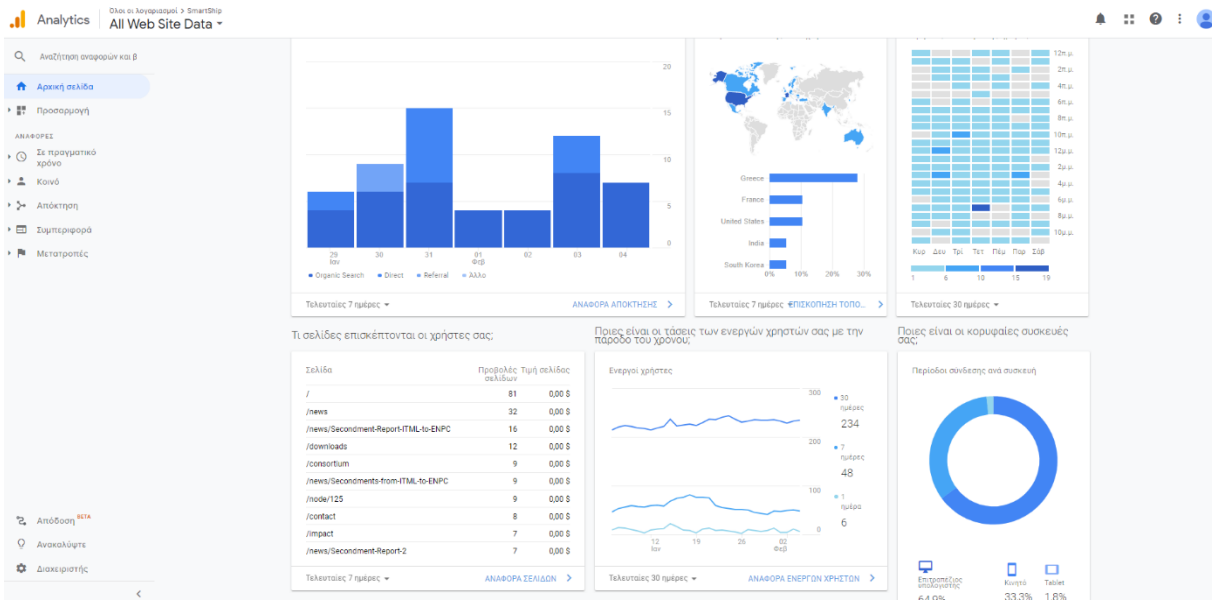


Figure 9: SmartShip Google Analytics

3.4 Project banner

A roll-Up Banner has been added to SmartShip printable dissemination material. The roll-up banner has been created to support the different dissemination activities of the project (**Figure 10**). The information depicted in the banner consists of the logo of the project as well as the logos of the companies' partners, the website of the project, the title, the aim, a brief explanation of the pairing the project with Circular Economy, and a brief description of the development of SmartShip. Finally, it includes information

related to the codification of the project and a mention to the European Commission. The roll-up banner will be used at events that the project will organise or contribute to. It is expected that their appearance in appropriate places will attract the attention of potential stakeholders and other audiences, especially during events, conferences, and workshops. They will be printed in a few copies since they can be re-used. Printable versions of the banner is available for partners' use in the SmartShip repository.

Figure 10: SmartShip Banner

3.5 Social Media

For the SmartShip project, LinkedIn and Twitter accounts were created as the primary initial proliferation of social media tools and are being used to disseminate SmartShip related news and events. **Figure 11** shows the SmartShip LinkedIn and Twitter accounts. The LinkedIn account has 196 followers, and the Twitter account has 48 followers and 23 tweets.

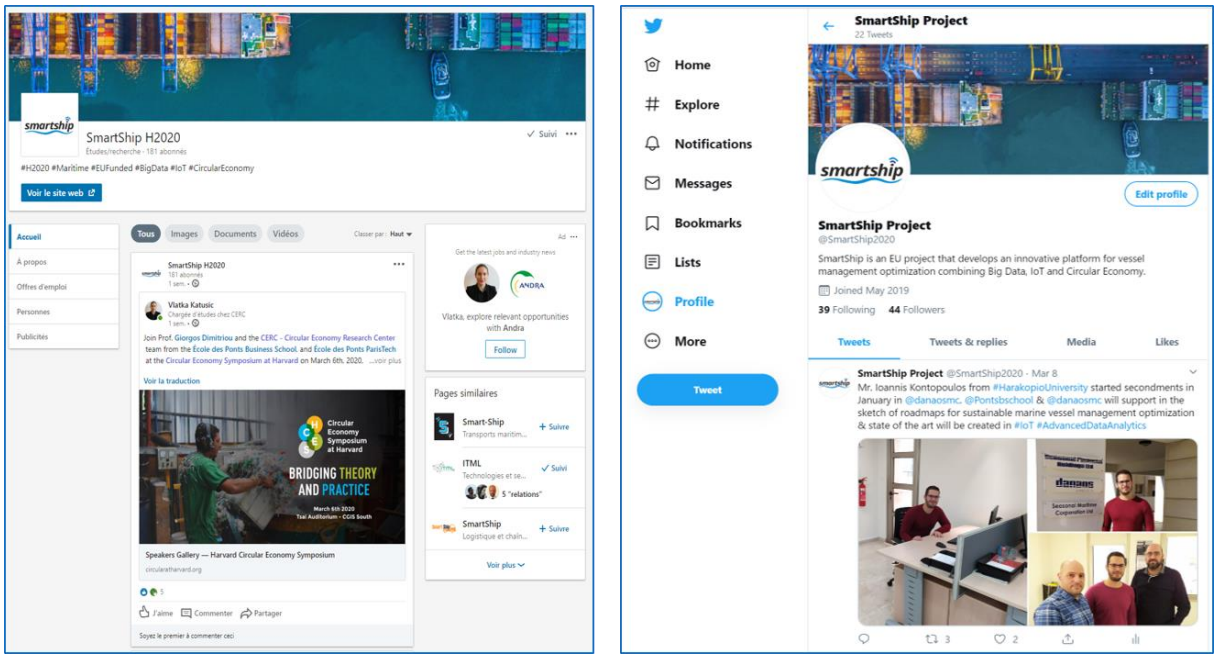


Figure 11: SmartShip Social Media Accounts: LinkedIn and Twitter

During the reporting period, LinkedIn reached 196 followers, and the last 30 days before the report, the SmartShip profile had 41 unique visitors, 28 new followers, and 2.4K post impressions as shown in **Figure 12**.

