RAW MATERIALS IN INTERNATIONAL WATERS

GLOBAL SEA MINERAL RESOURCES NV [DEME-GROUP]

[redacted]

1

Agenda

- Demand & Supply for Resources
- Polymetallic Nodules & GSR
- Position of Belgium
- Positon of NGOs
- Potential for Europe in the context of the ERMA
- Call for action

2

DEMAND & SUPPLY FOR RESOURCES

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7.8 (2020)
9.7 (2064)
BILLION

66% is projected to be urban

Predominantly in Africa and Asia

Ref: Vollset et al., 2020, UN, 2015

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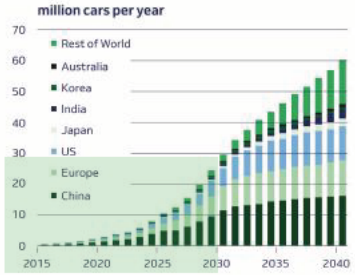
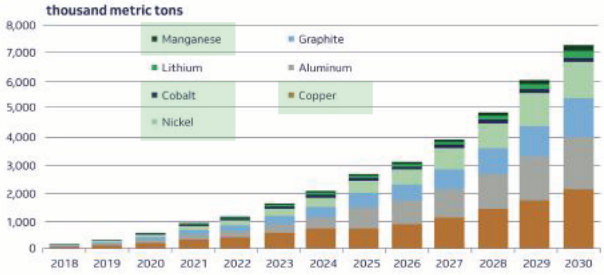
"THE WORLD CANNOT TACKLE CLIMATE CHANGE WITHOUT ADEQUATE SUPPLY OF RAW MATERIALS TO MANUFACTURE CLEAN TECHNOLOGIES." [WORLD BANK, 2020]





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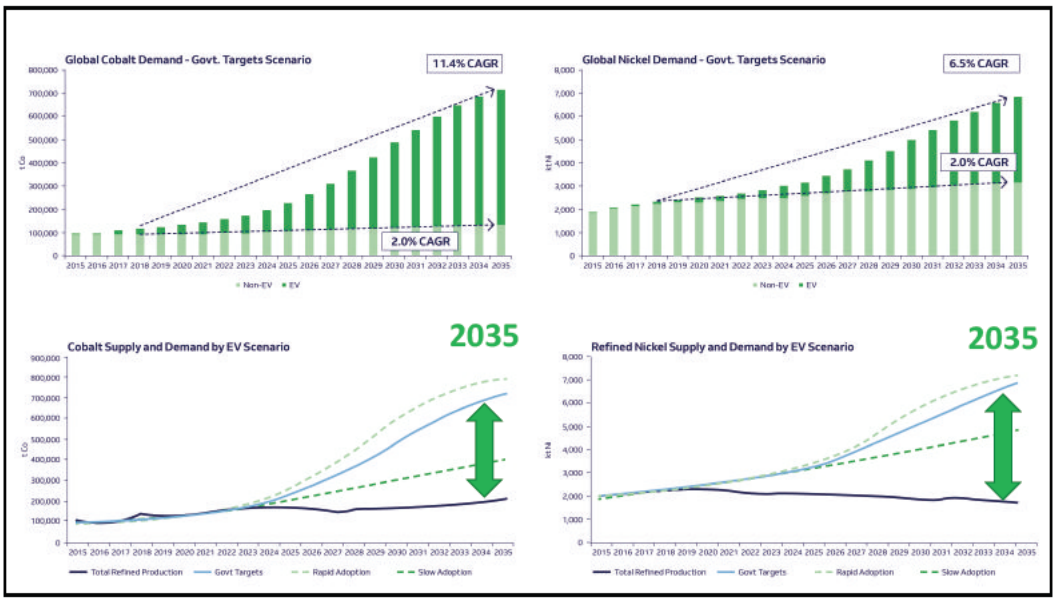

