the metals company

# Impact Report 2022

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# 2022 Sustainability Highlights

## ENVIRONMENT

### Data collection and sharing for the NORI-D Project environmental impact assessment (EIA):

we spent **146 days at sea at the NORI-D site in 2022** with world-leading scientists to complete our environmental baseline assessment, monitoring program, and post impact study.

### Peer-reviewed research:

data collected from the NORI-D site has served as the basis for **5 peer-reviewed papers completed in 2022**, while our staff members have contributed to three peer-reviewed papers (on lifecycle waste generation, ethical considerations, and visioning a framework for effective environmental management of deep-sea polymetallic nodule mining).

### Safe operation parameters for deep-sea nodule collection:

we engaged a CSIRO-led consortium to develop a science-based framework to assist NORI in developing an **ecosystem-based environmental management and monitoring plan (EMMP)** to enable the company to minimize adverse impacts in the marine operating environment.

### Operational visibility for stakeholders:

in collaboration with Kongsberg Digital, we tested Kognitwin in the CCZ, a digital twin that replicates the **deep-sea operating environment and nodule-collection operations in 3D.** Kognitwin gives stakeholders a view into the operations and operators a tool to anticipate and manage the impact that operations have on the environment.

### NORI-D Project comparative lifecycle assessment (LCA):

we commissioned Benchmark to conduct a third-party verified **seafloor-to-factory-gate LCA to assess the impact that producing nickel, cobalt, and copper from nodules would have on the environment** as compared to key land-based production routes for the same metals. Benchmark's LCA models show that metals from NORI-D performed better in each impact category analyzed than all the land-based routes assessed, except for global warming potential (GWP) and water consumption of producing cobalt sulfate from DRC.

### Our manganese silicate product's downstream carbon impacts:

we commissioned SINTEF, one of Europe's largest independent research institutions, to characterize the properties of our intermediate manganese silicate product when used to produce silicomanganese alloys rather than conventional medium-grade manganese ores. SINTEF found that, compared to conventional ores, our product appears to have significant downstream advantages in terms of cost and CO2 footprint and the potential for **7 to 17% higher value in use** depending on the carbon tax regime.

## SOCIAL

### The world's first social impact assessment (SIA) for a polymetallic nodule project in international waters:

NORI launched a **public stakeholder consultation program** to scope a SIA for the NORI-D Project.

### Our contribution to sponsoring state communities:

via our subsidiaries NORI and TOML, we awarded 40 community projects grants in Nauru and Tonga.

### STEM talent pipeline:

NORI and TOML sponsored 24 **scholarships and training opportunities** in environmental sciences and marine management through our community program.

### Global stakeholder engagement:

NORI provided responses to over **600 comments** on the environmental impact statement (EIS) for NORI's 2022 collector system trial in the CCZ.

## GOVERNANCE

### Our path to deliver net positive impacts:

we completed a materiality assessment and developed **sustainability goals.**

### The first environmental, social, and governance (ESG) handbook for marine minerals:

we joined an international consortium to develop an ESG disclosure guidance to advance **consistent and transparent industry disclosure** of material topics related to marine minerals projects in the deep-sea environment.

### Commitment to healthy and productive oceans:

we signed on to the **Ocean Stewardship Coalition** to formalize our contribution to the Blue Economy and UN Sustainable Development Goals.

### Gender diversity in the boardroom:

**3 out of 8 TMC** board members are women, a 38% representation above the 32% average for companies on Nasdaq.

# Who We Are


- Letter From the CEO
- Our Vision - Our Challenge
- Our Responsibility
- Our Key Milestones


## Forward-Looking Statements

The Impact Report contains “forward-looking statements” within the meaning of Section 27A of the Securities Act of 1933, as amended, and Section 21E of the Securities Exchange Act of 1934, as amended, that relate to future events, TMC the metals company Inc.’s (the “Company”) future operations or financial performance, or the Company’s plans, strategies and prospects. These statements involve risks, uncertainties and assumptions and are based on the current estimates and assumptions of the management of the Company as of the date of this report and are subject to uncertainty and changes. Given these uncertainties, you should not place undue reliance on these forward-looking statements. Important factors that could cause actual results to differ materially from those indicated by such forward-looking statements include, among others, those set forth under the heading “Risk Factors” contained in the Company’s Form 10-K for the year ended December 31, 2022, which was filed with the Securities and Exchange Commission on March 27, 2023, as well as any updates to those risk factors filed from time to time in our periodic and current reports.

# Letter From the CEO

**Gerard Barron**
Chairman & CEO

Over the past 12 months, we have made a great deal of progress towards understanding the future impacts of our nodule projects.

Several developments merit highlighting: An independent, third-party-reviewed lifecycle assessment of our NORI-D Nodule Project was completed by Benchmark Mineral Intelligence. Our subsidiary NORI executed a complex three-vessel campaign where the impacts of a pilot nodule collection system were carefully monitored by independent scientists. NORI has also started the process of making the collected data available to the public, with the initial batch of data from two of NORI's offshore environmental campaigns already available on the ISA DeepData and UNESCO's OBIS database. Seven peer-reviewed research papers based on the NORI dataset have already been published and we expect many more to follow. In close collaboration with the CSIRO-led consortium, we have made progress on defining environmental thresholds for our future nodule collection operations. At the industry level, we have been active contributors to the development of the ESG Handbook for Marine Minerals.

Here is what we have learned:

**Lifecycle impacts:** As a company, we see it as our responsibility to account for the full stack of our impacts as we look for our projects to deliver a net positive impact on people and the planet when compared to the alternatives. We began back in 2019 with the commission of an in-depth academic lifecycle assessment (LCA) covering 19 impact categories which drew upon preliminary NORI project data to assess the comparative impacts of sourcing metals for 1 billion electric vehicles, from both nodules and land ores. The results were promising but comparisons to the averages of land-based alternatives were crude. After two years of developing our offshore nodule collection technology and piloting our nodule processing technology, we produced a refined project dataset for NORI-D and commissioned a higher-fidelity LCA from Benchmark focusing on eight critical impacts including carbon emissions, waste, water, and toxicity. This time, we wanted to know how the NORI-D Project model would compare to specific land-based production routes. Benchmark covered 93% of global refined nickel production, 86% of global mined cobalt and about 20% of copper production. The big picture is still the same: the NORI-D Project model outperformed most analyzed land-based production routes for nickel, copper and cobalt—albeit there were two exceptions. Now we also have a refined assessment of the NORI-D Project impact hotspots that we can address prior to starting commercial production.

**Marine impacts:** Two critical areas not covered by Benchmark's LCA are potential impacts on marine biodiversity and ecosystem function. Assessing these impacts against a comprehensive environmental baseline has been the primary focus of our team for the past decade. During this time, NORI undertook 18 offshore campaigns in collaboration with leading independent marine research institutions to develop a high-resolution baseline of the NORI-D area from ocean surface, down into the seafloor. In 2022, we reached a significant milestone in our deep-sea research program. NORI conducted the first pilot collection system test in the Clarion-Clipperton Zone since the 1970s, while independent scientists closely monitored and assessed the environmental impacts. Our environmental team and research partners continue to analyze the vast volumes (>200 terabytes) of data gathered during the trials. Early results are encouraging: Our pilot collector entrained less sediment than we expected and preliminary plume monitoring results are consistent with earlier in-field studies from MIT and Scripps which found that 92-98% of sediment does not rise higher than 2 meters above the seafloor and re-settles locally. We plan to revisit the site of impact 12 months after the pilot test, so next year we'll be able to report on what we observe.

**Reach of collected environmental data:** The environmental data collected from NORI-D area will inform the Environmental Impact Statement (EIS) for proposed nodule collection operations on NORI-D and the development of the ecosystem-based Environmental Management and Monitoring Plan (EMMP) that will provide appropriate indicators and tolerance limits to create safe parameters for collecting nodules. All this work forms the scientific foundation of our Adaptive Management System (AMS) which will draw upon years of research and expertise from leading marine institutions and hundreds of environmental sensors deployed throughout the entire water column in our NORI-D project area. We now believe we have sufficient data to assess and manage environmental risks of a small-scale operation while we collect more data as part of the EMMP. We intend to start small, and to proceed with caution and care.

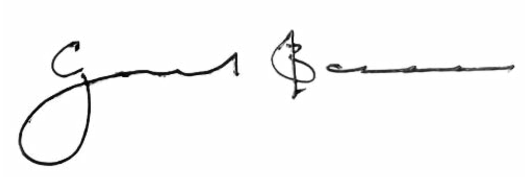
**Impact thresholds:** A crucial component of ensuring safe subsea operations is the implementation of defined environmental thresholds. Like guardrails on a highway, these thresholds will define how far an ecosystem can be modified without the risk of significant harm and will play a central role in our AMS. We are working with a consortium led by Australia's national science agency, the Commonwealth Scientific Industrial Research Organization (CSIRO), to create a framework for proposed deep-sea polymetallic nodule collection operations in the CCZ. The ISA has also confirmed the importance of these thresholds and established three working groups comprised of subject matter experts to advance this crucial work, targeting December 2024 for their completion. With deep experience in developing scientifically robust frameworks for marine ecosystem-based management — including for the Great Barrier Reef — CSIRO's team is the best in the business, and their past work will be invaluable when leveraging NORI's extensive dataset to identify appropriate indicators to monitor and create safe parameters for collecting seafloor nodules, before any operations begin.

**Transparency:** Most people assume that far offshore, deep-water operations will be "out of sight, out of mind" and, therefore, difficult for the regulator to inspect and control. That's where AMS comes in—it is intended to be the eyes and ears of our operations not just for us and our offshore partners but for the regulator and key stakeholders, enabling near real-time environmental and operational management of our activities. Last year, we piloted the Digital Twin that forms the backbone of the AMS and those of us who were not offshore were glued to our screens, tracking the movements of Hector, our pilot collector on the seafloor. I know we are not the only contractor developing such a system with the regulator and key stakeholders as end-users in mind. Together, we hope to set the bar for the industry going forward. Far offshore and at depth operations under the oversight of an international regulator could become the easiest resource extraction projects to monitor. Transparency is also top of mind for the international consortium TMC is part of alongside other companies like Equinor and Aker BP, non-profits like ACOPS and Fórum Oceano, and with the ISA and OECD as observers, working to create an ESG handbook for marine minerals. This handbook will serve as a blueprint for disclosing material topics associated with marine mineral projects while showcasing best practices.

If the last 12 months have been all about gathering the environmental data, the next twelve months are about putting that data to work to minimize and mitigate impacts on the marine environment. Together with our offshore partner Allseas, we are further refining the design of our nodule collection system. In parallel, we are working on producing the EIS, EMMP and Social Impact Statement for the NORI-D Project—all critical components of NORI's exploitation application that will give the regulator and key stakeholders a science-based view of the project's impacts.

I am pleased to share our second annual Impact Report and look forward to sharing further updates next year.

Sincerely,



**Gerard Barron**
Chairman & CEO

# Our Vision

Imagine if, a hundred years from now, our great-grandchildren could use the exact same metal atoms inside our phones, cars and homes. These metal atoms could continue to serve humankind through countless cycles of technological ingenuity. We envision a carefully managed metal commons that will be used, recovered, and reused again and again – for millennia. No more metal lost to landfills. No more damage to the planet and the people on it. A society built with a metal metabolism, similar to how many biological systems have evolved over time.

# Our Challenge

Getting there is not a straight path because today we do not have sufficient metal stocks to meet our growing needs. We face the challenge of building up a metal commons in a way that has the lowest possible adverse impact on people and the planet.

The fight against climate change, which some Pacific Island nations describe as a climate crisis, requires an accelerated transition to renewables and electric transportation. Such a transition comes with an exponential growth in demand for the critical metals that these technologies require. It will take decades to get to a place where humanity has enough metal stock in circulation to meet its needs without having to take significantly more metal from the planet.

We see two trends that we expect to continue to drive growth in metal demand:

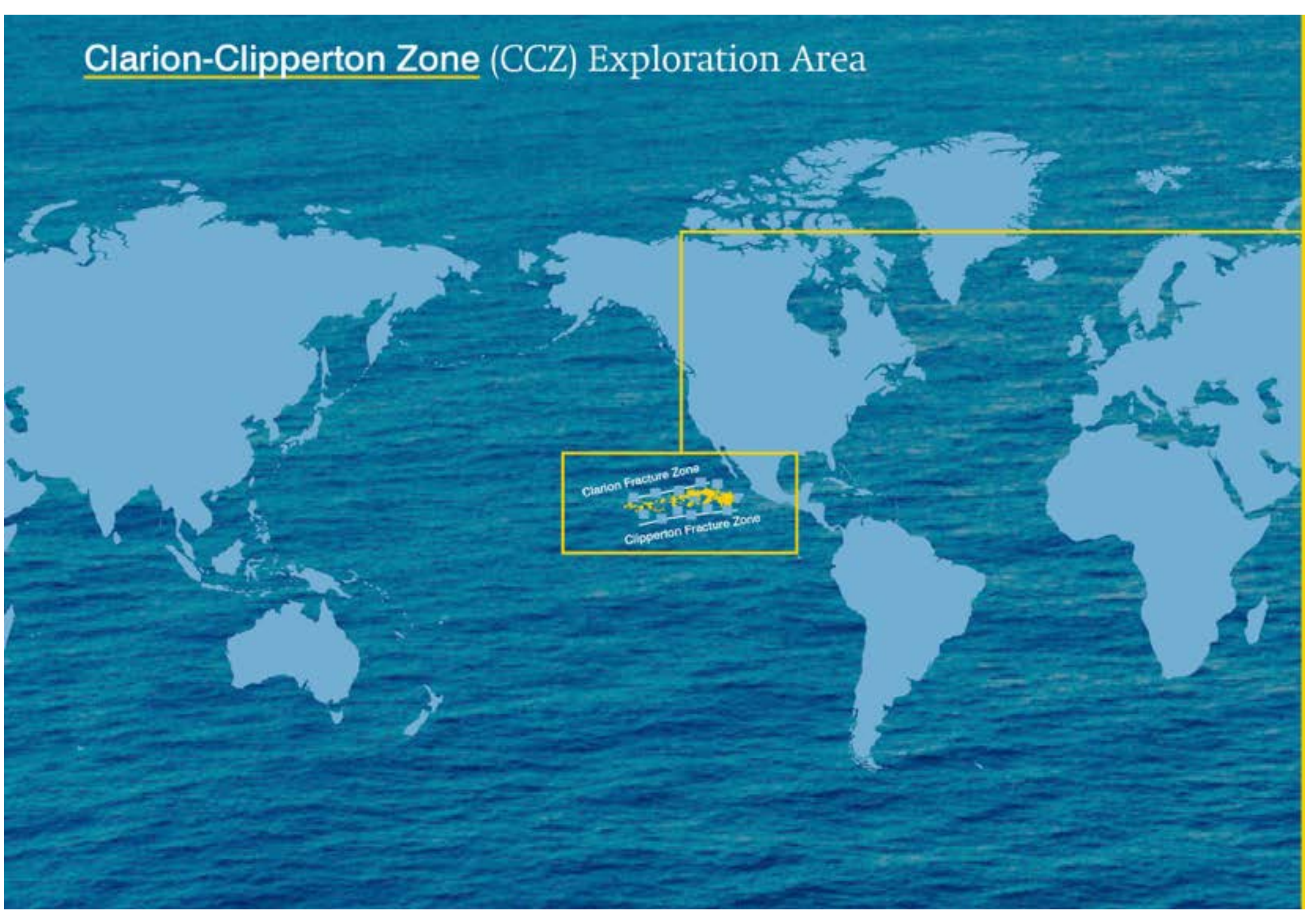
- The world has embarked on a massive, multi-generational project to decarbonize global energy and transportation.
- At the same time, the world's population continues to grow (the United Nations has predicted that it will grow by 2 billion net by 2050[1]), urbanize, and develop.

Given these developments, it is likely that in the next 30 years we will have to mine more nickel, cobalt and copper than we have mined in all of human history. However, existing land-based metal reserves reside in locations with multi-dimensional challenges. For instance, Indonesia (which produces the most nickel and has the most nickel reserves in the world) and the Democratic Republic of the Congo (DRC) (which produces the most cobalt and has the most cobalt reserves in the world) have significant human populations (over 270 million and 90 million, respectively) and possess large carbon sinks, high biomass, and mega-biodiversity.

[1] United Nations Department of Economic and Social Affairs, "World Population Prospects 2022: Summary of Results", 2022

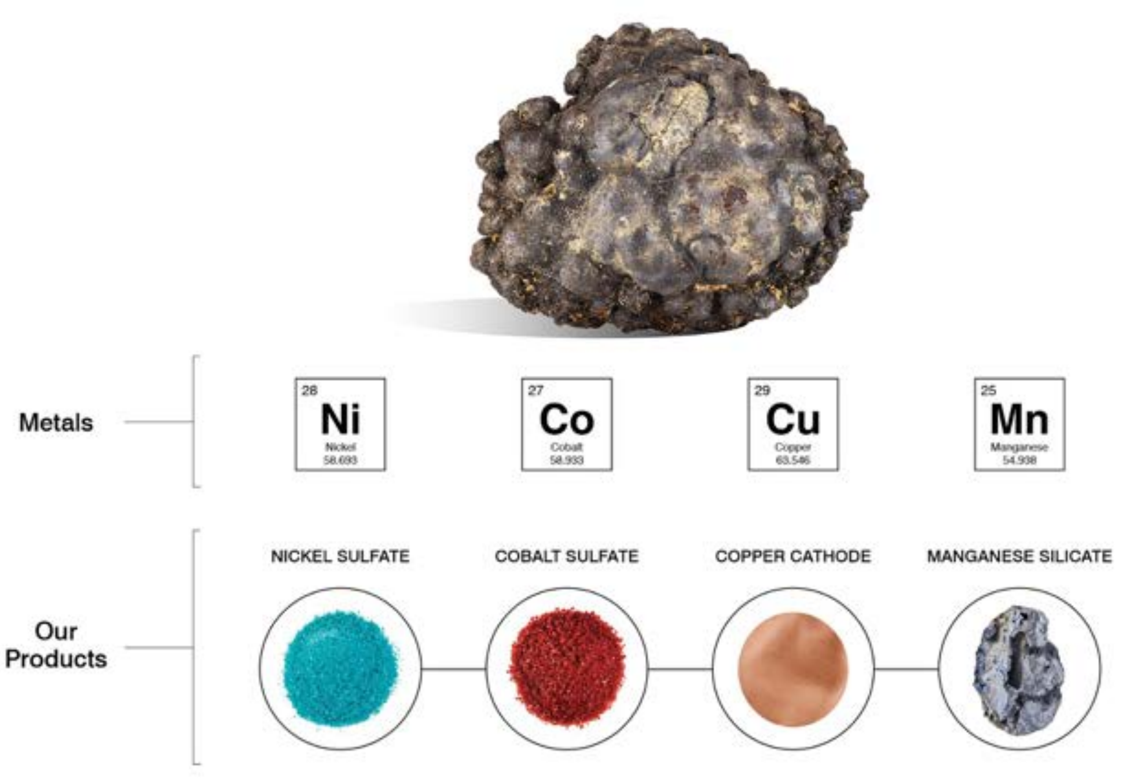
# Our Plan

We have a three-step plan. First, we focus on addressing the immediate challenge: How do we produce more metal required for the global energy transition and development with the lowest possible cost to people and the planet? If extracted responsibly, we believe polymetallic nodules found on the deep seafloor in the Clarion-Clipperton Zone (CCZ) could be a good answer for critical metals like nickel, copper, cobalt, and manganese.




The Earth's surface is 510 million km$^2$, of which the global deep-sea (defined as >200 m in depth) is 360 million km$^2$. The CCZ is 4.56 million km$^2$ or 1.2% of the total ocean floor. CCZ is an abyssal plain, which is defined as a seafloor at depths between 3,500-6,500 m. Abyssal plains cover 70% of the ocean floor and are the most common habitat on Earth.

**Key Battery Metals** Contained in Nodules




While our first step is to extract resources from the seafloor, every new ton of metal we add into the system today is a ton of metal that can be recovered and recycled in the future – we plan to help build up recyclable metal stocks to reduce future demand for mined metals. Second, we plan to track, recover and recycle the metals that we added into circulation. In a few decades, we expect to exit metal extraction from seafloor resources altogether as we expect most of global demand will be met with recycled metals. Finally, with metal recycling as our key focus, we will expand our scope to recover a broader set of metals.

We envision a carefully managed metal commons that will be used, recovered, and reused again and again – for millennia.

| Chapter 1 | Chapter 2 | Chapter 3 |
| --- | --- | --- |
| Supply required primary critical metals with the east negative impact on people and the planet | Recycle the metals we produce | Recycle the rest |

Exit primary production

# Our Responsibility

We consider it our responsibility to (1) account for the full stack of impacts we may have on planetary boundaries and social foundations, (2) aim to create a net positive impact on people and the planet, and (3) change course if the path we choose does not deliver on our net positive impact goal.

**Full stack of impacts:** Failing to account for negative externalities of human activities on people and the planet is what got our civilization in trouble. Taking metal from the planet inevitably damages nature and can have significant human costs as well. Minimizing these costs is why we decided to focus on developing a polymetallic nodule resource found far offshore, away from human communities, and at great depths of the abyssal plains that host lower biomass and biodiversity than most other biomes on Earth. But are we right? Will our operations deliver a better set of trade-offs compared to the alternatives? We believe that a careful inventory of all material impacts of our choices is a prerequisite for making informed decisions. It is therefore our responsibility to invest in understanding the environment, anticipating potential impacts of our future commercial operations on people and the planet, and improving before we begin.

**Net positive impact:** We have a rare opportunity to develop a resource deemed to be a common heritage of humankind. We believe it is our responsibility to develop such a resource in a manner that has a significant, lasting, net positive impact on people and the planet.

**Course correction:** We believe it is our responsibility to change course if our chosen path does not deliver on our net positive impact goal. We cannot afford path dependencies.

OUR RESPONSIBILITIES

**#1: Full Stack of Impacts**

No "externalities" – accounting for the full stack of our impacts on planetary boundaries and social foundations

**#2: Net Positive Impact**

Create a significant, lasting, net positive impact on people and planet using a common heritage of humankind resource.

**#3: Course Correction**

Change course if our chosen path does not deliver on our net positive impact goal: we cannot afford path dependencies.

For over a decade, in partnership with and support from three Pacific island nations as our sponsoring states, we have explored the seafloor of the Clarion-Clipperton Zone (CCZ) in the Pacific Ocean where the planet's largest-known deposits of undeveloped battery-grade metals reside. Together with our offshore engineering partner, Allseas, we have developed and successfully piloted an offshore nodule-collection system that lifted over 3,000 tonnes of nodules to the surface. And our onshore processing team has developed and successfully piloted our nodule-processing flowsheet to produce battery metals from the nodules while generating near-zero solid processing waste. We have also invested in comparative lifecycle assessments to determine the impacts associated with producing metals from nodules compared to other key land-based routes of producing the same metals and in a multi-year, comprehensive assessment program with leading scientific and academic institutions across the world to determine the environmental impacts associated with nodule-collection operations in the CCZ. Today, we remain in an exploration phase and are working on a comprehensive application for an exploitation permit. To date, our impacts on people and nature are limited to out offshore exploration expeditions and the technology-development work that our partners predominantly conduct in their own facilities.

With this impact report, which we have published since 2021, we share our motivation, approach, expected impacts and how they compare to key-land based metal-production routes, and current work to eliminate or reduce our future impacts. We do so to uphold our responsibilities as we look to account for the full stack of possible impacts that we may have on planetary boundaries and social foundations, aim to create a net positive impact on people and the planet, and change course if the path we choose does not deliver on our impact goal. With all the science driven work we have done and continue to do, we seek to help society make informed decisions.

We share these analyses and plans for another reason as well: to invite the many brilliant people in the world who do not work in TMC to keep reading and to respond to our plans. If you see questionable assumptions or if you have better ideas for solving our complex impact puzzle, please share them via impact@metals.co. We welcome a science-driven dialogue with a focus on solutions that consider the interconnectedness and complexities of planetary and social systems.

# Our Key Milestones

**2011** — DeepGreen is founded — Nauru Ocean Resources Inc. (NORI, fully owned subsidiary) in the Clarion-Clipperton Zone is granted an exploration contract, sponsored by Nauru

**2012** — TOML (Tonga Offshore Mining Limited, a fully owned subsidiary since 2020) exploration contract granted, sponsored by Tonga

**2015** — Marawa, sponsored by Kiribati, enters into an exclusive commercial agreement with DeepGreen (now TMC)

**2017** — Maersk Supply Service becomes a strategic partner and investor

**2019** — Allseas becomes a strategic partner and investor

**2020** — Allseas acquires first ship for nodule collection

**2021** — Sustainable Opportunities Acquisition Corp. (SOAC) + DeepGreen = the metals company

**2022** — NORI and Allseas Lift Over 3,000 Tonnes of Polymetallic Nodules to Surface (first integrated system trial in the CCZ since the 1970s)

**2023** — ISA roadmap target for finalization of Mining Code

**2025** — Projected to start small-scale commercial production

**2030** — Expected steady-state commercial production

# Why We Exist


## Metal-Intensive Future

- Metal-Intensive Future
- Availability
- Security
- Price
- ESG Impacts

## A Circular Metal Economy Future

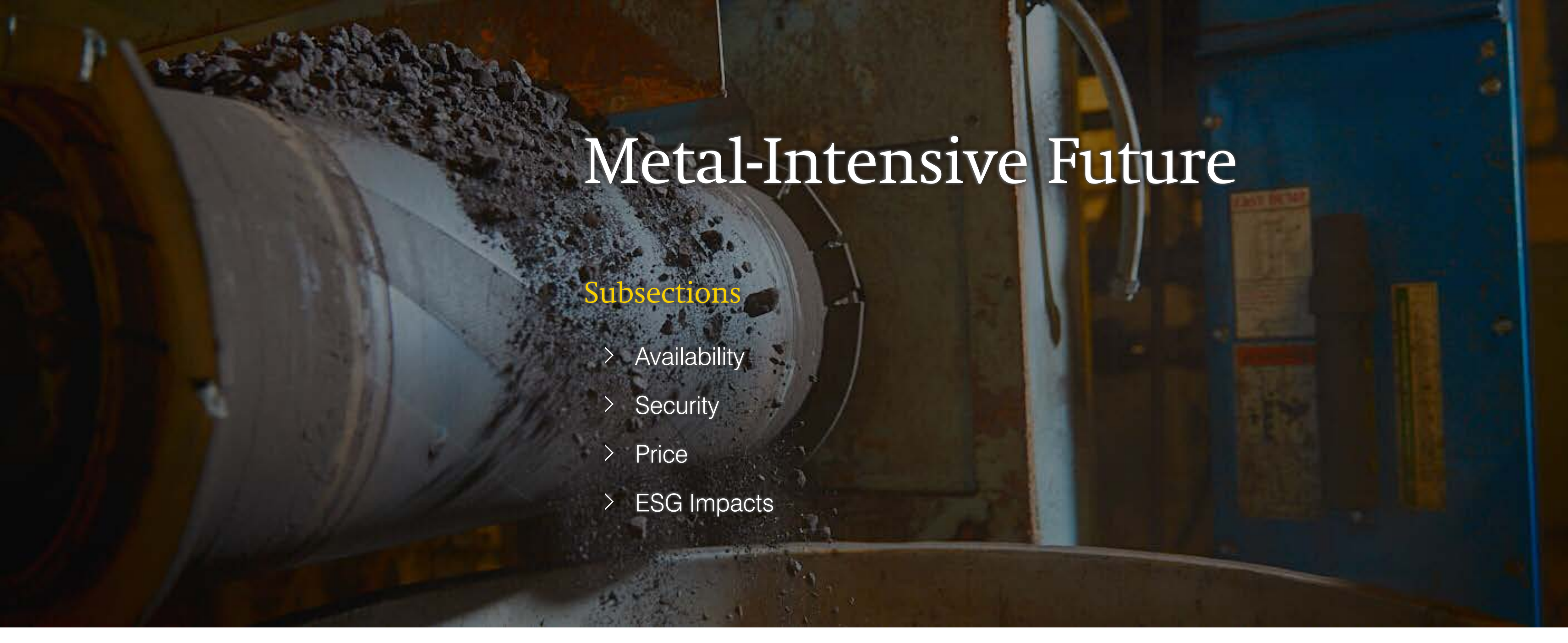
- A Circular Metal Economy Future

## Limitations and Trade-Offs of Mining More Metals

- Doughtnut-Shaped Solution Space
- Complications

## Our Hypothesis

- Our Hypothesis
- Why We Focus Only on Nodules
- The CCZ and Abyssal Plains
- Comparative Life Cycle Studies



# Metal-Intensive Future

Subsections

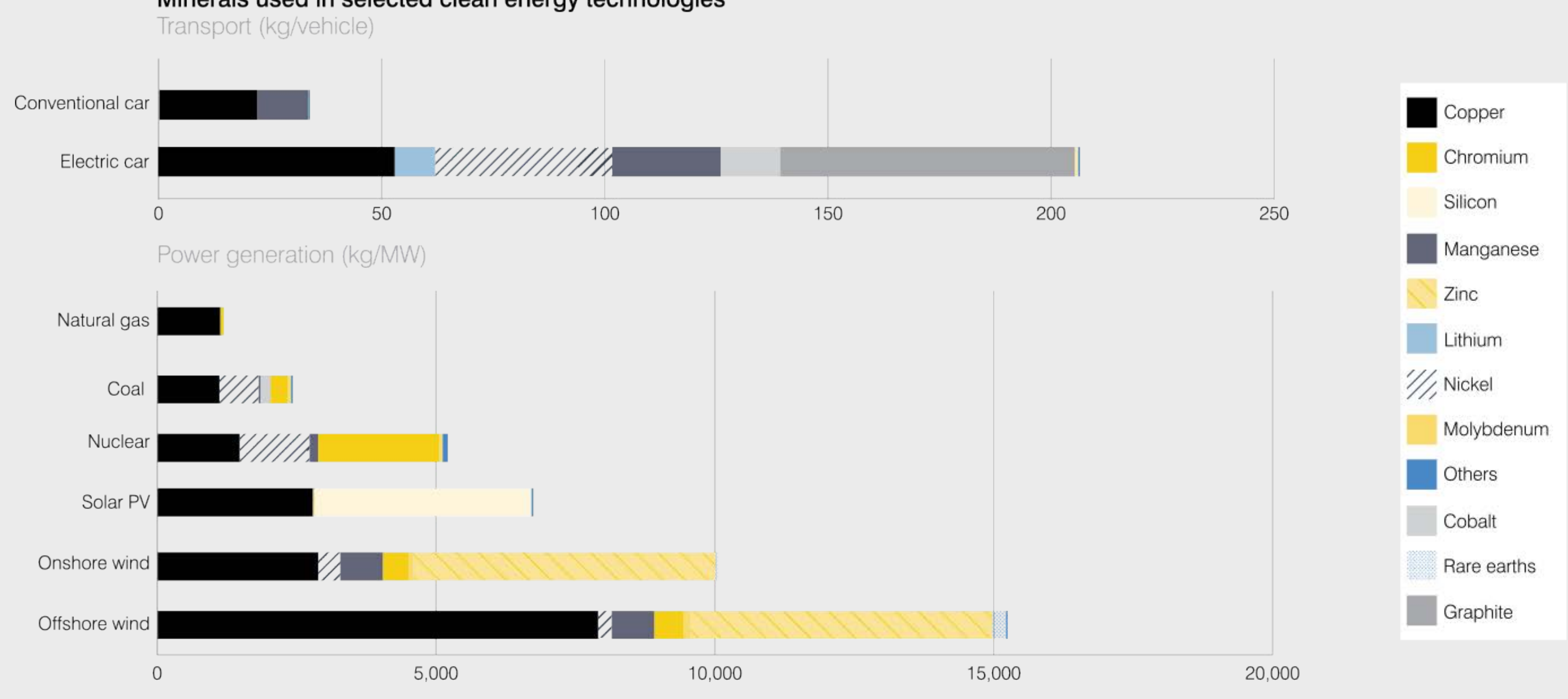
- Availability
- Security
- Price
- ESG Impacts

The global energy transition will require metal in significant quantities. An offshore wind farm requires eight times more critical metals to build than a coal-fired plant[1], while an electric car requires six times more compared to a conventional one[2].