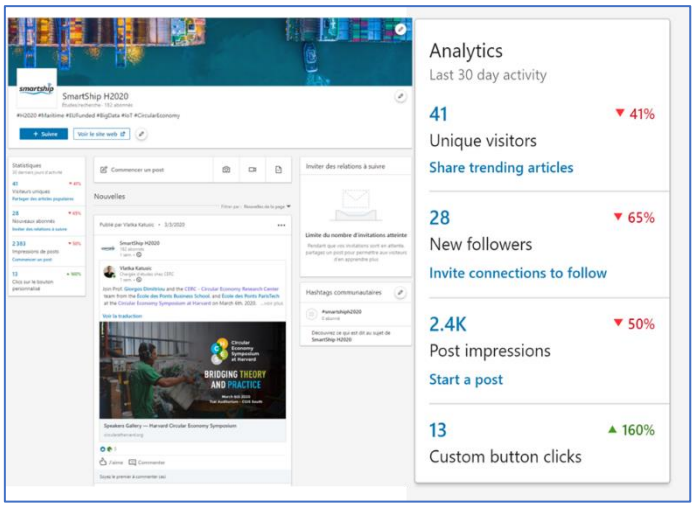


Figure 12: SmartShip LinkedIn Analytics

4. Dissemination, Exploitation and Training Plan

The overall objective of this section is to define the dissemination, exploitation, and training plan for the SmartShip project. SmartShip will conduct a comprehensive and continuous verification and validation of the SmartShip strategy covering operational, technical, business, and legal terms through use cases in the maritime domain.

This section provides a detailed overview of the different stakeholders, and the strategy for dissemination activities. Moreover, it defines the individual exploitation objectives set by each partner of the consortium. The key actions to disseminate the main results and to collect feedback from different stakeholders includes the development of training sessions, exploitation workshops, and events.

Exploitation workshops will help defining and aligning the exploitation plan, technical and business requirements. The training plan seeks to ensure an appropriate transfer of knowledge among the partners and within the different stakeholders involved in the development of the SmartShip framework.

4.1 Dissemination

This section describes the dissemination plan and strategy in terms of target stakeholders, audience, and types of dissemination activities for the SmartShip project.

An initial dissemination and exploitation plan is presented in **Figure 13**, the plan was finalized in M12, it depicts the timeline of the project, the activities already accomplished, and future activities.

Figure 13: Overview Dissemination, Exploitation and Training Plan

4.1.1 Stakeholders

There are six types of stakeholder groups, who represent the target of dissemination and public engagement activities. It is necessary to understand stakeholders' interests to tailor and define a suitable strategy. **Figure 14** identifies the main SmartShip stakeholder groups.

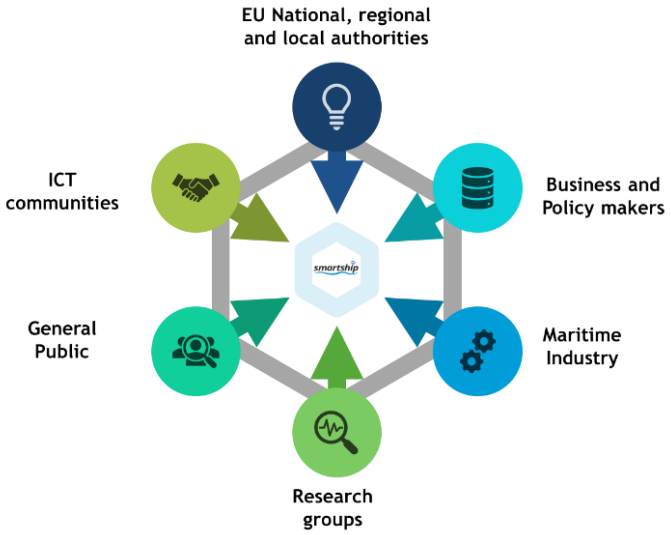


Figure 14: SmartShip Stakeholders

Maritime Industry. The primary target group for the dissemination of the project results consists of entities involved directly or indirectly with the maritime sector. Primarily, these are the groups engaged in technologies used for the implementation of holistic vessel management procedures, energy efficiency, and the emission control processes, but they may be also groups involved in other parts of the maritime field.

EU National, Regional and Local Authorities. The second target group consists of people related to environment–friendly implementations and especially in energy efficiency and emission control in vessels. This group may involve port authorities, environmental organizations etc. and SmartShip will target to communicate its outcomes to these communities in order (i) to make them aware of autonomic systems that can assist their efforts and (ii) to gather fruitful feedback regarding the efficiency of the envisioned system.

Research Groups. Similarly, we will disseminate results to the academic community, interested in the application of theoretical models and algorithms in realistic environments.

ICT and online communities. Furthermore, being a highly technical project, SmartShip is interested in disseminating the results to the ICT communities; mainly information software engineers and application developers who are involved in data mining, the social web, IoT, DSS and optimization algorithms. By disseminating the results to such communities, we aim to gain a higher recognition for our work, greater possibilities for future collaboration, as well as possible feedback while the work is ongoing.

General Public. Finally, SmartShip will pursue the communication of the project results to the wider public audience apart from the groups that their areas of interest coincide with SmartShip's areas of implementation. The wider Public will be targeted continuously from project launch; the Coordinator and individual partners will take advantage of local and European media to present the SmartShip results and spread the message to the interested maritime Industrial Communities.

Business and Policy Makers. They are concerned with understanding the main concepts and implications of the introduction of Circular Economy concepts in the maritime sector. For them, it is necessary to highlight the main aspects of SmartShip in terms of sustainability of such types of systems and value they bring to the economy, including their alternative business models. Dissemination and communication activities targeting them shall emphasise cost-benefit analyses and implications at policy level with limited technical details. This target group would be interested in understanding business opportunities of SmartShip, the potential markets, and to what extent such markets need to be regulated by policies. This target group may also include IoT manufacturers, who may be concerned with new potential opportunities and governance aspects of emerging markets.