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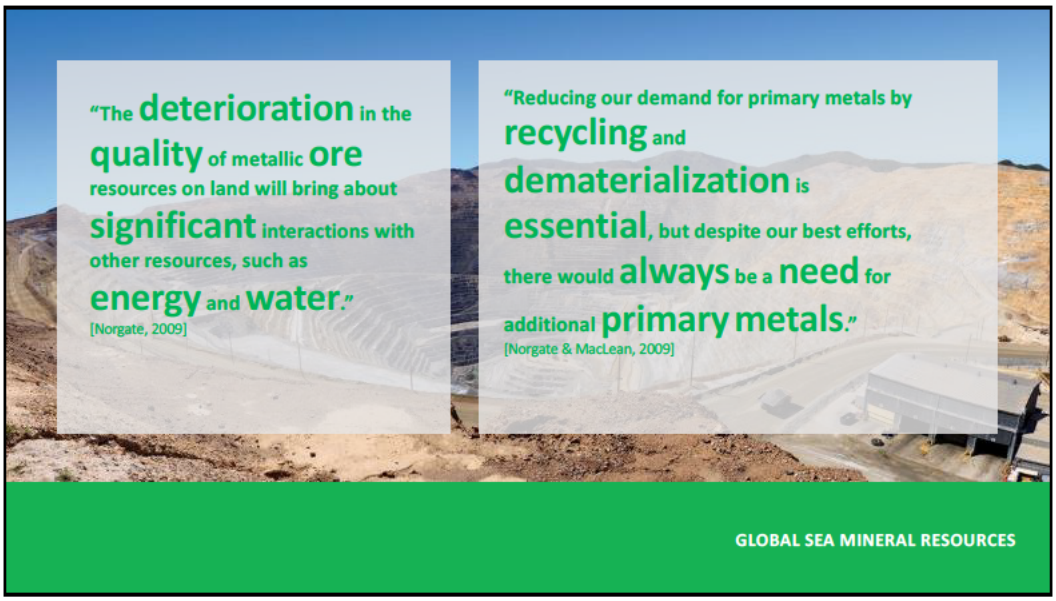
"The deterioration in the quality of metallic ore resources on land will bring about significant interactions with other resources, such as energy and water."
[Norgate, 2009]
"Reducing our demand for primary metals by recycling and dematerialization is essential, but despite our best efforts, there would always be a need for additional primary metals."
[Norgate & MacLean, 2009]
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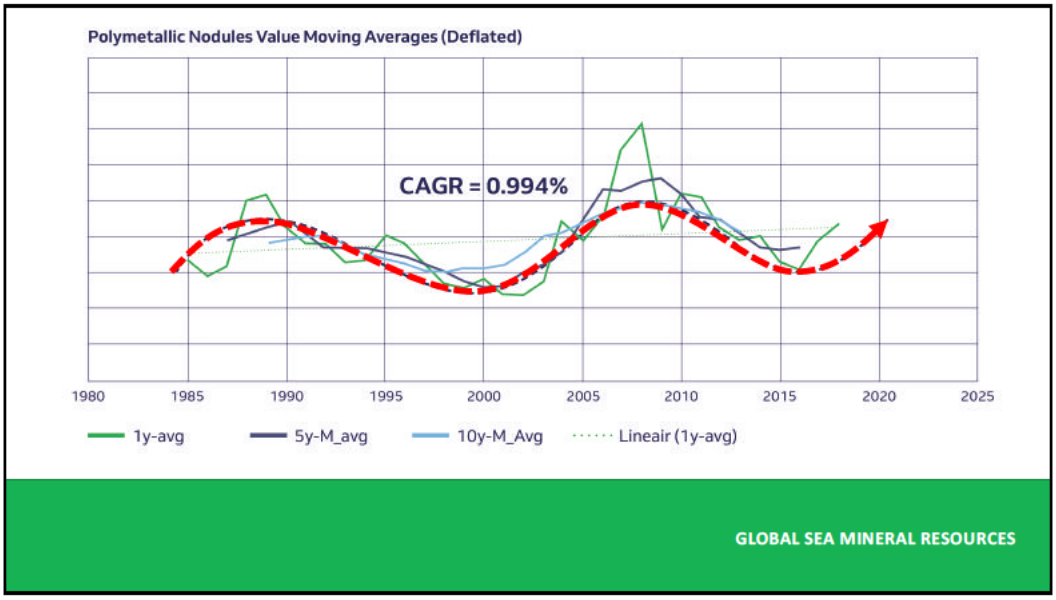
Polymetallic Nodules Value Moving Averages (Deflated)
CAGR = 0.994%
1980
1985
1990
1995
2000
2005
2010
2015
2020
2025
1y-avg
5y-M_avg
10y-M_Avg
Lineair (1y-avg)
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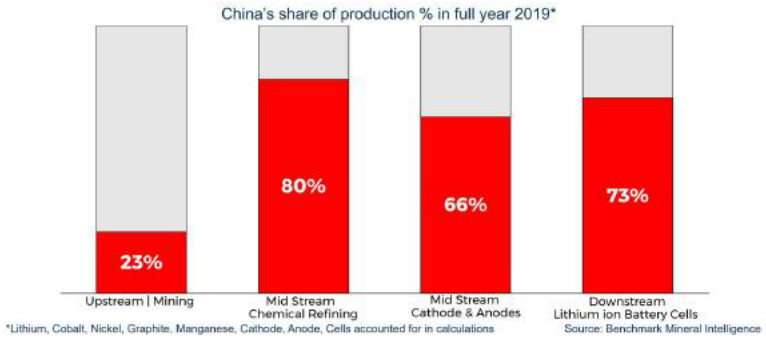
Where does China's dominance lie in the lithium ion battery to EV supply chain?



