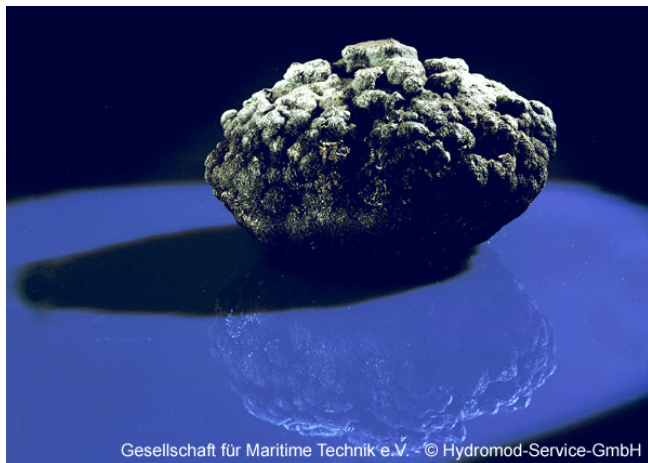


**Deep-sea mining** comprises all the technologies involved in the environmentally friendly exploration, exploitation and processing of marine mineral resources (MMRs). As an industrialised country, Germany is heavily dependent on imports of crucial metallic raw materials. MMRs are an as yet undeveloped source currently enjoying increasing interest at global level. However, in the medium-term they can contribute substantially to guarantee the supply of metallic raw materials.



In terms of economic usability and the long-term safeguarding of access to metallic raw materials, the incidence of manganese nodules, cobalt-rich manganese crusts and seafloor massive sulphides is of great interest.

Germany holds an **exploration license for manganese nodules** in the Pacific Ocean since 2006 and a **second exploration license for seafloor massive sulphides** in the Indian Ocean since 2015. With the support of the German government's **National Masterplan Maritime Technologies (NMMT)**, policy-makers and society have become more aware of deep-sea mining in recent years, and the issue has been highlighted at various events.

The objective of **environmentally friendly deep-sea mining** must be furthered. To this end, closer cooperation between the federal ministries involved and the industry is urgently needed. A close involvement of the Institute for Geosciences and Natural Resources (BGR) and an **environmentally sound mining test** is indispensable. This pilot mining test, required by the International Seabed Authority (ISA), could also be carried out in a European cooperation. Furthermore the technological realization of the entire process and value chain must taken into account.

**Innovative solutions** in the key fields of drilling technology, conveying technology and underwater engineering are available. Synergy effects can be achieved by using related technologies from the fields of mining engineering, drilling and tunnel-driving engineering, pump technology as well as automatic control engineering. German companies and institutions offer tried-and-tested exploration technologies and services. Furthermore, Germany has efficient, innovative shipyards and maritime suppliers in the field of special shipbuilding.

**Technological challenges** pertaining to the future commercialisation of the extraction of MMRs are: increasing economic efficiency, optimising environmental compatibility, the supply of energy and the development of intelligent systems for largely autonomous production processes.

The relevant **business associations** are currently realising various activities for **deep-sea mining**, e.g. the MMR working group of the German Association for Marine Technology (GMT), different **VDMA** working groups and the VDMA activities at the **BDI** (Federation of German Industries) level.

The association "**DeepSea Mining Alliance**" was established in April 2014. As a joint industrial platform its **main objective** is to support the coordinated representation of interests regarding politics, industry and society, focussing on the following items:

- Common platform for industrial and research partners
- Development of international cooperation projects
- Support of deep-sea mining innovations based on Research & Development and Joint Industry Projects
- Preparation and realization of a "Pilot Mining Test"
- Close cooperation with leading research institutes, taking into consideration all environmentally relevant aspects.

Based on the unique and coherent set of resources, skills and expertise concerning seabed mining operations **the French and the German government** as well as industrial **stakeholders from France and Germany** are signing **Memoranda of Understanding (MoU)** on industrial, technological and scientific cooperation during the **9<sup>th</sup> National Maritime Conference** on the 20<sup>th</sup> of October 2015 in Bremerhaven.

<b>BAUER Maschinen GmbH</b>	Drilling and cutting equipment for offshore foundations, sea bed exploration drill rigs
<b>Dr. Warner Brückmann</b>	Scientific consulting for marine mineral resources
<b>ContiTech / Oil and Marine Eddelbüttel + Schneider GmbH</b>	Special rubber riser systems for offshore mining
<b>DEA Deutsche Erdoel AG</b>	International exploration and production company for oil and gas
<b>DFKI - German Research Center for Artificial Intelligence</b>	Development and realization of artificial intelligence methods in underwater systems and robotics
<b>DNV GL SE</b>	Classification society
<b>EvoLogics GmbH</b>	Solutions for multiple underwater communication, positioning, navigation and monitoring applications
<b>Fraunhofer</b>	Maritime systems, underwater robotics
<b>GEOMAR Helmholtz Centre for Ocean Research Kiel</b>	The institute investigates the chemical, physical, biological and geological processes of the seafloor, oceans and ocean margins and their interactions with the atmosphere
<b>Harren &amp; Partner Ship Management</b>	Ship management in the sectors of heavy-lift, offshore oil & gas-offshore and the wind energy
<b>HYDROMOD Service GmbH</b>	Management, services in hydro-geophysical field measurements and oceanographic and environmental monitoring; EIA- and MetOcean-Studies
<b>IMS Ingenieurgesellschaft mbH</b>	Civil engineering, offshore technology, engineering and installation, environmental engineering
<b>Interoceanmetal Joint Organization (IOM)</b>	IOM has been focusing mainly on carrying out regional geological and geophysical surveys in the Clarion-Clipperton Fracture Zone of the Pacific Ocean
<b>JS Capital Power</b>	Specialised investment firm providing financial consulting services for investment in companies owning/operating assets for offshore exploration and minerals
<b>Keppel Offshore &amp; Marine</b>	R&D and product development for offshore and deep-sea technologies
<b>Prof. Hermann-Rudolf Kudrass</b>	Scientific consulting for marine mineral resources
<b>Lloyd's Register</b>	Classification society
<b>MBT GmbH</b>	Sales and service for oceanographic, geophysical and hydrographic equipment
<b>MC Marketing Consulting</b>	Management, management and technology consulting for marine mineral resources
<b>MHWirth GmbH</b>	Drilling rig systems for the offshore oil & gas industry, several concept studies for deepsea mining
<b>Neptun Ship Design GmbH</b>	CFD – Ship theory and ship hull optimization, offshore construction units, merchant and passenger vessels
<b>RWTH Aachen, AKR</b>	Processing concepts and solutions for marine mineral resources
<b>Siem Offshore Contractors GmbH</b>	Service contractor for the offshore oil and gas/renewable energy industry
<b>Technical University Clausthal</b>	Processing concepts and solutions for marine mineral resources