[1] IEA, "Minerals used in clean energy technologies compared to other power generation sources", Oct. 26, 2022

[2] IEA, "Minerals used in electric cars compared to conventional cars", Oct. 26, 2022

**Minerals used in selected clean energy technologies**




Sources: IEA, "Minerals used in electric cars compared to conventional cars", Oct. 26, 2022; IEA, "Minerals used in clean energy technologies compared to other power generation sources", Oct. 26, 2022

Our decarbonized, metal-intensive future has already attracted considerable analytical effort from organizations such as the World Bank[1], the International Energy Agency (IEA)[2], and the International Monetary Fund (IMF)[3] On a global scale, the IEA has predicted that the global energy transition will increase the overall demand for minerals by four to six times by 2040. For certain critical metals, the growth in demand may increase even higher—up to 42 times for lithium, 25 times for graphite, 21 times for cobalt, 19 times for nickel, 8 times for manganese, and 2.7 times for copper as compared to 2020[4].

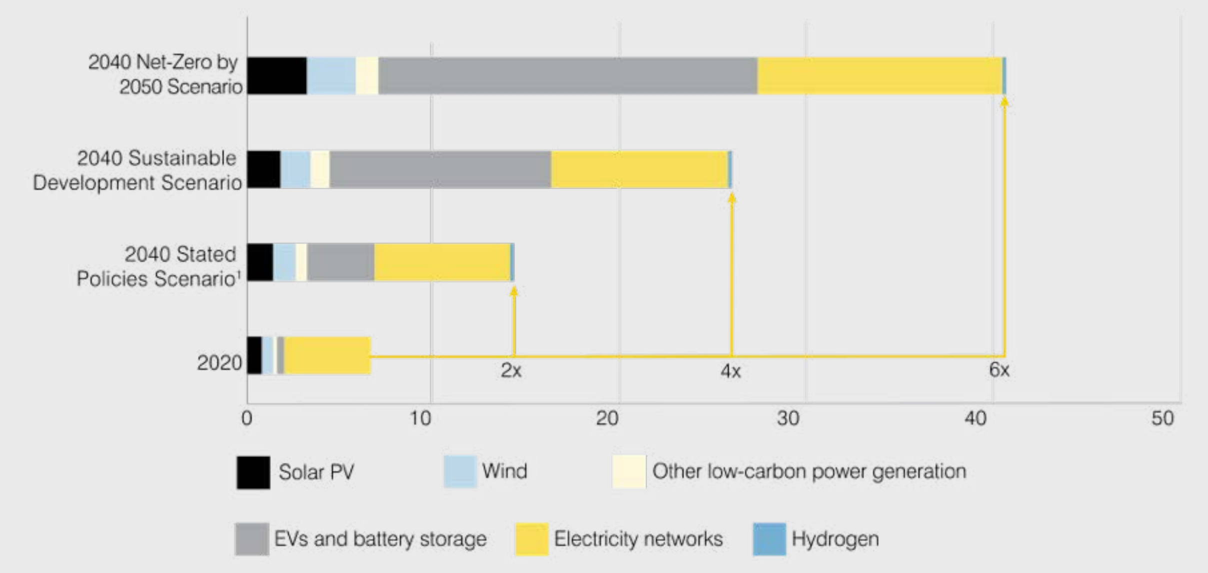
[1] World Bank, "Minwerals for Climate Action: the Mineral Intensity of the Clean Energy Transition", April 2020

[2] IEA, "The Role of Critical Minerals in Clean Energy Transitions", 2021

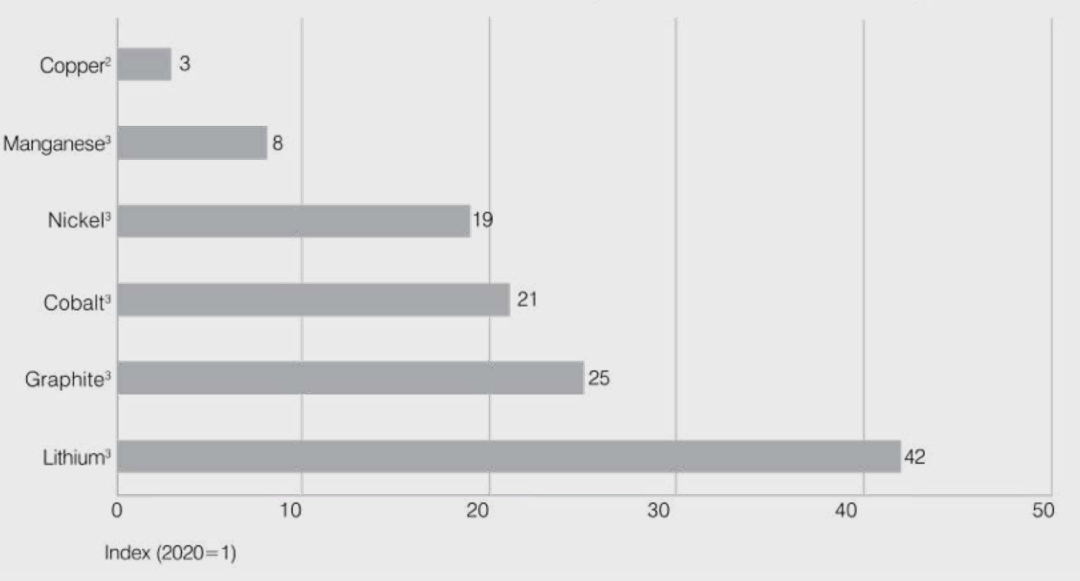
[3] Lukas Boer, et al., "Energy Transition Metals" Oct. 12, 2021

[4] IEA, "The Role of Critical Minerals in Clean Energy Transitions", 2021

**Total mineral demand for clean energy technologies by scenario, 2020 compared to 2040**




**Growth of selected minerals: Sustainable Development Scenario, 2040 compared to 2020**




Source: IEA, "The Role of Critical Minerals in Clean Energy Transitions", 2021

[1] Stated Policies Scenario (STEPS) and indication of where the energy system is heading is based on a sector-by-sector analysis of today's policies and policy announcements

[2] Renewables and network-related minerals

[3] Battery-related minerals

Many commitments that governments and industry made at the U.N. Climate Change Conference COP26 in Glasgow and COP27 in Sharm el-Sheikh have focused on accelerating the energy transition and further increased the implied demand for metals[1]. At COP26, governments, cities, automotive original equipment manufacturers (OEMs), fleet owners, and investors reached an agreement to rapidly accelerate the transition to zero-emissions vehicles and targeted 2040 (or 2035 for leading markets) as the date by which zero-emission cars and vans should account for 100% of all new car and van sales[2]. The final agreement from COP27 also highlights that "US$4 trillion per year needs to be invested in renewable energy until 2030 to be able to reach net zero emissions by 2050"[3].

[1] U.N. Climate Change Conference (COP26) at the SEC Glasgow, "COP26 Outcomes", Dec. 20, 2021

[2] COP26, "COP26 Declaration on Accelerating the Transition to 100% Zero Emission Cars and Vans", April 8, 2022

[3] UNFCCC, "Shram el-Sheikh Implementation Plan", 2022

An electric car with a 75 kWh battery using NMC811 (nickel-manganese-cobalt) cathode chemistry would need 155 kg of metals contained in nodules:

| 56 kg | 7.1 kg | 6.6 kg | 85 kg |
|---|---|---|---|
| of nickel in nickel sulfate ($NiSO_4$) | of cobalt in cobalt sulfate ($CoSO_4$) | of manganese in manganese sulfate ($MnSO_4$) | of copper cathode for the harness and connectors |


Source: Elsa Olivetti et al., "Lithium-Ion Battery Supply Chain Considerations: Analysis of Potential Bottlenecks in Critical Metals" Oct. 11, 2017

> To contain climate change, the world will have to produce more critical metals in the next 30 years than it has in all of human history[1].

The IEA acknowledges that current data shows a "looming mismatch between the world's strengthened climate ambitions and the availability of critical minerals that are essential for realizing those ambitions"[2]. Some market analysts already view supplying critical metals for accelerated decarbonization as "mission impossible"[3], while others predict that, by 2030, automakers will likely give up more than 30 million unit sales per year due to raw material underinvestment[4]. Several auto OEMs have acknowledged the potential for critical metals to slow down their electrification efforts[5].

[1] IEA, "The Role of Critical Minerals in Clean Energy Transitions", May 2021

[2] IEA, "World Energy Outlook - Topics", Oct. 1, 2021

[3] Wood Mackenzie, "COP26: Why Base Metals Should Be High on the Agenda", Oct. 6, 2021

[4] Battery Materials Review, "News & analysis of the international battery materials markets", Feb. 9, 2022

[5] Reuters, "Mercedes-Benz CEO Says Raw Material Scarcity Could Delay e-Mobility - Die Zeit. Reuters", Feb. 2, 2022; Financial Times, "Carmakers' battery plans in peril as raw material costs soar", Aug. 11, 2022

We can identify four main risks presented by the supply of critical metals needed for the energy transition: availability, security, price and ESG impacts.

# Availability

The world faces potential shortages for metals such as nickel[1], copper[2], and cobalt[3] as early as 2025 to 2028 depending on the metal[4]. Exploration pipelines currently look thin and, if major new discoveries arise, it will take a long time to assess them and plan, develop, and start production. Between 2010-2019, it took, on average, 16.5 years for major mining projects to move from discovery to first production[5].

[1] Marcelo Azevedo et al., "How clean can the nickel industry become?", Sept. 11, 2020

[2] Wood Mackenzie, Q4 2020 Copper Long Term Outlook, December 2020

[3] Pratima Desai and Mai Nguyen, "Shortages flagged for EV materials lithium and cobalt", July 1, 2021

[4] Benchmark Raw Material Forecast, 2023

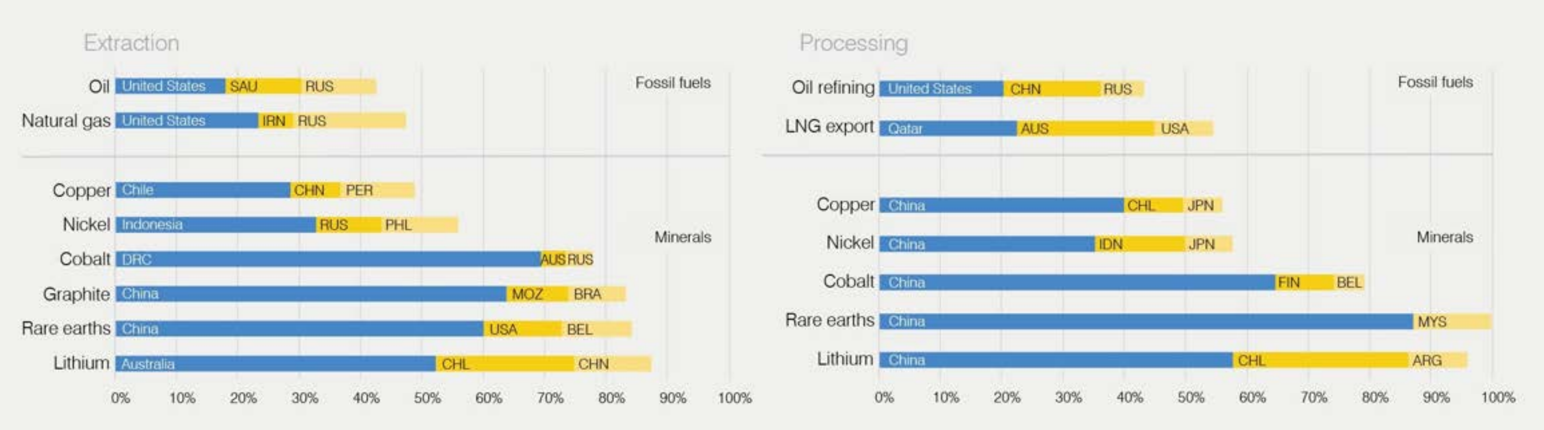
[5] IEA, "The Role of Critical Minerals in Clean Energy Transitions", May 2021

# Security

After decades of strategic investment and industrial policy codified in its governing five-year plans, China ("dubbed the "Saudi Arabia of clean technology" [1]) dominates the energy materials supply chain and has effectively secured its role as the world's primary economic beneficiary of the energy transition. The lack of geographical diversity in metal extraction and processing operations creates much more concentrated and vulnerable metal supply chains compared to the fossil fuel era from which we have begun transitioning.

[1] Peter Sopher, "How a Minerals Shortage is Halting our Energy Transition", Feb. 16, 2022

Share of top three producing countries in production of selected minerals and fossil fuels, 2019




Source: IEA, "The Role of Critical Minerals in Clean Energy Transitions", May 2021

Notes: LNG = liquefied natural gas; DRC=Democratic Republic of the Congo. The values for copper processing are for refining operations.

Sources: IEA (2020a); USGS (2021), World Bureau of Metal Statistics (2020); Adamas Intelligence (2020)

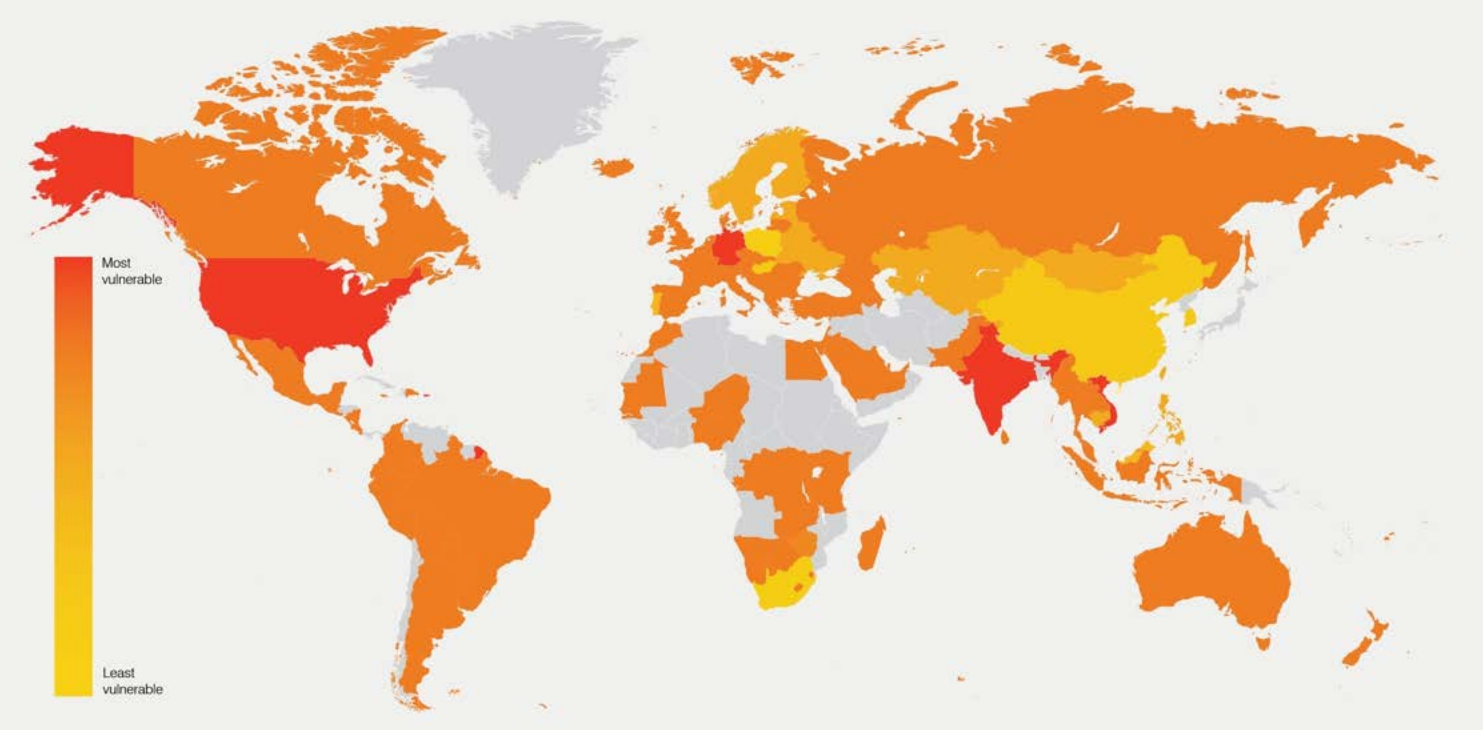
Electric vehicle (EV) sales soared by 60% in 2022 and, for the first time, attained a 10% global market share led by China and the European Union[1]. However, in a supply chain vulnerability assessment for battery EVs that it developed, GlobalData concluded that, except for China, countries with the biggest EV sales have among the biggest supply chain vulnerabilities[2].

[1] David Wallace-Wells, "Electric Vehicles Keep Defying Almost Everyone's Predictions", Jan 11, 2023

[2] Isabeau van Halm and Cathy Mullan, "Booming EV Sales Challenge Critical Mineral Supply Chains", Feb. 14, 2022

EV battery materials: 2022 supply chain vulnerability index

The trade balance of the components and raw materials going into EV batteries has been indexed. The countries with the highest trade surplus have the highest scores, while the countries with the highest trade deficit get the lowest scores.




Source: Isabeau van Halm and Cathy Mullan, "Booming EV Sales Challenge Critical Mineral Supply Chains", Feb. 14, 2022

Note: GlobalData based on Comtrade

Mineral dependence has now become a critical geopolitical issue in many countries around the world. In the United States, the White House has disclosed ambitious plans to achieve net-zero greenhouse gas (GHG) emissions by 2050, decarbonize the national electrical grid entirely by 2035, and ensure that zero-emission vehicles account for at least 50% of all new vehicle sales by 2030[1]. Encouraged by the tax credits incentives from the Inflation Reduction Act (IRA)[2], investments in EV battery plants in the US have skyrocketed—more than in any other country[3]. Yet, today, China produces three out of every four batteries, and we can expect the country to continue to dominate the global energy metals supply chain and battery manufacturing capacity, the latter of which looks set to increase fivefold by 2025[4].

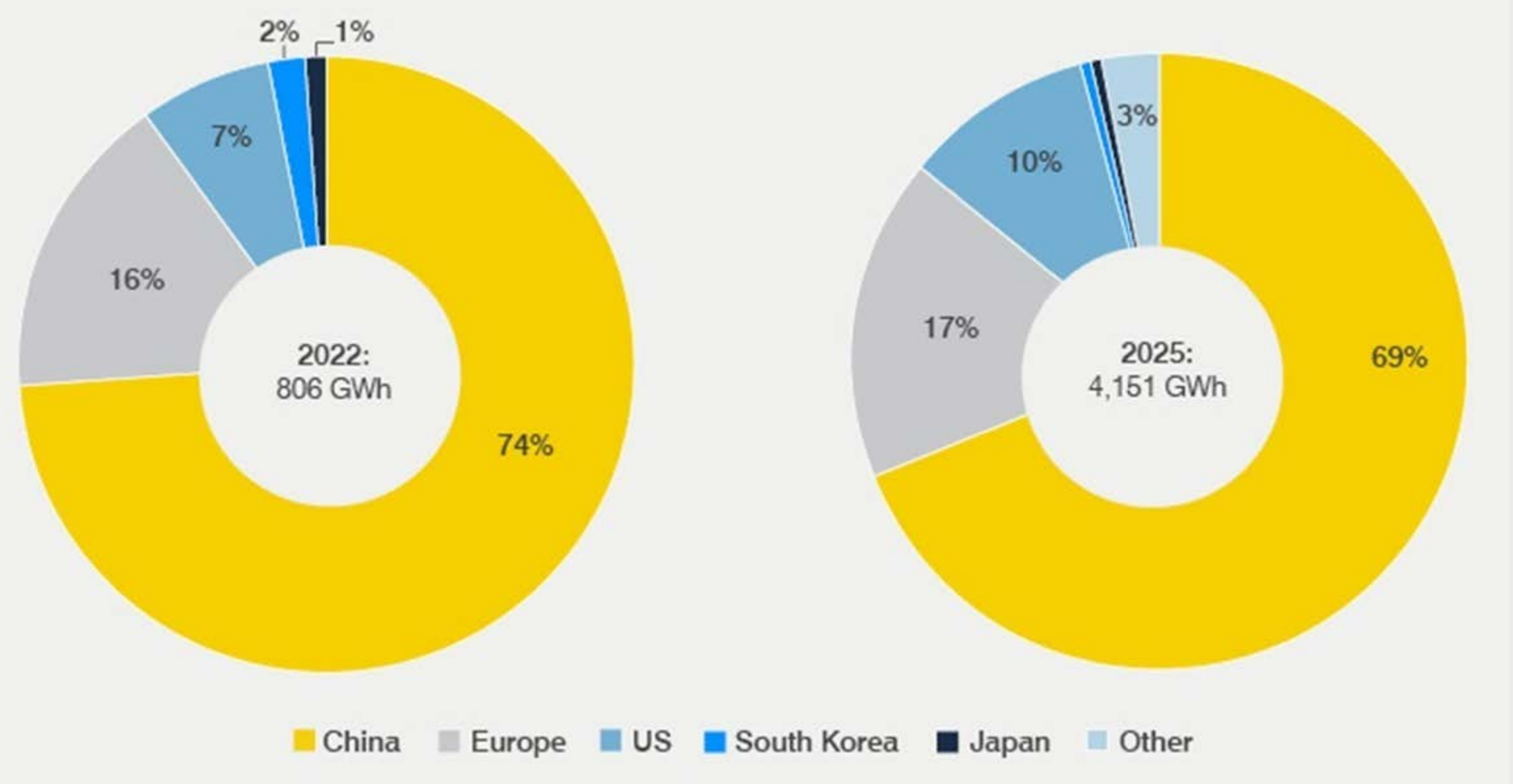
[1] US Department of Energy, "Biden-Harris Administration Releases First-Ever Blueprint to Decarbonize America's Transportation Sector", Jan. 10, 2023

[2] M. Moaz Uddin, "Understanding the Inflation Reduction Act's Electric Vehicle Tax Credits", Nov. 7, 2022

[3] Atlas EV Hub, "$210 Billion of Announced Investments in Electric Vehicle Manufacturing Headed for the U.S.", Jan. 12, 2023

[4] BloombergNEF, "Race to net zero: Pressures of the battery boom in five charts", Jul. 15, 2022.

## Battery production capacity by country/region



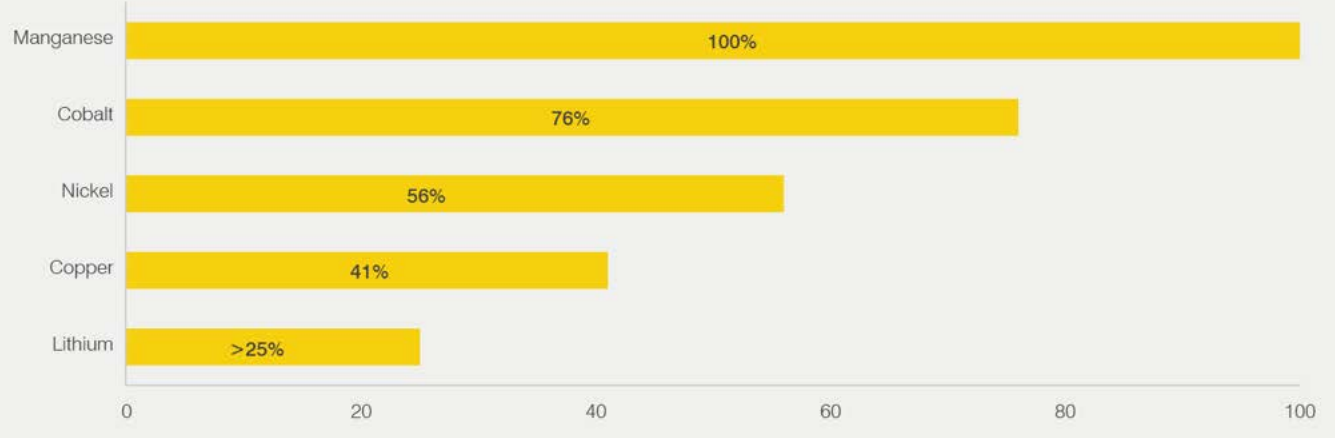

Source: BloombergNEF. Note: GWh = gigawatt-hours. 2022 includes facilities commissioned up to May 2022. 'Other' includes capacity outside of the coutnries indicated. Based on current announcements without de-risking. Values have been rounded.

Notwithstanding these ambitions, the US relies heavily on critical mineral imports. The White House's 100-day supply chain assessment report raised nickel as a critical mineral, and the United States Geological Survey (USGS) formally added nickel to the critical minerals list along with cobalt, manganese and lithium. The report also hightlighted steps the US needs to take to start building mineral independence while taking a more prominent role in the energy transition.

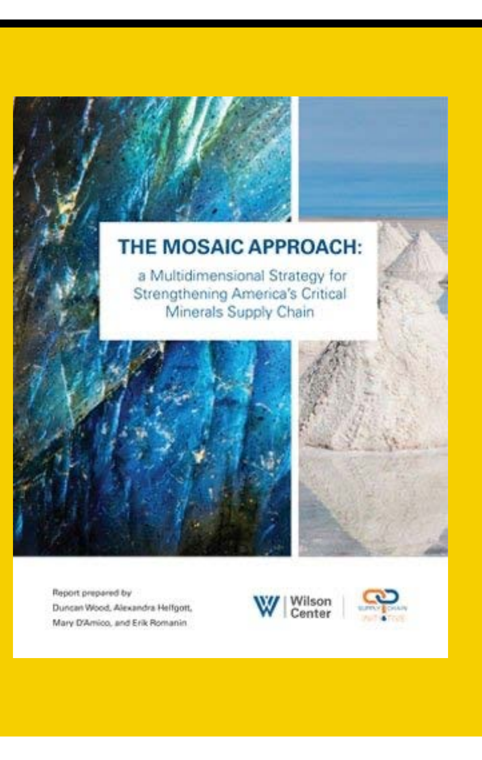
Yet, the IRA's sourcing requirements[1] might restrict the country's options to get the critical minerals it needs for its EV battery manufacturing industry. Thus, while the country strives to build mineral independence, critical mineral supply chain shortages could delay its decarbonization efforts.

[1] Green Car Congress, "Inflation Reduction Act mandates escalating battery critical mineral requirements to qualify for EV tax credit", Aug. 9, 2022

Reliance on imports for battery metals in the U.S. in 2022




Source: U.S. Department of Interior; U.S. Geological Survey, "Mineral Comodity Summaries 2023," Jan. 31, 2023




The Wilson Center in its Mosaic Approach report states it clearly: "Nearly all of U.S. produced nickel is exported abroad for further processing and refinement. Polymetallic nodules on the ocean floor represent a significant domestic opportunity for increasing U.S. supplies of nickel, with the added bonus that they also contain cobalt and manganese."


We can see the same concerns in the European Union (EU). The EU meets only 1% of its own critical metal demand, and European politicians have stated that they cannot allow a dependency on critical raw materials to replace Europe's current reliance on fossil fuels[1]. The European Commission recently presented its Green Deal Industrial Plan in response to the U.S. IRA that aims to provide EU countries with more financial support to compete as a hub for electric vehicles manufacturing[2].

[1] European Commission, "Keynote speech by Vice-President Maroš Šefčovič at the Raw Materials Security of Europe Conference", 12 Sep. 2022

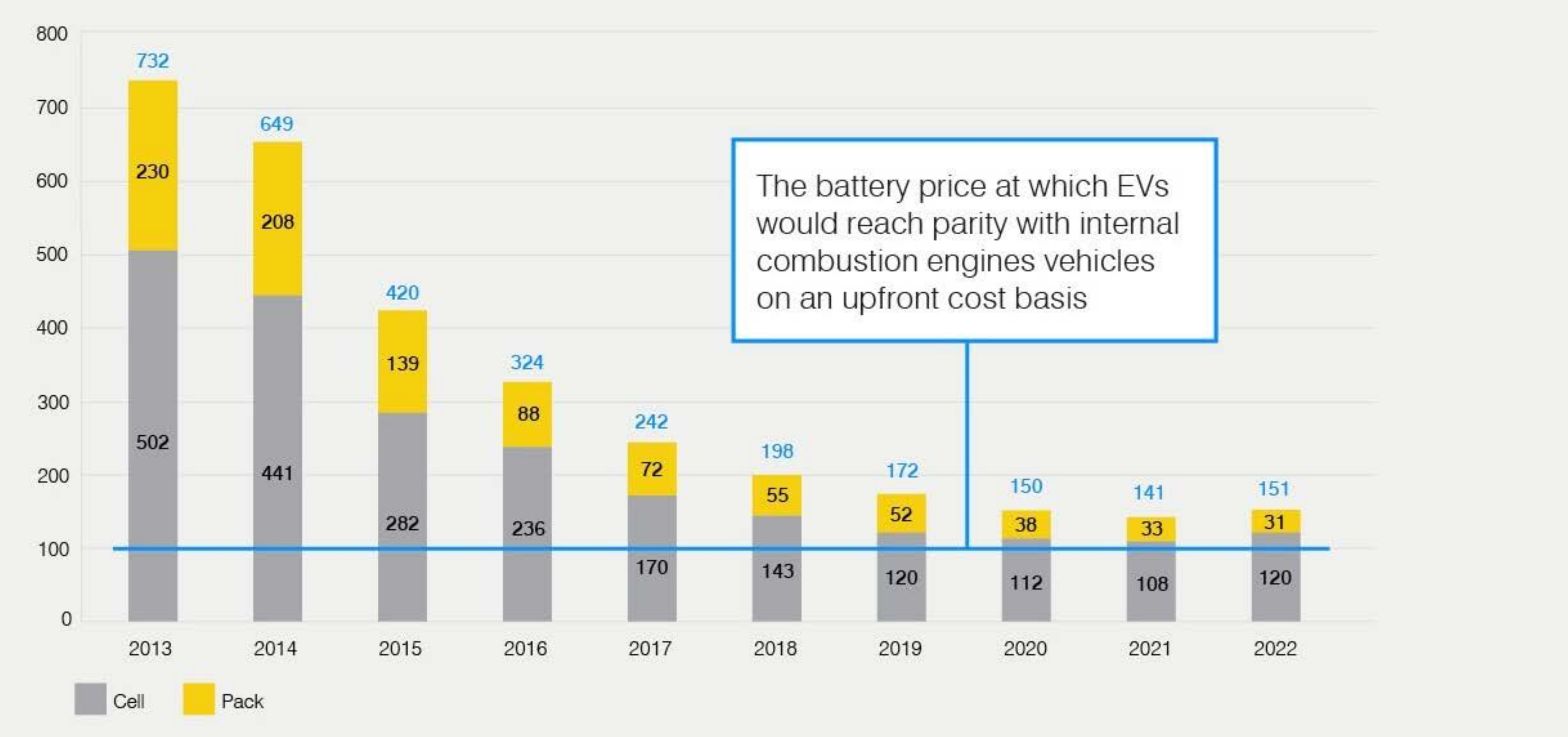
[2] Reuters, "Explainer: Why the U.S. Inflation Reduction Act Has Rattled Europe", Feb 1, 2023.