*Lithium, Cobalt, Nickel, Graphite, Manganese, Cathode, Anode, Cells accounted for in calculations

Source: Benchmark Mineral Intelligence

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POLYMETALLIC NODULES AND GSR

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"Nodules in the Pacific Ocean contain more Mn, Ni, Mo and Co than the entire global terrestrial reserve base for those metals."
[Hein et al., 2012]
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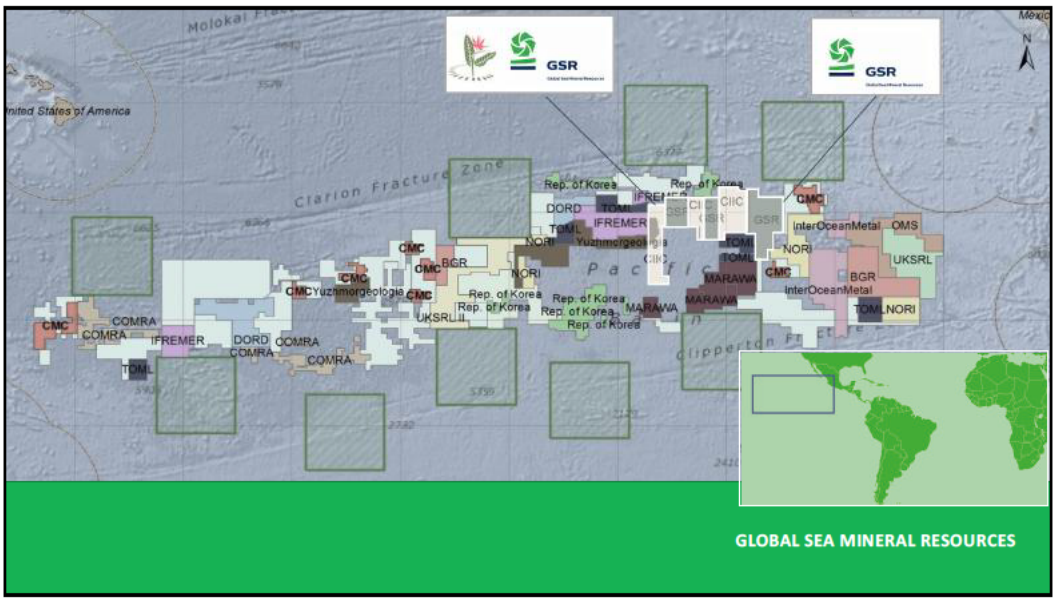
GSR
GSR
Clarion Fracture Zone
Clipperton Fracture Zone
Rep. of Korea
DORD
IFREMER
TOML
CMC
BGR
NORI
MARAWA
InterOceanMetal
OMS
UKSRL
COMRA
Yuzhmorgeologiya
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International Seabed Authority
25th Session 2019
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HYDROID
REMUS 6000

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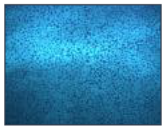
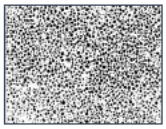
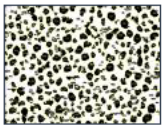
Step 1
Deployment of **Autonomous Underwater Vehicle** (AUV) flying five meters above the seabed, taking pictures every two seconds.



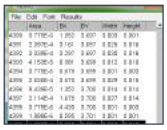
Step 2
Pictures of the seabed are collated into a Geographic Information System (GIS), denotating the exact position and collating with other sample and survey information.



Step 3
Raw pictures are analyzed and transferred into **binary pictures** being able to identify nodule dimensions.



Step 4
Software analyzes the different dimensions of nodules and determines the **nodule coverage** of each picture.



Step 5
Volume and weight for each nodule can be deduced based on the physical data measured on the nearest box core sample.

Step 6
Correlation between calculated nodule abundance, side scan sonar imagery and backscatter intensities will complete our methodology for an optimal estimation of the mineral resource.

