

19 November 2021
Brussels, Belgium

Hybrid Event

TECUBER



INESC
BRUSSELS
HUB

IN THE BLACK

IMPACT ASSESSMENT FOR FUTURE
EXPLOITATION OF UNDERWATER MINERALS

Welcome Message



We'd like to thank each of you for attending this workshop and bringing your expertise to our gathering.

Due to travel limitations and COVID-19 physical distancing guidelines, the workshop will be a hybrid event, with virtual participants and in person at INESC TEC Brussels Hub in Belgium.

IN THE BLACK'21, focusing this year on "IMPACT ASSESSMENT FOR FUTURE EXPLOITATION OF UNDERWATER MINERALS", is expected to generate renewed momentum to the Raw Materials Community in general. In addition to strengthening the connections between the IN THE BLACK community, we aim to redefine future enabling strategies.

This year IN THE BLACK will be the driving force to set up the "Portuguese" Raw Materials Week that will include two important side events: the MineHeritage Project FINAL MEETING (funded by the EIT Raw Materials Academy), and the inSITE Workshop (Upscaling project funded by EIT Raw Materials). This week will take place between 23-26 November in Porto (Portugal) at the School of Engineering of Porto|ISEP.

We thank INESC TEC, INESC BRUSSELS HUB and TEC4SEA for providing once again this opportunity and the support from the European Institute of Innovation and Technology's Raw Materials sector, ISEP and Forum Oceano.

Hope to see you next year, this time in person!

In The Back Team

The Organising Team of the Thematic Workshop



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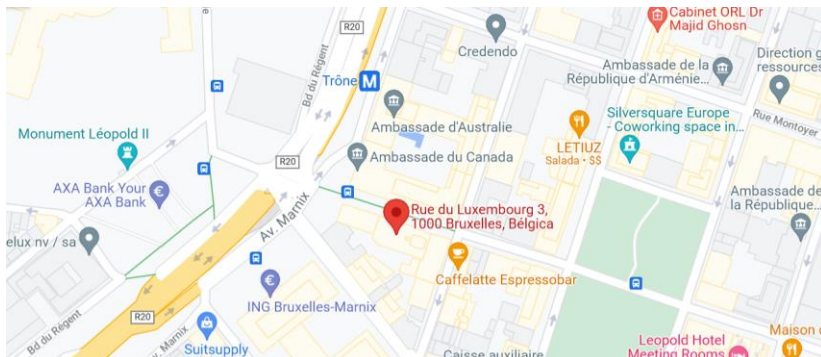
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Programme

Schedule

Start	End	Session	Speaker	Title
In the Black 21 Impact Assessment for future exploitation of underwater minerals for clean energy technology 19th November 2021 / Friday				
13:30	14:00	<i>Icebreaker</i>		
14:00	14:20	Opening Session	Nicolas Menou [Manager Business Creation & Development, EIT Raw Materials]	
14:20	14:40	Session 1	Bramley Murton National Oceanography Centre [NOA]	<i>Challenges and opportunities in monitoring of deep-sea mining operations</i>
14:40	15:00		Jon Hellevang GCE Ocean Technology	<i>Norwegian perspectives on marine minerals</i>
15:00	15:20		Luis Neves Global Enabling Sustainability Initiative [GeSI]	<i>Social and Environmental Responsibility in metals Supply: Learnings from the ICT Industry</i>
15:20	15:40		Kris De Bruyne Global Sea Mineral Resources, DEME-Group	<i>A precautionary approach to developing nodule collector technology</i>
15:40	15:50	<i>Coffee Break</i>		
15:50	16:50	Round Table	Simon Pickard (Moderator) [Science Business]	
16:50	17:00	Closing Session	Eduardo Silva [TEC4SEA, INESC TEC ISEP]	



Welcome and opening words

Nicolas Menou [Raw Materials]

Challenges and opportunities in monitoring of deep-sea mining operations

Bramley Murton [National Oceanography Centre]