# Price

Mass EV adoption depends on price parity with conventional, internal combustion engine (ICE) cars. We can generally expect that price parity to occur when a battery reaches approximately US$100 per kilowatt-hour (kWh)[1]. Since 2010, when lithium-ion battery pack prices exceeded US$1,200/kWh, prices have steadily fallen due to better technology and economies of scale. In 2021, they hit an all-time low of US$132/kWh with forecasts in the same year that they would reach average-price parity by 2024[2]. However, due to soaring inflation and the rising battery component costs, volume-weighted average prices have actually increased for the first time in history in 2022 to reach US$151/kWh—a 7% rise from 2021 in real terms[3].

Volume-Weighted Average Lithium-Ion **Battery Pack and Cell Price Split**, 2013 – 2022

Real 2022 $USD/kWh




Source: BloombergNEF. All values are in real 2022 dollars per kilowatt-hour. Weighted average survey includes 178 data points from passenger cars, buses, commercial vehicles and stationary storage.

The commodity prices for lithium, nickel, and copper reached multi-year highs in 2022, and, in March 2022, the London Metal Exchange (LME) suspended nickel trading for a week after prices more than doubled to cross a record US$100,000 per tonne[4]. Updated industry forecasts now expect battery pack prices to remain at a similar level as 2022 and average pack prices to fall below US$100/kWh only by 2026[5]. The road ahead for EV price parity with ICE vehicles looks bumpier than initially thought and puts the immediate mass EV adoption at risk.

1 BloombergNEF, "Battery Pack Prices Cited Below $100/kWh for the First Time in 2020, While Market Average Sits at $137/kWh", Dec. 16, 2020, BloombergNEF, "Battery Pack Prices Fall to an Average of $132/kWh, But Rising Commodity Prices Start to Bite", Nov. 30, 2021

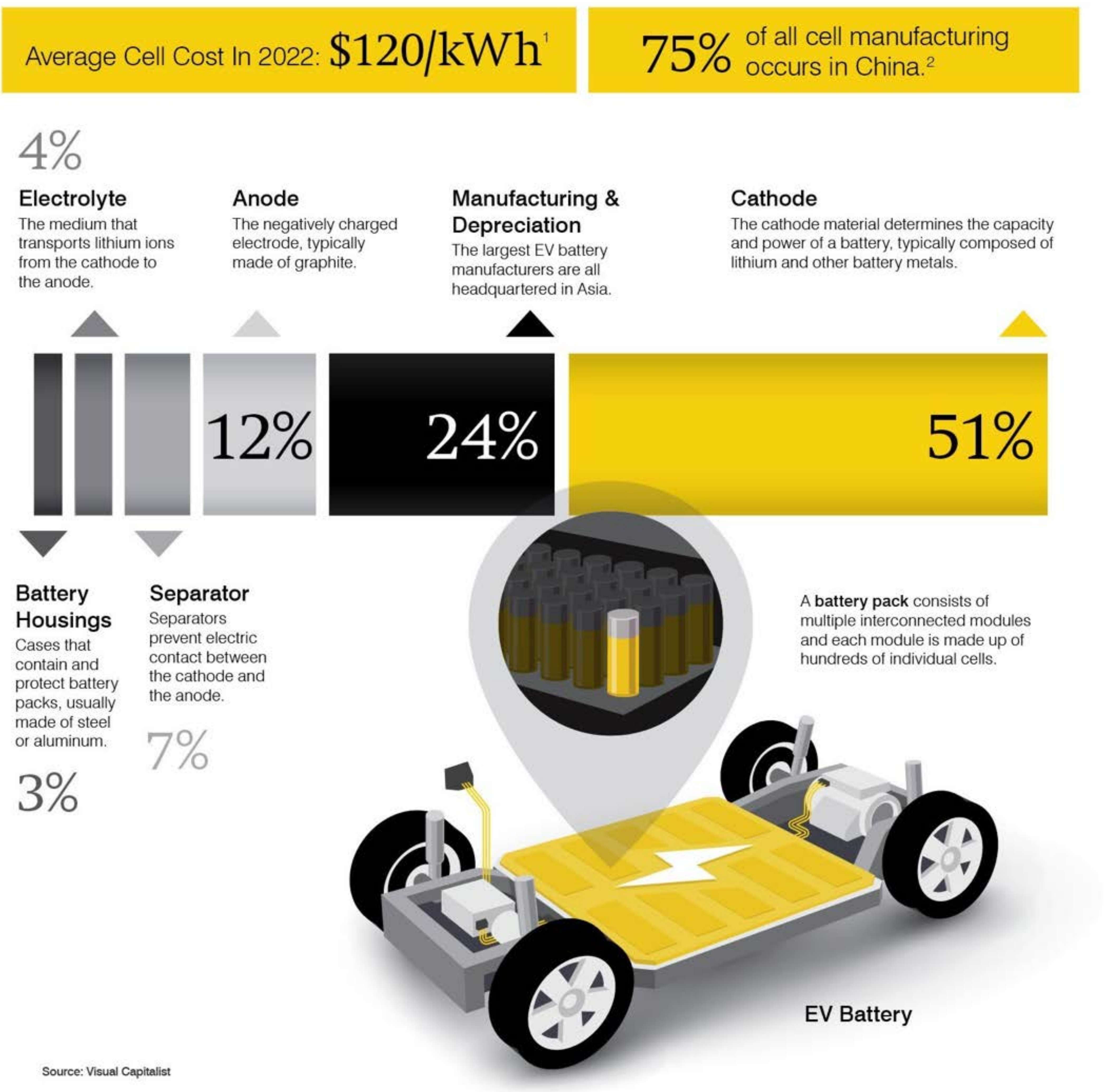
2 Isabeau van Halm and Cathy Mullan, "Booming EV Sales Challenge Critical Mineral Supply Chains", Feb. 14, 2022

3 BloombergNEF, "Lithium-ion Battery Pack Prices Rise for First Time to an Average of $151/kWh", Dec. 6, 2022

4 Jack Farchy et al., "The 18 Minutes of Trading Chaos That Broke the Nickel Market", March 14, 2022

5 BloombergNEF, "Lithium-ion Battery Pack Prices Rise for First Time to an Average of $151/kWh", Dec. 6, 2022

Breaking Down the Cost of an **EV Battery Cell**




Source: Visual Capitalist. The contribution of each EV battery cell component is based on 2021 costs from BloombergNEF.

1 BloombergNEF, "Lithium-ion Battery Pack Prices Rise for First Time to an Average of $151/kWh", Dec. 6, 2022.

2 BloombergNEF, "China's Battery Supply Chain Tops BNEF Ranking for Third Consecutive Time, with Canada a Close Second", Nov. 2022.

# ESG Impacts

A long history of severe environmental and social impacts makes increased land-based mining for metals an uncomfortable fit with the ethos behind the energy transition. By its nature, extracting resources constitutes a destructive process that often starts with the need to displace or change the land that local communities and Indigenous people use. Depending on an operation's nature, it may involve deforestation and associated loss of carbon sinks and biodiversity due to flattened mountains, giant holes from blasting, and other events that disfigure the landscape at a large scale. Factors such as location, ore type, ore grade, and processing technique create different ESG impacts. For example, low ore grades often result in operations that produce rock waste and tailings in large amounts that an operator must isolate from the environment and manage almost indefinitely in engineered structures, place underground, or dump into the deep sea[1].

[1] Lindsey L. Vare et al., "Scientific Considerations for the Assessment and Management of Mine Tailings Disposal in the Deep Sea", Feb. 5, 2018.

**190B Tons**
Land mining waste

**2B Tons**
Municipal solid waste

Each year, around 190 billion tons of waste are generated through land mining[1], making it the single largest source of waste on this planet and dwarfing the 2 billion tons of municipal solid waste generated globally each year[2].

[1] Research and Markets, "Mining Waste Management – Global Market Trajectory & Analytics", Mar. 2023.
[2] World Bank, "What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050", Sept. 20, 2018.

The tailings storage facilities that are used to contain these mountains of waste on land are among the world's largest engineered structures – they can be well over 150 meters tall and store more volume than 750,000 Olympic swimming pools. If they are not managed appropriately, tailings storage facilities can pose a threat to the surrounding environment and communities.


Brumadinho dam disaster, 2019, Brazil

At its worst, metal extraction can involve child labor[1] (with up to 40,000 children working in dangerous conditions in cobalt mines in the Democratic Republic of the Congo[2]), human rights abuses, shortened miner lifespans, and even loss of life. Land-based mining also frequently generates conflicts with surrounding communities, especially when it poses a risk to their livelihood and traditional ways of life. In a report, MSCI found that the majority of U.S. reserves for critical minerals reside within 35 miles of Native American reservations: 68% of cobalt, 89% of copper, 79% of lithium, and 97% of nickel reserves[3]. Metal extraction is usually an energy and water-intensive business and generates significant carbon emissions, noise, and dust, and it also puts additional stress on a region's freshwater resources. Copper mines, in particular, often coincide with water stressed regions that will likely face increased aridity in the coming decades[4].

As a result, new mining projects tend to face strong opposition on social and environmental grounds[5]. As IEA's executive director has said, "left unaddressed, these potential vulnerabilities could make global progress towards a clean energy future slower and more costly—and therefore hamper international efforts to tackle climate change[6]".

[1] Dailymail, "The Shaming Images That Show Where Our iPhones, Laptops and Tesla Cars REALLY Come From: The Truth About the Congolese Mines Where Kids are Paid $2-a-day to Dig for Cobalt", Jan. 30, 2023.
[2] International Labour Organization, "ILO – Child Labour in Mining and Global Supply Chains", May, 2019.
[3] Samuel Block, "Mining Energy-Transition Metals: National Aims, Local Conflicts", June 3, 2021.
[4] McKinsey, "Climate Risk and Decarbonization: What Every Mining CEO Needs to Know", Jan. 2020.
[5] Henry Fountain, "Alaska's Controversial Pebble Mine Fails to Win Critical Permit, Likely Killing It", Nov. 25, 2020; Ernest Scheyder, "Rio Tinto's 26-year Struggle to Develop a Massive Arizona Copper Mine", April 19, 2021; U.S Department of Interior, "Interior Department Takes Action on Mineral Leases Improperly Renewed in the Watershed of the Boundary Waters Wilderness", Jan. 26, 2022.
[6] IEA, "Clean Energy Demand for Critical Minerals Set to Soar as the World Pursues Net Zero Goals", May 5, 2021.


Child labor


Deforestation, loss of biodiversity and carbon sinks

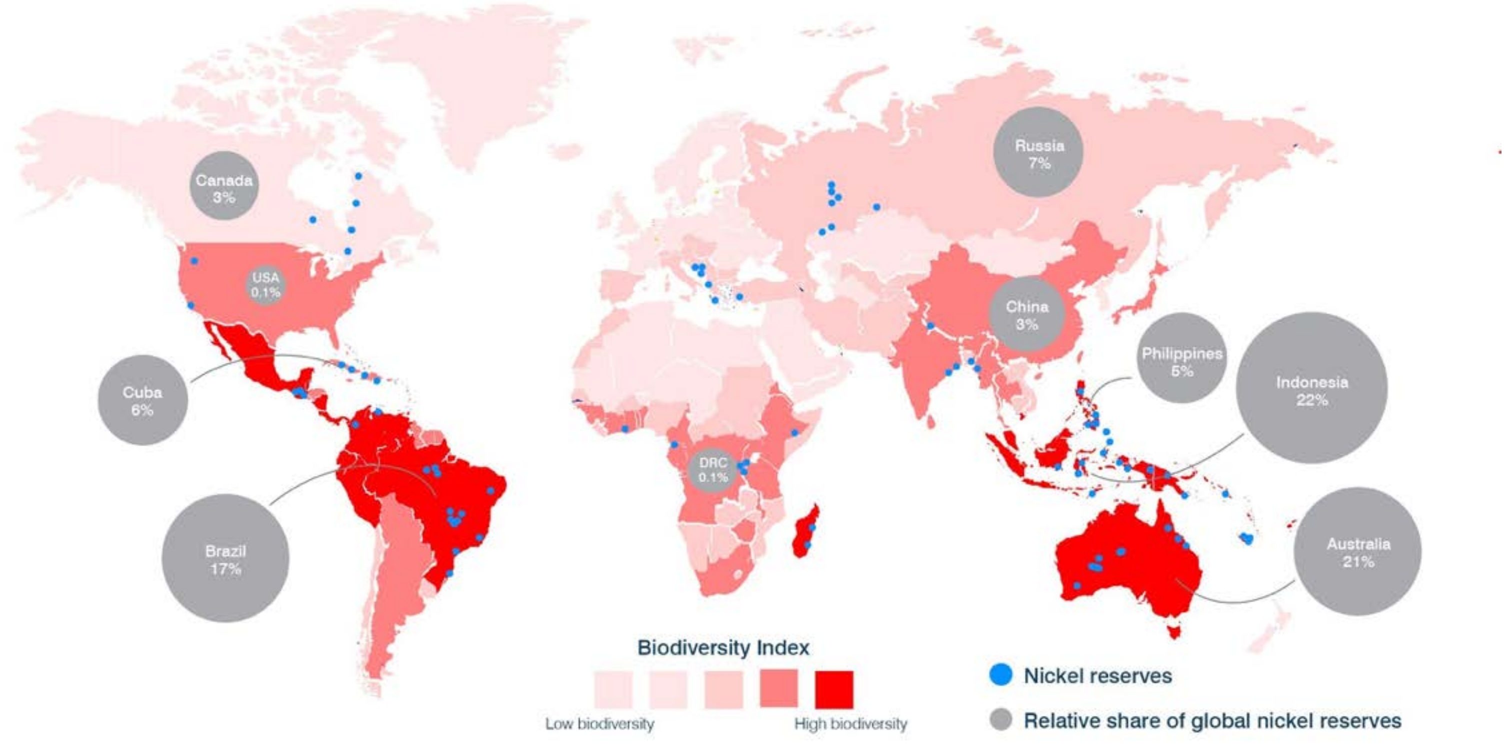

Toxic tailings


$CO_2$, $SO_x$ and $NO_x$ emissions

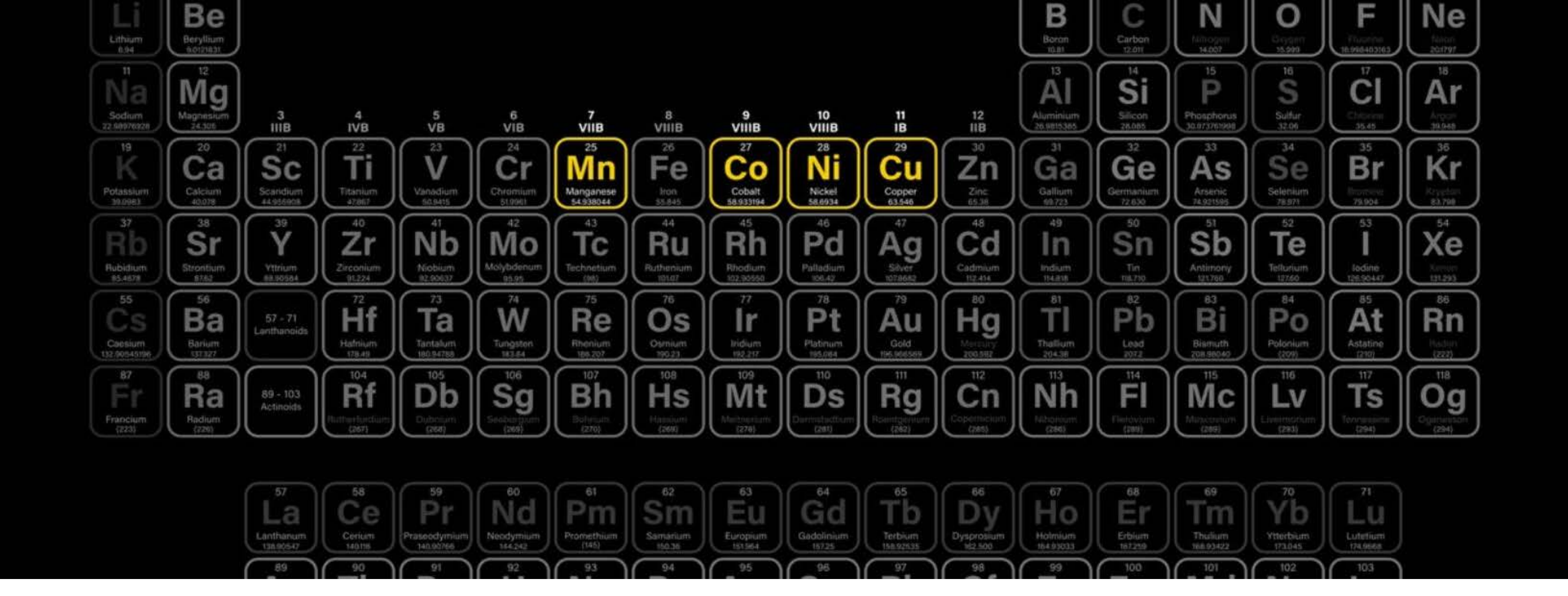
Location, ore type, ore grade and processing techniques result in significantly different ESG profiles. For example, nickel laterite ores appear in greater abundance in surface deposits in the tropics. They come with more impurities, require large amounts of energy and water to process, and generally impact the environment and the climate more significantly than nickel sulfide ores[1] (see the pages "Comparative Lifecycle Studies" and "TCFD & TNFD" for more information). Driven by demand growth, nickel production from laterite ores continues to rise and now represents about 70% of production globally[2]. Due to where these deposits reside, this tendency also comes with greater risks for biodiversity.

[1] USGS, 2011; Michelle Michot Foss et al., "Need Nickel ? How Electrifying Transport and Chinese Investment Are Playing Out In The Indonesian Archipelago", Apr. 2022.
[2] Daina Paulikas et al., "Where Should Metals For The Green Transition Come From?", 2020.

75% of Nickel Reserves on Land Reside in **High Biodiversity Countries**




Source: Carbon Trust analysis based on: 'Convention on Biological Diversity, Annex 1: Biodiversity Information by Country"; USGS, 'U.S. Geological Survey, Mineral Commodity Summaries: Nickel", Jan. 2021.



# A Circular Metal Economy Future

Metals are recyclable—the silver lining to our metal-intensive future. Our increasing reliance on metals makes it easier to reimagine how we can keep making and remaking our "technosphere" through iterative technological innovation cycles while relying on a shared metal stock (cradle-to-cradle). To a limited extent, we will need to continue to mine for more metals. However, as long as we take care of our metal stocks, we can ensure to significantly reduce mining activities and, thus, its potential harm to people and the environment.

We have yet to achieve this vision. Take copper—a metal we have arguably mined for the longest period (in fact, archaeologists have found copper artifacts that date far back as 8,000 years)[1]. Our predicted copper needs for the next 30 years far outstrip estimations for the total copper amount that humans have taken from the planet to date and, with declining ore grades, the projected tailings generation dwarfs those generated in the last century[2]. What's more, we cannot rely on using existing copper stock in the near future since long-term applications, such as building wire, copper pipes, and telecommunication and power cables, tie it up[3].

1 Robert J. Braidwood et al, "Beginnings of Village-Farming Communities in Southeastern Turkey", June 1971.

2 Ayman Elshkaki et al, "Copper Demand, Supply, and Associated Energy Use to 2050", July 2016.

3 UNEP, "Metal Stocks in Society: A Scientific Synthesis", 2010.

Societies have practiced metal recycling for decades. Estimates for current global end-of-life recycling rates range between 68% for cobalt, 59% for nickel, 53% for manganese[1], and 45% for copper[2]. Given the dynamic nature of metal flows, durable consumer goods can tie up metals for decades. Product lifespans differ and can even grow. For example, an EV battery may enter second-life applications in home or grid energy storage[3]. As a result, it might take a good part of the 21st century to get to a place where we have enough metal stock in circulation to meet our needs without having to dig up much more. According to analysis by the World Bank, if we currently recycled all copper, nickel, and cobalt at the end of a product's life, by 2050, we would have reduced demand for mining by only 26%, 23% and 15%, respectively[4]. The 2021 IEA special report, titled "The Role of Critical Minerals in Clean Energy Transitions", modeled the numbers for two scenarios: 1) a stated policies scenario (STEP) and 2) a more ambitious sustainable development scenario (SDS). According to its analysis, in 2040, recycled copper would account for approximately 20% of total supply in both scenarios, recycled nickel for 6% in STEP and 10% in SDS, and recycled cobalt for 24% and 21%, respectively[5]. As long as the overall metal demand grows, our reliance on mined metal will persist.

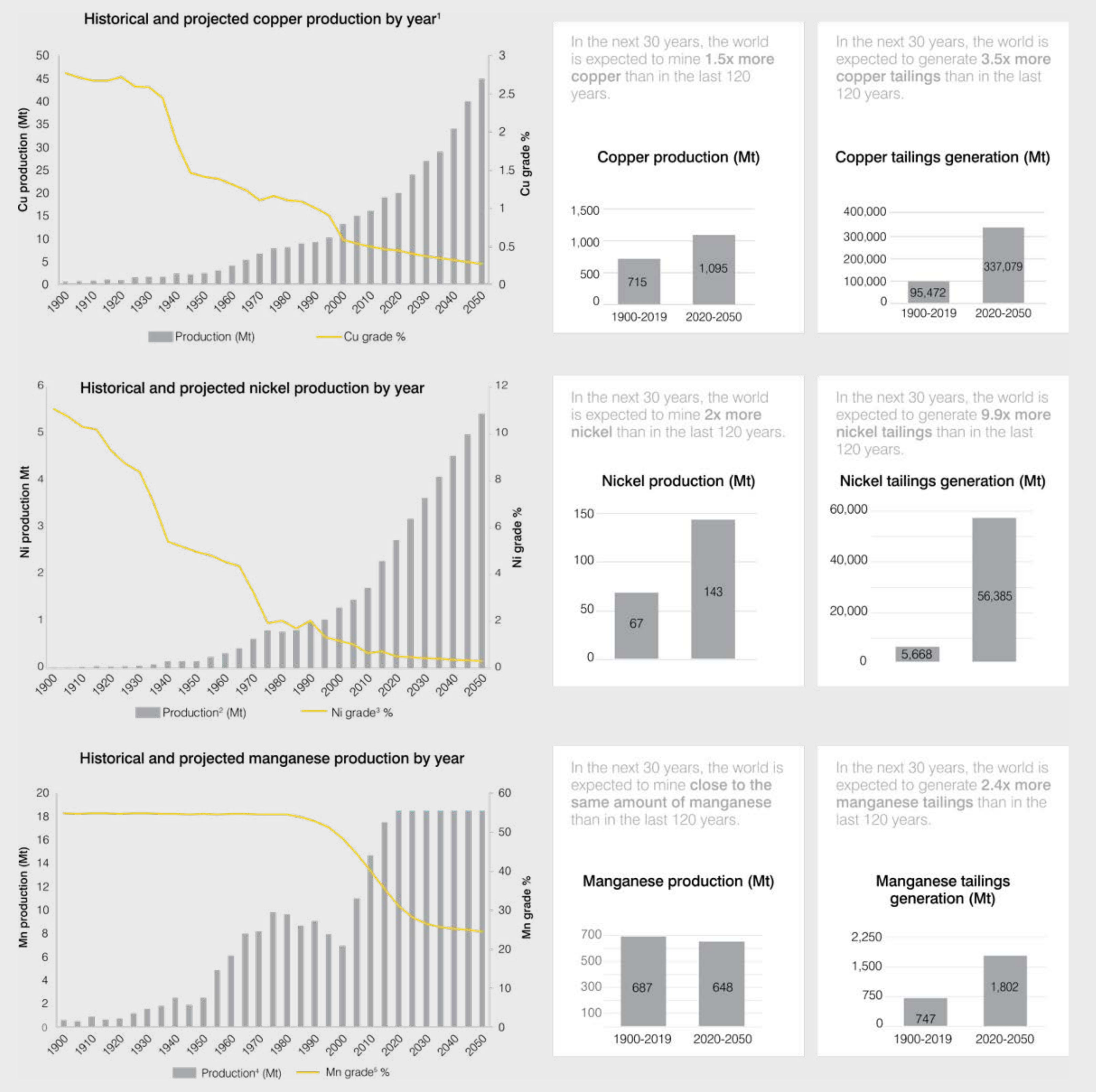
1 UNCTAD, "Commodities at a Glance", May 2020.

2 M.L.C.M. Henckens and E.Worrell, "Reviewing the Availability of Copper and Nickel For Future Generations. The Balance Between Production Growth, Sustainability and Recycling Rates", Aug. 10, 2020.

3 Jerad Ford and Jim West, "Known Unknowns: the Devil in the Details of Energy Metals Demand", Nov. 3, 2021.

4 The World Bank, "Minerals for Climate Action: The Mineral Intensity of the Clean Energy Transition", April 2020.

5 IEA, "The Role of Critical Minerals in Clean Energy Transitions", May 2021.




1 Ayman Elshkaki et al, "Copper Demand, Supply, and Associated Energy Use to 2050", July 2016.

2 Takuma Watari et al, "Review of Critical Metal Dynamics to 2050 for 48 Elements", April 2020.

3 Harald Ulrik Sverdrup et al, "Adaptation to a New Economic Reality", Nov. 30, 2019.

4 Takuma Watari et al, "Review of Critical Metal Dynamics to 2050 for 48 Elements", April 2020.

5 Harald Ulrik Sverdrup et al, "Adaptation to a New Economic Reality", Nov. 30, 2019.

Fortunately, we have seen real progress across the world: China already requires its EV battery manufacturers to assign individual batteries a unique ID that one can track from production to end-of-life recycling[1]. The European Union's new battery regulations establish requirements for achieving transparency, accountability, and circularity throughout an EV battery's entire lifecycle. The regulations introduce a digital "battery passport" that will improve traceability and will provide relevant information about the battery's environmental impact, origin, and lifecycle. This level of transparency will enable safer and easier to remove and replace batteries to build a stronger battery recycling industry[2]. Various organizations have also begun piloting blockchain solutions for supply-chain tracking throughout the lifecycle (e.g., Everledger, Circulor, ReSource), and dozens of established and new battery recycling companies (e.g., Umicore, Northvolt, Redwood Materials, Duesenfeld, Li-Cycle) have begun recovering metal from production scrap.

All these developments notwithstanding, we must face the fact that recycling alone cannot meet our current transitional metal needs for the next 30-50 years[3].

We can also expect other factors beyond the energy transition to drive the demand: projections expect the world's population to grow by almost another 2 billion people by 2050[4] and living standards to improve in the developing world. In the short to medium term, we cannot avoid extracting significantly more metal. We will need to mine more critical metals in the next 30 years than we have mined in all of human history. But that does not mean we cannot do it in a better way.

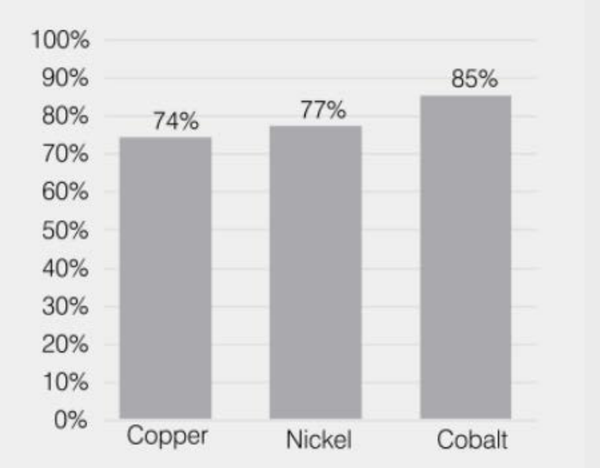
1 Lukas Merkle, "Automotive Battery Tracking in China", Nov. 2019

2 News European Parliament, "Batteries: Deal on New EU Rules for Design, Production and Waste Treatment", Dec. 9, 2022; Celltech; "New EU Battery Regulation – What Does it Mean in Practice?"

3 Daniele La Porta Arrobas et al, "The Growing Role of Minerals and Metals for a Low Carbon Future", June 2017

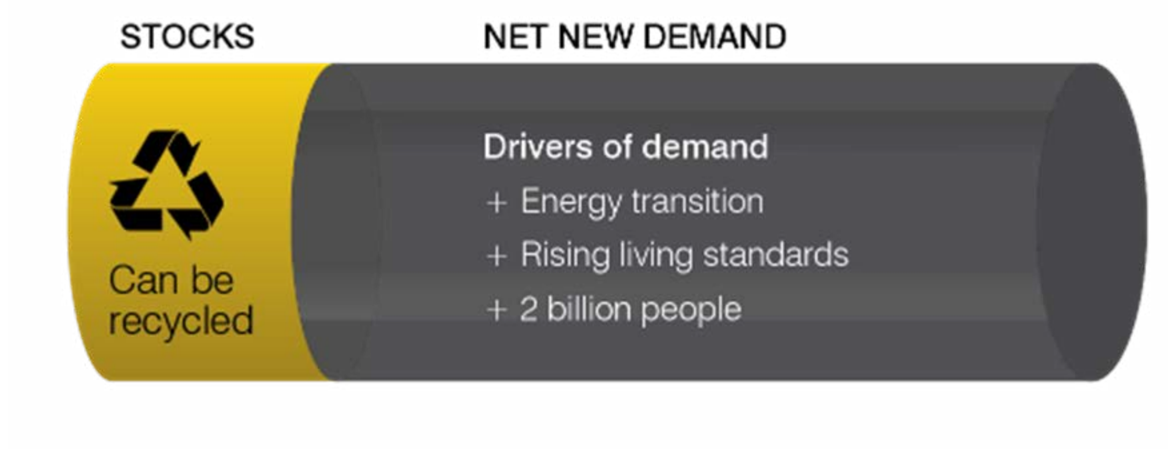
4 United Nations Department of Economic and Social Affairs, "World Population Prospects 2022: Summary of Results", 2022

## **New Metal Supply Still Needed** if Recycling Rate Reaches 100% by 2050




1 Source: The World Bank, "Minerals for Climate Action: The Mineral Intensity of the Clean Energy Transition", April 2020

## Global Metal Stocks and **Future Demand**



# Doughnut-Shaped Solution Space

Extracting and using our planet's resources without proper regard and accounting for environmental and human consequences has resulted in our current predicament. As a global community, we are moving toward taking responsibility for negative externalities and rethinking what it takes for humans and nature to thrive on our planet. In the last two decades, a new industry has emerged that focuses on producing sustainability principles, frameworks, standards, rankings and certifications. And, while we have finally attained increased awareness about the urgent challenges facing the world, we often see only commitments that fail to achieve the magnitude and speed of the change needed to ensure we do not surpass planetary boundaries while providing prosperity for all.