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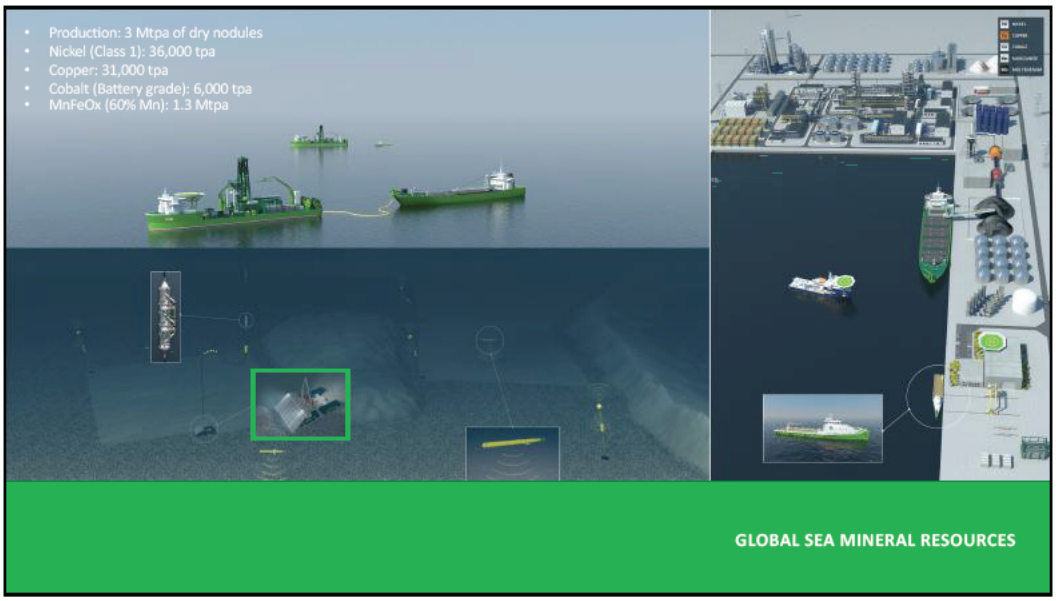
• Production: 3 Mtpa of dry nodules
• Nickel (Class 1): 36,000 tpa
• Copper: 31,000 tpa
• Cobalt (Battery grade): 6,000 tpa
• MnFeOx (60% Mn): 1.3 Mtpa
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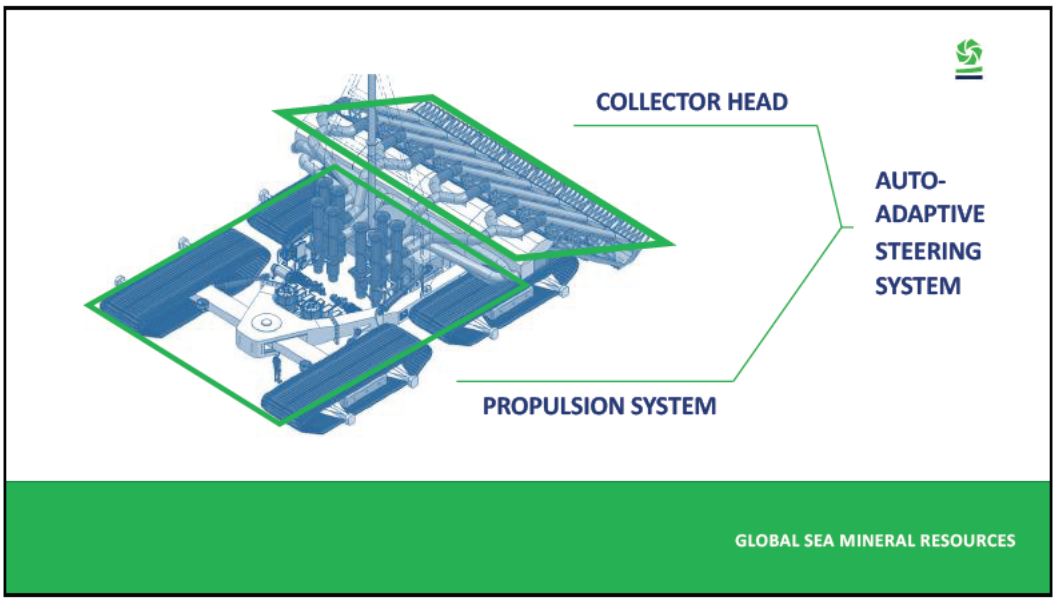
COLLECTOR HEAD
AUTO-
ADAPTIVE
STEERING
SYSTEM
PROPULSION SYSTEM
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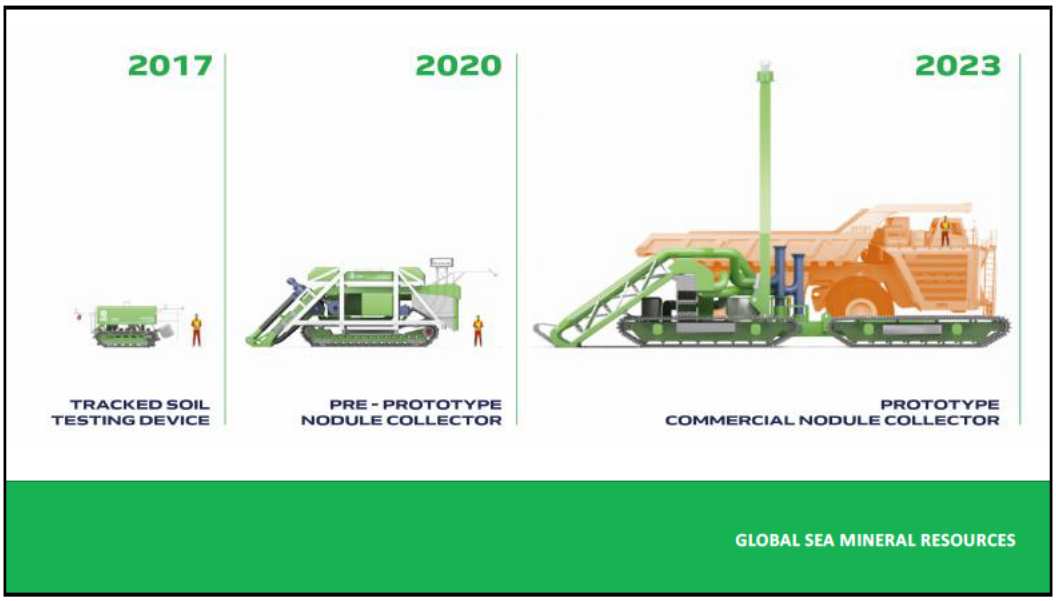
2017
2020
2023
TRACKED SOIL TESTING DEVICE
PRE - PROTOTYPE NODULE COLLECTOR
PROTOTYPE COMMERCIAL NODULE COLLECTOR
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DEME
AGENTSCHAP INNOVEREN & ONDERNEMEN
GSR
PATANIA
GLOBAL SEA MINERAL RESOURCES