4.1.2 Dissemination strategy

The dissemination strategy and transfer of knowledge will be conducted at the level of intra- and inter-partner cooperation:

a) Within their own institutions via seminars, small internal workshops, lectures and UG, MSc, and PhD student projects in the areas of SmartShip. Form sustainable groups to continue the work beyond the completion of SmartShip.
b) Inter-sectoral and international transfer of knowledge and training via remote seminars and lectures, podcasts, and recorded animated presentations from conferences and workshops, where SmartShip partners have presented relevant work. This form of activity will strengthen the links between the partners and will help promote sustainable links, which will continue after the completion of SmartShip.
c) Several face-to-face workshops will also be organized as part of secondments to promote the SmartShip concepts and business models to the stakeholders of the maritime field, with a focus on SMEs & industries.

Different approaches will be applied according to the different stakeholders to transfer the key communication points:

Maritime industry. Business and End user oriented, both technical and nontechnical overview of the project and its concept.

EU, national, regional and local authorities. Business models for the maritime sector including circular economy concepts, good practices for adopting energy efficiency, emissions control, fuel consumption and Circular Economy principles

Research groups. Technical insights including technical specifications of the SmartShip framework comprising energy efficiency, emissions control, fuel consumption, and Circular Economy principles.

ICT and online communities. Technical insights including technical specifications of the SmartShip framework comprising energy efficiency, emissions control, fuel consumption and Circular Economy principles

General Public. General public-oriented, non-technical overview of SmartShip project, and its principal concepts.

Business and policy makers. Business-oriented, nontechnical overview of the project and its principal concepts.

4.1.3 Dissemination activities

Dissemination activities will take place through several channels (**Table 15**) to engage the different stakeholder's groups. Moreover, the SmartShip framework will focus on the alignment with the new circular economy action plan.

Table 15: Communication Channels

	Conferences	journal papers	White papers	Training /events	Newsletter	Press Release	website	Mailing list	Social Media
Business and policy makers	✔		✔	✔	✔	✔	✔		✔
EU, national, regional and local authorities	✔	✔				✔	✔		✔
Maritime industry	✔		✔	✔	✔	✔	✔	✔	✔
Research groups	✔	✔		✔		✔	✔	✔	✔
General Public	✔			✔		✔	✔		✔
ICT communities	✔	✔		✔		✔	✔	✔	✔

Dissemination and public engagement activities will support tailoring the key findings and messages of the SmartShip project and spread the scientific results to help trigger their use in other fields:

Participation in Workshop and Conferences. SmartShip outcomes will be disseminated through the participation in maritime events organized by (i) Informa and seek to organize events scientific and industry events, (ii) the European Technology Platforms (ETPs) as industry-led, public/private partnerships to drive innovation and unite stakeholder communities in reaching strategic research objectives of key European industry sectors, (iii) Industrial Fairs, Symposiums and (iv) the Scientific community through targeted conferences.

SmartShip events will consist of (i) workshops, in order to communicate the SmartShip outcomes both among the project's participants and to the research community & industrial market outside the consortium. SmartShip seek to organise at least two business-focused and two scientific/research-focused workshops, to promote the interactive dissemination of project outcomes; (ii) training sessions & seminars, within which the key maritime-field beneficiaries of SmartShip (namely DANAOS, EPS, BLS, ITML) are expected to train all other beneficiaries with respect to the special requirements of the maritime field and (iii) public exhibitions of potential applications exploiting SmartShip integrated solution.

Publications Presentation of main Research and Technological Development results in top rated scientific journals and conferences, targeting the Scientific and Technical Community; all peer-reviewed journal publications (Open Access) also to obtain scientific feedback. Publications will aim to increase the awareness of the scientific and research communities to the potential of the framework comprising energy efficiency, emissions control, fuel consumption, and Circular Economy principles.

4.2 Exploitation Plan

This section provides an overview of the relevant exploitation activities. Particularly, it describes the exploitation objectives for each SmartShip partner as well as the implementation of exploitation workshops supporting interactions with relevant stakeholders. The exploitation workshops will help defining and aligning the exploitation plan between technical, business requirements and to collect feedback from different target groups.

4.2.1 Individual Objectives

The SmartShip partners identified the individual exploitation objectives, which are in alignment with their principal types of activities. Research and industry partners have different types of exploitation objectives. Based on the individual exploitation objectives depicted in **Table 16**, the identification of possible exploitation synergies between the partners will be analysed.

Table 16: Partner Exploitation Plan

Partners	Exploitation Plan
DANAOS	DANAOS shipping will bring into SmartShip maritime expertise defining challenges that should be addressed in the project with an aim to make a step forward, on top of the current state-of-the-art, towards the digitalization and optimization of maritime operation. DANAOS will interact with research community (represented by SmartShip institutions and universities) and exploit over new ideas and innovative thinking so to jointly re-design and enhance capabilities of existing technology systems dedicated specially to voyage optimization and vessel condition-based monitoring. DANAOS is also aiming to adopt principals of Circular Economy in everyday shipping operation meeting the increasing demand for less pollutant waters and energy efficiency maximization in waterborne transport.
ITML	ITML aims to deliver advancements and enrich its portfolio concerning the data analytics and algorithm tools provided so far by its contribution within the SmartShip consortium. The SmartShip project is a significant opportunity to collaborate with the maritime sector and adapt its platforms and tools according to this specific sector needs (specific type of data, presentation type etc.). ITML also aims to deliver and transfer knowledge regarding