Today, carbon emissions continue to rise, and ecosystems continue to lose biodiversity. According to the 2019 Intergovernmental Science-Policy Platform on Biodiversity and Ecosystems Services (IPBES) Global Assessment Report, approximately 25% of species in most animal and plant groups studied face extinction[1], and local domesticated plant varieties and animal breeds have begun disappearing, which poses a serious risk to global food security. As for why, since 1970, the largest negative impact on nature has come from changes in land use (e.g., mainly for producing crops and livestock), which have significantly altered 75% of the world's land surface and directly impacted terrestrial and freshwater ecosystems. As a result, we have lost forests, grasslands, and wetlands (e.g., 85% of wetlands area). While agriculture drives around 73% of deforestation and forest degradation, urban expansion drives 10%, infrastructure drives another 10%, and mining drives 7%. For the latter in particular, developing roads, rail, and port infrastructure to transport and explore minerals can have more indirect and cumulative impacts than actual mine sites[2].

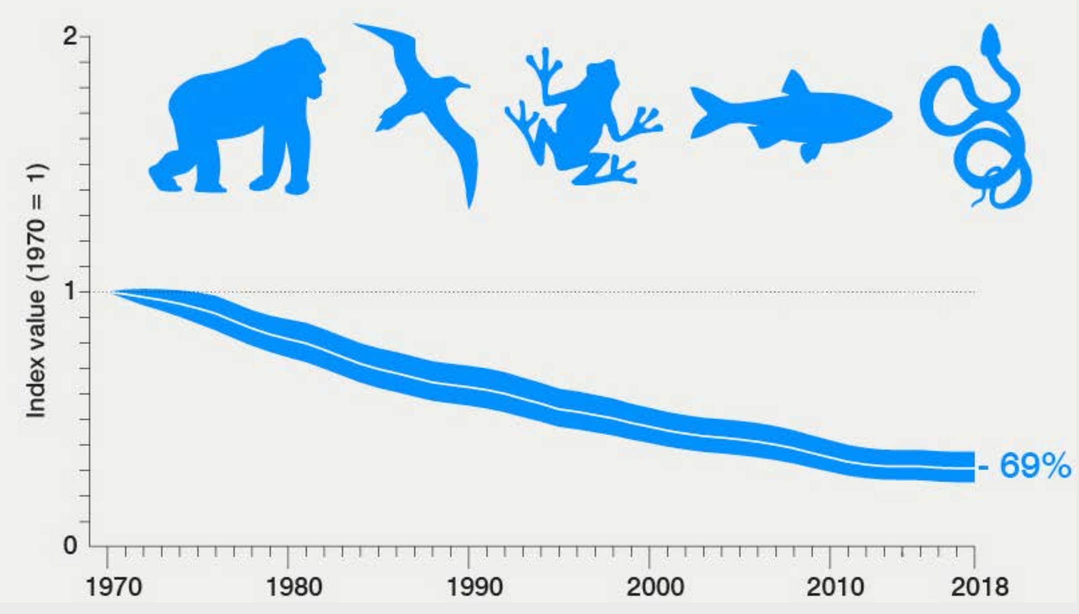
[1] IPBES, "Summary for Policymakers of the Global Assessment Report on Biodiversity and Ecosystem Services", Nov. 25, 2019.

[2] Siân Bradley, "Mining's Impacts on Forests", Oct. 14, 2020.

**The Global Living Planet Index (1970 to 2018)**

The average change in relative abundance of 31,821 populations, representing 5,230 species monitored across the globe, was a decline of 69%.

The white line shows the index values and the shaded areas represent the statistical certainty surrounding the trend (95% statistical certainty, range 63% to 75%).




Key
Global Living Planet Index
Confidence limits

Source: WWF/ZSL, "The Living Planet Index database", 2022

On average, the populations of terrestrial, freshwater, and marine vertebrate populations that the Global Living Planet Index (LPI) tracks have declined in abundance by 69% in less than 50 years[1]. LPI only monitors populations that represent 5,230 species. In a 2021 study, Yale researchers estimated that we have yet to discover 80 to 90% of all terrestrial species in the world and that Indonesia, Brazil, Madagascar, and Colombia (all nickel mining countries) provide the greatest opportunity for new discoveries overall (i.e., about a quarter of all potential discoveries)[2].

Since 1992, urban area across the world has doubled in size, which has resulted in a corresponding expansion in infrastructure linked to growing populations and consumption. Furthermore, soil erosion (e.g., from deforestation, agriculture, increases in urban areas, and mining) decreases soil fertility, and, today, soil erodes quicker than it forms, which reduces its ability to store carbon dioxide[3]. After oceans, soil constitutes the second largest natural carbon sink[4]. Oceans absorb 30% of the carbon dioxide released in the atmosphere. As the amount of carbon dioxide increases in the atmosphere, so will ocean acidification. As the ocean acidifies, it will impact many ocean species, "especially organisms like oysters and corals that make hard shells and skeletons by combining calcium and carbonate from seawater"[5]. The ocean faces other challenges as well: currently one-third of the global fish stocks experience overfishing and, in the last century, large ocean fish have decreased in abundance by 90%[6].

To meet everybody's needs while maintaining a healthy, living planet, we must subject solutions for resource extraction to two constraints: ecological limits and social needs. Known as "doughnut economics", this construct, which English economist Kate Raworth first proposed in 2012, refers to an economic model with two concentric rings: an ecological ceiling and a social foundation. Between these two boundaries lies an ecologically safe and socially just doughnut-shaped space in which humanity can thrive. In Raworth's words, she developed the construct "to ensure that no one falls short on life's essentials (from food and housing to healthcare and political voice), while ensuring that collectively we do not overshoot our pressure on Earth's life-supporting systems on which we fundamentally depend—such as a stable climate, fertile soils and a protective ozone layer"[7].

Doughnut economics offers a helpful conceptual framework to define the solution space for ramping up the rate at which we will need to extract metal to meet demand, but it only becomes meaningful when one updates it to reflect the world as it currently stands. Raworth uses nine planetary boundaries, which a group of earth systems and environmental scientists led by Swedish scientist Johan Rockström and American chemist Will Steffen introduced in 2009[8], as the ecological ceiling, and she derives the social foundation from internationally agreed-on minimum social standards that the U.N. Sustainable Development Goals identify. Humanity has already overshot five planetary boundaries (Atmospheric aerosol loading [air pollution] and the biodiversity intactness index [BII] remain unquantified). In addition, millions of people still fall short on all 12 social dimensions.

[1] WWF/ZSL, "The Living Planet Index", 2022.

[2] Mario R. Moura et al., "Shortfalls and Opportunities in Terrestrial Vertebrate Species Discovery", March 22, 2021.

[3] Dede Sulaeman and Thomas Westhoff, "The Causes and Effects of Soil Erosion, and How to Prevent It", Feb. 7, 2020.

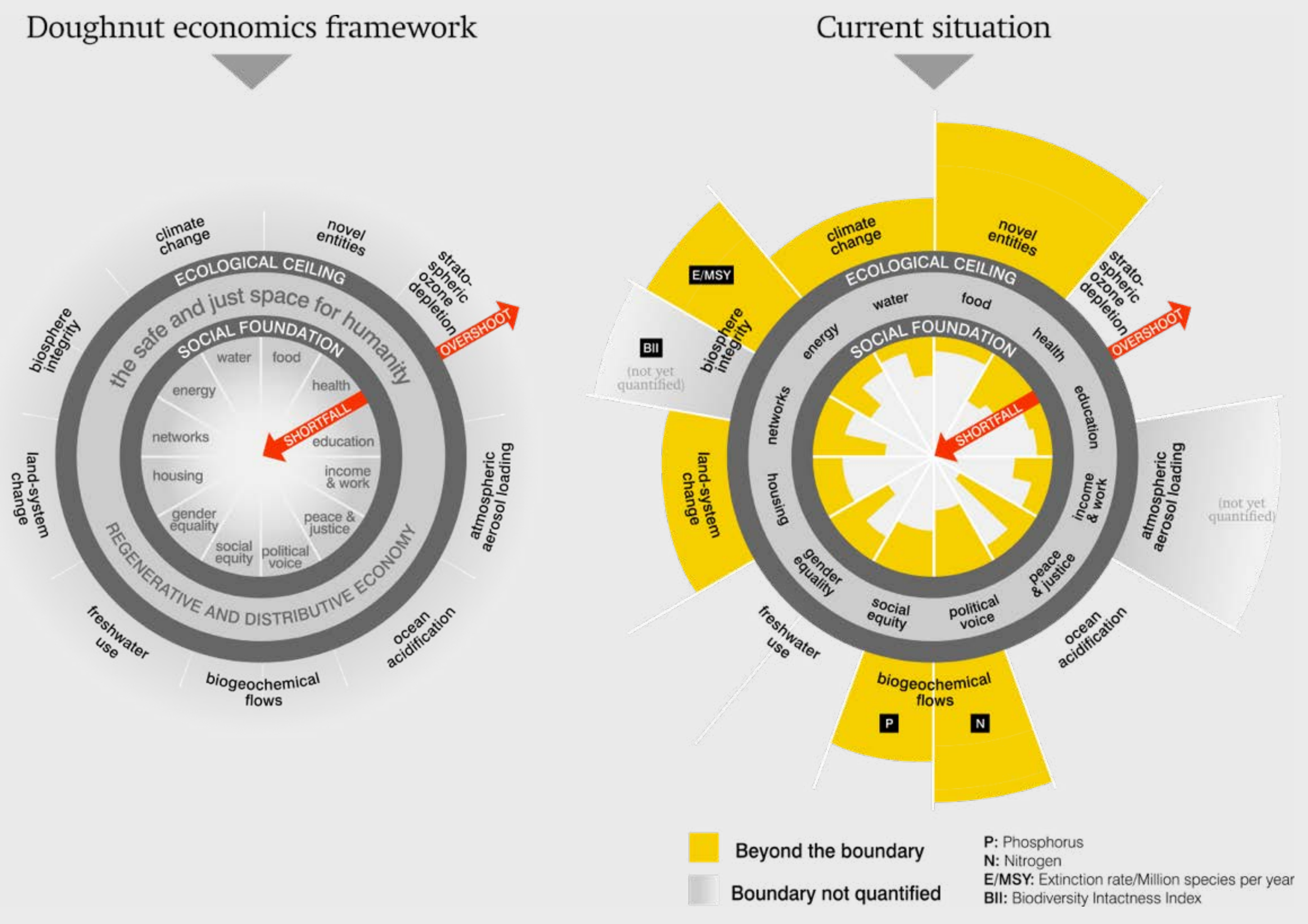
[4] European Environment Agency, "Soil, Land and Climate Change", May 11, 2021.

[5] NOAA, "Ocean Acidification", April 1, 2020.

[6] Campaign for Nature, "Why 30?".

[7] Kate Raworth, "Exploring Doughnut Economics".

[8] Johan Rockström et al, "A Safe Operating Space for Humanity", Sept. 23, 2009.




Source: Image based on the Doughnut economics framework. Planetary boundaries updated with the latest Stockholm Resilience Center information.

As a global civilization, we have much work to do to rein in the ecological overshoots while improving social shortfalls until we no longer breach these planetary and social boundaries. A significant increase in net new land-based mining would pose a monumental challenge to achieving this goal. On the one hand, we cannot rein in the climate change overshoot without extracting more metal. On the other hand, metal extraction often modifies the environment at a large scale, which will push humanity further towards breaching our ecological limits. It also has mixed social impacts.

Looking ahead, several factors will make these impacts even harder to deal with.

# Complications

Looking ahead, several factors, such deposit locations, falling ore grades, and increasing capital intensity will make land-based mining's impacts even harder to deal with.

## Deposit Locations

If we map our remaining known battery metal deposits, we can expect mining to expand into places with higher geopolitical risk, higher biodiversity, and greater carbon sinks and carbon-sequestration services to fulfill the future demand for critical metals. Most known nickel and cobalt reserves (and current production) appear in equatorial regions[1] such as Indonesia and the Democratic Republic of the Congo (DRC), respectively, which have forests with rich biodiversity and large carbon sinks. As a country, the DRC faces an ongoing battle with corruption[2] and political instability while its valuable cobalt industry has had to deal with issues such as child labor, safety risks, and environmental degradation[3]. For example, 20% of cobalt in the DRC comes from artisanal mines where some estimates have found that up to 40,000 children work in dangerous conditions with inadequate safety equipment and for low compensation[4]. In Indonesia, the government has implemented policies to rapidly grow its domestic nickel production capacity and become the top nickel producer[5]. By holding more than 20% of the world's nickel reserves in a market hungry for it, Indonesian output jumped 54% in one year as the global nickel production increased by 21% in 2022 as compared to 2021[6]. Given that these deposits reside under rainforests in a "megadiverse" country, a conservation hotspot with a high endemism level[7], they demand strongly enforced adequate environmental and social standards —a challenging feat when also facing an exponential growth in supply.

1 Nickel Institute, "Is There Enough Nickel? Reserves, Resources and Recycling", Jan. 6, 2020.

2 Transparency International, "Corruption Perceptions Index".

3 UNCTAD, "Commodities at a Glance", May 2020.

4 Michele Fabiola Lawson, "The DRC Mining Industry: Child Labor and Formalization of Small-Scale Mining", Sept. 1, 2021.

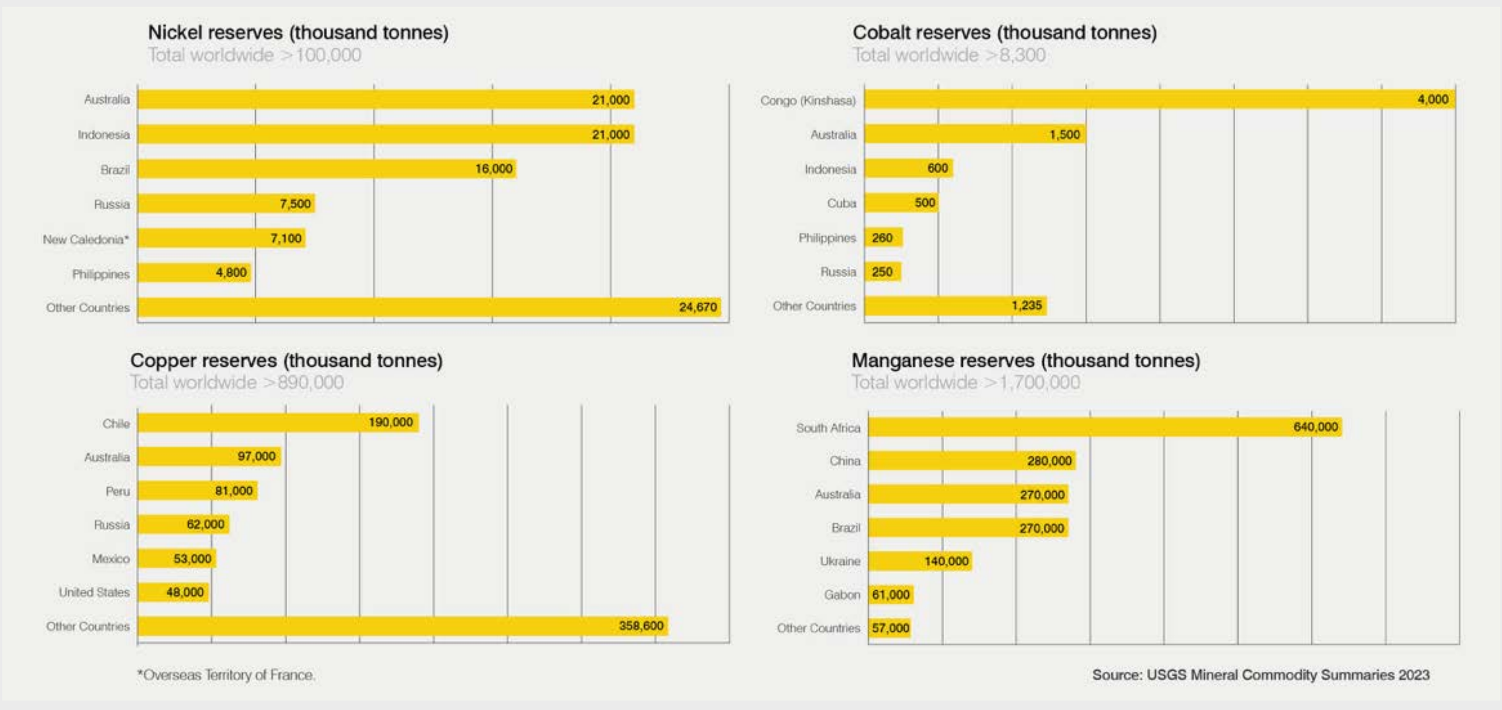
5 ASEAN Briefing, "Unleashing Nickel's Potential: Indonesia's Journey to Global Prominence", May 30, 2023.

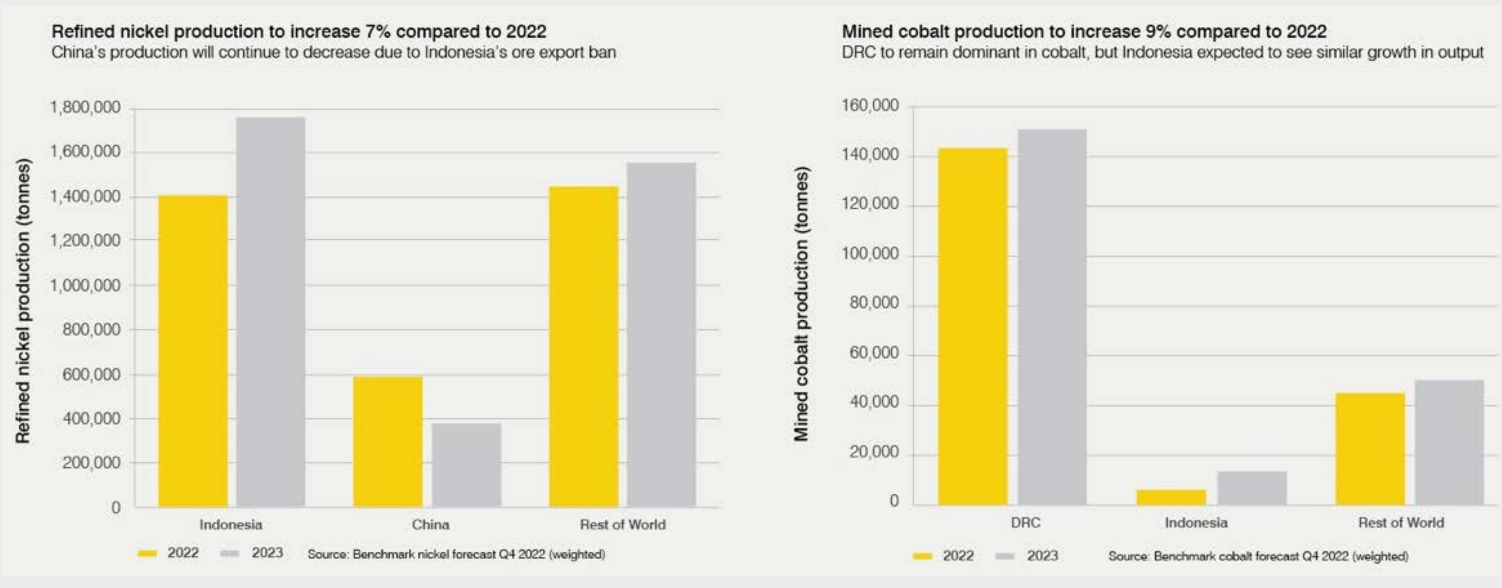
6 USGS Mineral Commodity Summaries, 2023.

7 UNEP WCMC, 'Megadiverse Countries", 2020.

Awareness around the fact that some cobalt mining involves child labor has attracted many initiatives to tackle the issue. In contrast, the public seems to appreciate to a more limited degree the fact that most nickel and cobalt come from clearing rainforests and woodlands, which destroys the carbon sinks and biodiversity they contain.

> Most new mined nickel and cobalt will likely come from Indonesia and DRC, respectively.




Source: Benchmark nickel and cobalt forecast Q4 2022 (weighted)

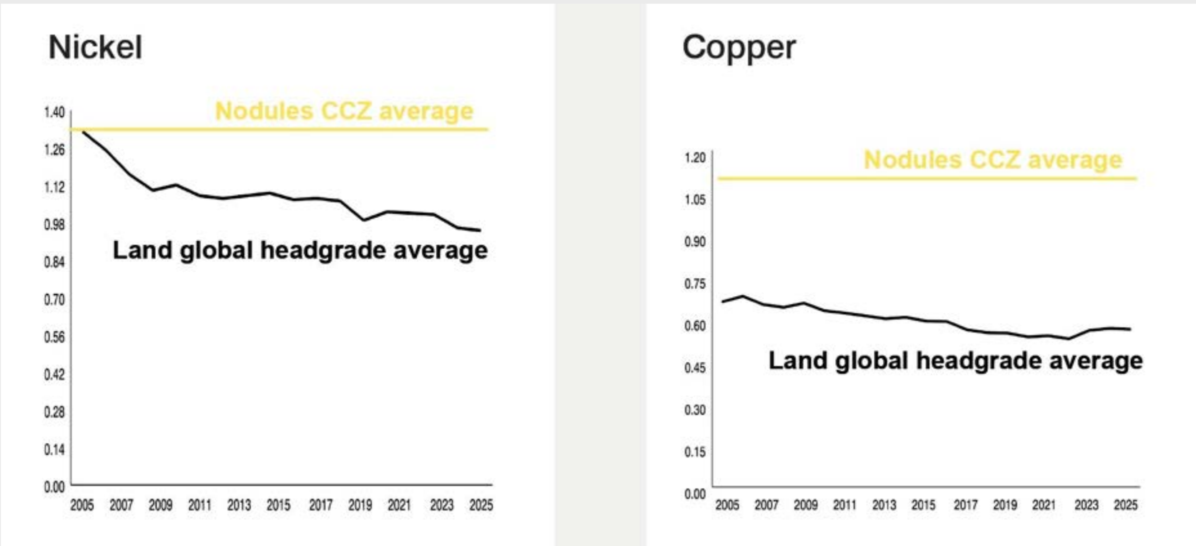
As a side note, although China's refined nickel production is expected to decrease in the coming years, its control over the production will likely not similarly fall. The change in nickel production output per country is a result of the Indonesian Government's ban of nickel ore exports to boost its economy in order to make value-added refined and manufactured nickel products domestically. Chinese companies have adapted by investing over US$3.2 billion in 2022 into Indonesian islands such as Sulawesi and Halmahera in order to secure their nickel supply into the next decade[1].

1. Bloomberg, 'Chinese Companies Are Flocking to Indonesia for Its Nickel", Dec. 15, 2022.

## Falling Grades

Resource extraction follows a simple logic: focus on the easy and high-grade resources first. As a result, the amount of metal per ton of mined ore for nickel and copper has decreased over time. In 1900, one ton of ore would generate 30 kilograms of copper. Today, to get that same amount of copper, one needs up to five times more ore[1], which means a mining operation needs to use more land, more energy, and more water. It also means that each kilogram of metal now comes with more waste (99.5% of ore ends up in mined waste and processing tailings in addition to the waste rock that one needs to mine to reach the target deposit), and someone must manage and contain that waste.

1 Calvo et al., "Decreasing Ore Grades in Global Metallic Mining: A Theoretical Issue or a Global Reality?", Nov. 7, 2017.




Sources: S&P Global, 2023

## Capital Intensity

As a result, failing ore grades leave land-based producers in a real predicament. They need to spend more capital to produce the same amount of metal and then spend more capital to decarbonize their operations, manage waste, and mitigate deforestation, biodiversity loss, and water depletion. In many cases, deposits reside in remote locations that lack infrastructure such as ports, rail, power, and freshwater. Mining companies often need to develop roads and housing; sometimes, they have to relocate local communities as well.

One cannot mine metal sustainably since, at its nature, it requires removing nonrenewable resources—at least not on human time scales. However, it does not mean that one cannot extract metal responsibly by managing and being accountable for all negative externalities that it has on people and the planet. In principle, one can resettle impacted communities and Indigenous people with their consent and through an equitable value exchange, provide mine workers with fair compensation and care, and keep children in classrooms rather than mine sites. In addition, one can replace diesel-powered dump trucks with electric ones, replace coal-fired plants with renewable energy, capture and manage waste streams, regenerate stripped soils, and replant cleared forests. Given that actual metal products account for a tiny fraction of the mass that any mining company manages, it would be fair to say that a responsible mining company's real core activity involves managing environmental and human impacts with metal extraction on the side. However, each new mining project comes with its own jurisdictional, geological, ecological, social, and economic challenges. Ensuring that every new mining project over the coming decades operates at the highest possible standard seems implausible.

To understand the scale of the challenge in quantitative terms, we commissioned a life cycle assessment (LCA) to look at the impacts of producing energy-transition metals via key land-based production routes. The assessment[1] found that producing 1kg of nickel in nickel sulfate through key land-based production routes results in varying degrees of environmental impacts as a result of location, ore type, ore grade and processing routes as shown below.

| | | =93% of global refined nickel production for 2022 | | | | | Lowest value |
|---|---|---|---|---|---|---|---|
| Impact category | Unit | INDONESIA Laterite RKEF route | AUSTRALIA Sulfide Conventional | INDONESIA Laterite HPAL (MHP) | PHILIPPINES Laterite HPAL (MSP) | CANADA Sulfide POX route | CCZ Nodules RKEF route |
| Global warming potential | kg $CO_2$ eq | 102.0 | 28.5 | 19.2 | 13.9 | 8.0 | 6.2 |
| Stratospheric ozone depletion | mg CFC11 eq | 14.1 | 27.1 | 3.1 | 3.1 | 3.4 | 0.7 |
| Fine particulate matter formation | g PM2.5 eq | 1,187.6 | 42.9 | 262.0 | 160.0 | 39.5 | 9.2 |
| Terrestrial acidification | kg $SO_2$ eq | 0.96 | 0.13 | 0.69 | 0.53 | 0.13 | 0.03 |
| Freshwater eutrophication | g P eq | 91.0 | 76.4 | 9.1 | 5.2 | 2.9 | 1.0 |
| Marine eutrophication | g N eq | 5.5 | 2.3 | -1.8 | -1.3 | 0.2 | -2.1 |
| Water consumption | $m^3$ | 0.31 | 0.13 | 0.25 | 0.24 | 0.15 | 0.05 |
| Land-based waste generation* | kg | 244 | 545 | 337 | 337 | 82 | 0 |
| Marine waste generation* | kg | N/A | - | N/A | N/A | - | 137 |

1 Benchmark, 'Life Cycle Assessment of NORI-D Polymetallic Nodule Project and Comparison to Key Land-based Routes for Producing Nickel, Cobalt and Copper", 2023.

Note: Global warming potential includes the direct emissions from metal mining, processing & refining, but does not account for the release of carbon stored in vegetation, detritus & soil; nor the emissions from land use change.

The LCA compared the key land-based routes results to those obtained for producing the same metals from NORI-D polymetallic nodules. A summary of the findings of this ISO-standards-compliant analysis completed by Benchmark Mineral Intelligence and reviewed by an independent third-party expert is also available here, and the complete study here. More can also be found on the comparative lifecycle studies page and TCFD & TNFD page of this report.

The world faces a catch-22 situation: to mitigate climate change's impacts and support the infrastructure that a growing population requires, we need to promptly transition to lower-carbon technologies. However, implementing these technologies involves large amounts of mineral resources that put additional pressure on the Earth's life-support systems and can lead to negative social consequences.

## Land Mining


This is a representation of the current planetary boundaries and social foundations that terrestrial mining exacerbates and/or alleviates.

Getting these resources in the same way we do today will require the world to continue to destroy forests, which will release additional greenhouse gas (GHG) emissions currently stored in their carbon sinks—something that we at TMC want to avoid. It will also severely impact wildlife and people living in affected areas. Most mining operations happen in developing countries that want to attract investment while addressing their own challenges such as poverty, violence, and poor governance. These factors add complexity in achieving reforms, especially in jurisdictions where governments cannot safeguard against severe social and environmental externalities[1]. Land mining can have positive impacts on humans and societies by increasing employment and contributing to local economies, but it also tends to exacerbate pre-existing vulnerabilities in host communities, which then continue to fall short on fundamental social foundations such as peace and justice, equality, health, and education while adding to other negative impacts such as deforestation, erosion, pollution, human rights violations, displaced communities and practices, and conflicts over land and water allocation[2].

1 Éléonore Lèbre et al., "The Social and Environmental Complexities of Extracting Energy Transition Metals", Sept. 24, 2020.

2 Ibid.

# Our Hypothesis

Finding a way to obtain the metal that humanity needs without further exceeding the planetary boundaries and worsening social shortfalls is what TMC is working on. As a team, we started with a premise that, if humanity has largely exhausted high-grade (and, as a result, often lower-impact) metal deposits on land, it might be preferable to look at the seafloor.

Many people with justifiable concerns about our oceans might find this idea counterintuitive. Indeed, our oceans face enormous pressure from overfishing, marine pollution, and ocean acidification, and the ecosystem services they provide face more serious threats than ever before. Climate change drives acidification and contributes to warmer seas, which have begun to cause widespread damage to coral reefs. These reefs occupy less than 1% of the ocean floor but house more than 25% of marine life[1]. According to the Food and Agriculture Organization of the United Nations (FAO), 34.2% of fish stocks have been fished beyond sustainable limits[2], and overfishing and illegal and unreported fishing continue to pose a major challenge. With over 3 billion people in the world depending on marine and coastal biodiversity for their livelihood, addressing oceans threats is of vital importance[3].

The ocean also plays a prominent role in shaping Pacific Islanders' cultural and spiritual identity, home, and common heritage. As Pacific scholar Epeli Hau'ofa explains, "the sea is our pathway to each other and to everyone else, the sea is our endless saga, the sea is our most powerful metaphor, the ocean is in us"[4]. With our partnerships with our sponsoring states, we have come to better understand the ocean's special significance to Pacific Islanders. Rather than perceiving the ocean as an endless physical barrier that seemingly separates them from outlanders, they perceive it as a path to the world.