Deep-sea mining aims to supply the raw materials needed for the transition to low-carbon technologies for energy and transport. With terrestrial mines at an all-time low in grade, and the relative abundance of many of the elements critical to the energy transition found on the seafloor, deep-sea minerals may provide the resources required to accelerate the move to a low-carbon society. An essential ingredient in the future prospects for deep-sea mining is social licence. This is a rather woolly concept about the acceptance by society at large for any industrial activity. With deep-sea mining high on the agenda, it is beholdant on the stakeholders to provide the means by which society can trust the industrial process. With this in mind, one of the key requirements is transparent monitoring. For this, we need to understand what needs to be monitored, where, and how often. The spatial and temporal scales of monitoring are dependent on the types of material being mined from their associated environments. Polymetallic nodules are distributed as a 2D deposit over vast areas of the abyssal seafloor. These are host in fine muds and clays and do not require excavation to remove them from the seafloor. Instead, harvesters are likely to pluck them and pump them through vertical riser pipes to the sea surface. . Cobalt-Iron rich crusts are found on rocky underwater mountains and are also 2D deposits a few centimetres thick. These are firmly attached to the substrate and require excavation. Mechanical grinding is the most likely mechanism for removal and the produced slurry will be transported to the surface via risers. Polymetallic seafloor sulphides are 3D deposits and occur in small areas of the seafloor and extend down to over 100m sub-seafloor. These have an overburden of sediment and other non-ore-bearing rocks that have to be removed. Many occur in areas close to hydrothermal activity that support unique and charismatic chemosynthetic ecosystems. The impacts arising from deep-sea mining are both proximal and distal. The proximal ones are the immediate removal of the hard substrate, thick sediment plumes, disturbance of the soil, light and noise. For seafloor sulphide deposits there may be impacts on the local hydrothermal systems. Distal impacts are the spread of plumes, both at the seafloor where disturbed sediment will flow, and at mid-water depths where process water will be discharged causing salinity, temperature and turbidity effects. Some toxicity may result from the metal rich plumes at the seafloor. Sea-surface impacts are likely to be mainly proximal and arise as a result of noise and light, and dewatering during ship-to-ship transfer.

Norwegian perspectives on marine minerals

Jon Hellevang [GCE Ocean Technology]

The Norwegian government passed the “Seabed minerals act” in 2019. An opening process for minerals activity on the Norwegian Continental Shelf (NCS) as initiated in 2020 and the plan for impact assessment has just been finalized. The presentation will give an overview of the current resource mapping, plans for the impact assessment as well as examples of projects and test-sites in Norway. GCE Ocean Technology will also introduce the cluster and the ongoing energy transition as a backdrop for the debate.

Social and Environmental Responsibility in metals Supply: Learnings from the ICT Industry

Luís Neves [Global Enabling Sustainability Initiative (GeSI)]

The talk will focus on the learnings from GeSI’s research and initiatives on sustainable minerals supply and how they can apply them to deep-sea mining practices. These will include GeSI’s Coltan Mining in the DRC report, the Responsible Minerals Initiative, the OECD Due Diligence Guidance for Responsible Supply Chain of Minerals from Conflict-Affected areas and more.

A precautionary approach to developing nodule collector technology

Kris De Bruyne [Global Sea Mineral Resources NV, DEME- Group]

Global Sea Mineral Resources NV (GSR) holds an exploration contract with the International Seabed Authority (ISA) established under UNLOS, to explore for polymetallic nodules on the seafloor of the Clarion Clipperton Zone (CCZ) in the Pacific Ocean. (ISA, 2012)

The basis of GSR’s research and development (R&D) strategy was developed in 2013 following a desktop study which defined an integrated concept of operation. By performing this integrated study, it was possible to identify all systems and related sub-systems, and define an overall architectural diagram. A key component of the deep seabed mining system is the Seafloor Nodule Collector (SNC).

The SNC has a significant influence on the overall operational environmental impact and on the achievable production rate, two criteria that are critical in developing a responsible mining operation. Additionally, given commercial deep-seabed mining operations are unprecedented, the SNC is the sub-system involving the highest number of information and knowledge gaps, such as the environmental impacts and effects, its response to soil characteristics, trafficability and nodule collection methodology.