	technological advancements to the academic partners and built new collaborations and partnerships in the research domain of Europe. Moreover, the outcomes of SmartShip will be exploited by ITML, by reaching better spot in the EU market and environment of big data analytics and machine learning.
EPSILON	EPSILON is flourishing the SmartShip with project Life Cycle Analysis deep knowledge and fundamental Circular Economy understanding. Through the numerous projects undertaken and effectively participated in the Maritime sector for the a/m subjects will deliver a holistic view of all contributing factors towards an optimization of processes. Additionally, partners transfer knowledge in the fields of economics, business, maritime, project management will have significant contributions by EPSILON.
ENPC	ENPC plans to exploit the project results through its Business School and the Circular Economy Research Center (CERC) by offering high-quality executive education, cutting edge technology postgraduate courses, and the opportunity to both doctoral students and researchers (i.e., Ph.D., EDBA) to work on collaborative R&D projects with external stakeholders. ENPC expects exploitation routes through E-MBA, specialized E-MBA, specialized Masters, and E-DBA courses and thesis. The SmartShip outcomes can quickly become the subject of co-innovation projects across the ENPC Business School Paris-Marrakech- Shanghai-Spain innovation network. SmartShip outcomes are likely, to be relevant to specialized consultancy services, executive briefings, and executive training offered by ENPC Ponts Business School. ENPC sees the target audience for the outcomes of this project as a vast swathe of academic partners in France and Europe, as well as further afield in its program partnerships in Asia and Africa. Also, students from undergraduate to postgraduate programs, from various disciplines and schools, and business/industrial partners from multiple sectors in France, Europe. The CERC focus areas include Data Economy (as data – notably big data - is circular by nature). It is expected that the project outputs will provide case studies, peer-reviewed publications, creation of specialized workshops, and training, as well as regular blog articles.
BLS	BlueSoft provides a full range of IT services and dedicated, purpose-built software with experience in a wide range of business-oriented solutions, including system integration, cloud and hybrid services, Big Data, and advanced data analysis. The SmartShip project is an excellent opportunity to excel in our capabilities in advanced data analysis, data analysis tools, and to exchange knowledge with academic and commercial partners. It will allow us to provide state of the art solution in the data decision support module and multi-layer optimization tools and technologies. We truly believe that the SmartShip project will create a commercially useful solution to reduce the costs of fleet operation and automated fuel consumption management. We also treat the SmartShip project as an excellent opportunity to build business relationships and transfer know-how and experience from the IoT & circular economy area.
TUBS	TUBS is one of Germany's pioneers in IoT and Embedded system design automation, HW-SW co-design and real-time analysis and optimization for networked systems. TUBS plans to exploit SmartShip project results through its main outlet (being a teaching institution) of offering high quality graduate and postgraduate courses and programs in its areas of expertise, that will be developed based on the effective transfer of research, content, partnerships, and outcomes relative to this project.
HUA	HUA as a non-profit, academic institution intends to be involved in challenging, real-life problems to extend its research interests to new areas and thus advance and proliferate scientific knowledge. The exploitation of the project outcomes from HUA will be in the context of the university's strategic plans, which extend in the following directions: - Education, in which the existing and well-established knowledge and methods combined with the outcomes of the project, will be proliferated among the attendants of the University activities. Due to the advanced nature of this research, this activity will be targeted towards postgraduate as well as continuing education programmes. - Extension of the University's scientific expertise and support of PhD candidates to promote the research. This will enable the organisation to keep the leading position

	in linking the Greek industry with worldwide evolutions in science and technology. The scientific outcomes of the project will be presented in international conferences and journals, propagating knowledge through the scientific community and stressing the prestige of HUA and the European Community. - HUA is strongly affiliated with and supports the open source initiatives. As such HUA comprises one of the Centres of Excellence of the Greek Open Source community (https://ellak.gr). Technology transfer towards the Greek IT industry. HUA maintains very close links with the Greek ICT industry (e.g. organizing the Greek ICT Forum since 2008, working on private research projects, internship programmes), which are used for the promotion of state-of-the-art awareness in technology-oriented organizations of the public and private sectors.

The synergies between different partners will allow to develop a sound exploitation strategy and develop a joint exploitation plan. In that sense, SmartShip partners will organise workshops to support the exploitation activities within the consortium and between relevant stakeholders.

4.2.2 Exploitation Workshops

The participation of relevant stakeholders from the maritime sector is essential to support exploitation and dissemination activities. The SmartShip consortium will organise three exploitation workshops to support the development and implementation of the exploitation strategy.

Exploitation plan development (M22). The first workshop will envisage the development of the joint exploitation strategy. The workshop will allow to determine the applicability of different circular business models as well as the identification of the different dynamic factors towards the implementation of the SmartShip framework comprising energy efficiency, emissions control, fuel consumption, and CE principles.

Identification project results (M32). The second workshop will valorise the key exploitation results of the project, identifying the role of the partners regarding the solutions and determining the different strategies for exploitation. Furthermore, the use of business modelling tools for circular business models development is a proactive and transversal activity throughout the project.

Short-medium term exploitation plan and long-term sustainability (M44). The third workshop consists in the iteration, update and alignment of the exploitation plan with updated practices for short-medium (6-12 months) period beyond the project. The long-term sustainability (>12months) will allow the assessment of the potential circular business plan.

4.2.3 Use cases

The SmartShip framework analyses use cases from the maritime sectors and circular economy in the areas of energy efficiency, emission control, fuel consumption, and condition-based maintenance, involving circular economy business aspects in different enabling technologies. The uses cases will allow the evaluation and the alignment with the necessary technical requirements to assess potential circular business models and improve user experience. The use cases description is available in D2.1.

4.3 Training Plan

A basic Gantt chart has been designed regarding activities of T7.3. Specifically, two training sessions have been scheduled so far. **Figure 15** depicts training plan for public impact and societal challenges of SmartShip aligned with the exploitation workshops as described in section 4.2.2 of the document; the plan will be continuously updated.

The first training session will be held in M20 at the premises of Harokopio University and the second training session will be held in M32 at ENPC premises. Both training sessions will include presentations of ENPC and DANAOS management staff regarding the concepts of circular economy and the maritime domain, respectively. As far as the workshops are concerned, final scheduling will be decided after careful consideration of the project's progress. As already noted in a previous section, there is a plan for

three exploitation (WSE) sessions (M22, M32, M44), each to be held in such intervals where association of technical experiments with business requirements is facilitated. The last workshop/event (WS) will be held after something tangible is developed, e.g. following Task 4.3 results which refers to the development of the Advanced Data Analytics module (initial WS plan: M40).