The global community has begun to focus on protecting our oceans. At the COP15 UN Biodiversity Conference in Montreal in December 2022, 188 governments from around the world agreed on a landmark new Global Biodiversity Framework (GBF) to address biodiversity loss, restore ecosystems, and protect indigenous rights. The plan, known as the Kunming-Montreal Global Biodiversity Framework, comprises 23 targets that aim to halt and reverse nature loss, such as protecting 30% of the planet's land, coastal areas and oceans by 2030 (also known as the 30x30 target)[5].

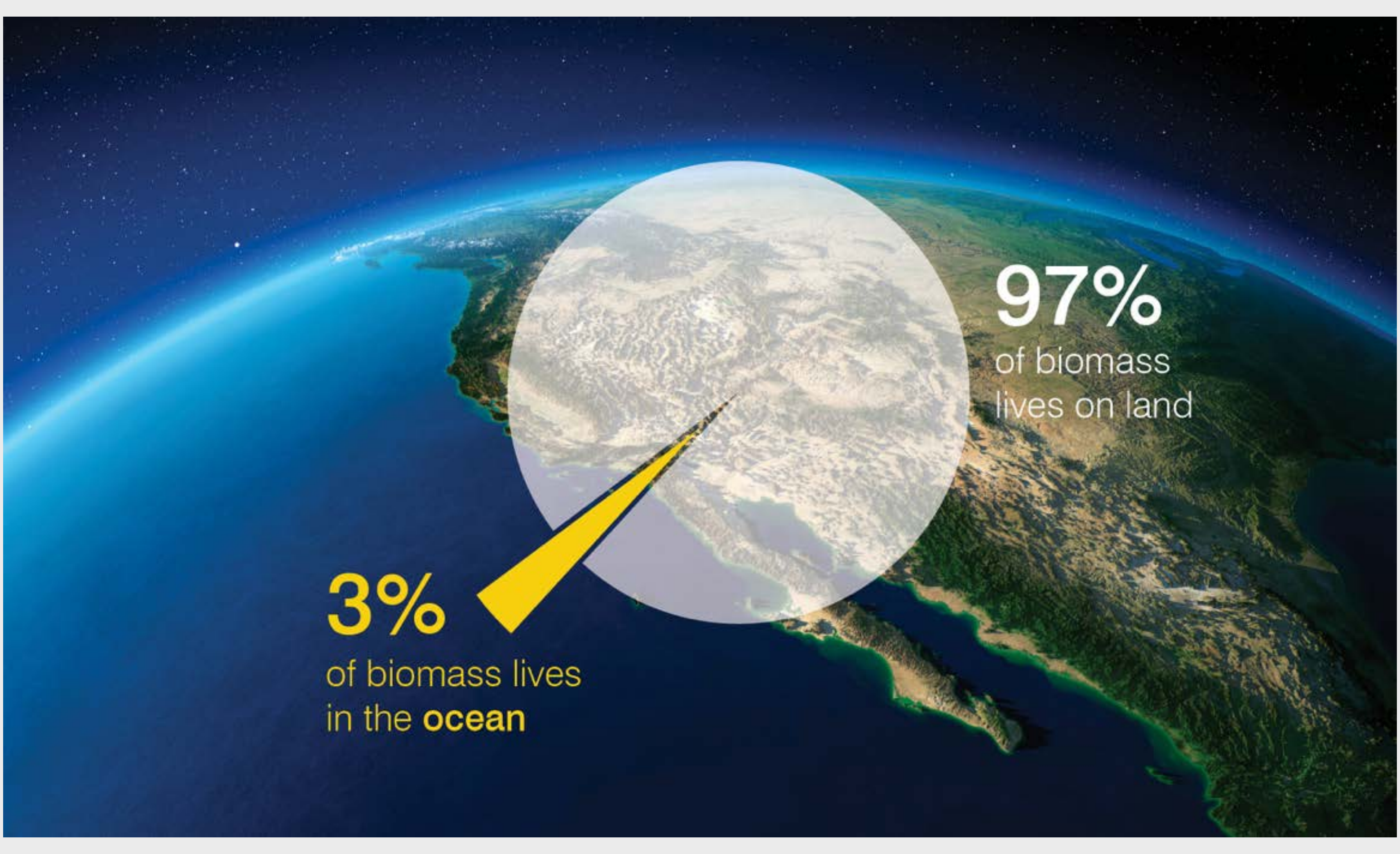

The UN subsequently wrote the 30x30 target into the UN High Seas Treaty on March 2023 to protect the oceans and biodiversity in international waters. After talks over nearly two decades, delegates attending the Intergovernmental Conference on Marine Biodiversity of Areas Beyond National Jurisdiction (BBNJ) agreed—subject to member state ratification—to consider 30% of the world's oceans as protected areas by 2030, put more money into marine conservation, and provide a framework to share marine genetic resources and deep-sea scientific knowledge[6]. As UN Secretary General António Guterres has said, this "breakthrough is vital for achieving ocean-related goals and targets of the 2030 Agenda for Sustainable Development, and the Kunming-Montreal Global Biodiversity Framework". The High Seas Treaty is one of the three implementation instruments for the U.N. Convention on the Law of the Sea (UNCLOS) adopted in 1982 to establish a single set of rules to protect the world's oceans and govern efforts to use their resources[7]. The ISA, established pursuant to another UNCLOS implementation instrument (1994 Implementation Agreement), has already placed 43% of the Clarion-Clipperton Zone under protection as of May 2023. Note that the High Seas Treaty neither impacts the ISA's mandate as regulator nor sponsoring states and contractors' rights and responsibilities.

Given these efforts to protect the world's oceans and given land-based mining's destructive legacy, one might find it odd to even consider introducing a new extractive activity on the seafloor. However, we believe that the deep seafloor on the abyssal plain is worth exploring as a potential source of energy transition metals with a lower impact mainly due to advantages offered by the location of polymetallic nodules and its characteristics.

Even though life likely originated in the ocean which accounts for 70% of the Earth's surface, most life lives on land. Only 3% of living biomass resides in the oceans while 97% resides on land[8]. While vast, oceans largely lack the structure that vegetation on land offers and, as a result, feature less abundant ecological niches for life to evolve. The ocean represents an expanse of similar habitats, while land features a much wider variety of smaller habitats and ecological niches mainly due to plant and tree diversity[9]. This diversity translates into greater biodiversity overall on land than in the oceans[10].

1 UNEP, "Life Below Water", 2020.
2 UN SDGs, "Goal 14: Conserve and Sustainably Use the Oceans, Seas and Marine Resources", Accessed in July 2023.
3 UNEP, "Life Below Water", 2020.
4 Epeli Hay'ofa, "The Ocean in Us", Fall 1998.
5 CDB, "COP15: Nations Adopt Four Goals, 23 Targets for 2030 in Landmark UN Biodiversity Agreement", Dec. 19, 2022.
6 United Nations, "Intergovernmental Conference on Marine Biodiversity of Areas Beyond National Jurisdiction", March 16, 2022.
7 United Nations, "UN Delegates Reach Historic Agreement on Protecting Marine Biodiversity in International Waters", March 5, 2023.
8 Yinon M. Bar-On et al, "The Biomass Distribution on Earth", May 21, 2018.
9 Yinon M. Bar-On and Ron Milo, "The Biomass Composition of the Oceans: A Blueprint of Our Blue Planet", Dec. 12, 2019.
10 Katona et al, "Land and Deep-Sea Mining: the Challenges of Comparing Biodiversity Impacts", Mar. 18, 2023.

Life in the Ocean: Despite the Large Area of the Ocean, **Most Life is Found on Land**




Note: Ocean life is defined as marine life and deep-subsurface life

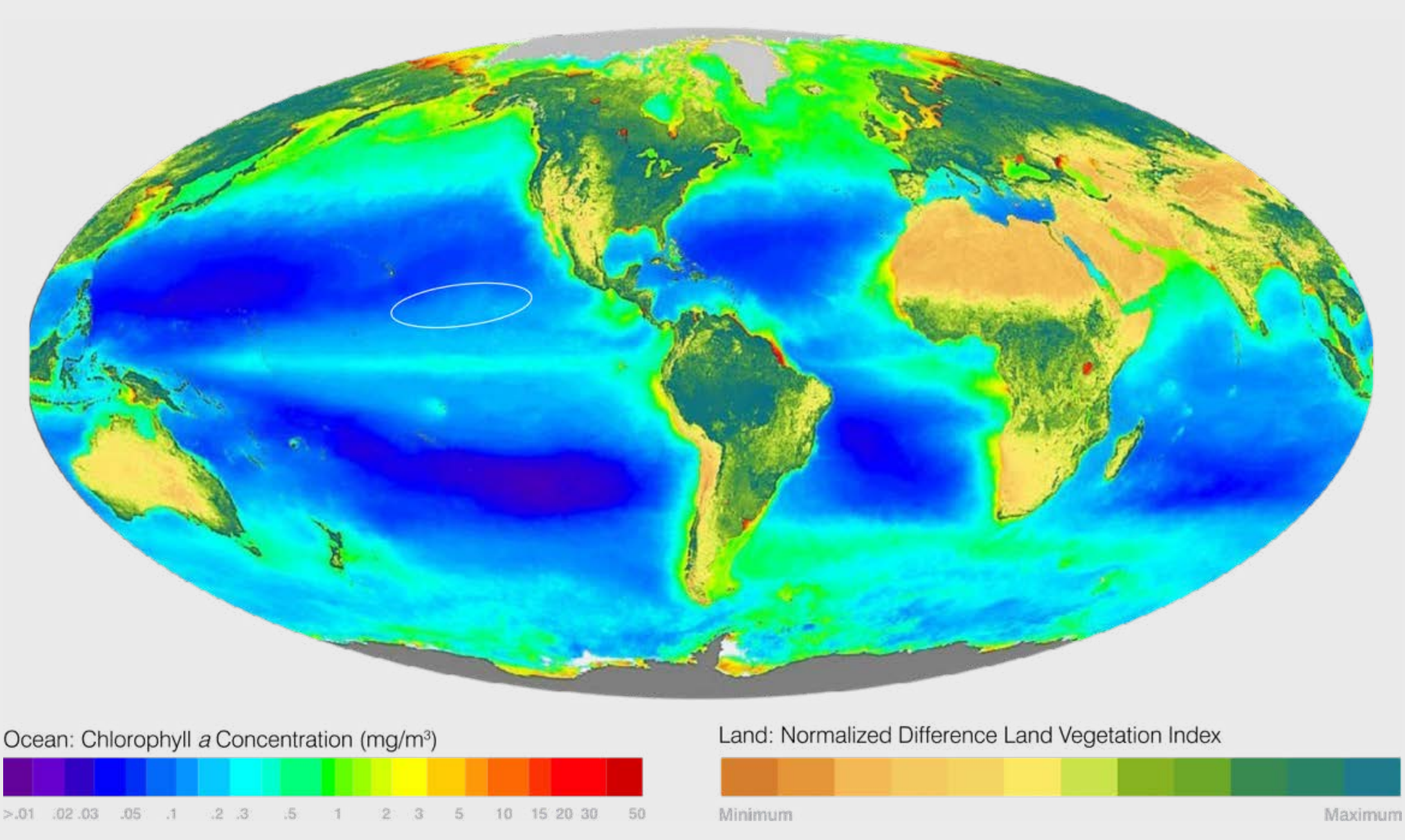
Source: Yinon M. Bar-On et al, "The Biomass Distribution on Earth", May 21, 2018.

Not unlike different biomes on land (e.g., deserts vs. tropical rainforests), the ocean comprises areas that vary in productivity. Coral reefs possess among the most biodiversity in the ocean (e.g., the Coral Triangle in the Indo-Pacific region), whereas abyssal plains have among the lowest biomass on the planet (akin to deserts on land).

> We decided to focus on areas with the lowest ocean productivity, far away from human coastal communities, coral reefs and fisheries.

Global Surface Ocean **Primary Productivity**

As measured by chlorophyll concentration average 1997-2000, combined with the SeaWiFS-derived Normalized Difference Vegetation Index over land

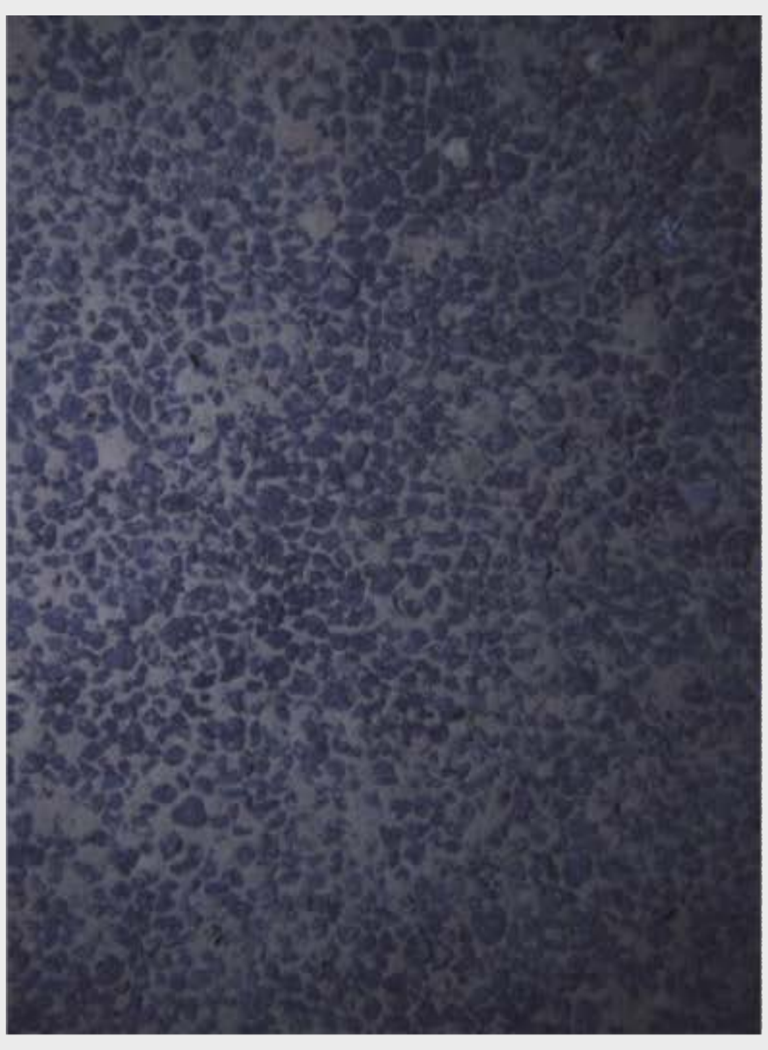



Source: NASA Ocean Color

Accordingly, we decided to look at areas with the lowest ocean productivity, and this decision took us to look to the deep sea in international waters where three types of metal deposits reside: polymetallic nodules found on the abyssal plains, cobalt crusts found on seamount slopes (underwater mountains), and seafloor massive sulfides found around hydrothermal vents.

# Why We Focus Only on Nodules

## Deepsea Minerals



### The Abyssal Plain
**Polymetallic nodules**

**3,800-5,500 m depth**

Discrete rocks, 2-30 cm in diameter, formed by dissolved metal compounds precipitating around a nucleus.

- **Growth: 10-20 mm per million years.**
- Unattached to the seafloor. Can be collected using gentle water jets directed at nodules in parallel with the seafloor.
- Low-food, low-energy environment.
- **13 grams of biomass/m²**

### Seamounts
**Cobalt crusts**

**800-2,500 m depth**

Rock-hard metallic layers that are 2-26 cm thick and precipitate on the flanks of submarine volcanoes.

- **Growth: 1-5 mm per million years.**
- Integral part of the seafloor that requires hard-rock cutting to break the ore from the substrate.
- Abundant food supply due to nutrient-rich water upwelling from near-bottom currents. High-frequency destination for tuna and sharks.
- **10-100x biomass vs. abyssal plain**

### Hydrothermal Vents
**Seafloor massive sulfides**

**1,000-4,000 m depth**

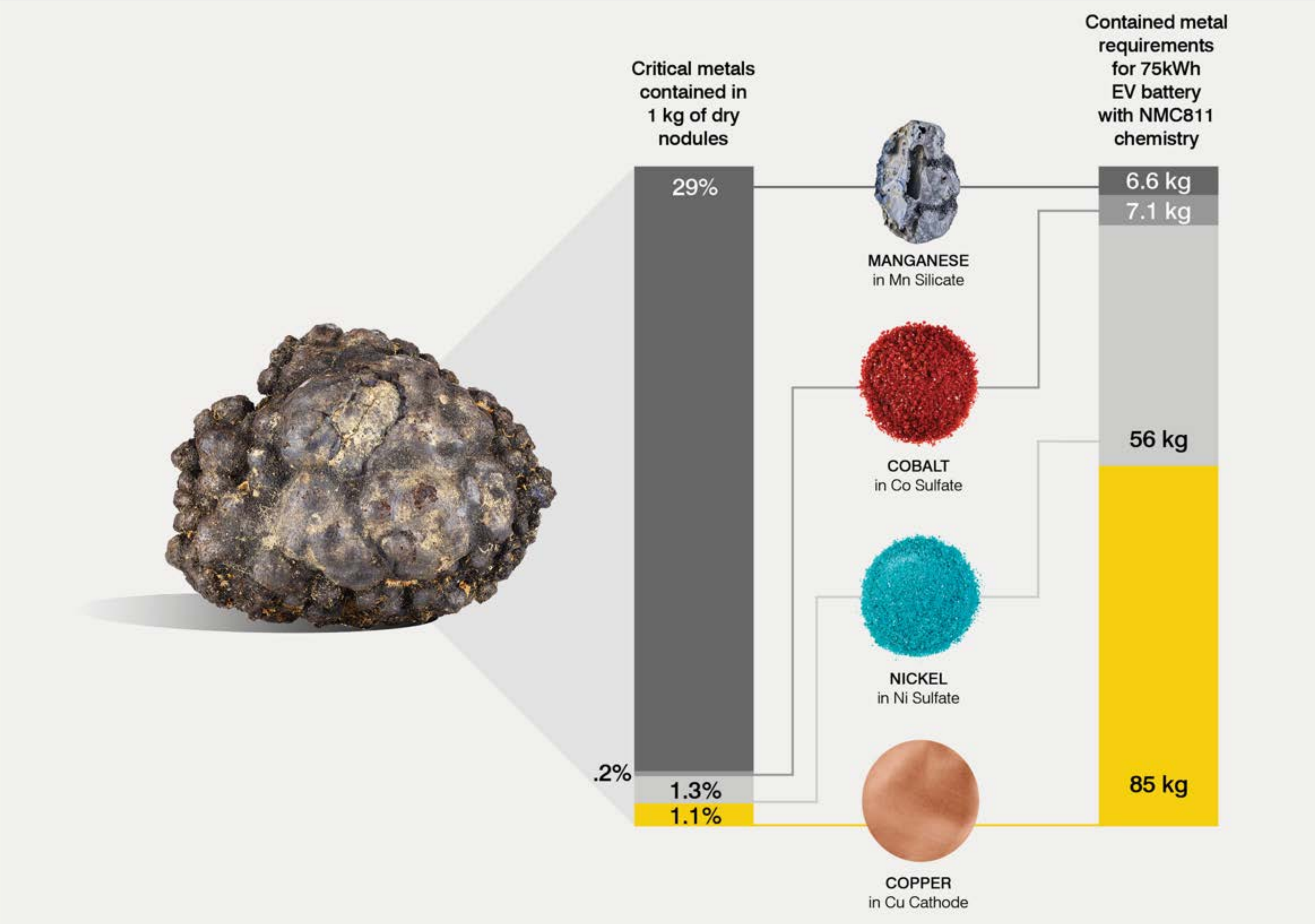
Tall chimney-like structures that form at hot vents where sulfide-enriched water flows out of the seabed, causing dissolved metals to bind into minute sulfide particles and sink as fine precipitants to the bottom.

- Integral part of the seafloor that requires hard-rock cutting to break the ore from the substrate.
- Abundant food supplied by chemoautotrophic bacteria that exploit energy-rich chemical compounds from the vents.
- **100x biomass vs. abyssal plain**

Sources: Skowronek et al, "Chemostratigraphic and Textural Indicators of Nucleation and Growth of Polymetallic Nodules from the Clarion-Clipperton Fracture Zone (IOM Claim Area)", August 11, 2021; Yinon M. Bar-On et al, "The Biomass Distribution on Earth", May 21, 2018

Polymetallic nodules stand out because each one contains high-grades of four critical metals that the energy transition requires. In addition, since they sit unattached on the abyssal plain seafloor (an area that, as we note previously, has among the lowest biomass on the planet), one does not need to cut, dig, or blast into the seafloor to collect them. This fact explains why we use the term "nodule collection" rather than "nodule mining" when referring to our future operations. In contrast, cobalt crusts and seafloor massive sulfides represent integral seafloor structures and one would have to mine them via conventional means (i.e., by breaking and cutting hard rock).

## Nodule Composition vs. Battery Metal Needs




These decisions landed us in the abyss at 4-6-kilometer depths.

# The CCZ and Abyssal Plains

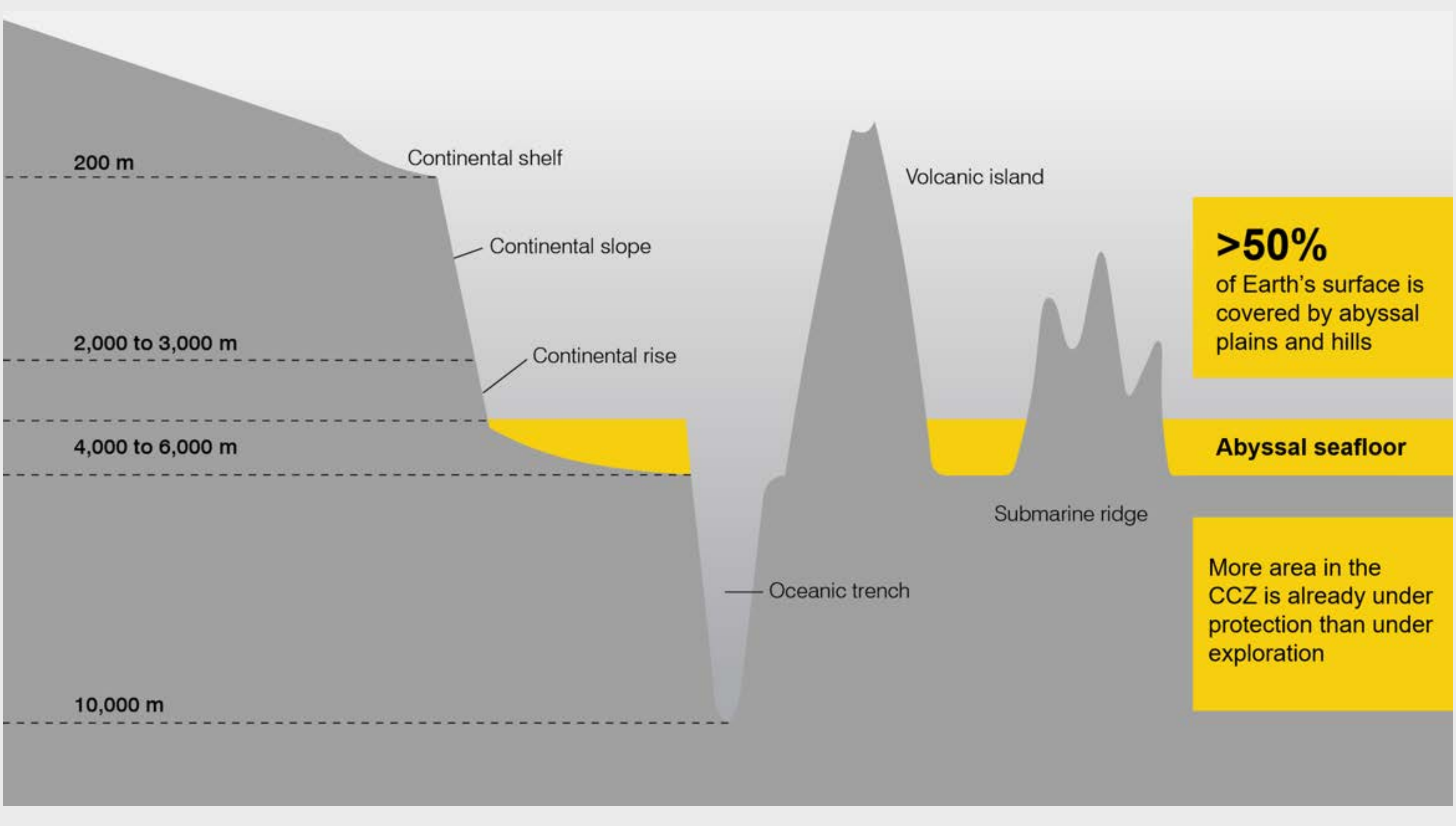
While operating far offshore at depths that exceed 4km involves many challenges, collecting polymetallic nodules from the abyssal plains has several advantages. For instance, abyssal seafloor covers more than 50% of the Earth's surface and 70% of the ocean floor[1], which makes it easier to set aside vast areas for protection[2].

[1] Harris et al., "Geomorphology of the Oceans", Jun. 2014

[2] NOAA, "Ocean Floor Features"

## The Abyssal Seafloor: the **Most Common Biogeographical** Area on the Planet

Abyssal plains and hills, where polymetallic nodules are found, are the most abundant habitat type on the surface of the Earth, accounting for >50% of the Earth's surface and 70% of the ocean floor.




Visual representation not to scale.

Source: Harris et al., "Geomorphology of the Oceans", Jun. 2014


The seafloor sediments of the abyssal plains contain up to 15 times less carbon than all vegetation and soil on land—a much better starting point compared to land-based mining. Although nodule-collection operations can disturb the upper seafloor sediment layer (disturbance at around 5-10cm), we are finding that the sediment resettles relatively quickly and at a short distance away). Furthermore, we know about no known pathways for the sediment (and carbon contained on it) to travel 4 kilometers upwards to reach the atmosphere. In a 2022 study based on actual field trials that the ISA contractor GSR conducted in the Clarion-Clipperton Zone (CCZ), the Massachusetts Institute of Technology (MIT) and Scripps Institute of Oceanography, found that the seafloor plumes from the nodule-collector vehicle on flat terrain remained relatively low. Between 92% and 98% of the plumes remained in suspension within 2 meters of the sea floor as opposed to traveling higher into the water column as some had speculated they would do[1]. As a result, we do not expect nodule-collection activities to release significant amounts of carbon sequestered in seafloor sediments. More in field data was obtained during our pilot collection test in 2022 and we will continue to improve the design of our system to further reduce this impact.

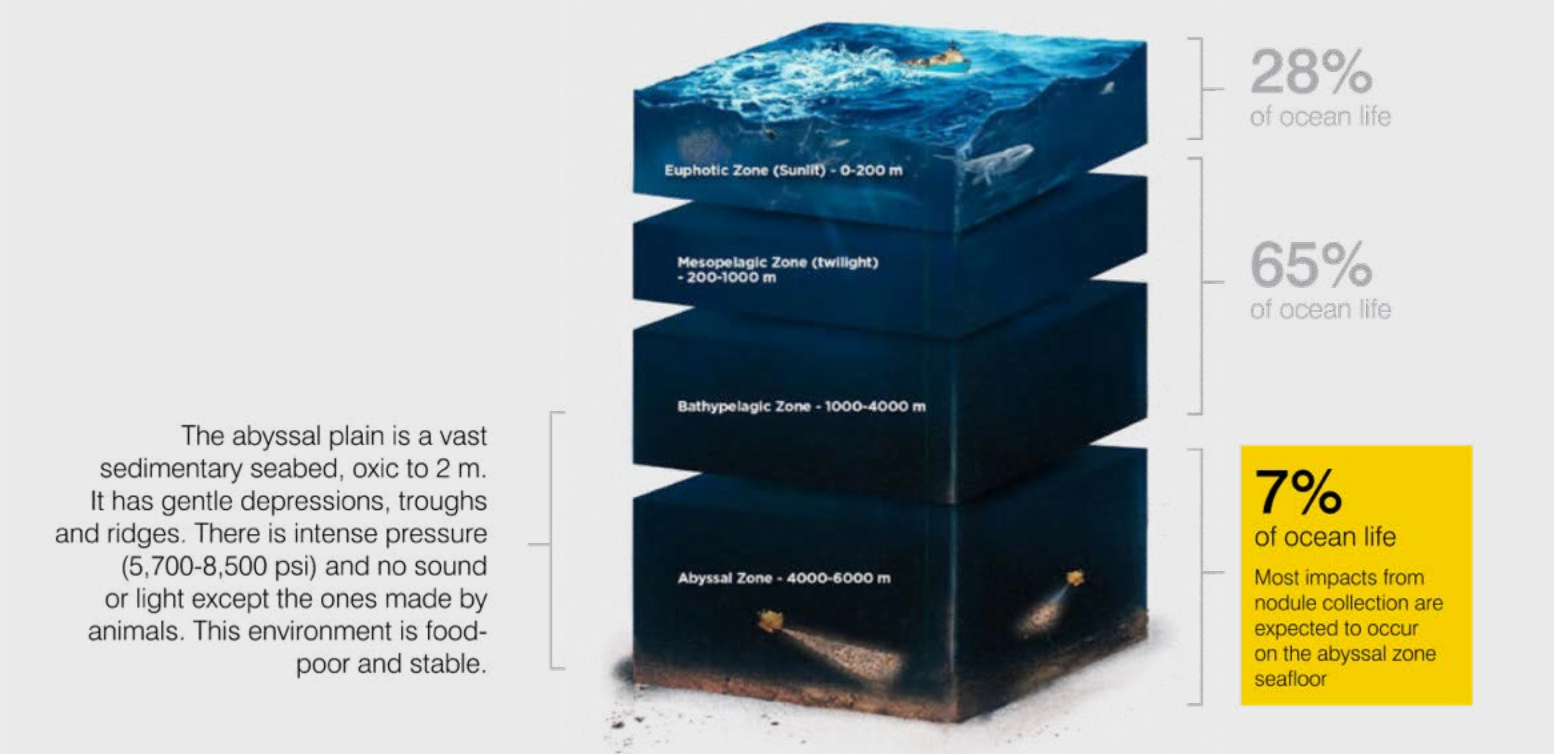
[1] Carlos Muñoz-Royo et al., "An In Situ Study of Abyssal Turbidity-Current Sediment Plumes Generated by a Deep Seabed Polymetallic Nodule Mining Preprototype Collector Vehicle", 21 Sep. 2022.

Less than 10% of all marine life lives below 4,000 meters[1] due to the enormous pressure, low temperatures, lack of light (which means no plants), and poor food availability at these depths. If one lines up all terrestrial and marine biomes on a scale from poorest to richest in terms of life, the scale runs from a few grams to about 30 kilograms of contained carbon per square meter. Rainforests such as the ones in Indonesia sit on the rich end of the scale at 15-30 kilograms. The abyssal plain sits on the opposite, lowest end of the scale at about 10 grams. For clarity, these values mean the abyssal CCZ has 300 times less biomass than an average biome on land and up to 3,000 times less biomass compared to rainforest regions where much nickel mining occurs[2].

