Smart & Safe Technologies
for Port and Marinas Innovation

WP 1 – Project Management

Task 1.1 Project coordination
The task aims to coordinate and control the time sequence of project activities. The correct time planning (scheduling and/or coordination) of the project is necessary to establish for each activity: a) the type and level of resources required for execution; b) the duration of the work; c) the logical and physical links or dependencies constraining one activity to the others.
Partners: **MAR.TE., NAVTEC, CETENA, ….**

Task 1.2 Project Evaluation & Risk Management
The task aims to evaluate and monitor the implementation of each phase of the project. A starting point for this activity is the identification of the types, characteristics and quantities of resources that will be used in the project (e.g. manpower, equipment, materials). Tools and methodologies such as Earned Value, one of the most widely used methods of controlling costs and progress, will be used. Moreover, in the task will be used time planning tools - such as linear diagrams (e.g. Gantt, bar chart diagram, etc.) – and risk management tools (e.g. SWOT, Probability and Impact Matrix, etc.).
Partners: **MAR.TE., NAVTEC, CETENA, ….**

WP 2 – Shipbuilding 4.0

Task 2.1 – Smart production in shipbuilding (additive manufacturing, robot and cobot systems, in cloud innovative equipment, etc.)
The aim is to increases the industrial performances through the introduction in the shipyard of enabling technologies such as: robotic systems (i.e. for the treatment of ship hulls); cobots and exoscheleton; sensor to enhance safety inside the shipyard; additive manufacturing (i.e. in order to optimize the enterprise layout and to produce homemade components that can meet the requirements of the regulations); Internet of Things (IoT); big data; cloud; artificial intelligence. Significant is also the environmental requalification through the introduction of instruments that can reduce the industrial impact (i.e. technologies for the installation of welding fumes treatment and washing water recovery).
Partners: Cantiere Navale di Augusta, Caronte & Tourist, UNIME, …

Task 2.2 – Smart energy in shipbuilding (Renewables, Storage, biofuel)

The aim is to increase the energy efficiency of the shipyards through, i.e., the installation of renewable energy sources that use not only electrical but also thermal storage, the use of automated low-energy-consumption equipment, the energy enhancement of marine biomass in biofuels (solid, liquid and gaseous) for the production of electrical and thermal energy, with the aim of provide a transition towards zero emission, also through the use of hydrogen as an energy vector. Also smarter and more sustainable ways to refurbish ships and recover main materials from scrapped ships will be evaluated, as a major part of the sailing fleet will incur in major refitment of power unit or hybrid power plant in the forthcoming years.

Partners: Intermarine, CNR ITAE, UNIME, …

WP 3 – Port Logistics 4.0

Task 3.1 – Smart freight logistics

The aim is to improve the integrated logistics process by optimizing and making sustainable the logistics operations of the last marine-terrestrial mile through innovative solutions such as:

- the design and the construction of new port infrastructures;
- the use of less impacting vehicles powered by electricity for the distribution of the last mile (i.e. electric propulsion of lifting and transport equipment);
- the increase of autonomous, semi-autonomous and remotely controlled means of transport and means of lifting;
- the possibility of producing the same energy within the ports by creating an energy grid to support port operations;
- the use of simulation tools and scenario analysis for the sizing of specific facilities.

Moreover, the task aims to define and implement systems and technologies of logistics 4.0 that can support the physical and logical infrastructures of port logistics. Innovative systems will be implemented that consider the methodologies/technologies (i.e. connection of machinery on reliable private local LTE or 5G networks, enabling automation, robotics, machine learning, analysis and remote monitoring in real time, big data, clouding computing) supporting the planning and control of goods flows from their unloading to their sorting in the port.

In this connection, optimization models and simulation tools for planning and management of transportation and handling activities in port areas will be designed and developed (with the objective of testing the use of new technologies – such as electrification, automation and connectivity – and their impact on system performance).

Partners*: UNICT, UNIParthenope, UniGe-DIEC, Grimaldi, Caronte & Tourist, MAR.TE., Leonardo-Vitrociset, Grimaldi, UniGe-DIME*, …

Task 3.2 – Smart passengers' mobility

The aim is to develop a digital / real platform that, with an integrated approach, makes use of the most advanced information, communication and connection technologies (among people / vehicles / infrastructures), and allows the management of an intra / extra mobility service that has to be sustainable, intelligent, multimodal, resilient and able to adapt dynamically and in real time to user requests.

In this connection, multimodal transportation models for planning and management of port-city connections will be designed and developed (with the objective of testing smart mobility services and their impact on sustainability and resilience).

Partners*: CNT STEMS, Grimaldi, Caronte & Tourist, UniGe-DIME*, UNIParthenope, UniGe-DIEC, …

Task 3.3 – Smart bunkering

The aim is to study the sea-land interactions that guarantee safe bunkering not only of LNG, in terms of transport, production in port, storage, etc., but also of electricity (cold ironing) and that, above all, address all aspects related to regulatory issues (i.e. use of LNG) and safety (i.e. fire prevention).

Partners: Caronte & Tourist, …

WP 4 – Marinas and yachting 4.0

Task 4.1 – Green and Sustainable Marinas

An environmental monitoring system of the marina and surrounding area (pollution and noise emissions, both in the air and in the water) will be developed, providing forecasting and decision support models to limit the negative impact of these aspects on the territory, with benefits in terms of health and safety.

An energy management system will also be developed, fully integrated with the above.

In the context of a port concept that in the near future will be increasingly based on renewable and green resources, resulting in a widespread electrification of berths, the full system will support the optimization of energy flows, then limiting the related management costs and positively affecting the yachting environmental footprint.