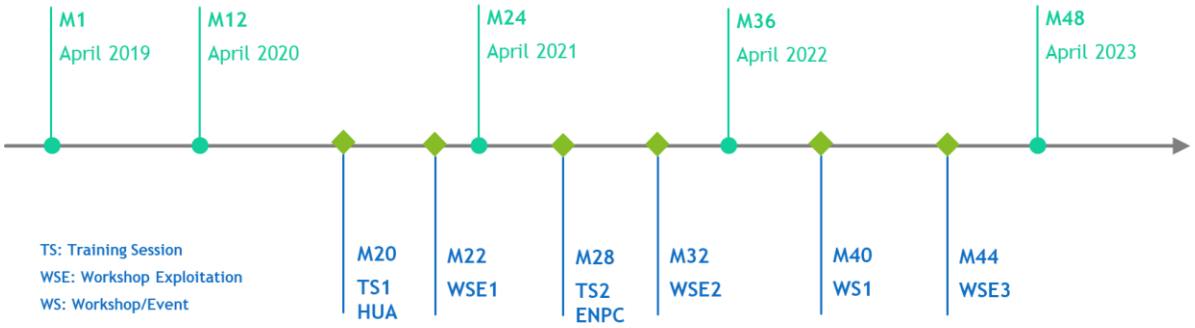


Figure 15: Timeline SmartShip Events

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[1] B. C. Z. C. G. E. a. K. S. V. Kumar, ""Resource-Aware Distributed Stream Management Using Dynamic Overlays"," *25th IEEE International Conference on Distributed Computing Systems (ICDCS'05),*, 2005.

[2] B. C. O. Z. W. a. C. Y. Q. Lin, ""Scalable Distributed Stream Join Processing"," *Proceedings of the 2015 ACM SIGMOD International Conference on Management of Data*, 2015.

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[5] F. G. a. D. T. B. Butzin, ""Microservices approach for the internet of things"," *IEEE 21st International Conference on Emerging Technologies and Factory Automation (ETFA)*, 2016.

[6] D. H. A. W. a. D. M. D. Lu, " "A secure microservice framework for IoT"," *IEEE Symposium on Service-Oriented System Engineering (SOSE)*, 2017.

ANNEX I: Project Meetings

A. Kick-off Meeting

The SmartShip Kick-Off meeting was successfully launched on 17-18 April 2019 at the DANAOS premises. It was the first face-to-face meeting of the SmartShip consortium allowing the partners to generate good relationships amongst them. During the meeting the work packages, administrative, technical, and management procedures have been presented and discussed.

Description:	SmartShip Kick-off Meeting
Date:	17-18 April 2019
Location:	DANAOS premises
Participants:	All partners
Agenda:	Annex I: Kick-off Meeting Agenda
Event URL:	https://smartship2020.eu/events/SmartShip-Kick-Off-Meeting
Photos	 

Meeting Agenda:

SmartShip - Project ID: 823916

A data analytics, decision support and circular economy – based multi-layer optimization platform towards a holistic energy efficiency, fuel consumption and emissions management of vessels

Kick-Off Meeting

Athens, 17 - 18 April 2019

Project ID:	823916
TOPIC:	MSCA-RISE-2018 Research and Innovation Staff Exchange
Starting date :	01/04/2019
Duration in months:	48
Consortium	DANAOS (Leader), ITML, EPS, ENPC, BLS, TUBS, HUA

Contact Details:
Mr Fotis Oikonomou
Email: drc@danaos.gr
Tel: +30 6936279262

The SmartShip project has received funding from the European Union's Horizon 2020 research and Innovation programme under the Marie Sklodowska-Curie grant agreement No 823916

SmartShip - Project ID: 823916

AGENDA

Meeting From / To	17-APR-2019, 09:30-16:00 & 18-APR-2019, 10:00-17:00
Location	Kick-off Meeting DANAOS Premises, Akti Kondyli 14, Piraeus 18545, Greece Meeting Room: 4th Floor, Danaos Meeting Rooms
Minutes taker	WPLs will provide a short summary of the discussion

Wednesday, 17 April 2019		
Time (CEST)	**Topic**	**Responsible partner**
09:30 – 09:45	Welcome and meeting arrangements	DANAOS / ALL
09:45 – 10:15	Consortium partner round table • Who you are • What you do ○ Existing Portfolio of Tools & Services related to SmartShip • What you are expected to do within SmartShip project	ALL 3-5' minutes presentation per partner
10:15 – 10:45	Short project overview • Project Vision & Objectives • The activities of the first year (milestones, deliverables) • Project Terminology	DANAOS
10:45 – 11:40	About H2020 MSCA-RISE Staff Exchange • Eligibility, Rights and Obligations, Amendments • Payments & Audit • Projects Meetings & Reporting • Ethics & Research Integrity • Communication, Dissemination & Exploitation	PO: Radu DIACONESCU
11:40 – 12:30	**WP1 Meeting**	
11:40 – 11:50	WP1 Project Management and Secondments Coordination • Quality management scheme • Risk Management & Contingency planning • Secondments	DANAOS
11:50 – 12:00	T1.1 Administrative project management • Objectives, Plans & Methodology • List of actions and next steps (6 months)	Lead: DANAOS, Participants: All, M1-M48
12:00 – 12:10	T1.2 Secondment coordination • Objectives, Plans & Methodology • List of actions and next steps (6 months)	Lead: DANAOS, Participants: All, M1-M48
12:10 – 12:20	T1.3: Quality assurance and risk management • Objectives, Plans & Methodology • List of actions and next steps (6 months)	Lead: DANAOS, Participants: All M1-M48
12:20 – 12:30	WP1 Actions List – Next Steps	
12:30 – 13:45	**Lunch break / Extended Break**	

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SmartShip - Project ID: 823916