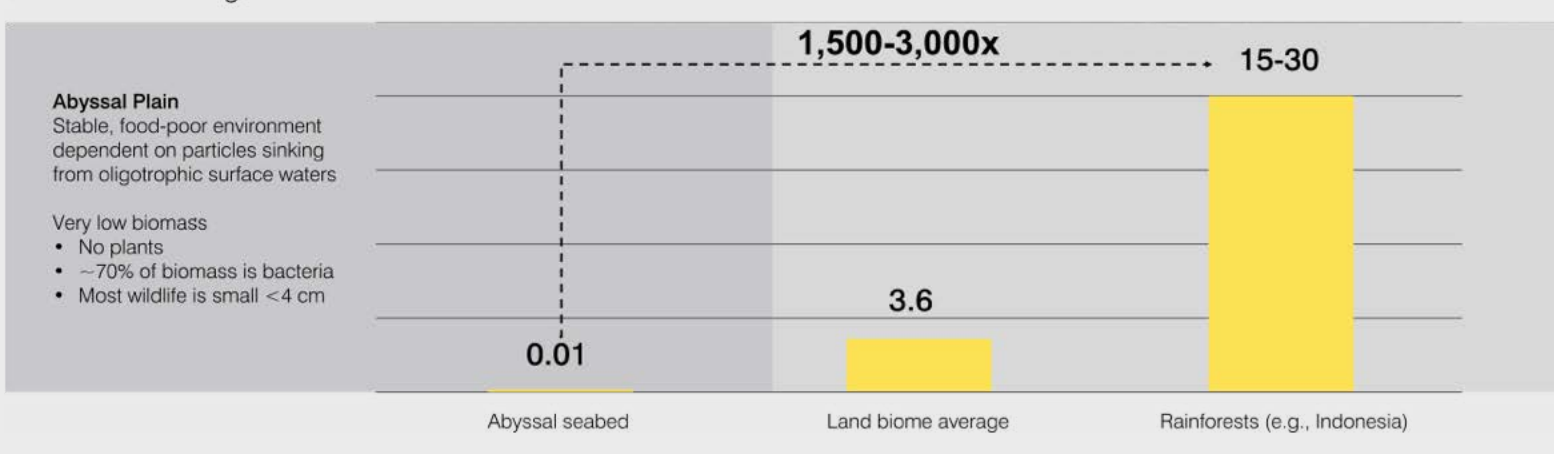
[1] Yinon M. Bar-On et al, "The Biomass Distribution on Earth", May 21, 2018.

[2] Ibid.

## The Abyssal Plain: Home to **Less Than 10%** of Ocean Life




## The Abyssal Plain Advantage: One of the **Lowest Biomass and Carbon Sequestration Environments** on the Planet




Note: The seafloor-biomass value incorporates an estimate of seamounts and hydrothermal vents attributed to Wei, et al., 2010. It is also an overestimate because it includes all fish in the water column, rather than focusing only on the seafloor and mid-water column. The overall biomass of Earth's ice-free terrestrial area was 472.7 gigatonnes of carbon, compared to 2.49 gigatonnes of carbon for the global abyssal seabed.

Sources: Yinon M. Bar-On et al., "The Biomass Distribution on Earth", May 21, 2018; Wei, et al., "Global Patterns and Predictions of Seafloor Biomass Using Random Forests", Dec. 30, 2010.

Bacteria account for approximately 70% of the life in the abyssal plain based on biomass. Many creatures in the abyssal CCZ include invertebrates that filter organic matter from the sediments or overlying water. The main food source comes from the marine snow, organic particles that fall from the productive photic zone throughout the water column as they get metabolized along the way. Given the limited amount of food that reaches the bottom, most animals on the abyssal plain do not exceed 4 centimeters long; in fact, most have microscopic dimensions. Some large mobile species such as ratfish and shrimp do live on the abyssal plain and can swim, so they will be able to move away from the areas that nodule collection disturbs. We have built a library of deep-sea biological samples to preserve and better understand them. To learn more, please view the Environmental Program page.

## **Life** on the Abyssal Plain

Megafauna photo credit: Amon et al., 2016.

Meiofauna photo credit: C.R. McClain, "An empire without food," Amer. Sci. 98(6), 2010.

As a precautionary environmental management and protection measure, the International Seabed Authority (ISA), which regulates efforts to explore and exploit seabed resources in international waters, has already set aside 1.97 million square kilometers) or 43% of the CCZ, as protected areas or Areas of Particular Environmental Interest (APEIs). These areas go beyond the Global Biodiversity Framework's objective to protect 30% of the ocean by 20301, which the High Seas Treaty will help achieve by establishing additional marine protected areas in international waters[1].

[1] CBD, 'COP15: Nations Adopt Four Goals, 23 Targets for 2030 in Landmark UN Biodiversity Agreement", Dec. 19, 2022; BBC, "What Is the UN High Seas Treaty and Why Is it Needed?", March 8, 2023.

**Earth:**
510 million km²

**Global ocean:**
362 million km² (71% of Earth's surface)[1]

**Pacific Ocean:**
162 million km² (45% of the global ocean)

**Deep sea (>200m depth):**
360 million km² (70% of the Earth's surface)

**International waters/high seas (generally >200 nautical miles or 370 km from a country's shoreline):**
230 million km² (>60% of the ocean)

**Abyssal plains (3,500-6,500 meters in depth):**
~253 million km² (70% of the ocean floor and one the largest habitat on earth)[2]

**Clarion-Clipperton Zone (CCZ):**
4.56 million km² (1.2% of total ocean area, 1.7% of the abyssal plains and 3% of Pacific Ocean)

**CCZ currently under exploration contract:**
1.24 million km² (27% of CCZ)[3]

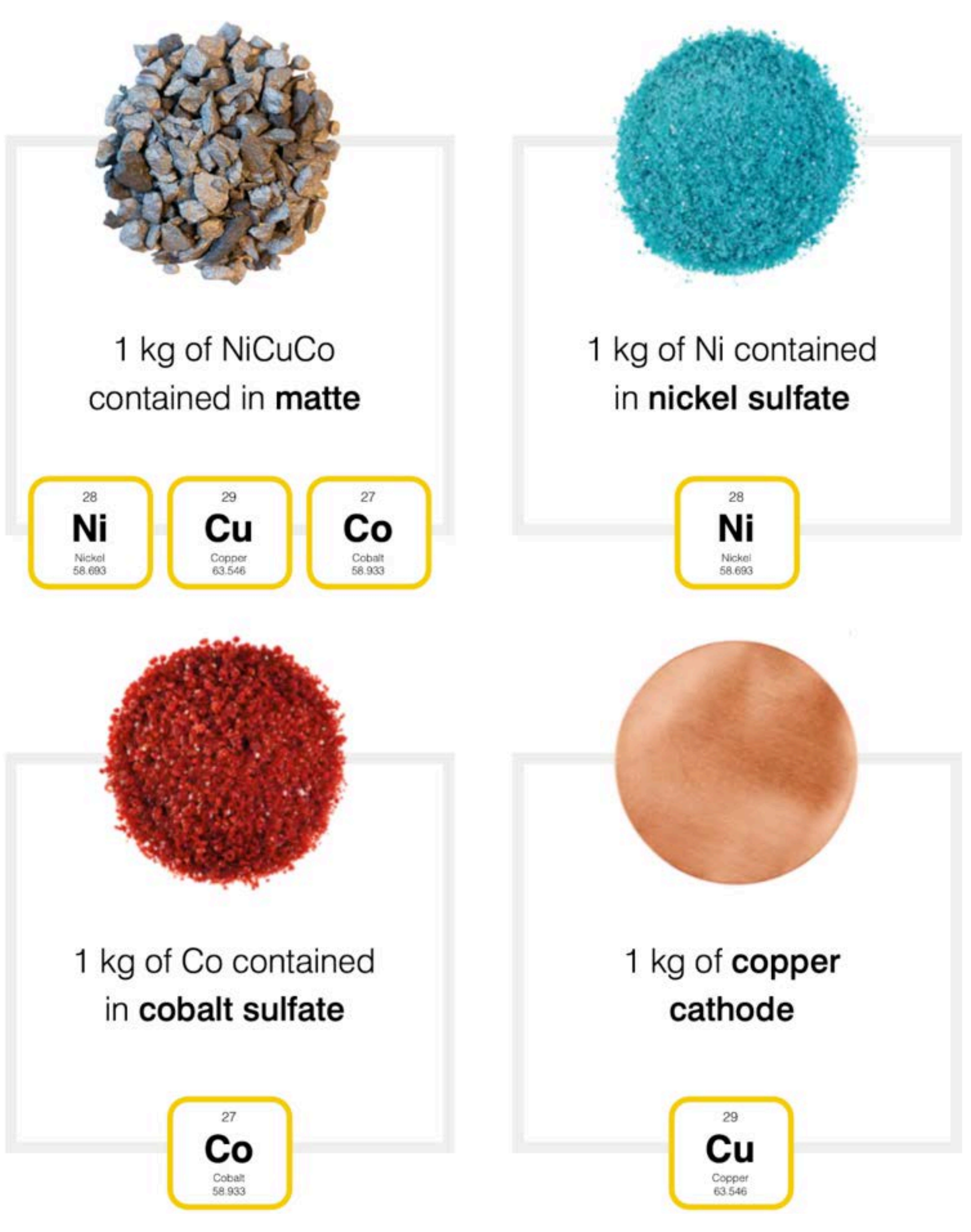
**CCZ Areas of Particular Environmental Interest (APEI):**
1.97 million km² never to be mined (43% of the CCZ)

**TMC's exploration area:**
224,000 km² (5% of CCZ)

# Comparative Life Cycle Studies

Recently, we have commissioned several research assessments to quantitatively understand the lifecycle impacts associated with TMC's future operations and how they compare to key land-based routes for producing the same metals.

In March 2023, Benchmark Mineral Intelligence (Benchmark) completed an independent life cycle analysis (LCA) that compared the NORI-D Project's lifecycle environmental impacts with key land-based routes for producing intermediate (NiCuCo matte) and end-products (nickel sulfate, cobalt sulfate, and copper cathode). A third-party expert reviewed the LCA in compliance with ISO standards. TMC's flowsheet will also produce a pre-reduced manganese silicate expected to deliver cost and emission savings to downstream users.




The land-based routes Benchmark analyzed represent 93% of global refined nickel output and 86% of global mined cobalt output for 2022. This cradle-to-gate LCA analyzed seven environmental impact categories critical for the metal industry: global warming potential, stratospheric ozone depletion, terrestrial acidification, freshwater and marine eutrophication, particulate matter formation, and water consumption. Benchmark also conducted supplementary research into waste generation.

| Impact Category (ReCiPe 2016) | Details |
|---|---|
| **Global Warming Potential** | Emissions included: carbon dioxide, carbon monoxide, methane, nitrous oxide, chlorofluorocarbons and hydrochlorofluorocarbons **(in kg $CO_2$ equivalent to air)**. |
| **Stratospheric Ozone Depletion** | Chemicals that cause the depletion of the ozone layer have chlorine or bromine groups in their molecules that interact with ozone (mainly) in the stratosphere. Ultimately, they cause human health issues because of the resultant increase in UVB radiation **(in mg CFC-11 equivalent to air)**. |
| **Terrestrial Acidification** | Atmospheric deposition of inorganic substances, such as sulfates, nitrates and phosphates, cause a change in the acidity of the soil. Major acidifying emissions include nitrogen dioxide ($NO_x$), ammonia ($NH_3$) or sulfur dioxide ($SO_2$). This can cause extinction of species, leading to damage to the terrestrial ecosystem **(in kg $SO_2$ equivalent to air)**. |
| **Freshwater Eutrophication** | Occurs due to the discharge of nutrients into soil or into freshwater bodies and hence in the subsequent rise in nutrient levels, e.g., phosphorus and nitrogen linked to algae blooms, tainted drinking water supplies, degradation of recreational opportunities, and hypoxia 'dead zone' lacking sufficient oxygen to support most organisms **(in g P equivalent to freshwater)**. |
| **Marine Eutrophication** | Occurs due to the discharge of nutrients into marine environments and hence in the subsequent rise in nutrient levels, e.g., phosphorus and nitrogen, setting off a chain reaction in the ecosystem that leads to acidification and the reduction of marine life **(in g N equivalent to marine water)**. |
| **Particulate Matter Formation** | Represents a complex mixture of organic and inorganic substances. PM2.5 can cause human health problems as it can deposit to the upper part of the airways and lungs when inhaled. Secondary PM2.5 aerosols are formed in air from emissions of $SO_2$, $NH_3$ and $NO_x$, among other elements **(in g PM2.5 equivalent to air)**. |
| **Water Consumption** | Attributed to the availability reduction of freshwater, which leads to impacts on human health and ecosystem quality **(in $m^3$ water consumed)**. |

| Supplementary Research | Details |
|---|---|
| **Waste Generation** | Waste stream analysis does not form part of the third-party LCA but Benchmark included it as supplementary research to this study. Includes mine waste, mine and processing tailings,tailings bleed, slag and mobilized sediments (in kg of waste). |

Benchmark found that NORI-D Project model performed better for nickel and copper in every impact category analyzed and the vast majority of impact categories analyzed for cobalt on all the routes chosen for comparison.

Given that the world predominantly sources nickel from beneath biodiverse rainforests and carbon sinks in Indonesia, the study found that TMC's nickel sulfate product would outperform not just Indonesian nickel but all other key land-based production routes, with more than 70% lower emissions on average, including GWP.

## Summary: Environmental Impacts of NORI-D Project By Product

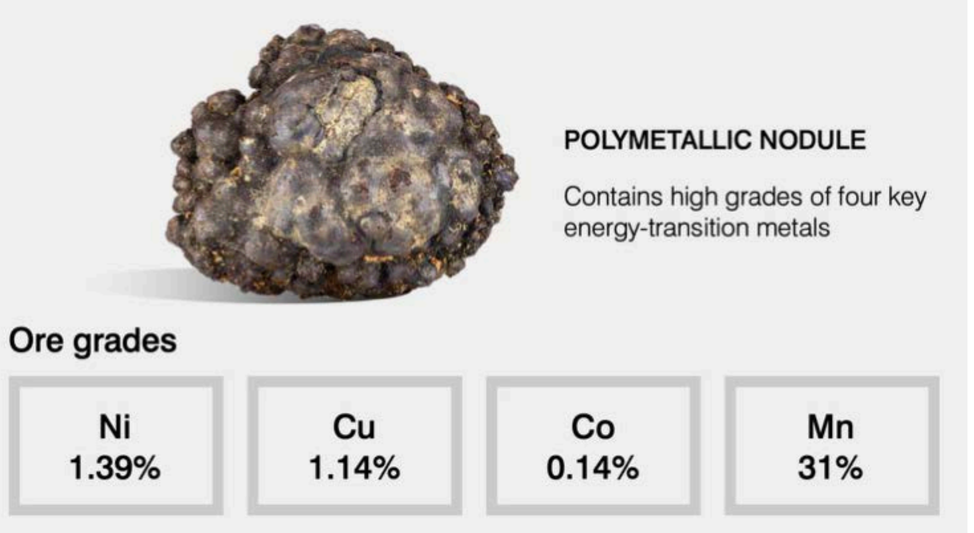
| NORI-D Project products | NiCuCo matte | Nickel in nickel sulfate | Copper cathode | Cobalt in cobalt sulfate |
|---|---|---|---|---|
| Environmental Performance | **Best environmental performance** in all **7 impact categories** among the 3 processing routes analyzed | **Best environmental performance** in all **7 impact categories** among the 8 processing routes analyzed | **Best environmental performance** in all **7 impact categories** among the 4 processing routes analyzed | **Best environmental performance** in **5 of 7 impact categories** among the 8 processing routes analyzed |
| Overall Impact | On average **>90% lower emissions** than the conventional and DON processing routes in 4 of 7 impact categories, namely stratospheric ozone depletion, freshwater eutrophication, marine eutrophication and water consumption. And on average **lower emissions by >63% in GWP, >36% in terrestrial acidification and >44% in fine particulate formation** | On average **>80% lower emissions** than other routes in 5 of 7 impact categories, namely stratospheric ozone depletion, terrestrial acidification, freshwater eutrophication, marine eutrophication and fine particulate matter formation. And on average **>70% lower emissions in GWP and water consumption** | On average **>90% lower emissions** in 3 of 7 impact categories for stratospheric ozone depletion, freshwater eutrophication and marine eutrophication. And on average **lower emissions by >55% in GWP, 64% in terrestrial acidification and 43% in water consumption** | On average **>70% lower emissions** in 5 of 7 impact categories, namely stratospheric ozone depletion, terrestrial acidification, freshwater eutrophication, marine eutrophication and fine particulate matter formation. And on average **>44% lower emissions in GWP and water consumption** |
| Global Warming Potential (GWP) | **60% and 64% lower GWP** than conventional and DON processing routes respectively | Between **23-94% lower GWP** than other 7 processing routes analyzed | Between **11-78% lower GWP** than other 3 processing routes analyzed | Between **11-92% lower GWP** than other 7 processing routes and **58% higher GWP** than the RLE route |
| Notes | Lower electricity demand, use of renewable energy and differences in the mining process contributed to better performance. Since nodules are unattached to the seafloor, obtaining metal ores by collecting nodules avoided emissions from blasting in traditional terrestrial mining, one of the chief environmental hotspots in stratospheric ozone depletion, fine particulate matter formation and terrestrial acidification in conventional and DON processing routes. Sulfidic tailings are also avoided, leading to 97% lower freshwater eutrophication emissions. | In addition to renewable electricity and higher recovery rates, the main reason for NORI-D Project's lower emissions in most impact categories is because use of sulfuric acid in the MHP and MSP routes is respectively 5-6 times higher than that in the NORI-D Project. Another critical contributor to the better performance is the absence of blasting in the mining stage. TMC NORI-D's absence of sulfidic tailings has proved significant in lowering the freshwater eutrophication emissions and the absence of blasting in the mining stage is another critical contributor to the better performance. | NORI-D Project's emissions from electricity contributed to only 0-7% in six impact categories, thanks to an energy efficient process and the use of renewable electricity. Another factor is the emissions from blasting in Conventional and DON technologies make NORI-D Project perform better in ozone depletion, fine particulate matter formation and terrestrial acidification. Similar to the previous products, the absence of sulfidic tailings helps differentiate the NORI-D Project from other routes in terms of eutrophication emissions. | Although the Indonesian RKEF route is similar to NORI-D in terms of the pyrometallurgical process for converting ore to matte, emissions from the NORI-D Project are between 76-149% lower in all impact categories. This is due to an 18% higher cobalt recovery rate, an 81% lower energy consumption rate, the use of renewable electricity and an 87% lower coal consumption. As compared to the RLE route, TMC NORI-D Project has higher GWP due to emissions from coal combustion and 10% higher water consumption. |

Source: Benchmark Mineral Intelligence, 'Life Cycle Assessment of NORI-D Polymetallic Nodule Project and Comparison to Key Land-based Routes for Producing Nickel, Cobalt and Copper – Report Summary", March 2023.

While nodules on the abyssal seafloor reside far beyond any countries and communities, it does not mean that they do not have social benefits, such as economic royalties and fees, capacity building and training through education, jobs, and knowledge sharing with the people in our sponsoring states. It means that instead of focusing on mitigating adverse impacts to nearby communities, we can focus on creating positive impact. You can find more information about these benefits in our social impact section.

LIFE CYCLE STUDIES COMMISSIONED BY THE METALS COMPANY:


Other studies that TMC has commissioned include a 2020 white paper looking at 19 ESG indicators, a 2020 peer-reviewed paper looking at climate change impacts, a 2022 peer- reviewed paper looking at waste streams, and a 2023 paper looking at biodiversity impacts.




These life cycle studies suggest that using nodules to produce energy-transition metals provides an opportunity to significantly compress most lifecycle ESG impacts associated with conventional metal production from land-based ores.

Nodule collection also avoids various ESG impacts associated with conventional metal-production from land-based ores, such as child labor, displaced local communities, deforestation, destroyed carbon sinks, large amounts of mine waste generation and toxic processing tailings. In addition, nodule collection can significantly reduce several impacts as compared to metal-production from land-based ores, such as greenhouse gas emissions freshwater use, and land competition. Given that these benefits stem from the polymetallic nodules' intrinsic properties, their location, and technology developments and tests that TMC has conducted for over a decade, we have a reasonably high confidence about our ability to deliver them.

With that said, uncertainties around the impact that commercial-scale nodule-collection operations may have on the biodiversity and ecosystem function of the CCZ abyssal seafloor and overlying water column remain. Unlike biomass, one cannot easily measure and compare biodiversity (defined as species richness). Some uncertainty about the full inventory of local and regional biodiversity will always remain. Measuring biodiversity on land faces a similar situation in that many species remain undescribed despite 250 years of taxonomic classification. More than 150,000 published papers have discussed polymetallic nodules in general and over 40,000 on CCZ nodules in particular. Still, research continues. TMC has conducted research for over 10 years, and several academic institutions have contributed to our environmental impact assessment (EIA) program that comprises over 100 studies throughout the water column from the seafloor to ocean surface. We will continue conducting this research and expanding on the world's collective deep-sea knowledge.

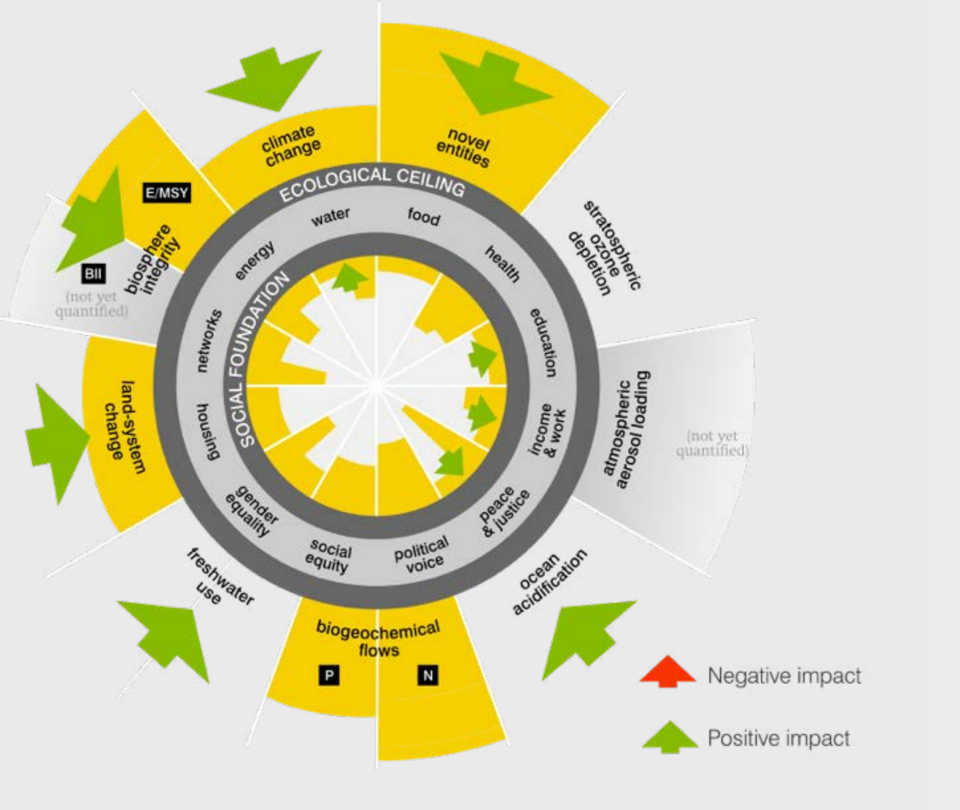
It is also worth noting that in the highly unlikely scenario where the entire CCZ area currently under exploration (1.24 million square kilometers) were to be exploited over a 30-year period, these nodule collection operations would impact an estimated 42,000 square kilometers of the abyssal seafloor per year in one of the least productive areas of the ocean. This is less than 1% of the estimated 4,900,000 square kilometers of the seafloor currently impacted every year by trawling operations that take place primarily in highly productive coastal waters[1].

[1] Enric Sala et al., "Protecting the Global Ocean for Biodiversity, Food and Climate", March 17, 2021.

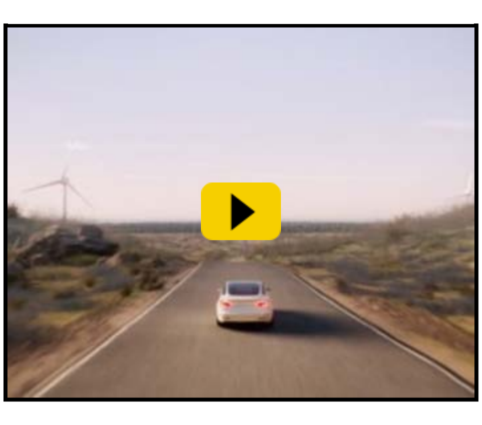
Trawling today impacts 175x more seafloor every year than potential nodule collection tomorrow.

The above reasoning forms the basis for our hypothesis that nodules represent a viable lower impact source from which to obtain critical metals for the energy transition—a source that could allow humanity to move forward while helping to prevent it from overshooting most planetary boundaries and falling short on most social foundations.

Nodules




This is a representation of the current planetary boundaries and social foundations that nodule collection presents.



Even if this hypothesis proves correct, collecting polymetallic nodules would only reduce rather than eliminate negative externalities. While it may constitute a responsible and the best option we have, it cannot be sustainable. It still involves taking resources from the planet. That explains why, in our plan, we have a goal to recycle the metals we produce as we help build up sufficient metal stocks. Over time, we will be able to sunset our nodule-collection activities and transform into a recycling business. From there, we intend to expand our scope to possibly recover a broader set of metals to build a carefully managed metal commons that will be used, recovered, and reused again and again.

# How We Do It

The Metals Company has a fundamental vision: to build up and maintain a global metal commons with the least possible environmental and social impact.

Whether we design an offshore nodule collection system or an onshore processing plant, engage with our sponsoring states, or develop a decarbonization strategy prior to production, we focus on addressing key ESG risks and opportunities as we work toward commercial production. Developing a resource deemed a common heritage of humankind (CHH) means we must embrace the responsibility that comes with it.

The CHH principle represents the notion that certain globally important resources should be managed and protected. We believe the spirit of the CHH principle calls for transparency, strong partnerships, and broad stakeholder engagement.

## TMC Governance

- TMC's Governance Structure
- Business Ethics and Transparency
- Sustainability Approach
- TCFD & TNFD
- Other Initiatives We Support
- Stakeholders Engagement

## CCZ Governance

- International Treaty for the High Seas
- Sponsoring States: States Profiles
- ISA Mining Code
- Environmental Impact Statement (EIS)

### A CLOSER LOOK AT THE COMMON HERITAGE OF HUMANKIND

While there is no concise fully agreed-on definition for the CHH, it has several core elements:

- **The non-appropriation principle**: no state or other entity (e.g., corporations and people) can own or claim sovereignty/sovereignty rights over certain global heritage spaces or resources that belong to humanity as a whole.
- **Cooperative management:** one can use the CHH only in accordance with a cooperative management system for all humankind's benefit (i.e., for the common good).
- **Sharing of benefits:** benefits (including financial, technological, and scientific) derived from activities in an area deemed the CHH must be actively and equitably shared.
- **Peaceful purposes:** one can use the CHH only for peaceful (and not military) purposes.
- **Preservation:** one must protect ecological integrity and intergenerational equity between present and future generations.

These elements in the United Nations Convention on the Law of the Sea (UNCLOS), which governs the Area (the seabed and ocean floor and the subsoil thereof beyond the limits of national jurisdiction) and embraces the goal to contribute to realizing a just and equitable international economic order that considers all humankind's (but, in particular, developing countries') interests and needs[1].

[1] David Bollier and Silke Helfrich, "The Wealth of The Commons: A World Beyond Market & State", 2012.

# TMC's Governance Structure

We have developed a governance structure to ensure that we actively embed environmental, social, and governance (ESG) topics into our business. Accountability for ESG-related performance is an open and iterative exercise across all levels in the company. Ultimately, TMC's Chief Executive Officer (CEO) is responsible for our overall sustainability performance, while the board of directors is responsible for our sustainability strategy, which our chief sustainability officer proposes and the board's sustainability and innovation committee vets. In addition, we have begun creating a sustainability and innovation external advisory council to help challenge ourselves to perform better, think bigger, and aim higher.

**Sustainability and Innovation External Advisory Council**
Independent members will serve as the company's sounding board to challenge us to do better. They bring their expertise and diverse perspectives to enrich TMC's approach.

**Board of Directors**
Responsible for ESG strategy and governance.

**Sustainability & Innovation (S&I) Committee**
In-depth review of strategy and performance. First stop to discuss ESG risks and opportunities.

**CEO**
Responsible for the company's ESG management, compliance and performance.

**Chief Sustainability Officer**
Identifies TMC's most material sustainability issues and sets the sustainability strategy framework, with oversight by the S&I Committee and input from external and internal stakeholders. Works with TMC leadership and department heads on strategy, goals development and implementation. Works closely with the **chief strategy officer** to ensure sustainability and business strategy are fully aligned.

**Leadership Team**
Responsible for TMC's sustainability performance, monitoring progress and addressing challenges. Provides relevant information to identify ESG-related risks and opportunities, develops strategy and defines targets.

**Department Heads**
Responsible for implementing sustainability strategy, tracking progress on goals and mitigating material risks. Provide regular updates to peer leadership and the board.

### TMC's Board of Directors

TMC's board of directors recognizes that strong corporate governance, which involves actively engaging with and seeking input from stakeholders, promotes accountability, transparency, and sound decision-making that fosters sustainable business growth over the long term. At TMC, we see strong corporate governance as particularly relevant given that we operate in an emerging industry to collect a mineral resource declared a common heritage of humankind. Our board of directors sets high standards for the company's employees, officers, and directors and oversees key risks, which includes strategic, financial, operational, safety, environmental, social, and legal compliance matters.

Gerard Barron
Executive Chairman & CEO

Andrew Hall
Director

Sheila Khama
Director

Christian Madsbjerg
Director

Andrei Karkar
Director

Amelia Kinahoi Siamomua
Director

Kathleen McAllister
Director

Andrew C Greig
Lead Independent Director

Visit this page for more information on board member's roles and biographies.

### Board Composition, Responsibilities and Commitments

TMC's plan to deliver on our vision includes first expanding metal stocks through primary metal production before transitioning to a business model that tracks, recovers and recycles secondary metals. This plan requires a board willing to commit to a long-term strategy while balancing many different stakeholders' interests.