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(1) Biodiversity, connectivity, resilience: Prior and after
(2) Fate and toxicity of the plume: Monitoring in space and time
(3) Biogeochemistry and ecosystem functioning: Prior and after
Boxcore
AUV
ROV
SyPRID
Deep sea Moorings
Water samplers
Pushcores
Multicore
CUBE
Landers
Benthic chamber
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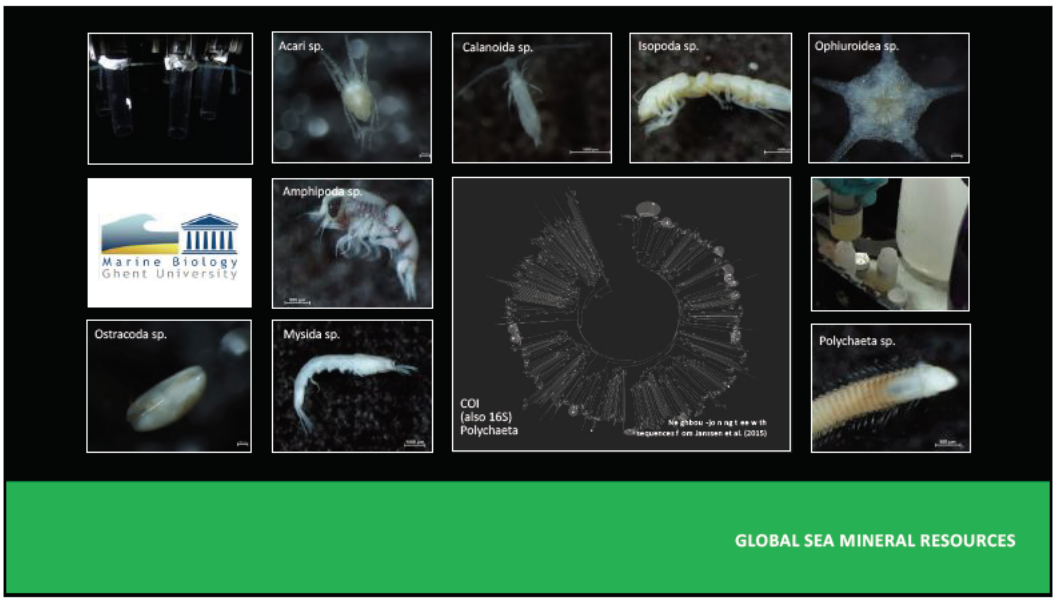
Acari sp.
Calanoida sp.
Isopoda sp.
Ophiuroidea sp.
Marine Biology
Ghent University
Amphipoda sp.
Ostracoda sp.
Mysida sp.
COI
(also 16S)
Polychaeta
Polychaeta sp.
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ENVIRONMENTAL IMPACT STATEMENT

1. Introduction
2. Policy, legal and administrative context
3. Project description
4. Description of the existing environment
5. Assessment of impacts and proposed mitigation
6. Accidental events and natural hazards
7. Environmental management, monitoring and reporting
8. Abbreviations
9. Study team
10. Expert review
11. References

Ref Following ISBA/23/LTC/CRP.3* Download
https //www.deme-group.com/gsr/news/gsr-publishes-its-prior-environmental-impact-statement-relating-2019-patania-ii-disturbance