13:45 – 14:35	**WP2 Meeting**	
13:45 – 13:55	WP2: Requirements elicitation, use case scenarios and roadmaps for integrated vessel management • Overview and plans (tasks, objectives etc) • Milestones and deliverables for the 1st year • Action Plan for the next 6 months	HUA
13:55 – 14:05	T2.1 Requirements elicitation and analysis • Objectives, Plans & Methodology • List of actions and next steps (6 months)	Lead HUA, Participants: DANAOS, TUBS M1-M9
14:05 – 14:15	T2.2 Scenarios and KPIs definition • Objectives, Plans & Methodology • List of actions and next steps (6 months)	Lead: DANAOS, Participants: ENPC M1-M9
14:15 – 14:25	T2.3 Roadmaps for marine vessel management optimization • Objectives, Plans & Methodology • List of actions and next steps (6 months)	Lead: ENPC, Participants -; M10-M18
14:25 – 14:35	WP2 Actions List – Next Steps	
14:35 – 15:25	**WP3 Meeting**	
14:35 – 14:45	WP3: SmartShip Circular-Economy based functional architecture design • Overview and plans (tasks, objectives etc) • Milestones and deliverables for the 1st year • Action Plan for the next 6 months	ENCP
14:45 – 14:55	T3.1: Design and specification of the SmartShip architecture • Objectives, Plans & Methodology • List of actions and next steps (6 months)	Lead ITML, Participants: DANAOS, ENPC M10-M18
14:55 – 15:05	T3.2 Supporting functionalities for SmartShip • Objectives, Plans & Methodology • List of actions and next steps (6 months)	Lead: EPS, Participants: ITML, ENPC M10-M18
15:05 – 15:15	T3.3 Circular Economy principles in SmartShip architecture • Objectives, Plans & Methodology • List of actions and next steps (6 months)	Lead: ENPC, Participants: BLS M19-M24)
15:15 – 15:25	WP3 Actions List – Next Steps	
15:25 – 16:00	**Discussion**	
16:00	**Closure of the 1st day of the Meeting**	

20:00	**Dinner** *(Optional Social Event – details will follow)*

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SmartShip - Project ID: 823916

Thursday, 18 April 2019		
Time (CEST)	**Topic**	**Responsible partner**
10:00 – 10:30	Welcome and meeting arrangements	DANAOS
10:30 – 11:20	**WP4 Meeting**	
10:30 – 10:40	WP4: SmartShip Baseline framework: IoT and advanced data analytics • Overview and plans (tasks, objectives etc) • Milestones and deliverables for the 1st year • Action Plan for the next 6 months	ITML
10:40 – 10:50	T4.1: State of the art in Advanced data analytics and IoT Technologies • Objectives, Plans & Methodology • List of actions and next steps (6 months)	Lead HUA, Participants: ENPC M10-M19
10:50 – 11:00	T4.2: IoT-based data analytics tools and technologies applied in the maritime industry • Objectives, Plans & Methodology • List of actions and next steps (6 months)	Lead: EPS Participants: ITML, DANAOS, ENPC, HUA, TUBS M10-M19
11:00 – 11:10	T4.3: Design and Development of Advanced Data analytics module • Objectives, Plans & Methodology • List of actions and next steps (6 months)	Lead: ITML Participants: EPS, BLS, M20-M36
11:10 – 11:20	WP4 Actions List – Next Steps	
11:20 – 11:30	**Coffee Break / Short Break**	
11:30 – 12:20	**WP5 Meeting**	
11:30 – 11:40	WP5: SmartShip Decision Support System and multilayer optimization module • Overview and plans (tasks, objectives etc) • Milestones and deliverables for the 1st year • Action Plan for the next 6 months	BLS
11:40 – 11:50	T5.1: State of the art in Decision Support and multi-layer optimization Technologies • Objectives, Plans & Methodology • List of actions and next steps (6 months)	Lead ENPC, Participants: TUBS M10-M19
11:50 – 12:00	T5.2: Decision support and optimization tools and technologies applied in the maritime industry • Objectives, Plans & Methodology • List of actions and next steps (6 months)	Lead: BLS, Participants: ITML, ENPC M10-M19
12:00 – 12:10	T5.3: Design and Development of Data analytics and Decision Support module • Objectives, Plans & Methodology • List of actions and next steps (6 months)	Lead: BLS Participants: ITML, TUBS, HUA M20-M36
12:10 – 12:20	WP5 Actions List – Next Steps	
12:30 – 13:15	**Lunch Break**	
13:15 – 14:15	**WP6 Meeting**	
13:15 – 13:25	WP6: Integrated SmartShip Framework • Overview and plans (tasks, objectives etc) • Milestones and deliverables for the 1st year • Action Plan for the next 6 months	EPS

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13:25 – 13:35	T6.1 Integration & Implementation • Objectives, Plans & Methodology • List of actions and next steps (6 months)	Lead: EPS Participants: ITML, BLS, ENPC; M25-M42
13:35 – 13:45	T6.2 Validation • Objectives, Plans & Methodology • List of actions and next steps (6 months)	Lead: BLS Participants: DANAOS, ITML; M30-M44
13:45 – 13:55	T6.3 Pilot preliminary design and pre-pilot test • Objectives, Plans & Methodology • List of actions and next steps (6 months)	Lead: DANAOS Participants: ENPC M25-M29
13:55 – 14:05	T6.4 Main pilot test & evaluation • Objectives, Plans & Methodology • List of actions and next steps (6 months)	Lead: DANAOS Participants: ITML, ENPC, HUA, TUBS; M30-M48
14:05 -14:15	WP6 Actions List – Next Steps	
14:15 – 15:05	WP6 Meeting	
14:15 – 14:25	WP7: Dissemination, exploitation and training management • Overview and plans (tasks, objectives etc) • Milestones and deliverables for the 1st year • Action Plan for the next 6 months	ENPC
14:25 – 14:35	T7.1 Dissemination management • Objectives, Plans & Methodology • List of actions and next steps (6 months)	Lead: ENPC Participants: All; M1-M48
14:35 – 14:45	T7.2 Exploitation management • Objectives, Plans & Methodology • List of actions and next steps (6 months)	Lead: ENPC Participants: All; M1-M48
14:45 – 14:55	T7.3 Training management & material development • Objectives, Plans & Methodology • List of actions and next steps (6 months)	Lead: HUA Participants: All; M1-M48)
14:55 – 15:05	WP7 Actions List – Next Steps	
15:05 – 16:30	Discussion: Administrative & Accounting issues, Project Management	
16:30 – 17:00	Closing Remarks, Next Meetings Schedule	
17:00	Closure of the Meeting	

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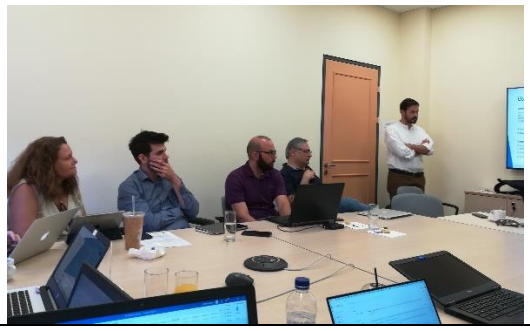
B. WP2 Technical meeting

The first SmartShip Technical Meeting took place on 8/7/2019 at Harokopio University of Athens. SmartShip Team set the requirements towards an Integrated and intelligent fleet management framework for energy efficiency, fuel consumption optimization, and ship emissions reduction along with the KPIs for the framework's validation and evaluation.