The board (together with management) has a current focus on getting the polymetallic nodule resource into commercial production, scaling to meet demand with the lowest ESG footprint, and setting the company up for long-term growth and profitability, which includes decisions to:

- Set a new bar for a metals business that aligns with the common heritage of humankind (CHH) principle.
- Secure the world's first International Seabed Authority (ISA) exploitation contract.
- Develop the world's first commercial nodule project.
- Develop a meaningful relationship with our sponsoring states to create shared lasting value.
- Develop strategic partnerships with offshore and onshore companies to enable capital-efficient and ESG-focused paths to start and scale metal production capacity in response to demand driven by the energy transition and development.

The board directly and regularly engages with management on these topics. Furthermore, board members have significant experience as top-level executives at public companies or as entrepreneurs who founded successful organizations.

As of 1 June, 2023, our board comprises five males and three females who come from Australia, South Africa, Botswana, Denmark, the Kingdom of Tonga, and the United States.

### Board Committees

The board has four standing committees:

1. Audit committee
2. Nominating and governance committee
3. Compensation committee
4. Sustainability and innovation committee

| Name | Function | Audit Committee | Compensation Committee | Nominating & Governance Committee | Sustainability & Innovation Committee |
|---|---|---|---|---|---|
| Andrew C Greig | Lead independent director | | Member | | |
| Andrew Hall | Director | Member | | | |
| Andrei Karkar | Director | | Chairperson | Member | |
| Sheila Khama | Director | Member | Member | Member | Chairperson |
| Christian Madsbjerg | Director | | | Chairperson | Member |
| Kathleen McAllister | Director | Chairperson | | | |
| Amelia Kinahoi Siamomua | Director | | | | Member |

● Chairperson ● Member

Each committee member qualifies as an independent director under NASDAQ's listing standards. In addition, as part of our governance review and succession planning, the board (which the nominating and governance committee leads) evaluates our leadership structure to ensure that it remains the optimal structure for TMC; reviews the board's and its committees' composition, size, and performance; evaluates individual board members; and identifies and evaluates candidates for election or re-election to the board.

**The committees have the following responsibilities:**

#### Sustainability and Innovation Committee

- Oversee sustainability and innovation initiatives with significant business, financial, environmental, and reputational impact
- Oversee sustainability- and innovation-related risks and opportunities
- Review and advise on TMC's sustainability performance

#### Audit Committee

- Oversee auditors
- Review financial reporting policies and processes
- Manage risk (e.g., enterprise risk management), related party transactions, legal compliance, and ethics
- Oversee regulatory and other financial matters
- Administer whistleblower policy

#### Nominating and Governance Committee

- Nominate directors
- Oversee corporate governance and review policy
- Oversee code of business conduct and ethics

#### Compensation Committee

- Establish corporate performance scorecard
- Review CEO performance
- Oversee executive compensation and administer the equity-incentive plan

# Business Ethics & Transparency


TMC aspires to act in ways that benefit the planet and people for generations to come. Our code of business conduct and ethics (the "code") sets out basic principles that guide all individuals who work at or for TMC to prevent any improper behavior. The company also requires collaborators and business partners to abide by the requirements and guidelines set forth in other applicable TMC policies, such as its anti-corruption and anti-bribery compliance policy.

TMC requires any person, which includes partners and contractors, who learns about anyone who may have or has violated the code to report the violation to our ethics hotline, the board chairman, or our general counsel. A third-party service provider operates the hotline, and one can make reports in a completely anonymous and confidential manner. TMC encourages any person who, in good faith, suspects that someone has violated the code to report it without fear that they will face negative repercussions (e.g., termination, demotion, reprimand, or other harm). We logged no reported incidents in 2022.

# Sustainability Approach

The energy transition and global development are metal intensive and require unprecedented quantities of mined metals in the coming decades. Metal extraction comes with its own set of human and planetary costs, and while there are no perfect solutions, we see the collection of polymetallic nodules from the seafloor of the Clarion Clipperton Zone (CCZ) of the Pacific Ocean as an opportunity to provide an abundant supply of battery metals for the energy transition with the least social and environmental impact.!

Our destination is a carefully managed metals commons that is used; recovered, and reused for generations to come. Getting there will be tricky and as long as the world's metal demand keeps growing, existing metal stocks will not be enough. At TMC, it is our mission to find a workable path to this future. In our sustainability approach, we are pleased to share the thought processes and principles that will guide our decisions as we work towards realizing this vision.!

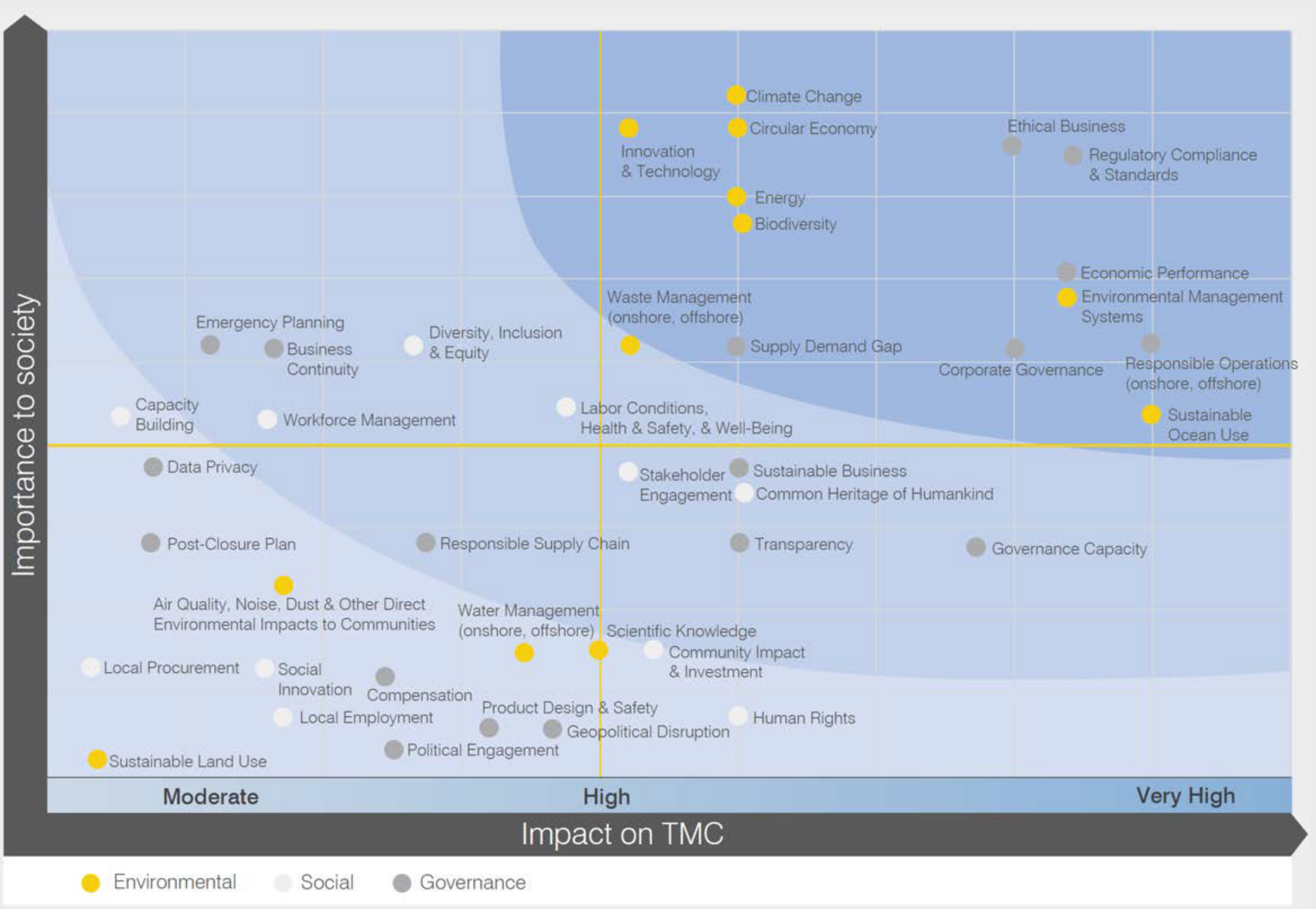
| | | | |
|---|---|---|---|
| **Vision** | **We envision a carefully managed metal commons that will be used, recovered, and reused again and again – for millennia.** | | |
| **Our Plan** | CHAPTER ONE<br><br>Supply required primary critical metals with the least negative impact on people and the planet | CHAPTER TWO<br><br>Recycle the metals we produce | CHAPTER THREE<br><br>Recycle the rest |
| | We see polymetallic nodules found far offshore in the international waters of the CCZ as a promising pathway to supply critical metals with the least negative impact on people and the planet. | | |
| **Why Nodules** | **Location:**<br>- Far offshore – no human settlements, no child labor, no human displacement<br>- Deep on the abyssal zone – 4-6 km beneath the ocean surface; no forests, no plants, 70% of life found in the form of bacteria<br>- International waters –regulations developed by the International Seabed Authority's 168!member states plus the EU | **Resource Characteristics:**<br>- Unattached to the seafloor – no drilling, digging or blasting needed<br>- Four metals in a single ore, high ore grades – much less ore mass to process<br>- Very low traces of hazardous elements such as arsenic, cadmium and mercury – no toxic processing tailings<br>- CCZ holds much larger resources of nickel, cobalt and manganese than known reserves of these metals on land – addressing supply availability | **Our choices:**<br>- Near-zero processing waste<br>- Onshore plants can be located on any continent – addressing supply chain diversification<br>- Onshore processing powered with low carbon electricity<br>- Enable traceability and recovery of the metals produced – circular economy |
| **Our Responsibilities** | **#1: Full stack of impacts**<br><br>No "externalities" –accounting for the full stack of our impacts on planetary boundaries and social foundations | **#2: Net positive impact**<br><br>Create a significant, lasting, net positive impact on people and the planet using a common heritage of humankind resource | **#3: Course correction**<br><br>Change course if our chosen path does not deliver on our net positive impact goal; we cannot afford path dependencies |

## Our Methodology!

We are taking a methodical approach to bringing our vision to reality. In 2022, we carried out a materiality assessment to identify the areas that matter most to internal and external stakeholders, and to our business. The results of this exercise were used as the foundation of our sustainability goals and reporting, and periodic materiality assessments will continue to take place to ensure alignment with the evolving global landscape. The four-step process included:

1. **IDENTIFICATION**: Topics were identified via a materiality horizon, where we developed an initial list of more than 500 topics based on a desktop review of related legislation, standards, frameworks, industry trends, global megatrends, media, peers, value chain and TMC's strategy.
2. **PRIORITIZATION**: Topics were grouped into 40 key topic areas. Two sets of criteria were developed to help prioritize them – one for the level of importance to stakeholders and another to measure the level of impact to the company, including factors such as stakeholder relations, business strategy and purpose, among others.
3. **STAKEHOLDER ENGAGEMENT**: Via interviews and surveys using the two sets of criteria developed, the topics were ranked. Participants of this exercise included external stakeholders, TMC's Board of Directors, TMC's leadership team and department heads.
4. **VALIDATION AND REVIEW**: The process and the results of the exercise were shared and discussed internally with TMC's leadership team and with the Board's Sustainability & Innovation Committee. Discussion around continuous improvement of this process and topics where communication needs to increase were an additional valuable part of this exercise.

## Materiality Matrix



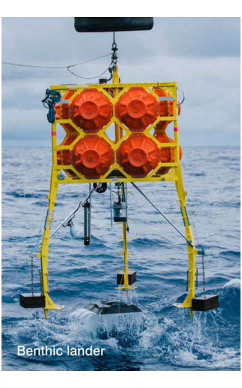

## Our Goals

The results of the materiality process gave us key insights into what the focus of our 2030 sustainability goals should be and, via an iterative feedback process with all TMC employees, the Board and its Sustainability & Innovation Committee, we have identified 12 key goals for the company.!

| | | | |
|---|---|---|---|
| **Driver** | **The energy transition should not come with the destruction of our planet or the suffering of people. At TMC, we look to help supply the minerals needed to accelerate this transition with the least negative planetary and social impacts while intentionally building a circular economy for these metals.** | | |
| **Ambitions** | ENVIRONMENTAL<br><br>We will account for the full stack of our impacts; through a science-driven approach, we will address our emissions, waste and impacts to ecosystems, and share our knowledge of the deep sea. | SOCIAL<br><br>We acknowledge the responsibility that comes with developing a resource deemed common heritage of humankind, and as such we commit to consult and communicate openly and transparently with global stakeholders and invest to deliver positive impact. | GOVERNANCE<br><br>We understand the responsibility that comes with starting a new extractive industry in a new environment – we will proceed with caution, transparency and openness. |
| **Goals** | 1. Continue to build and share knowledge of deep-sea ocean ecosystems<br>2. Protect and manage ecosystems we impact using a science-driven approach<br>3. Systematically implement path toward net-zero emissions<br>4. Drive circularity of critical minerals through materials tracking partnerships, investment and innovation | 5. Build trusted relationships by engaging with stakeholders and providing visibility into our operations<br>6. Protect people by ensuring the right policies and programs are in place to support their well-being<br>7. Invest in capacity building to develop the next generation of deep-sea scientists and, with our sponsoring states, help close the skills gaps needed by them<br>8. Fund solutions that benefit people and the planet such as community-led initiatives and conservation projects | 9. Report transparently on our progress and impacts<br>10. Build strong environmental, social and governance (ESG) oversight into our daily business activities<br>11. Drive industry-leading ESG performance and disclosure<br>12. Course-correct if chosen path does not deliver on our impact goals |
| **Targets** | The targets that will drive us to achieve these goals and that will allow us to track our progress are under development. We want your feedback and that is why we are sharing where we are now to give you a clear idea of the areas that we are working on and that will take us where we want to be. Insights from your feedback will be reviewed to help us finalize them. | | |
| **Highlights** | 1. TMC makes extensive Deep-sea Submission of Environmental Data to UNESCO's Ocean Biodiversity Information System<br>2. TMC Contracts CSIRO-led Consortium to Pioneer Ecosystem-Based Environmental Monitoring and Management Plan for Deep Sea Nodule Collection<br>3. TMC identified ways to reduce metcoal consumtion by at least 10%<br>4. TMC's offshore partner Allseas retrofitted a 228-meter-long former drill ship into first subsea mining vessel | 5. TMC engaged Prizma to conduct a scoping study and a social impact assessment for the NORI-D project<br>6. We work with partners who are experts within their respective fields and who share our commitment to ensuring the safety and well-being of all those who work for and with us<br>7. Since 2020, we have provided 63 training opportunities and scholarships<br>8. We have a formalized grant program in Nauru and Tonga for community-led initiatives | 9. TMC Publishes Inaugural Impact Report Detailing Future Operations and Strategy for Net-Positive Planetary Impact<br>10. TMC Has a Sustainability & Innovation Committee at the Board, a Chief Sustainability Officer and Clear Sustainability Goals Developed<br>11. TMC joins International Consortium to Develop the First ESG Handbook for Marine Minerals<br>12. Lifecycle Assessment by Benchmark Shows TMC's NORI-D Nodule Project Could Outperform Land-Based Routes of Producing Nickel, Copper and Cobalt in Almost Every Impact Category Analyzed |
| **UN SDGs alignment** | 13 CLIMATE ACTION<br>14 LIFE BELOW WATER | 8 DECENT WORK AND ECONOMIC GROWTH | 12 RESPONSIBLE CONSUMPTION AND PRODUCTION<br>17 PARTNERSHIPS FOR THE GOALS |

A set of key performance indicators is being finalized per goal, and as we implement them, we will provide a scorecard on our progress toward meeting them. We welcome feedback and look forward to hearing from you. Write us at impact@metals.co.

# TCFD & TNFD




Getting to net zero emissions by 2050 requires an accelerated transition to renewable energy sources and electrified vehicles, which will likely lead to an exponential growth in demand for the critical metals that these technologies use. However, producing the metals in the first place will lead to impacts on nature. Thus, we need to think about how we will reconcile our need for metals while tackling the climate and biodiversity crises. TMC seeks to address the need for critical minerals with the lowest environmental and social impacts to support a low-carbon economy. We have committed to adopting the recommendations of the Task Force on Climate-Related Financial Disclosures (TCFD) and the Task Force on Nature-Related Financial Disclosures (TNFD).

We welcome the launch of the TNFD framework as there is much-needed guidance for reporting complex and interconnected nature-related impacts. We believe in shifting financial flows away from nature-negative outcomes and toward nature-positive outcomes—something that the Global Diversity Framework and High Seas Treaty also support. The TNFD framework provides a structured approach and common language that underpins our efforts to quantify the nature-related trade-offs and opportunities associated with producing energy-transition metals from polymetallic nodules as compared to producing them via key land-based routes. We look forward to continuing to strengthen our disclosures and risk management process in line with the recommendations that the TNFD and TCFD provide.

## Governance

TMC's board of directors is ultimately responsible for the oversight of risks and opportunities including those related to climate change and nature. Within the board, TMC has a Sustainability & Innovation (S&I) Committee in charge of overseeing, reviewing and advising management on the potential impacts of business, economic, environmental, social and reputational issues. These include climate change, as well as environmental and community impacts and innovation matters. The S&I Committee also advises on sustainability and innovation related risks and opportunities, arising in the company's strategic plan, M&A activities, general policies and budgets.

The S&I committee meets at least once a quarter to address these and other issues and works with TMC's leadership team and, in particular, with the chief sustainability officer to guide the company's sustainability strategy. The S&I committee reviews and makes recommendations to management on the company's progress towards establishing ESG goals, and delivering at a minimum an annual public report on the company's progress towards them and other non-financial initiatives, strategies, and targets. The S&I committee currently focuses on discussing business plans and budgets for implementing TMC's ESG goals. At the management level, the chief sustainability officer monitors climate- and nature-related issues and brings them to the S&I committee. For more information, refer to TMC's governance structure page, and the S&I committee charter.

TMC has begun establishing a sustainability and innovation external advisory council to bring in diverse, outside-in perspectives to provide insight and advice our sustainability strategy and impact report.

## Risk and Impact Management

Sustainability and innovation-related risks and opportunities have clear and iterative avenues to be identified across the organization, with the board holding the ultimate oversight responsibility. Our business strategy focuses on de-risking execution to ensure we achieve commercialization. To help us identify, assess and mitigate risks, and support the achievement of our vision, we are continuously acquiring insights through research and third-party engagement:

- We continuously scan for key risks and opportunities. For example, we use reports from the International Energy Agency (IEA), World Economic Forum, and Benchmark Mineral Intelligence (Benchmark) in addition to industry reports, research, and other sources to acquire more insights. The leadership team reviews and escalates potential significant insights to the S&I committee as needed.
- We adopt a science-driven approach to better understand and mitigate the potential impacts of our operations in the Clarion-Clipperton Zone (CCZ). To that end, we have implemented a robust science program and begun developing an environmental management system (EMS) with aid from technology such as an adaptive management system (AMS).
- We analyze the impact that our future operations will have on the climate and nature, test our hypotheses, and identify opportunities to further reduce our footprint. To that end, we have invested in several lifecycle studies, such as a recent third-party verified, ISO standards-compliant analysis that Benchmark conducted to assess the impact that producing nickel, cobalt, and copper from nodules would have on the environment and to compare the results to key land-based production routes for the same metals.
- We strive to work with like-minded members across the value chain with the skills and resources to ensure we can achieve better performance from before we even begin commercial operations.
- We seek consistent engagement with external stakeholders to keep up to date in the most concerning areas for them. From engagement with our sponsoring states to NGOs, we connect with key stakeholders who help us identify climate- and nature-related risks and opportunities.

## Strategy

As its core, TMC seeks to build a carefully managed metal commons with the lowest environmental and social impacts to help close the rapidly growing supply gap in battery metals that the energy transition requires. With a strong alignment to sustainable development and the transition to a lower-carbon society, we see many opportunities to build economic, environmental, and societal value, which includes supplying lower-impact battery metals, reducing battery costs, and contributing to track, recover, and recycle metals. Producing these metals from polymetallic nodules also offers potential valuable opportunities to reduce land-based mining's impacts on nature while meeting the projected demand for critical metals since it involves no drilling, digging, or blasting activities; does not involve removing overburden as nodules sit unattached on the seafloor; does not produce tailings; and does not remove carbon-rich habitats (e.g., forests) since the abyssal plains lack plant life. Our vision aligns with and supports TCFD and TNFD's intent to protect the climate and nature.

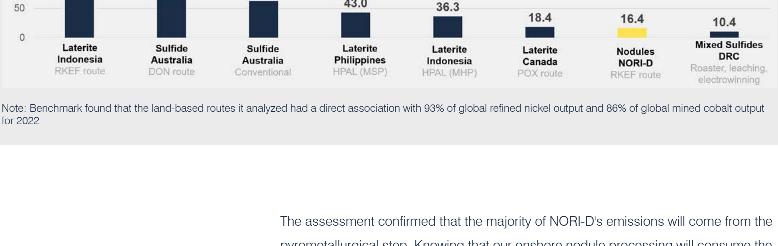
We take an intentional and methodical approach to building a sustainable business, and we consider ways to eliminate or minimize climate- and nature-related risks in the choices we make as we develop our onshore flowsheet and offshore operations. We expect our offshore commercial operations to start with a former drillship that we acquired while on its way to being recycled and instead extended its life by converting it into a production vessel. For our onshore operations, we intend to start commercial operation by using existing metallurgical facilities, and, as the project scales up, we may partner to build a bespoke metallurgical plant using our near-zero waste processing flowsheet. In both scenarios, our operations will undergo an environmental and social impact assessment. We aim to use renewable electricity to power our metallurgical processes and to maximize the extent to which we electrify our processes to minimize the resulting carbon footprint. We also aim to use closed-loop water systems and produce near-zero processing waste.

As we have yet to enter commercial production, we have time to experiment, test, and plan to do even better than the base case impact scenario we have developed. To that end, we commissioned a third-party verified, ISO standards-compliant lifecycle assessment (LCA) that Benchmark conducted to determine the environmental impacts associated with producing metals from nodules compared to other key land-based metal-production routes. More detailed information appears in the comparative lifecycle studies page in this report, and below you can find an extract with the results from the LCA.

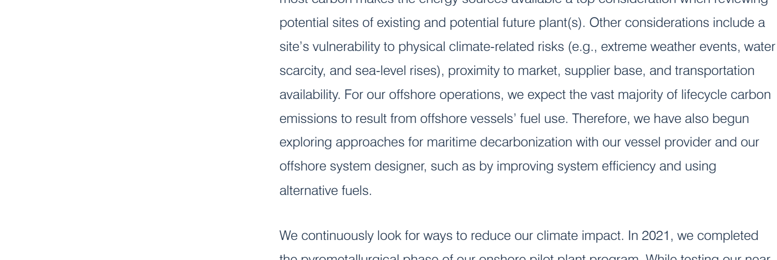
### Climate-Related Impacts for Producing Nickel and Cobalt from NORI-D Nodules and Key Land-based Routes

#### Global Warming Potential

Kilogram of $CO_2e$ emissions per kilogram of **nickel in nickel sulfate**




Kilogram of $CO_2e$ emissions per kilogram of **cobalt**



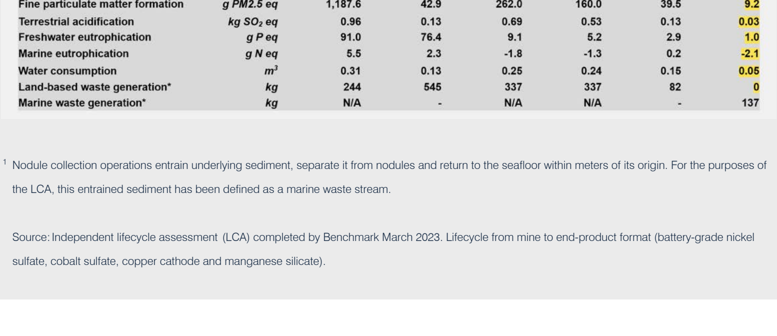

Note: Benchmark found that the land-based routes it analyzed had a direct association with 93% of global refined nickel output and 86% of global mined cobalt output for 2022

The assessment confirmed that the majority of NORI-D's emissions will come from the pyrometallurgical step. Knowing that our onshore nodule processing will consume the most carbon makes the energy sources available a top consideration when reviewing potential sites of existing and potential future plant(s). Other considerations include a site's vulnerability to physical climate-related risks (e.g., extreme weather events, water scarcity, and sea-level rises), proximity to market, supplier base, and transportation availability. For our offshore operations, we expect the vast majority of lifecycle carbon emissions to result from offshore vessels' fuel use. Therefore, we have also begun exploring approaches for maritime decarbonization with our vessel provider and our offshore system designer, such as by improving system efficiency and using alternative fuels.

We continuously look for ways to reduce our climate impact. In 2021, we completed the pyrometallurgical phase of our onshore pilot plant program. While testing our near-zero waste process flowsheet, we found a way to reduce metallurgical coal consumption by at least 10%. We also tested potential replacements for metallurgical coal to further improve the carbon footprint of our future onshore operations. In 2022, SINTEF, one of Europe's largest independent research institutions, conducted a study to compare TMC's manganese silicate product with four other typical manganese feedstocks used for producing silico-manganese (SiMn)—an alloy primarily used in the steel-making industry. The study found that TMC's high-grade nodule-derived manganese silicate product appears to offer significant advantages to the SiMn producer on both cost and carbon footprint. As a pre-reduced product, TMC's manganese silicate effectively offers downstream clients the opportunity to decrease how much energy the process to produce silico-manganese alloy requires and how much carbon it produces. At TMC we consider our manganese silicate product—which could account for almost 30% of our future revenues—to offer an opportunity to help support decarbonization efforts in the hard-to-abate steelmaking industry value chain.

### Other Nature-Related Impacts

#### Potential Environmental Impact From Nickel Production From Polymetallic Nodules and Indonesia Laterites via Rotary Kiln Electric Furnace (RKEF) and High Pressure Acid Leaching (HPAL) Processing Routes:



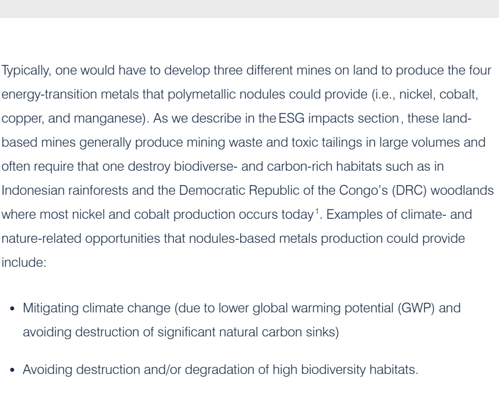

| Impact category | Unit | INDONESIA Laterite RKEF route | AUSTRALIA Sulfide Conventional | INDONESIA Laterite HPAL (MHP) | PHILIPPINES Laterite HPAL (MSP) | CANADA Sulfide POX route | CCZ Nodules RKEF route |
|---|---|---|---|---|---|---|---|
| | | ≈93% of global refined nickel production for 2022 | | | | | Lowest value |
| Global warming potential | kg $CO_2$ eq | 102.0 | 28.5 | 19.2 | 13.9 | 8.0 | 6.2 |
| Stratospheric ozone depletion | mg CFC11 eq | 14.1 | 27.1 | 3.1 | 3.1 | 3.4 | 0.7 |
| Fine particulate matter formation | g PM2.5 eq | 1,187.6 | 42.9 | 262.0 | 160.0 | 39.5 | 9.2 |
| Terrestrial acidification | kg $SO_2$ eq | 0.96 | 0.13 | 0.69 | 0.53 | 0.13 | 0.03 |
| Freshwater eutrophication | g P eq | 91.0 | 76.4 | 9.1 | 5.2 | 2.9 | 1.0 |
| Marine eutrophication | g N eq | 5.5 | 2.3 | -1.8 | -1.3 | 0.2 | -2.1 |
| Water consumption | $m^3$ | 0.31 | 0.13 | 0.25 | 0.24 | 0.15 | 0.05 |
| Land-based waste generation* | kg | 244 | 545 | 337 | 337 | 82 | 0 |
| Marine waste generation* | kg | N/A | - | N/A | N/A | - | 137 |

[1] Nodule collection operations entrain underlying sediment, separate it from nodules and return to the seafloor within meters of its origin. For the purposes of the LCA, this entrained sediment has been defined as a marine waste stream.

Source: Independent lifecycle assessment (LCA) completed by Benchmark March 2023. Lifecycle from mine to end-product format (battery-grade nickel sulfate, cobalt sulfate, copper cathode and manganese silicate).

Producing energy-transition metals from nodules rather than via land-based routes could have significantly less impacts on nature.

#### Nature's Four Realms According to TNFD: Land, the Ocean, Freshwater and the Atmosphere




Source: TNFD, "Nature's Four Realms", Accessed in July 2023.

Typically, one would have to develop three different mines on land to produce the four energy-transition metals that polymetallic nodules could provide (i.e., nickel, cobalt, copper, and manganese). As we describe in the ESG impacts section, these land-based mines generally produce mining waste and toxic tailings in large volumes and often require that one destroy biodiverse- and carbon-rich habitats such as in Indonesian rainforests and the Democratic Republic of the Congo's (DRC) woodlands where most nickel and cobalt production occurs today[1]. Examples of climate- and nature-related opportunities that nodules-based metals production could provide include:

- Mitigating climate change (due to lower global warming potential (GWP) and avoiding destruction of significant natural carbon sinks)
- Avoiding destruction and/or degradation of high biodiversity habitats.
- Consuming less water
- Avoiding impacts from waste on nature (no mining waste, no toxic tailings, near-zero process waste)

[1] Source: Benchmark nickel and cobalt forecast Q4 2022 (weighted)

### Key Findings from Benchmark's Comparative LCA


Benchmark's LCA quantitatively explains how producing energy-transition metals from the NORI-D project could come with lower climate- and nature-related impacts as compared to key land-based production routes.

We next plan to continue strengthening our strategy via:

- Using climate-scenario analyses to create a climate-related risks and opportunities register in the short term (before 2030), medium term (from 2030 to 2050), and long term (from 2050 to 2070). We based these horizons on our offshore vessels' and onshore facilities' expected lifetime (which ranges from 30 to 50 years).
- Building a nature-related risks and opportunities register that considers different scenarios and timeframes.
- Setting targets and metrics to mitigate our risks and seize opportunities, such as establishing an internal price on carbon and tying compensation to performance in meeting sustainability goals.
- Explore the viability to use key levers to continue to reduce the potential impact our future operations will have on society and the environment (e.g., find a replacement for coal as a reductant in the pyrometallurgical processes and use lower carbon energy sources to collect, transport, and process nodules).

## Metrics and Targets

Since we remain in an exploration phase, we disclose emissions from our offshore exploration campaigns (both our own direct emissions and emissions that our subsidiaries produced) since we started conducting them in 2012. We take full responsibility for our impacts and work with our partners to identify the most value-added ways to offset our emissions, which includes emissions from entities that we have acquired along the way (i.e., TOML). In particular, we prioritize offsets that would directly and tangibly benefit our sponsoring states. While this approach will take longer compared to purchasing offsets from the market, we see more value in working with our sponsoring states and the Pacific region to develop offset programs and local capacity and focus on issues that they find the most important.