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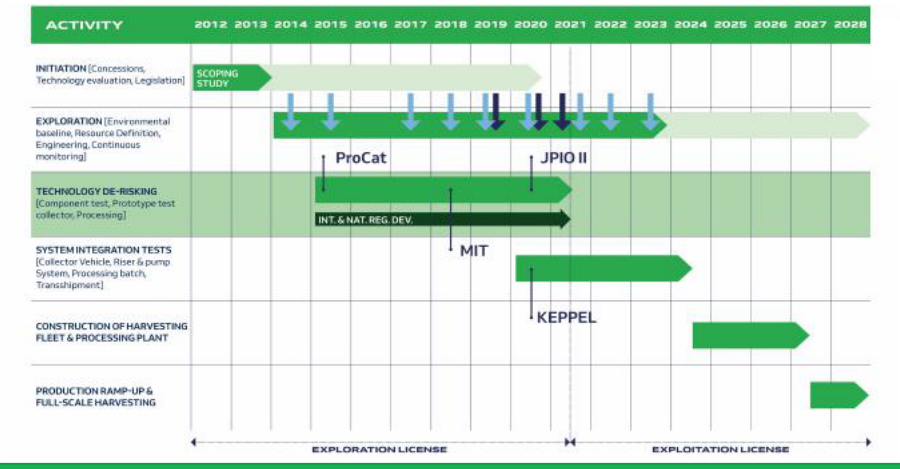

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POSITION OF BELGIUM

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PARLIAMENTARY HEARING

- 23 June 2020
- #7 experts
- #2 biologist, #1 geologist, #1 ngo, #1 policy makers, #1 industry, #1 regulator
- Concenssus that a **moratorium is not the right tool**
- Instead – "Need for time"

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MINISTRY OF ENVIRONMENT

1. To be listened to, you have to participate
2. A Belgian moratorium will not put a stop to ISA negotiations
3. Scientific research currently depends largely on investment through exploration
4. We have an opportunity here to set the bar high
5. A moratorium could impact upon other international processes, such as the BBNJ
6. We need to consider what will happen after the moratorium
7. Different stakeholders, including NGOs, have different views on the moratorium

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COALITION AGREEMENT, 30 September 2020

"Scientific research and data collection related to deep-sea mining is further supported. By participating at the international level, we ensure that environmental legislation and the precautionary principle are observed during the development of the exploitation rules."

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POLICY STATEMENT OF DEP. PM, 18 October 2020

"Our voice at the table is being heard as we argue for further scientific research and data collection related to deep-sea mining. Belgium will ensure that strict environmental norms and standards as well as the precautionary principle are taken into account."

https://www.dekamer.be/FLWB/PDF/55/1610/55K1610005.pdf

POSITION OF NGOs


PEW
IUCN
deepsea conservationcoalition
WWF
GREENPEACE
SEAS AT RISK
• Claims: Biodiversity loss; Recovery beyond human lifetime; Carbon release;…
• Solution: Circularity
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POTENTIAL FOR EUROPE IN THE CONTEXT OF THE EUROPEAN RAW MATERIALS ALLIANCE
SCIENTIFIC PAPERS ON:
EU DEMAND
IMPACT ON LAND
IMPACT OF OCEAN
GLOBAL SEA MINERAL RESOURCES

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7 September 2020

nature sustainability

ANALYSIS

https://doi.org/10.1038/s41893-020-00607-0

Check for updates

Circular economy strategies for electric vehicle batteries reduce reliance on raw materials

Joris Baars[1], Teresa Domenech[2], Raimund Bleischwitz[2], Hans Eric Melin[3] and Oliver Heidrich[1]✉

The wide adoption of lithium-ion batteries used in electric vehicles will require increased natural resources for the automotive industry. The expected rapid increase in batteries could result in new resource challenges and supply-chain risks. To strengthen the resilience and sustainability of automotive supply chains and reduce primary resource requirements, circular economy strategies are needed. Here we illustrate how these strategies can reduce the extraction of primary raw materials, that is, cobalt supplies. Material flow analysis is applied to understand current and future flows of cobalt embedded in electric vehicle batteries across the European Union. A reference scenario is presented and compared with four strategies: technology-driven substitution and technology-driven reduction of cobalt, new business models to stimulate battery reuse/recycling and policy-driven strategy to increase recycling. We find that new technologies provide the most promising strategies to reduce the reliance on cobalt substantially but could result in burden shifting such as an increase in nickel demand. To avoid the latter, technological developments should be combined with an efficient recycling system. We conclude that more-ambitious circular economy strategies, at both government and business levels, are urgently needed to address current and future resource challenges across the supply chain successfully.

