



Pioneering Discovery in Extreme Marine Environments



Untapped potential of extreme marine ecosystems

The deep ocean remains one of the least explored frontiers on Earth. Extreme marine environments harbour microorganisms that have evolved under exceptional temperature, pressure and chemical stress. These organisms carry specialised enzymes representing an untapped resource for sustainable industrial bioprocesses, with direct relevance to the EU Blue Bioeconomy Strategy and the European Ocean Pact.

Project Objectives

NEXTMARINE targets the discovery of novel biocatalysts from extreme marine environments through ROV-based multispectral mapping and minimal-impact sampling at two primary field sites: the Aegean volcanic arc, where exceptional heat and chemical pressure drive thermostable enzymes, and the Baltic Sea anoxic and ammunition dumpsites, which select for unique anaerobic metabolic diversity. All fieldwork complies with the Nagoya Protocol and EU ethics requirements, ensuring responsible access to marine genetic resources. Environmental samples feed into an integrated discovery pipeline combining metagenomics, AI-driven bioinformatics, protein engineering and bioprocess scale-up, to deliver novel enzymes for pharmaceutical, food and biomaterial applications.

At a glance

Type of Action: HORIZON Research and Innovation Actions

Duration: 48 months

Coordinator: University of Crete

Budget: 4 496 933.75€



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Expected results



Innovative field methodology: ROV-based multispectral mapping and minimal-impact sampling protocol, replicable for future deep-sea bioprospecting campaigns.



Novel enzyme library: A validated collection of halogenases and CAZymes discovered from extreme marine environments, characterised and ready for industrial screening.



Biochemically validated biocatalysts: Heterologously expressed and functionally confirmed enzymes demonstrating superior activity, selectivity and stability under industrial conditions.



Proof-of-concept applications: Demonstration of NEXTMARINE enzymes in pharmaceutical synthesis, agrochemical production and advanced biomaterial processing.



Open-access metagenomic datasets: Curated genomic resources and bioinformatic pipelines contributing to the European Blue Bioeconomy knowledge infrastructure.

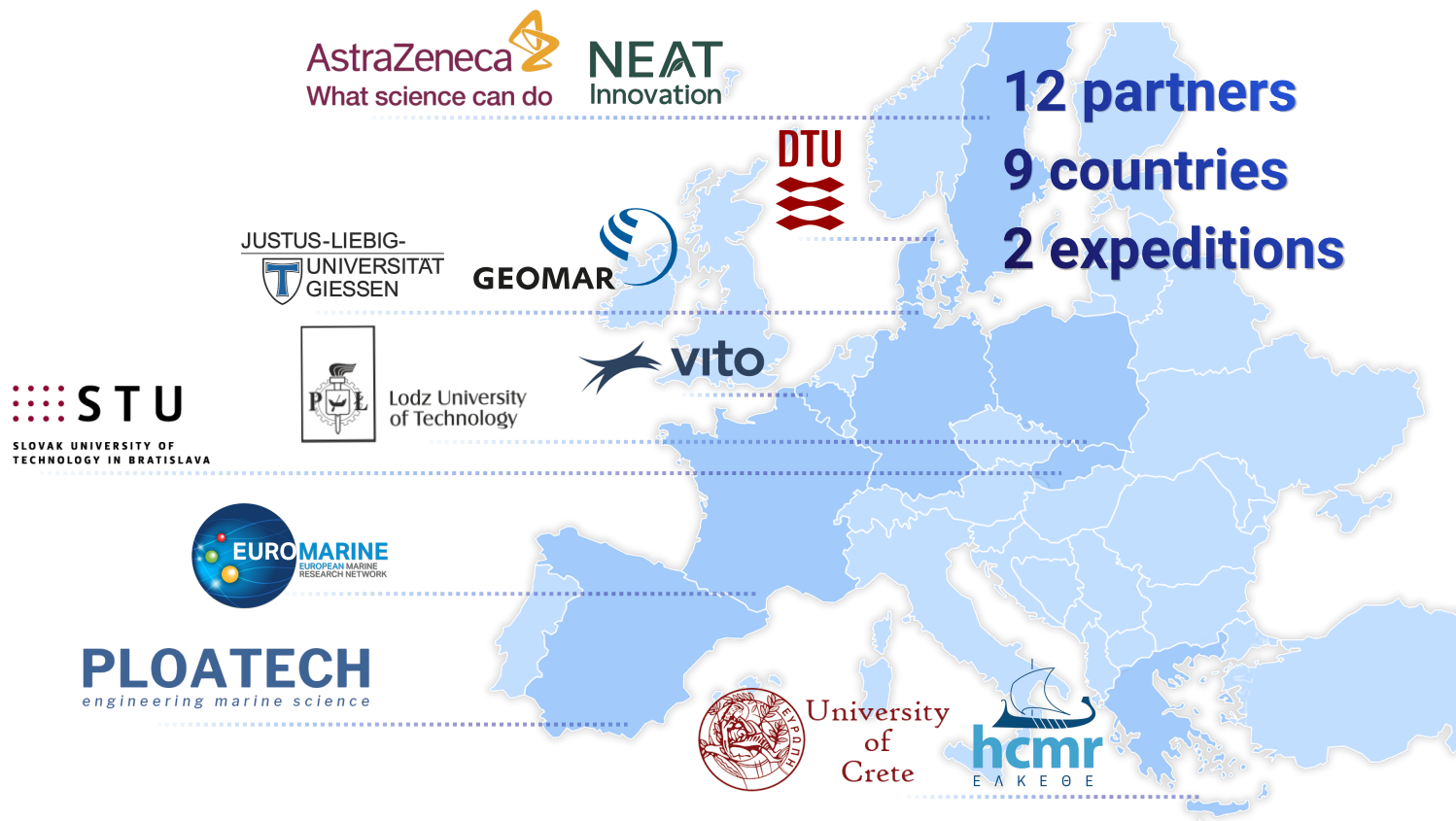


Cross-sector exploitation roadmap: A co-developed strategy with industrial partners positioning NEXTMARINE outputs for regulatory approval and market uptake.



Policy recommendations: Evidence-based guidelines for the sustainable bioprospecting of extreme marine environments at EU level.

Project Network



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