Network of Leading Ecosystem Scale Experimental AQUAtic MesoCOSM Facilities Connecting Rivers, Lakes, Estuaries and Oceans in Europe and beyond

Reporting

Project Information

AQUACOSM-plus

Grant agreement ID: 871081

Project website

DOI
10.3030/871081

Project closed

EC signature date
2 March 2020

Start date
1 April 2020

End date
31 March 2024

Funded under
EXCELLENT SCIENCE - Research Infrastructures

Total cost
€ 9 999 564,88

EU contribution
€ 9 999 563,00

Coordinated by
FORSCHUNGSVERBUND BERLIN EV
Germany

Periodic Reporting for period 3 - AQUACOSM-plus (Network of Leading Ecosystem Scale Experimental AQUAtic MesoCOSM Facilities Connecting Rivers, Lakes, Estuaries and Oceans in Europe and beyond)

Reporting period: 2023-04-01 to 2024-03-31

Summary of the context and overall objectives of the project

Water is a fundamental resource on Earth and aquatic ecosystems are under increasing pressure due to climate change in the Anthropocene. Results are a loss of biodiversity and basic ecosystem functions at a dramatic rate, representing one of the present societal Grand Challenges. With growing human populations, demands for aquatic ecosystem services will continue to increase. The sustainable provision of aquatic ecosystem services and well-being of society, critically depends on addressing these environmental challenges.
It is, hence, important to identify and understand the mechanisms behind observed aquatic ecosystem changes. Mesocosm-based science is a powerful tool to investigate these environments, because it combines realistic scale and complexity close to natural systems, with multiple experimental units allowing replicated manipulations. Moreover, mesocosms can be used to test predicted future scenarios, mitigation and rehabilitation measures, and to identify tipping points in these complex natural systems. The mesocosm approach becomes even more powerful when integrated in collaborative studies using long term data observational RI networks (e.g. LTER, JERICO), to guide experimental design for model and scenario-testing.
AQUACOSM-plus brings together a research community specialised in experimental mesocosm-based research, covering the full range of freshwater to marine ecosystems representing all EU-climatic zones from the Arctic to the Mediterranean. It offers international researchers and other stakeholders access to a high quality, innovative European mesocosm research infrastructure. Compared to the previous related EU-projects MESOAQUA and AQUACOSM, AQUACOSM-plus increased the focus on user needs for easy, wide and efficient access to harmonized experimental facilities. This includes focus on training of TA participants and early career scientists to ensure that a new generation of researchers receives essential skills.

Work performed from the beginning of the project to the end of the period covered by the report and main results achieved so far

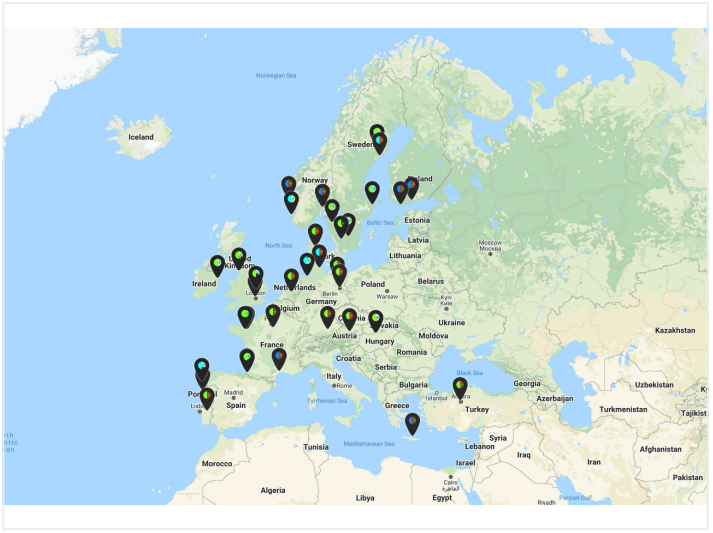
AQUACOSM-plus has successfully:
• Established contact with industries, collaborated in SME-TA activities and produced a guidance manual about successful collaboration with industry, available online and promoted within the consortium and social media.
• Analysed the European RI landscape outlining ways for collaboration with several RIs.
• Redeveloped the website, aquacosm.eu making the services/ products available in a sustainable and user-friendly way for at least several years beyond the project end.
• Integrated the specifically developed Project Tracker into the TA programme for more exchange and collaboration, now available as collection of information on performed TA mesocosm experiments.
• Provided an online WikiBook of information collected throughout the AQUACOSM-plus project promoted through the website and social media.
• Trained a new generation of aquatic mesocosm scientists by offering 2 training schools; workshops

