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MILESTONE N° 41: Sensor packages and deployment sites prepared for demonstration mission

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Objectives

The JERICO-S3 project represents a significant advancement in marine science and environmental monitoring, funded by the European Union. Its primary aim is to enhance understanding of coastal and shelf sea environments through the development and deployment of advanced observation systems. This initiative integrates a network of coastal observatories to address key scientific challenges related to coastal dynamics, marine ecosystems, and environmental changes. A critical focus within JERICO-S3 is the advancement of technologies for integrated observation of ecosystem processes, including marine biology. The development of three innovative sensor systems—the Plankton Dynamics Sensor Package (PSP), the Autonomous Coastal Observing Benthic Station (ACOBS), and the Water-sample Filtering & Preservation Device (WASP)—marks a significant step in achieving these goals. These systems are designed to provide optimal observation and analysis of key biological and environmental variables describing pelagic and benthic processes. The upcoming demonstration deployments at designated sites—English Channel for PSP, Arcachon Lagoon for ACOBS, and Skagerrak/Kattegat for WASP—will further validate these technologies in real-world conditions, providing critical insights into their operational effectiveness and potential for broader application.

Methods

The development process involved integrating advanced sensors into three main systems:

- **Plankton Dynamics Sensor Package (PSP):** Utilized the cEGIM platform to integrate sensors for observing physical, biogeochemical, and biological variables related to plankton dynamics.
- **Autonomous Coastal Observing Benthic Station (ACOBS):** Focused on assessing benthic biological processes, including oxygen fluxes, using various sensors and technologies.
- **Water-sample Filtering & Preservation Device (WASP):** Designed for collecting and preserving environmental DNA samples, integrated with a Ferrybox system.

Each system underwent rigorous bench-testing and field trials to ensure functionality and reliability in both controlled and natural environments.

Results

The testing phase demonstrated the effectiveness of the sensor systems:

- **PSP:** Successfully collected high-resolution data on plankton dynamics, with an AI-driven sampling controller optimizing data collection during plankton blooms.
- **ACOBS:** Provided comprehensive data on benthic processes, including oxygen fluxes, through innovative sensor integration.
- **WASP:** Effectively collected and preserved eDNA samples, with bench tests confirming the system's reliability compared to conventional methods.

These results validated the systems' readiness for the demonstration phase, showcasing their potential to provide valuable insights into marine ecosystems.



Preparation of Demonstration Deployment Sites

The preparation of demonstration deployment sites for each sensor system is also crucial to ensure successful testing and data collection:

- **PSP Deployment:** The Plankton Dynamics Sensor Package will be deployed in the English Channel, utilizing the SMILE buoy system. This site is chosen for its dynamic hydrological conditions, which are ideal for studying plankton dynamics and eutrophication processes.
- **ACOBS Deployment:** The Autonomous Coastal Observing Benthic Station will be deployed in the Arcachon Lagoon. This site is selected for its shallow waters, allowing for detailed observation of benthic processes and sediment-water interactions.
- **WASP Deployment:** The Water-sample Filtering & Preservation Device will be demonstrated aboard the MS Color Fantasy FerryBox system, operating in the Skagerrak/Kattegat region of the Eastern North Sea. This route offers diverse environmental conditions for testing the system's automated sampling capabilities.

Conclusion

The successful development and testing of these sensor technologies mark a significant advancement in marine observation capabilities. The systems developed are poised to contribute substantially to the JERICO-S3 project's goals, offering enhanced tools for monitoring and understanding coastal and marine environments. The upcoming demonstrations at the designated sites—English Channel for PSP, Arcachon Lagoon for ACOBS, and Skagerrak/Kattegat for WASP—will further validate these technologies in real-world conditions, providing critical insights into their operational effectiveness and potential for broader application. These advancements support better-informed management and conservation efforts, aligning with the project's objectives of improving coastal ecosystem observation and sustainability.

NB: Detailed reporting of the related activities will be available in JERICO-S3 related deliverables D7.4, D7.7 and D7.9 where all technological developments' owners, contributors and contributing institutes are cited.