# blue

# **PROJECT PARTNERS**

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www.2hoffshore.com
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# **PROJECT INTERACTIONS**

The Blue Mining project will interact with other initiatives, current and past research projects. These are EC funded initiatives, like FP7 MIDAS (The MIDAS project addresses fundamental environmental issues relating to the exploitation of deep-sea mineral and energy resources) and ERA-MIN (Era-Min – Network on the Industrial Handling of Raw Materials for European Industries). Next to this the Blue Mining project will interact with the EC Study: "Study to investigate state of knowledge of Deep Sea Mining".



# **FACTS & FIGURES**

Full name: Breakthrough Solutions for

Mineral Extraction and Processing

in Extreme Environments

Acronym: Blue Mining
Duration: 48 months / 4 years
Start date: 1 February 2014

Total budget: 15 M€ EC Funding: 10 M€



## CONTACT

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Breakthrough Solutions for

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www.bluemining.eu



## **AIMS & OBJECTIVES**

The overall objective of Blue Mining is to provide breakthrough solutions for a sustainable deep-sea mining value chain. The project aims to develop the technical capabilities for accurate and cost-effective discovery, assessment and extraction of deep-sea mineral deposits from water depths up to 6,000m, as this is the required range where valuable seafloor mineral resources are found.

Controlling these three capabilities is the key to accessing raw materials, decreasing EU dependency on imported resources, and strengthening Europe's mining sector and its technology providers.



### **BACKGROUND**

Earth provides many natural resources, such as fossil fuels and minerals that are vital for human life. As global demand grows — especially for strategically important metals — commodity prices rapidly rise, causing an identifiable risk of increasing supply shortage for metals identified as critical to Europe's economy. This is why securing the supply of these strategic metals must be a major element in Europe's long-term economic strategy.

In this rapidly changing global economic landscape, mining in the deep sea has gone from a distant possibility to a probable reality within just a decade. Although deep-sea minerals extraction was investigated in the 1970s, it was abandoned because of changing commodity economics, advances in



Blue Mining will advance the controlled source electromagnetic survey technology for extinct SMS deposits.

on-land exploration techniques, and increasing concerns regarding the environmental impact and political and legal aspects with regard to ownership issues.

The developmental data from the 1970s, if still available, would not be adequate to allow for the engineering and construction of an integral system for the extraction of deep-sea minerals. Additional research and technological development work is required. At present the methods for deep-sea mining are yet to attain sufficient technology readiness levels for successful operations. The European partners in the Blue Mining project will take a step forward in the process of developing effective resource discovery, assessment and exploitation techniques.

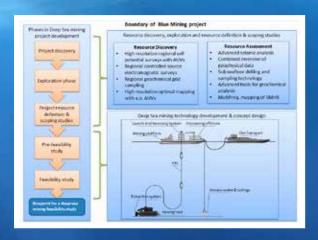


## **APPROACH**

In terms of project delivery, there are many similarities between deep-sea mining and land-based mining. Common activities include: resource discovery, exploration, resource definition and scoping studies, pre-feasibility studies, feasibility studies, project approval, and financing and implementation. The differences are simply the nature of the resource and the extreme environmental conditions where the value chain activities take place. As a result, deep-sea mining activities require a range of unique technologies, hardware and procedures in order to be successful.

Blue Mining has adopted the land-mining project development approach as the backbone for economical, overall technical, environmental and legal evaluation. Even for the most advanced deep-sea mining projects, no professional full-scale feasibility study is publicly available. Blue Mining will develop a blueprint for feasibility studies and validate this blueprint via the evaluation of deep-sea mining projects of two different resources: (extinct) Seafloor Massive Sulphides (eSMS) and Seafloor Manganese Nodules (SMnN). The project also studies incentives for sustainable deep-sea mining and resource management.

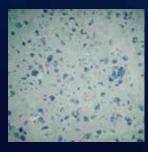
For the scientific and technical approach, Blue Mining has adopted the Technology Readiness Level (TRL) methodology. TRL is a measure used to assess the maturity of evolving technologies (devices, materials, components, software, work processes, etc.) during its development and in some cases during early operations.



Blue Mining's objective is to bring the TRLs for exploration and exploitation to a system demonstration level.

The TRLs for the exploration of eSMS and SMnN are raised by research into self-potential surveys, controlled source electromagnetic surveys, optical mapping and geochemical grid sampling. Furthermore, seismic imaging, sub-seafloor drilling and sonar mapping – together with inversion of this data – will be used for faster and more reliable resource assessment.

The research into the exploitation of a deep-sea mine focuses on bringing the TRL of the vertical transport system (VTS) to a system demonstration level (in a relevant environment). A design methodology for the VTS will be devised, including investigation into wear, and models for the slurry flow and riser dynamics. Blue Mining will also create its own design for the VTS. This will be integrated into a concept design of a full deep-sea mining operation, including ship-to-ship transfer of ore.





Typical polymetallic nodule field in the German license area of the Clarion Clipperton. Image courtesy of BGR.