Partners: CETENA, MAR.TE., UniGe-DIEC, UNIParthenope, …

Task 4.2 – Smart services (energy, etc.)

The aim is to study, design and implement smart systems of energy production by renewable energy sources connected to storages and to develop charging system for recreational applications (i.e. yachts). These can be integrated with other smart services such as water, wi-fi, video surveillance, etc.

Partners: UNIME, UNIPA, CNR STEMS, DACA-I, StAel-LAB Srl, Inessecorporation Ltd, …

WP 5 – Safety & security

Task 5.1 – Safety management & simulation

A simulation model of the port activities will be developed, aimed to forecast any possible operational interference and critical situations, ensuring that the activities themselves take place in a more coordinated, safe and fast way.

The model will integrate all the smart technologies (5G, IoT, artificial intelligence, etc.) implemented in the port system, allowing to increase the level of awareness of the entire infrastructure. Bringing security to this new level, in fact, will not only allow avoiding dangerous accidents, but will help to identify inefficiencies and speed up port activities.

In addition, some formal methodologies (both combinatorial methods and state-based approaches) will be applied to the case of port activities, with the objective of assessing safety & security under different scenarios.

Partners: **Leonardo-Vitrociset, UniGe-DIME,…**

Task 5.2 – Physical & Cyber security

The monitoring of the potential degradation of the infrastructures will guarantee a further increase in safety levels; the monitoring will regard both port physical infrastructure (docks, goods handling systems, power plants, etc.) and cyber infrastructure (hardware, software and data).

Partners: **Cetena, UniGe-DIEC, …**

WP 6 – Intelligent Transport Systems & Port Management

Task 6.1 – Port activities and infrastructures Monitoring

This task aims to define and implement innovative solutions to support the Port Authority in monitoring port infrastructure and activities. The main functions of Port Authority are the following: a) the planning, regulation, promotion, and control of port operations and services, including the issuance of authorizations of use and concessions for commercial and industrial activities; b) the maintenance of common areas of the ports, including the seabed.

In order to guarantee real-time technical support to the Port Authority, the following solutions will be implemented: 1) IoT (Internet of Things – see the focus in task 6.2); 2) Remote assistance and control of terminals and port channels; 3) Augmented reality for operators and administrations

Partners: **MAR.TE., Leonardo-Vitrociset, CNIT, Grimaldi, UniGE, Cetena, Gematica, …**

Task 6.2 – Internet of Things for Ports and Ships

In this task, the Internet of Things (IoT) technologies will be analysed, designed and implemented aiming at developing intelligent ports ships. Modern electronic information technology, whose features are to provide multifarious information services for port and ship participants based on the collection, processing, release, exchange, analysis, and usage of the relevant information.

IoT technology is the basis for the development of the intelligent ports and ships. Sensor technology, together with opportune signal and information processing techniques allows objects have the "perception"; IoT technology (e.g., RFID) makes them "speak"; machine-to-machine (M2M) let them “exchange”; finally, IoT let all objects in the world interconnect and also provide localization solutions. So, the handling equipment, ships, containers, vehicles, and instruments, which are widely distributed in the global ports, are connected to this "net". IoT, extending human senses and collecting directly business data from operation terminal in ports, can eliminate manual collection errors, improve the collection efficiency, and deliver instantly to every corner of the earth through Internet. It will be allowed due to a strict cooperation with the Task related to Big Data Analysis, which is fed by IoT sensing solutions of this Task.

Partners: UniGe-DITEN, …

Task 6.3 – Big Data Management

This task aims to define and implement a data management system capable of efficiently managing the large amount of data (i.e. Big Data) generated within the port community. The importance of Big Data does not concern its quantity but its use. Data management is the practice of collecting, storing and using data securely, efficiently and economically.

The innovative solutions to be implemented will include database management systems and data repository systems, such as data lakes and data warehouses.

Partners: **MAR.TE., Leonardo-Vitrociset, CNIT, Grimaldi, Cetena, …**

Task 6.4 – DSS for strategic port management

This task aims at defining and implementing innovative solutions to support “Port 4.0”. The port of the future must be port community-oriented and have a strategic operational capacity to achieve the common objectives set by the European Commission, in terms of digital interconnection and sustainability of operations. To this end, a prototype Decision Support System - based on the balanced scorecard model - will be developed to support the strategic decision-making process of the port's corporate governance.

Partners involved: **MAR.TE., Leonardo-Vitrociset, CNIT, Grimaldi, UniGe-DIEC, Cetena, …**

WP 7 – Diffusion & Exploitation

Task 7.1 Exploitation & Commercial Planning

This task aims to define the innovative product concept, highlighting the main features that have been implemented. A marketing and commercial plan will be developed in order to: a) identify the right positioning of the product on the market; b) maximise the value of the innovative solutions for the target customer. In particular, the marketing plan will report the positive effects that the innovative solutions can generate in the reference sector, providing valid support to the project partners through the participation to B-to-B meeting and exhibitions. Instead, the commercial plan will provide some predictive models to evaluate the potential customer adoption of the innovative solutions.

Partners: **MAR.TE., NAVTEC, CETENA, ….**

Task 7.2 Findings Diffusion & Communication

This task aims to disseminate the scientific results of the R&D project. Part of these findings will be collected into scientific articles. They will be refereed in the main scientific journals dealing with the research topics. In addition, two workshops will be organized (i.e. an intermediate meeting and a final event), to which leading national and international academics will be invited. This will represent a favourable opportunity to obtain useful indications for the improvement and implementation of the designed innovative solution.

Partners: **MAR.TE., NAVTEC, CETENA, ….**