on science communication, metanalysis, grand challenges, open science, 2 AquaSUMMIT writing retreats and forming an ECR Network. Results are published in peer reviewed scientific journals.
• Provided guidance and resources to lower barriers for open science and data, including:
o Videos tutorials for TA users on submissions to the Mesocosm Metadata Catalogue.
o Materials on DOI allocation
o Nodes in ZENODODRYAD, PANGAEA, GitHub
o An open virtual platform for near-real-time data streams
o A primary mesocosm data collection portal (primary data shell)
• Developed & updated the project's DMP
• Engaged with the general public, news media and Universities, academia in scientific conferences (EGU, ASLO, GLEON, SIL)
• Webinars on the Grand Challenges in Aquatic Mesocosm Research, now available on YouTube,
• 30 well received peer-review manuscripts
• Provided and developed resources for low cost mesocosm science including:
o Developed, built and improved a light-weight, portable mesocosm raft system (Video building instructions)
o Developed and tested a prototype of a Chlorophyll-a sensor
o Constructed a low-cost self-flushing system for automated measurement of GHG fluxes
• Investigated Grand Challenges using AQUACOSM-plus developed technology. Results are in the process of conclusive analysis and publication.
• Established a new low-cost and long term mesocosm facility in Hungary, including both pelagic/ optionally benthic communities. These are expected to contribute to further projects and scientific output for years to come.
• Improved the technological readiness to conduct full scale pelagic experiments also under harsh ice and wave conditions. The 12 constructed "Aquacosms" are available for collaborative use in the future.
• Opened its facilities for 163 TA projects with provision of 10,047 person-days
• Disseminated project results as well as outcomes from TA-activities to the community during 3rd International Symposium on Aquatic Mesocosm-based Research.

Progress beyond the state of the art and expected potential impact (including the socio-economic impact and the wider societal implications of the project so far)

As leaders in the field of aquatic mesocosm based science, AQUACOSM-plus has shown how TA provision can be progressed by combining scientific expertise and technical solutions of an application system with high standards in personally interacting with the user community from advertising TA opportunities, through the application process, TA itself and the administration of the whole process. This approach has led to a well-known TA program and successful collaborations producing a large number of high impact publications.
Furthermore, AQUACOSM-plus has advanced both, the geographical reach of mesocosm experimentation by facilitating further studies in Arctic regions as well as mobility of mesocosms relevant for regions lacking permanent installations. Conquering both has provided the means to

greatly advance our understanding of aquatic systems globally.
The activity of AQUACOSM-plus has increased the use of the mesocosm facilities and generally the user base from within as well as outside the ERA, including direct collaboration with other RIs (JERICO-S3, LTER), e.g. through joined experiments and acting as experts in panels for the eLTER ESFRI-preparatory process, sharing ideas and approaches developed during the AQUACOSM-project. An example of the impact on the research community is that the AQUACOSM-plus consortium held one of the largest of over 140 different sessions at ASLO 2023, the biggest international marine and freshwater conference, supporting a specific focus on Grand Challenges and solution-oriented research. This momentum has also been used to form an Early Career Researcher network of mesocosm professionals, with the aim to be sustainable long after the conclusion of the project. The direct input to societal outreach and NGO activities has been realised through e.g. input to publication series such as Acid News.
This wider participation is expected to contribute to: 1) further share competence leading to a more cost-effective use of research funds in the ERA, by enhancing know-how in aquatic experimental ecosystem science across all EU member & associated states as well on a wider global scale e.g. in collaboration through the (mesocosm.org network), and to 2) reduce duplication between RIs and instead effectively translate predictive science into experimental scenario testing and possible environmental engineering in the AQUACOSM-plus facilities.



AQUACOSM-plus partner facilities

Last update: 29 January 2025

Permalink: https://cordis.europa.eu/project/id/871081/reporting