Hence, from all the systems and sub-systems identified, GSR decided to focus its first efforts on the SNC system and more specifically on a pre-prototype of a SNC. This feasibility study, called ProCat (derived from “Prototype Caterpillar”) extended from 2015 to 2021 and consisted of a step-by-step approach and culminated in the design, building and testing of a pre-prototype SNC, called Patania II (PATII):

- ProCat#1 [2015 – 2017]: Separate parallel testing of nodule collection system and propulsion system (TSTD Patania I). ProCat#1 was successfully completed in September 2017.
- ProCat#2 [2018 –2021]: The knowledge acquired during the first phase was applied in this second phase. The nodule collection system and propulsion system were integrated into the design of a Pre-Prototype SNC called Patania II. This vehicle was used for pilot mining trials in Q2 2019 and Q2 2021 in the GSR exploration license area.

With regard to the 2021 offshore test campaign, GSR defined several objectives which were mostly focused on the technical performances of PATII and the monitoring of the environmental response.

Firstly, the technologies and different working principles developed during ProCat#1 needed to be validated and optimized in situ. Purpose-built measurement equipment was installed on PATII that provided insight into the functioning of the collection system and how it influences its surrounding environment. Secondly, the trials with PATII were a major opportunity to improve the understanding of the impact and effects of deep seabed mining. Two field trials were conducted in the GSR and BGR license areas. The potential geophysical, biogeochemical, and biological effects were monitored from a second ship (M/V Island Pride) involving an equipment spread consisting of ROVs and AUVs (for far field sediment plume monitoring), among others. Beside the far field sediment plume monitoring, also the source term and near field effects have been studied. The size, concentration and behavior of the suspended sediment generated by PATII was measured during different operational scenarios. The results will lead to an optimized design of a discharge system and an optimized mining pattern to minimize the environmental impacts.

With the successful ProCat program, GSR's solution for responsible deep seabed mining has taken a giant leap forward. From a technological, operational, and environmental perspective, there is sufficient confidence to proceed to the next phase, the System Integration Phase (SIP). The SIP will culminate in a System Integration Test (SIT), whereby a commercial scale Seabed Nodule Collector, Patania III, and Vertical Transport System (VTS), including all necessary auxiliary (deck) equipment, will be integrated and tested in the CCZ. With regard to the SIT, GSR will continue to advocate a step-by-step development strategy using the Best Available Technologies, in collaboration with world-leading experts, scientists and universities, while simultaneously adhering to all the relevant environmental considerations.

GSR remains committed to responsible deep-sea research and technology development, one step at a time.



Figure 1 - PATII during deployment (2020)

The background of the slide is an abstract, textured blue image. It features various shades of blue, from deep navy to bright cyan, with visible brushstrokes or fiber-like patterns that create a sense of movement and depth. The overall effect is ethereal and artistic.

Speakers *(by alphabetical order)*



Bramley Murton



National Oceanography Centre
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Prof. Bramley J. Murton is professor of marine geology at the National Oceanography Centre where he leads the UK national research effort into deep-sea mineral resources at the National Oceanography Centre in Southampton. Prof. Murton has 30 years of experience, leading research into the formation of oceanic crust, seafloor spreading, hydrothermal activity, and developing methods to discover and assess new deep-sea mineral deposits, their formation and preservation. Prof. Murton is a recipient of the Coke Medal from the Geological Society of London (in 2019), has published over 120 peer-reviewed research papers on marine geology, and is a member of the Elsevier editorial board for the journal *Deep-Sea Research II*. He has been chief scientist on numerous nationally and internationally-funded research programmes including the EU-funded study ('Blue Mining Programme') of extinct seafloor massive sulphides, a large UK-funded strategic research study (the 'MarineE-tech Project) on tellurium and cobalt-rich ferromanganese crusts, and he is currently chief scientist for a new four-year strategic research programme (called 'Project ULTRA') on gold, nickel, platinum and copper-rich hydrothermal deposits on the Mid-Atlantic Ridge. The motives for this deep-sea mineral research are to provide the raw materials for high-tech and low-carbon technologies including renewable energy. In support of his deep-ocean exploration, Bramley has developed several technologies including the deep-diving robotic vehicle 'HyBIS' that first located the world's deepest hydrothermal vents at a depth of 5,000 m in the Caribbean.



Jon Hellevang



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Jon Hellevang is R&D Manager in GCE Ocean Technology, a cluster with + 140 partners and members from the industrial, corporate, entrepreneurial, financial, R&D and public sectors in Norway.