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7 September 2020

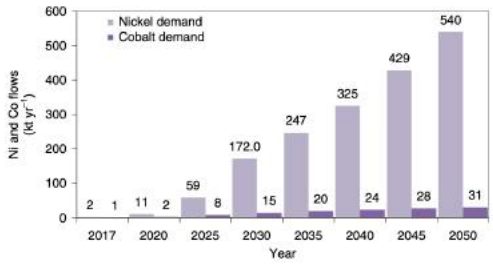

Fig. 3 | Co and Ni demand for European EVs in a rapid adoption of high-Ni cathodes. The values represent annual Ni and Co demand for EU BEVs and PHEVs. The scenario assumes a 100% adoption of NCM 9.5.5/NCA-II cathodes for all BEV and PHEV sales by 2050.

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1 September 2020

Article | Open Access | Published: 01 September 2020

Renewable energy production will exacerbate mining threats to biodiversity

Laura J. Sonter ✉, Marie C. Dade, James E. M. Watson & Rick K. Valenta

Nature Communications **11**, Article number: 4174 (2020) | Cite this article

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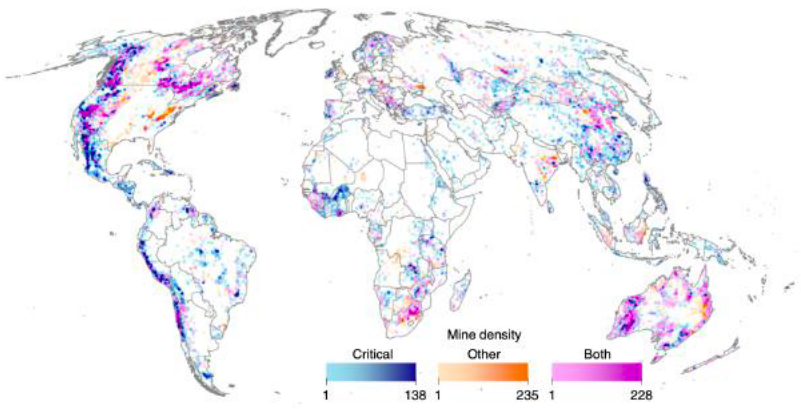
1 September 2020



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1 September 2020

Abstract

Renewable energy production is necessary to halt climate change and reverse associated biodiversity losses. However, generating the required technologies and infrastructure will drive an increase in the production of many metals, creating new mining threats for biodiversity. Here, we map mining areas and assess their spatial coincidence with biodiversity conservation sites and priorities. Mining potentially influences 50 million km^2 of Earth's land surface, with 8% coinciding with Protected Areas, 7% with Key Biodiversity Areas, and 16% with Remaining Wilderness. Most mining areas (82%) target materials needed for renewable energy production, and areas that overlap with Protected Areas and Remaining Wilderness contain a greater density of mines (our indicator of threat severity) compared to the overlapping mining areas that target other materials. Mining threats to biodiversity will increase as more mines target materials for renewable energy production and, without strategic planning, these new threats to biodiversity may surpass those averted by climate change mitigation.

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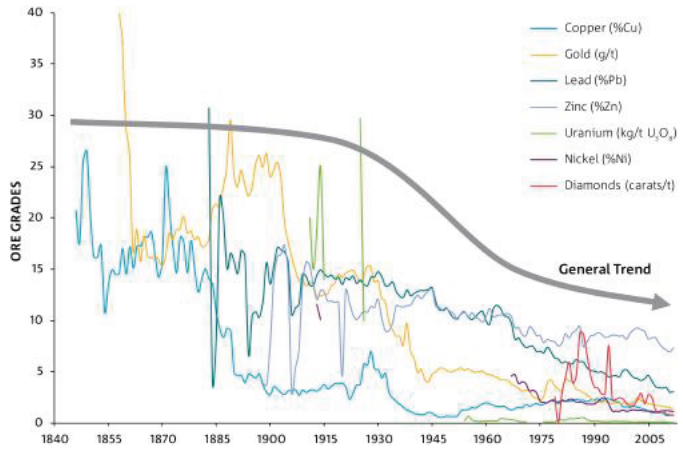

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28 August 2020

Contents lists available at ScienceDirect

Journal of Cleaner Production

journal homepage: www.elsevier.com/locate/jclepro

Life cycle climate change impacts of producing battery metals from land ores versus deep-sea polymetallic nodules

Daina Paulikas [a, *], Steven Katona [b], Erika Ilves [c], Saleem H. Ali [a, d]

[a] Minerals, Materials and Society Program, University of Delaware, Newark, DE, 19716, United States
[b] College of the Atlantic (emeritus), 105 Eden St, Bar Harbor, ME, 04609, United States
[c] Deep Green Metals Inc, 10th Floor, 595 Howe Street, Vancouver, British Columbia, V6C 2T5, Canada
[d] Sustainable Minerals Institute, Level 4, Sir James Foots Building (No. 47A), The University of Queensland, St Lucia, QLD, 4072, Australia