Description:	SmartShip WP2 Technical Meeting
Date:	8 July 2019
Location:	Harokopio University of Athens
Participants:	All partners
Agenda:	Annex II: WP2 Technical Meeting Agenda
Event URL:	https://smartship2020.eu/events/SmartShip-WP2-Technical-Meeting
Photos	  

Meeting Agenda:

SmartShip - Project ID: 823916

A data analytics, decision support and circular economy – based multi-layer optimization platform towards a holistic energy efficiency, fuel consumption and emissions management of vessels

Technical Meeting

Athens, 8 July 2019

Project ID:	823916
TOPIC:	MSCA-RISE-2018 Research and Innovation Staff Exchange
Starting date :	01/04/2019
Duration in months:	48
Consortium:	DANAOS (Leader), ITML, EPS, ENPC, BLS, TUBS, HUA

Coordinator Contact Details:

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SmartShip - Project ID: 823916

Location

Meeting day & time	08-Jul-2019, 09:30-15:30 EEST
Location	Harokopio University, Department of Informatics & Telematics 9, Omirou Str. 177 78, Tavros – 1st floor
Minutes taker	Eleftheria Marini, emarini@itml.gr, ITML

Proposed Agenda

Start - End Time	Agenda Item	Responsible partner
9:30 – 10:00	Welcome and reception	HUA
10:00 – 11:00	*Secondment Plan review* • Amendments • Ongoing secondments according to the current plan	DANAOS
11:00 – 13:00	*WP2 discussion:* • T2.1 Requirements elicitation and analysis • T2.2 Scenarios and KPIs definition • T2.3 Roadmaps for marine vessel management optimization	HUA, DANAOS, TUBS, ENPC
13:00 – 13:45	Lunch Break	
13:45 – 14:30	*Upcoming Deliverables:* • D2.1 SmartShip requirements analysis, scenarios and KPIs definition [HUA / December] • D7.1 Data Management Plan [ENPC / September]	HUA, ENPC
14:30 – 15:30	*Next Steps*	All
15:30	Closure of the meeting	

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SmartShip - Project ID: 823916

Directions to HUA & Hotel Recommendations

HUA - Department of Informatics and Telematics address:

- 9 Omirou Str. 177 78, Tavros (https://goo.gl/maps/xEjq6sLiEW69sC218)
- This building is slightly detached from the main campus of the Harokopio University. The best ways to get to the meeting room are the following:
  - via the green line (line "1") of the metro, stop "Tavros" (https://goo.gl/maps/9Dnd6zSPdPDF9SFC7).
  - take a taxi to "9, Omirou Str. 177 78, Tavros"
- Here's a map of the subway in Athens.

Directly from Athens International Airport (AIA):

1st option: Use the blue line M3 from AIA to Monastiraki Station and then use the green line M1 (link here)

2nd option: a 40-minute route by taxi (link here)

If you plan to stay at the city centre before the meeting, you could stay in the Monastiraki area which is a nice neighbourhood close to many restaurants, bars and cafes and also within walking distance to other nice places you might want to visit by foot in Athens (e.g. the Plaka area, the Psiri area, Thisio). There is also a direct connection to the meeting. You can take the overground from Monastiraki station (green line number M1) that goes directly to Tauros station in 6 min. When you get off at the station, it is a 3 min walk from HUA premises. (link here)

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C. Use Cases meetings

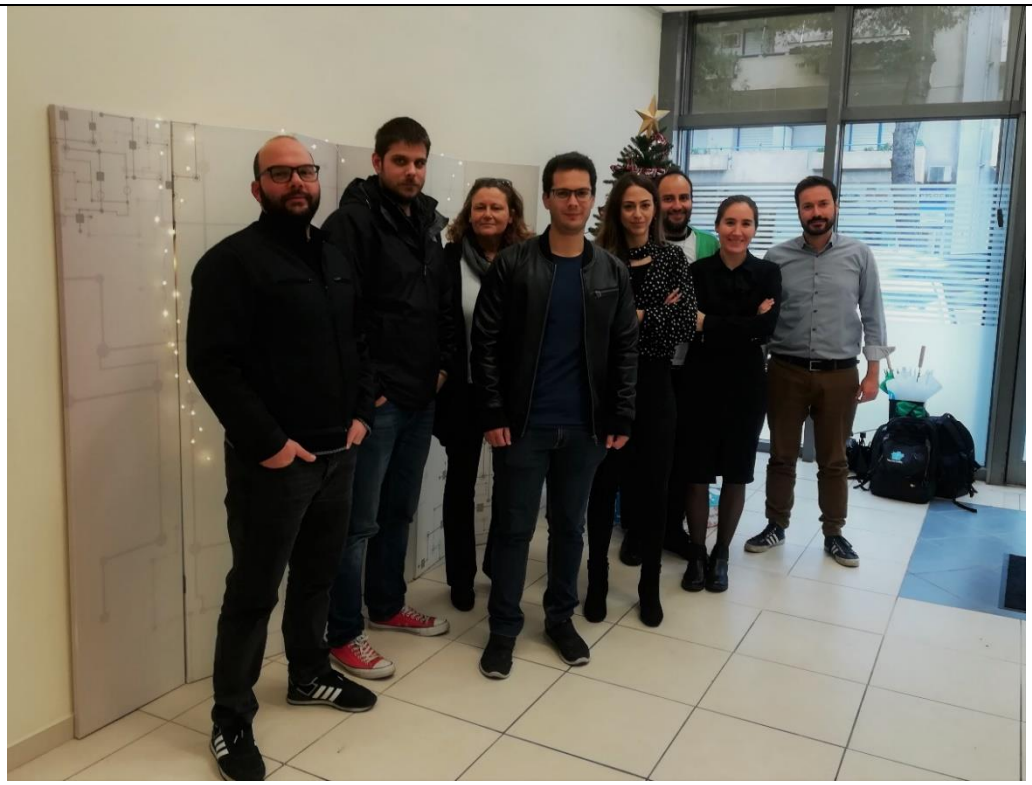
On July 16th and on September 24th of 2019, researchers from HUA, secondees from BLS and maritime experts from Danaos Shipping met, at DANAOS premises, to discuss over SmartShip use cases definition. Both sessions supported a productive discussion for the design of the use cases, highlighting all these maritime challenges that should be addressed in SmartShip framework. Result of these meetings was to set the roadmap towards the identification of specific maritime use case scenarios as recorded in D2.1.