Hellevang holds an MSc in physical electronics from NTNU and has almost 20 years of RDI experience in the intersection between industry and applied research. Hellevang began his career at FMC Technologies (now part of TechnipFMC), working with subsea control systems. He is also a senior researcher at NORCE (Norwegian Research Centre), focusing on optical measurement technologies.

Hellevang has operated different roles for GCE Ocean Technology since 2006, focusing primarily on project development and developing new concepts, establishing partnerships, identifying funding opportunities and assisting with applying for public funding schemes. Hellevang has been leading the clusters activities related to marine minerals since 2014.

About GCE Ocean Technology

GCE Ocean Technology is an industry driven cluster with about 140 partners and members from the industrial, corporate, entrepreneurial, financial, R&D and public sectors. The cluster develops and supplies innovative ocean technology within subsea oil and gas production, marine renewable energy production, marine food production and the exploration of marine mineral resources.

Our key strategy involves transferring the clusters strong subsea oil and gas technology and expertise, to take a leading position in advancing and developing new sustainable ocean industries.

The cluster is a Global Centre of Expertise (GCE); the highest level in the Norwegian Innovation Cluster programme, which is organised and supported by Innovation Norway, the Research Council of Norway and Siva (The Industrial Development Corporation of Norway).



Kris De Bruyne



Project Manager
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Mr. De Bruyne joined GSR in 2015 as a Technical Engineer and was actively involved in developing GSR's R&D strategy. Mr. De Bruyne was Lead Engineer on board of the vessel conducting the trafficability trials in 2017 in the CCZ with the Tracked Soil Testing Device (TSTD) Patania I. In parallel, he organized and facilitated fundamental research on the nodule collection system performed at the Flanders Hydraulic Research Institute in Antwerp. Since then, as a Project Manager, Mr. De Bruyne has been responsible for the development, build and test of the Pre-Prototype Vehicle (PPV) Patania II. For the offshore trials in 2019, 2020 and 2021, Mr. De Bruyne was responsible for all operations with PPV Patania II. Mr. De Bruyne obtained a master's degree in Mechanical Engineering - Naval Architecture in 2010 at the University of Ghent, along with a master's degree in Organizational Management at the University of Antwerp in 2011 (BE)



Luís Neves



CEO of the Global Enabling Sustainability Initiative (GeSI)
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Luis Neves is CEO of the Global Enabling Sustainability Initiative (GeSI) since 2017. Prior to that, from 2008-2017, Luis held the position of GeSI Chairman. Under Luis' leadership, GeSI has become a globally recognized “thought industry leader” organisation in the field of ICT-sustainability with strong focus on the enabling role and positive contribution of digital technologies to climate protection.

Before GeSI, Luis worked at Deutsche Telekom for over 15 years holding positions such as Head of Sustainable Development and Environment, VP of Corporate Responsibility and Chief Sustainability and Climate Protection Officer. Luis has also held positions and played relevant roles at European and international levels in organisations, such as the UN Global Compact Lead Group, Econsense -the German Sustainability Association, World Resources Forum Association and UNFCCC Momentum for Change Initiative.

Luis was born in Portugal and obtained a degree in History from the University of Lisbon.

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Nicolas Menou



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Nicolas is Business Development Manager at EIT Raw Materials, the European engine for innovation in the raw materials sector where he is responsible for business creation and development activities in the Benelux, UK and Germany. Nicolas holds a PhD in Physics from the University of Toulon (France) and an Executive Master in Innovation and Entrepreneurship from Vlerick Business School (Belgium). Prior to joining EIT Raw materials Nicolas has held several positions in R&D, Innovation management and Entrepreneurship in a variety of sectors (Energy, nanoelectronics, chemistry).



Simon Pickard



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Simon leads on network engagement and development for Science|Business in line with the company's growth strategy. He previously held directorial positions with The Academy of Business in Society (ABIS) network and IDAS Global, a technology solutions provider to the global cash industry. Within these roles, he designed and coordinated a wide range of international projects focused on sustainability-driven innovation, both in research and education. Simon holds a Master's Degree from the University of Oxford and an MBA from HEC Paris School of Management.





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