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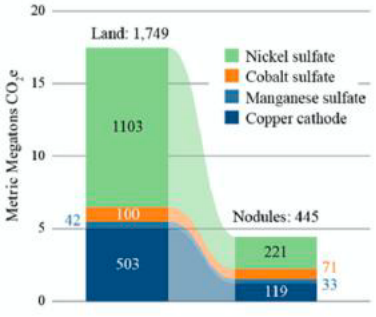
28 August 2020

1 EV Battery CO_2e (Land)	1 EV Battery CO_2e (Nodules)
1,103	221
100	71
42	33
503	119
Land 1,749 kg	Nodules 445 kg



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30 September 2020
UNIVERSITEIT GENT
STEN
Life Cycle Assessment of metal commodities from deep sea mining, including biodiversity impacts and comparison with terrestrial supply
Ghent University
Research Group Sustainable Systems Engineering (STEN)
GLOBAL SEA MINERAL RESOURCES
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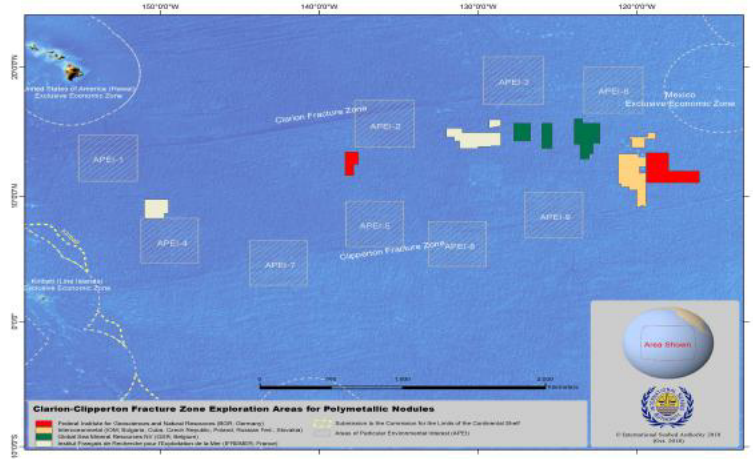
WIP



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CALL FOR ACTION

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Call for Action

- Include potential of DSM in the strategic vision of the ERMA
- Call out to four EU countries with contracts
- Support research into comparing biodiversity loss and GHG emission between land-based and seabed
- Carefully study GSR business case
- Evidence-based decision making

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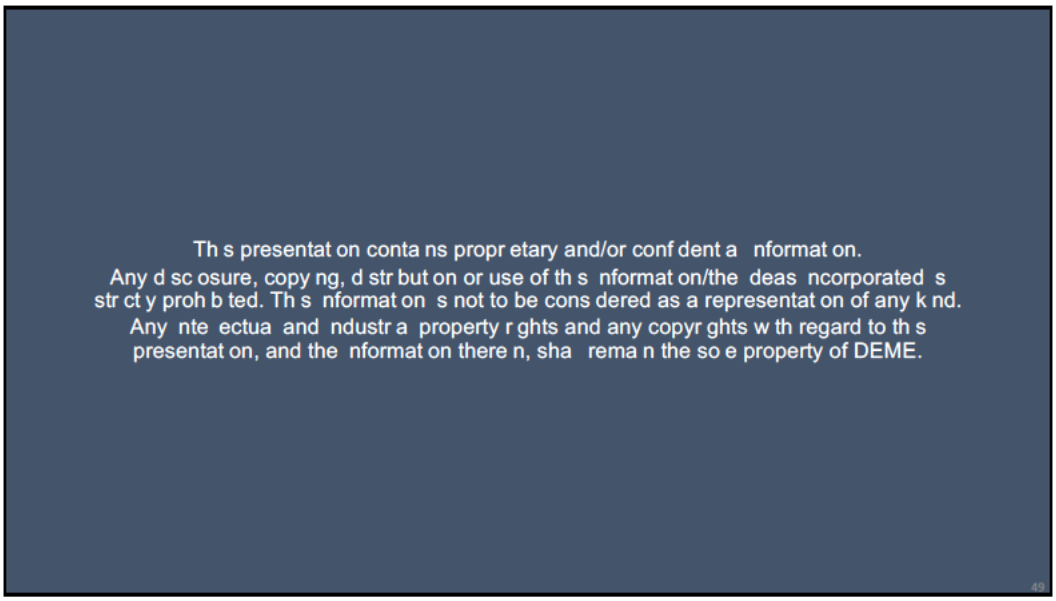
Th s presentat on conta ns propr etary and/or conf dent a nformat on.
Any d sc osure, copy ng, d str but on or use of th s nformat on/the deas ncorporated s str ct y proh b ted. Th s nformat on s not to be cons dered as a representat on of any k nd.
Any nte ectua and ndustr a property r ghts and any copyr ghts w th regard to th s presentat on, and the nformat on there n, sha rema n the so e property of DEME.
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