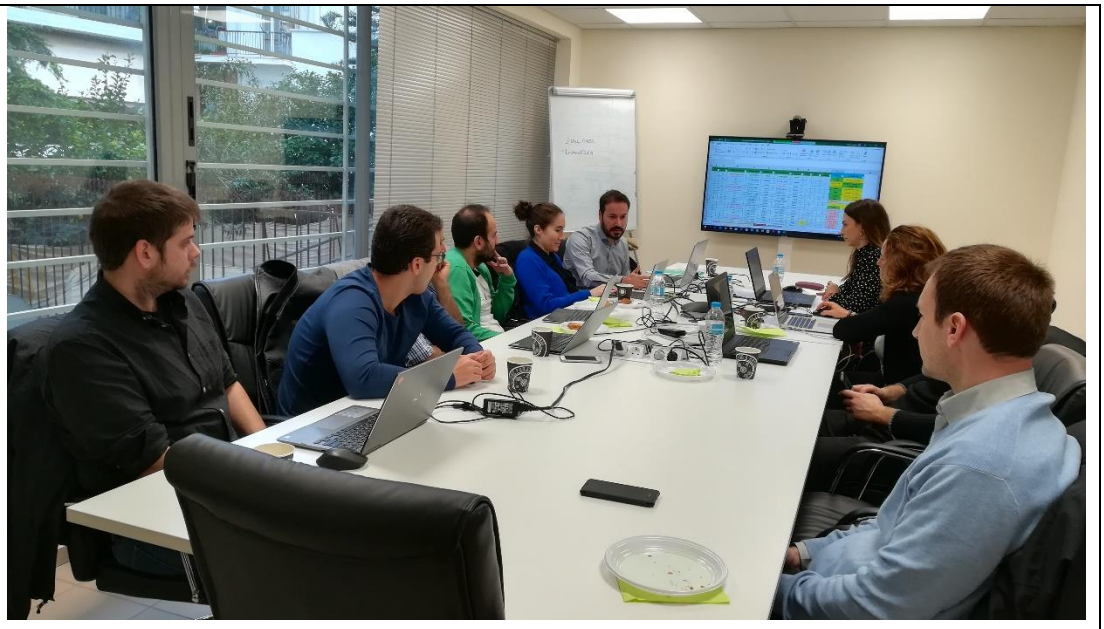
Description:	SmartShip Use Cases Meeting
Date:	16 July 2019 & 24 September 2019
Location:	DANAOS Premises
Participants:	DANAOS; HUA; BLS
Photos	

D. 1st Progress Meeting

The 1st progress meeting of SmartShip projects took place on 04/12/2019 at ITML premises in Athens. During the meeting, administrative and technical issues was presented by each responsible beneficiary. More specifically, each WP leader presented the actions that are planned to be done in the upcoming months regarding the SmartShip architecture definition, the design and development of the advanced data analytics module, the deployment of the decision support and multi-layer optimization module, and implementation of dissemination activities. At the meeting closure, the upcoming mid-term progress meeting was scheduled for September 2020.

Description:	SmartShip 1st Progress Meeting
Date:	4 December 2019
Location:	ITML Premises
Participants:	All partners
Agenda:	Annex III: 1st Progress Meeting Agenda
Event URL:	https://smartship2020.eu/events/SmartShip-1st-Progress-Meeting

Photos	 

Meeting Agenda:

SmartShip - Project ID: 823916

A data analytics, decision support and circular economy – based multi-layer optimization platform towards a holistic energy efficiency, fuel consumption and emissions management of vessels

Progress Meeting

Athens, 4 December 2019

Project ID:	823916
TOPIC:	MSCA-RISE-2018 Research and Innovation Staff Exchange
Starting date :	01/04/2019
Duration in months:	48
Consortium:	DANAOS (Leader), ITML, EPS, ENPC, BLS, TUBS, HUA

Coordinator Contact Details:
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Meeting organizer details:
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SmartShip - Project ID: 823916

Location

Meeting day & time	04-Dec-2019, 10:00-15:30
Location	ITML - 22 Katechaki Str. 11525 Athens
Minutes taker	Eleftheria Marini, emarini@itml.gr, ITML

Agenda

Start - End Time	Agenda Item	Responsible partner
9:30 – 10:00	Welcome coffee	
10:00 – 11:15	*WP1* • Admin issues • Secondment Plan review (Ongoing & Upcoming secondments / Amendments etc.) • Action Points	DANAOS
11:15 – 12:30	*WP2* • Technical Discussion • D2.1 for use cases specifications due in December 31st • Action Points	HUA
12:30 – 13:15	Light Lunch	
13:15 – 13:30	*WP3* Actions to be done in the upcoming 1-2 months period	ENPC
13:30 – 13:45	*WP4* Actions to be done in the upcoming 1-2 months period	ITML
13:45 – 14:00	*WP5* Actions to be done in the upcoming 1-2 months period	BLS (remotely)
14:00 – 14:15	*WP7* • Overview and progress • Actions to be done in the upcoming 1-2 months period	ENPC
14:15 – 15:00	*Next Steps & Action Points – Closure of the meeting*	All
16:00	Early dinner at Efxaris Athens (5 min walking distance from Monastiraki Metro Station)	

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