Ultimately, in line with the Paris Agreement, we want to achieve net-zero emissions as soon as practically feasible and have begun reviewing technologies, targets and pathways that could help us achieve this goal. Powering our onshore processing plants with renewable electricity and replacing metallurgical coal with lower carbon alternatives will play a key role in these efforts.

# Other Initiatives We Support

We share a vision for a thriving world for all with the U.N. Sustainable Development Goals (SDGs), and we believe we have a role to play in contributing to a more sustainable planet. Given that deep-sea mining has attracted intense ideological debates and strong opposition from several environmental non-governmental organizations (NGOs), we have committed to making science-driven decisions and entering into open dialogue with stakeholders. We will continue to partner with experts, share what we learn, and correct our course accordingly because we believe that the energy transition must not compromise the health and safety of people and the planet.

We developed our sustainability goals based on a materiality assessment that involved internal and external consultation, and they reflect our commitment to advance the U.N. SDGs and to embrace the principles that the U.N. Global Compact and the Ocean Stewardship Coalition (initiatives TMC has formally supported since 2019 and 2022, respectively) have set forth. Below, we discuss U.N. SDGs that are most relevant to our business and for which we have the greatest opportunity to make a positive impact.

## Direct Contribution to SDGs

### Goal 8: Decent Work and Economic Growth

We already provide training and employment opportunities to nationals from our sponsoring states and see the potential to provide even more once we begin commercial production. In addition, our operations could result in the need for new metallurgical plants and could support further growth of the battery manufacturing industry, thus we see an opportunity to generate more work and economic growth. We have also committed to equal pay for equal work, continue to have a strong health and safety record, and have progressively improved resource efficiency in consumption and production to help decouple economic growth from environmental degradation.

### Goal 12: Responsible Production and Consumption

In order to create a carefully managed metal commons that will be used, recovered, and reused again and again in perpetuity, we have already invested in developing onshore processing flowsheets that will generate near-zero solid waste and will work with partners to track, recover, and recycle the metals we supply. We look to help supply the minerals needed to accelerate the energy transition with the least negative environmental and social impacts in a way that actively contributes to responsible production and consumption practices, and plan to intentionally participate in the circular economy for these metals.

### Goal 13: Climate Action

How we build a metal commons also matters. In focusing on protecting the climate, we have committed to ensuring that we monitor our operations as we look to achieve near-zero waste and net-zero emissions. We have already begun building a path to decarbonize our operations via optimizing our processes and assessing renewable energy sources, fuel alternatives, and new technologies. Given that we seek to supply metals that electric vehicle (EV) batteries and renewable energy storage need, we will directly contribute to enabling the energy transition. Considering power generation and transport together account for more than two-thirds of total global greenhouse gas (GHG) emissions and have caused almost all global GHG growth since 2010[1], the energy transition will play a crucial role in addressing climate change. For additional context, fuel combustion for vehicles accounts for 27% of all direct CO2 emissions, which EVs powered with renewables could mitigate.

[1] IEA, "Greenhouse Gas Emissions from Energy: An Overview", Aug. 2021

### Goal 14: Life Below Water

Currently, the International Seabed Authority (ISA) has allocated 43% of the CCZ as protected area. In addition, TMC is setting aside areas for protection and monitoring in our contracted areas. In this way, we can contribute to conserving and responsibly using the ocean and its marine resources. We also look to help increase the economic benefits to small island developing states (SIDS) from sustainably using marine resources while implementing international law as reflected in UNCLOS. To learn more about how TMC focuses on conserving the ocean through the nine principles that the Ocean Stewardship Coalition has set forth, refer to the corresponding index table.

### Goal 17: Partnership for Goals

Since TMC has a small workforce, partnerships play an important role in helping the company leveraging expertise and amplifying impact. For instance, we have many partnerships with the scientific community. For the last 10 years, we have completed research with several academic institutions that have contributed to our environmental and social impact assessment program, which comprises more than 100 studies throughout the water column from the seafloor to the surface. This research has increased the world's scientific deep-sea knowledge, and it will help us develop technology to manage and mitigate our negative impacts to the marine environment (Goal 14).

Given deep-sea mining's international nature, we will need to engage in multi-stakeholder partnerships with a particular focus on SIDS. Through our partnerships, we seek to mobilize and share knowledge, expertise, technology, and financial resources as we look to meet the SDGs.

## Equator Principles and IFC Performance Standards

We will manage environmental, social and governance (ESG) risks effectively and transparently by using best practice guidance suitable for our future multi-jurisdictional and multi-industry operations. Our offshore activities will occur in international waters governed by the ISA, while we have yet to confirm the relevant jurisdictions that will govern our onshore operations based on where they will reside. When looking at risk management, our project presents both unique risks that pertain to the novel nature of deep-sea activities and well-known ones that occur in industrial activities (e.g., onshore metallurgical processes). For both onshore and offshore operations, TMC has begun developing and will implement robust environmental and social risk-management systems based on relevant international frameworks.

The Equator Principles and IFC Performance Standards offer strong guidance for managing environmental and social risks, which we look to incorporate in our management systems. For example, to develop our stakeholder engagement approach, we built on IFC's principles for engagement[1], which we plan to use throughout our projects' entire lifetime (e.g., provide meaningful information in a format and language that target stakeholder group(s) can readily understand, provide information before consultation activities and decision-making, and so on). The environmental impact statement (EIS) that we submitted to the ISA for the collection system trials that we performed in the CCZ in 2022 included the feedback that we received from a broad audience through a formal stakeholder-consultation process. Likewise, the social impact assessment (SIA) that we have begun preparing for the NORI-D exploitation contract application to the ISA includes a scoping process to engage and consult stakeholders so that they can contribute to designing the terms of reference (TOR) and help shape the SIA study.

[1] See Stakeholder Engagement: "A Good Practice Handbook for Companies, Doing Business in Emerging Markets, International Finance Corporation", 2007.

TMC commissioned Prizma LLC, third-party SIA expert, to develop the NORI-D SIA—the first ever conducted for a deep-sea mining project in international waters. After a preliminary analysis, Prizma recommended that TMC should manage the NORI-D Project's potential impacts in a manner consistent with the following IFC Performance Standards:

- PS 1: Assessment and management of environmental and social risks and impacts
- PS 2: Labor and working conditions
- PS 3: Resource efficiency and pollution prevention
- PS 4: Community health, safety, and security (mainly for onshore facilities)
- PS 6: Biodiversity conservation and sustainable management of living natural resources

These standards shape our commitments and actions. For example, our environmental impact statement for the collector test study and the exploitation contract application for NORI-D present a risk-assessment method based on the ISO 31000 Standard, which, in the ISA's words, demonstrates "rigorous implementation of environmental management systems". For our offshore campaigns, we work with partners who have third-party audited environment and health and safety management systems aligned with ISO 45001 and ISO 14001, respectively, and follow International Maritime Organization (IMO) Standards to prevent marine pollution (e.g., all vessels systematically use water ballast treatment systems). Our future metallurgical operations will undergo a rigorous environmental and social impact assessment that we will use to strengthen our onshore environmental and social risk-management systems.

We have begun developing corporate policies to formalize TMC's commitment to implement best international practices for managing ESG risks alongside several actions to provide clarity and certainty to our stakeholders about the performance standards we set for ourselves and our business partners for operating in safe, responsible, and more sustainable ways for the planet and people. In addition, we have begun developing indicators and mechanisms to achieve these performance standards. TMC joined an international consortium to develop the first ESG handbook for marine minerals that will provide disclosure guidance on material topics specific to developing marine minerals projects in the deep-sea environment. This handbook will provide specific guidance for companies in the industry to report performance in a uniform manner and in a manner that concurs with the rapidly evolving global ESG disclosure landscape. This standardized approach intends to promote ESG thinking and improvements before any commercial activity begins.

# Stakeholder Engagement

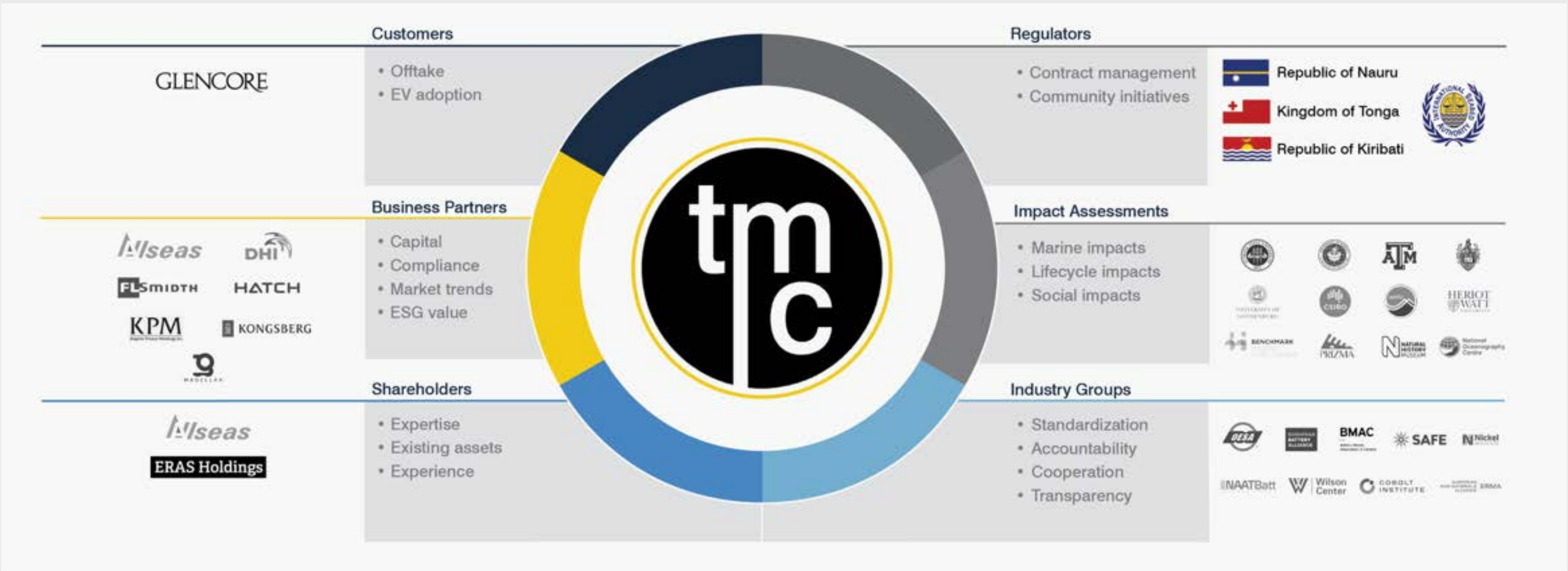
As we have proceeded with advancing our vision to effect systems change across the metals value chain, we have focused on building a safe, diverse, and inclusive culture for our workforce, partners, contractors, independent researchers, sponsoring states communities, and other stakeholders.

We recognize that several environmental non-governmental organizations (NGOs) strongly oppose our industry, and we welcome engagement and open dialogue with them. Although these NGOs might not agree with our project, we acknowledge their concerns for the environment and share the vision for a thriving world for all. Halting climate change and biodiversity loss while simultaneously delivering on equitable development goals will require partnerships between unlikely allies. For that reason, we have committed to working openly and collaboratively with our stakeholders. For instance, we engage proactively and transparently with our regulatory bodies—the ISA and our sponsoring states' governments. We work with leading scientific research institutions and universities to increase deep-sea knowledge by collecting environmental baseline data during our exploration campaigns, monitoring environmental impacts during collector tests, studying post-collection test data, and paving the way for independent peer-reviewed research. We also engage with NGOs and civil society to make our activities and plans transparent and to receive feedback. For example, we received more than 600 comments from 19 unique submissions from stakeholders around the world (e.g., ISA member state governments, research institutions, and NGOs) during the open stakeholder consultation, which TMC's wholly owned subsidiary NORI's sponsoring state Nauru facilitated, on the environmental impact statement (EIS) for the 2022 collector test in the NORI-D area in the CCZ. In response to the feedback, we considered all the material issues raised and updated the EIS submission. We also released a social impact assessment (SIA) scoping document for the NORI-D Project for public stakeholder comment in late 2022, which provided stakeholders with the opportunity to comment on and contribute to terms of reference for the SIA report.

Developing a common heritage resource in the Pacific Ocean under a regulatory regime that an intergovernmental organization governs and under sponsorship from Pacific Island nations represents an unprecedented endeavor. To ensure we do it right, we need the best and the brightest, which explains why we draw on a broad network of professionals from various organizations to leverage our collective expertise, knowledge, and strengths. By engaging in meaningful dialogue, we seek to drive change by focusing the conversation around sustainability and shared value creation.

Below, we present the (non-exhaustive) stakeholder network that we currently work with.

## Building Networks to Create Shared Value




Given that the polymetallic nodule resource in international waters constitutes a common heritage of humankind (CHH), we define our stakeholders as any interested individual or organization. This global view means we need to engage and partner with many different stakeholders across the world. Stakeholder engagement creates a feedback loop that enhances the way we develop this resource. By openly communicating, engaging in meaningful dialogue, and building relationships, we aspire to be and do better from the very start. The table below broadly shows the main stakeholder groups with whom we engage and the key topics we discuss with them.

TMC Governance – Stakeholder Engagement Table

| Stakeholder | Engagement Method | Key Topics | Objectives |
|---|---|---|---|
| Employees | Townhalls, in-person team meetings, company chat "AllHandsOnDeck," emails, internal committees for topics such as the ESIA program, ESG, Pacific Islands engagement | Vision, plan, strategy, company values, projects performance and updates, climate change, ESG performance expectations and progress | · Communicate strategy and progress<br>· Gain feedback and insights<br>· Maintain an engaged purpose-driven workforce |
| Strategic Partners and Contractors | Meetings, emails, website, reports, exploration campaigns, technology development and testing | Opportunities, megatrends, vision, projects timeline and forecast, ESG focus, decarbonization, renewables, climate change | · Create shared value<br>· Leverage expertise<br>· Mitigate risk<br>· Deliver science-based solutions<br>· Foster innovation to decarbonize value chain |
| Scientific Community | Meetings, emails, reports, webinars | Environmental management and impact assessments, innovation, climate change, carbon offsets, blue economy, conservation, transparency, deep sea knowledge | · Promote open and healthy debate and understanding that drive science-based decisions<br>· Advance deep-sea research and understanding of impacts<br>· Support conservation and advance solutions from the blue economy |
| Value Chain (Suppliers, Potential Customers) | Meetings, emails, reports, conferences | Critical metals demand trends: availability/security/ price/ ESG impacts of critical metals supply; climate change | · Develop opportunities<br>· Foster collaboration<br>· Build ESG focus and transparency<br>· Leverage expertise<br>· Decarbonize value chain<br>· Deliver science-based solutions |
| NGOs and Global Community | Meetings, website, social media, press releases, reports, consultation | Transparency, accountability, shared value, ESG, climate change, best practices, | · Promote transparency, inclusivity<br>· Foster collaboration<br>· Drive science-based understanding of impacts and receive feedback to understand and address concerns |
| Communities of Sponsoring States | Meetings, townhalls, website, social media, local newsletter, local events, community programs, consultation, press releases | Governance, shared value, climate change, local capacity building, education, local initiatives, grants | · Be a good partner<br>· Develop and access talent<br>· Understand community priorities<br>· Create shared value |
| Investors and Shareholders | Annual general meeting, meetings, emails, website, reports, webinars, conferences, press releases | Financial reporting, ESG strategy, electrification and mineral supply, climate change, governance, risks and opportunities, market trends | · Communicate strategy, updates and progress, including risks and opportunities<br>· Understand market trends and expectations<br>· Build transparency and drive value by sharing ESG performance |
| Industry Groups | Meetings, emails, website, reports, webinars, press releases | Best practices, standards development, climate change, transparency, ESG, environmental and social impacts | Go beyond compliance and support the development of ESG standards and certification that drive continuous improvement for the industry |
| Governments, ISA, Regulators, Sponsoring States | Meetings, emails, reports, industry events, webinars | Governance, transparency, accountability, compliance, permitting, standardization, ESG strategy, climate change, ESG certification development | Support and implement best-in-class regulations and standards that build in a high level of transparency and accountability |

# International Treaty for the High Seas

### Common Heritage of Humankind: International Treaty for Waters Outside National Jurisdictions

For the first time in human history, we seek to develop a resource deemed a common heritage of humankind (CCH) rather than an endowment of any nation state. While we have no precedent to follow, we believe the spirit of the CHH principle calls for radical transparency, strong partnerships, and broad stakeholder engagement. We realize the CHH means that we must do more and be better compared to traditional resource-exploitation operations. Therefore, TMC has committed to exploring new ways to conduct business in collaboration with its stakeholders.

The following paragraphs summarize CHH principle, its governance, and its relevance to developing deep-sea minerals.

In 1967, Arvid Pardo, the Maltese ambassador to the United Nations, delivered a speech at the United Nations General Assembly in which he called for the deep seabed beyond national jurisdictions and the resources contained therein to be declared the common heritage of humankind. His speech provided the most comprehensive proposal on the concept, and he gave it due to reports about rich resources in this part of the sea and concerns that wealthy, technologically advanced nations would unilaterally exploit the resources and, thus, exclude poorer nations.

The freedom-of-the-seas doctrine—a principle that proclaimed the sea beyond a narrow belt surrounding a nation's coastline as free to all and belonging to none—prevailed into the 20th century. During his speech in 1967, Pardo spoke about the superpower rivalry that had begun spreading to the oceans, about the pollution that poisoned the seas, about the conflicting legal claims and their implications for a stable order, and about the rich resource potential that lay on the seabed[1]. Pardo asked the world's nations to look around them and open their eyes to a looming conflict that could devastate the oceans.

Pardo urged the nations to develop an international regime over the seabed to avoid escalating tensions. His call-to-action came at the right time as many recognized the need to update the freedom-of-the-seas doctrine to consider the technological changes that had altered humanity's relationship with the oceans. As a result, the General Assembly created an ad hoc committee in the same year, which became the United Nations Seabed Committee[2]. In 1970, the General Assembly declared the seabed, ocean floor, and subsoil thereof beyond the limits of national jurisdiction (i.e., "the Area" and the resources in the Area the Common Heritage of Humankind)[3].

Initially, the CHH concept had a sole association with the United Nations Convention on the Law of the Sea (UNCLOS), but it has since expanded to other domains, such as outer space, the Moon, Antarctica, human rights, human genomes, and plant genetic resources[4].

### International Seabed Authority (ISA)

Historical Background

The realization that the problems that concern the ocean relate to one another and, thus, that one needs to consider them as a whole led to heightened interest in establishing a legal-economic regime to govern efforts to explore and exploit the non-living resources in the Area.

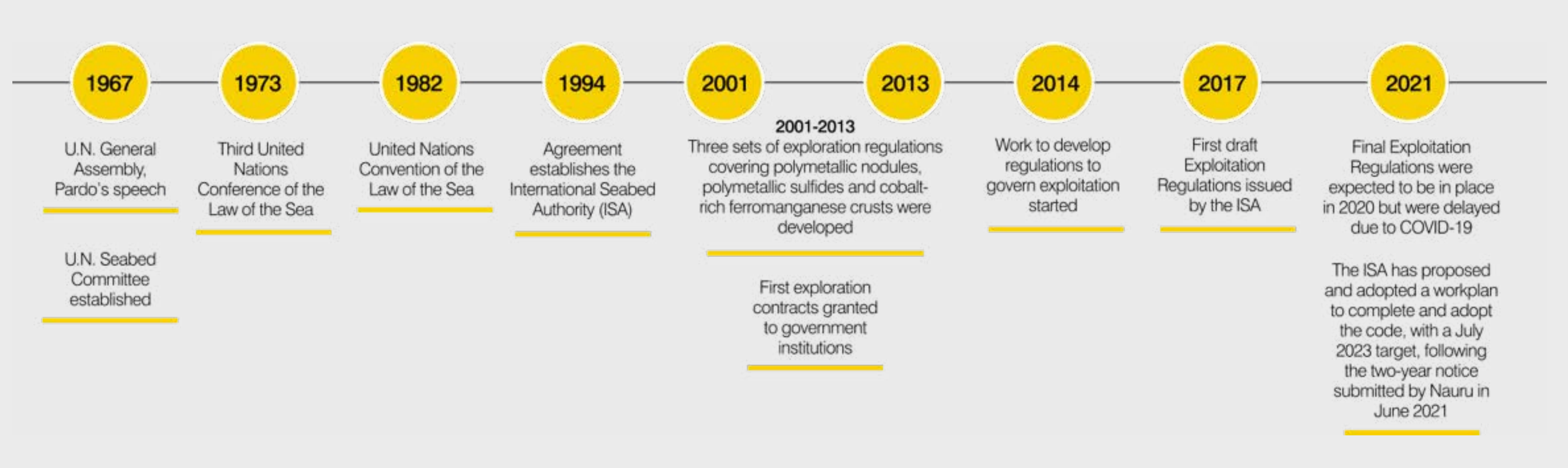
Based on its 1970 declaration and provisions surrounding the CCH principle, the General Assembly mandated the Seabed Committee to produce a draft convention for a seabed regime and an agenda for the Third United Nations Conference on the Law of the Seas in New York in 1973. The conference, which 160 sovereign states participated in, held 11 sessions between 1973 and 1982. During these years, sovereign state representatives discussed, negotiated, and prepared a draft convention on the law of the sea. In the final year (1982), the conference adopted the convention at which point it contained 320 articles and nine annexes governing all aspects of ocean space, such as environmental control, marine scientific research, economic and commercial activities, technology transfers, and the process to settle disputes relating to ocean matters[5]. UNCLOS focuses on ensuring that efforts to develop seabed mineral resources beyond national jurisdiction will benefit developing states and not just wealthy countries.

UNCLOS included provisions for establishing four institutions to bring it to life: the International Seabed Authority (ISA), the International Tribunal for the Law of the Sea, the Commission on the Limits of the Continental Shelf, and the Meeting of the States Parties to the Convention[6]. The ISA was established with the 1994 Implementation Agreement relating to implementing Part XI of UNCLOS and it is entrusted to supervise and regulate exploration and exploitation of the resources derived from the established complex regime.

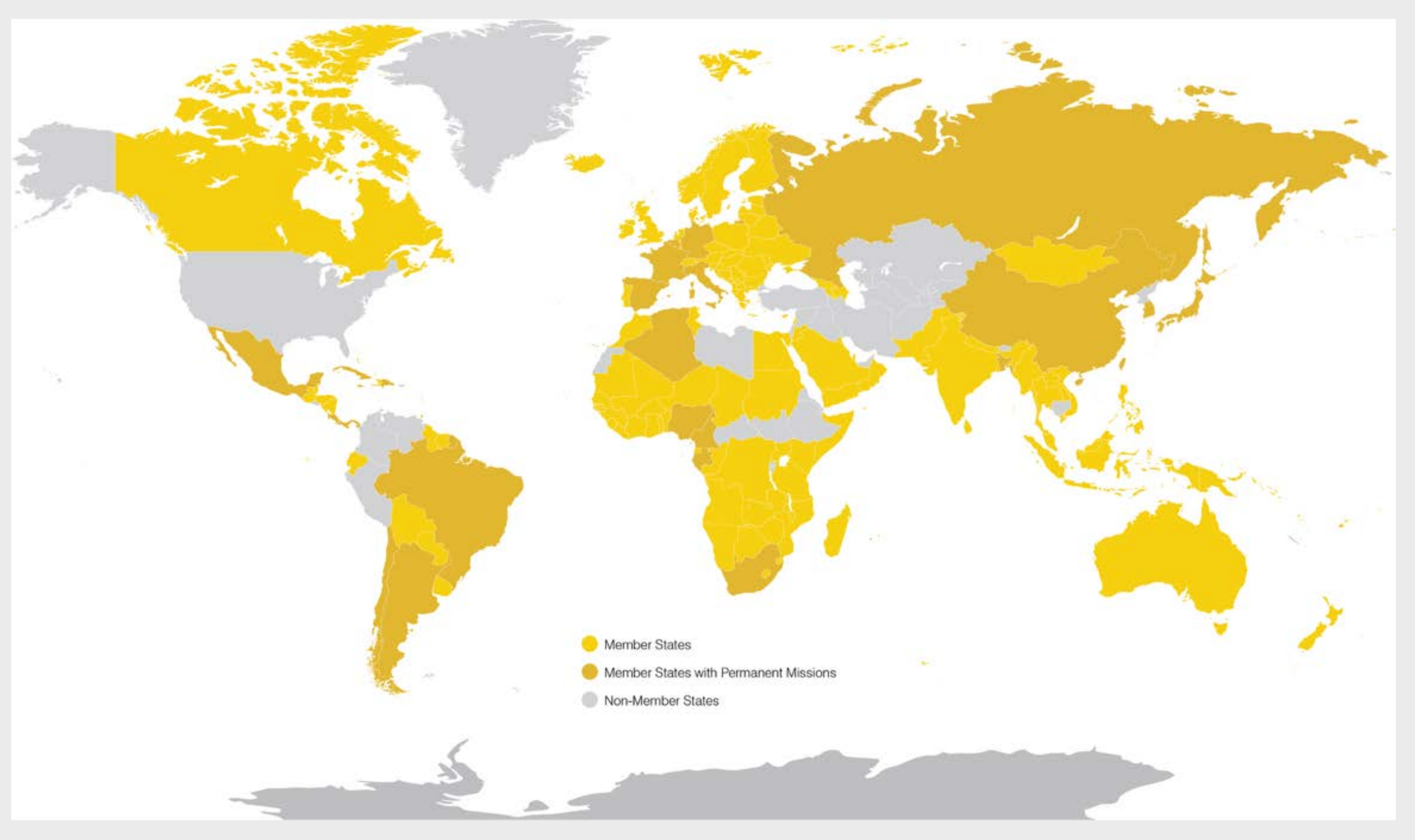
Today, the ISA is an autonomous international body that comprises 169 members, including 168 member states and the European Union. It has a mandate under UNCLOS to organize, regulate, and control all mineral-related activities in the Area while ensuring the effective protection of the marine environment on behalf of humankind[7]. A "reserved areas" mechanism (i.e., reserving certain areas for developing countries to access) plays an important role in how the ISA manages access to the Area and its mineral resources under UNCLOS. Specifically, after applying to the ISA for exploration rights to an area and surveying it, developed states must divide it into two parts that possess equal estimated commercial value. After it does so, the ISA decides which part to reserve for developing countries (or for the Enterprise—the ISA organ that can carry out activities in the Area directly)[8].

[1] UNCLOS, "A Historical Perspective, Originally Prepared for the International Year of the Ocean", 1998.
[2] UNCLOS, "United Nations Convention on the Law of the Sea", Dec. 10, 1982.
[3] United Nations General Assembly Resolution 2749 (XXV).
[4] Oxford Bibliographies, "Common Heritage of Mankind", May 12, 2017.
[5] U.N, "UNCLOS Overview".
[6] Ibid.
[7] ISA.
[8] ISA. "Reserved Areas"; UNCLOS, "Annex III, Article 8, Reservation of Areas".

## A Timeline of Important Milestones

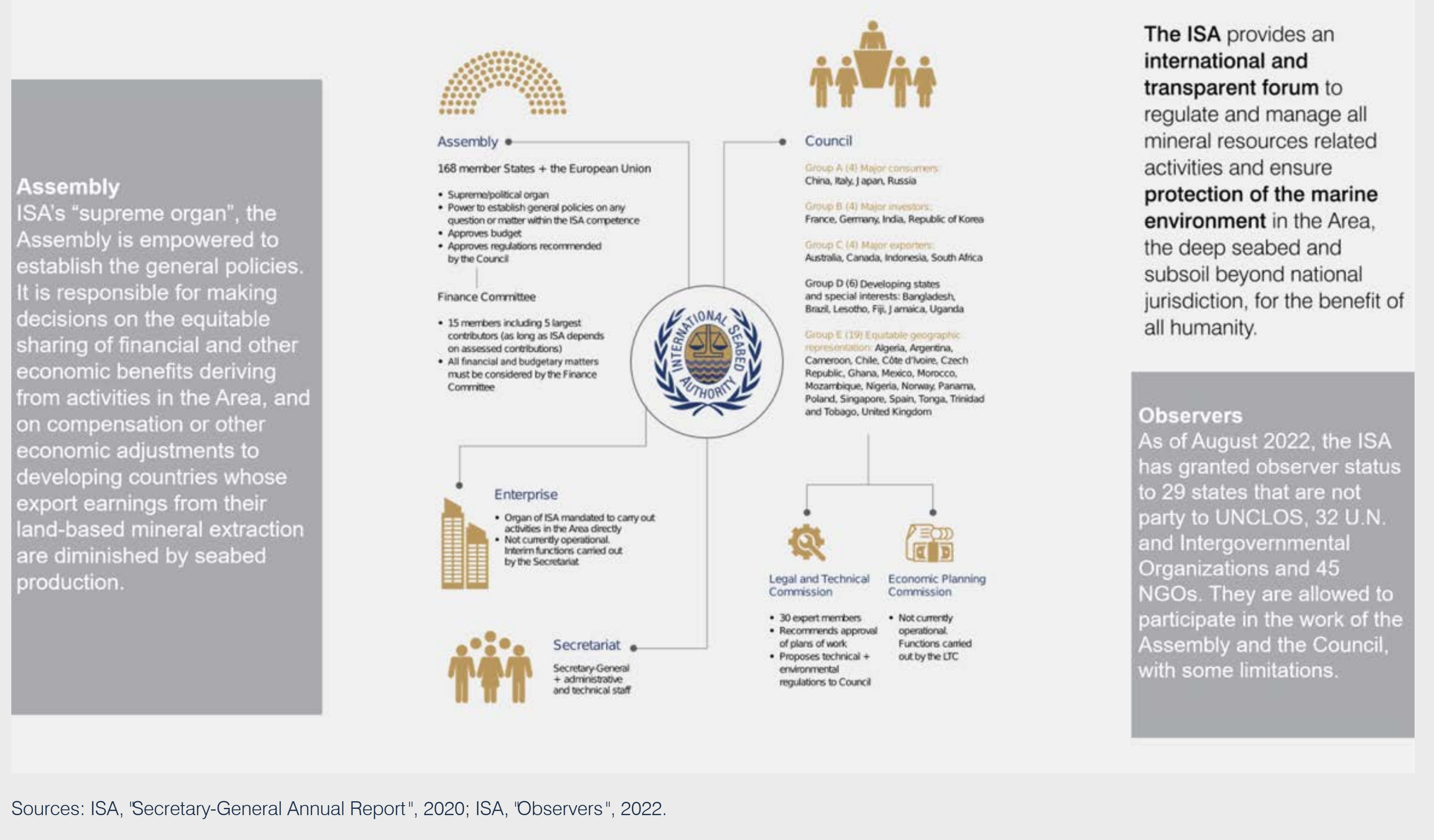



## ISA Member States




Source: ISA, "Member States", Accesses in May 2023.

## ISA Principal Organs: Structure and Functions




Sources: ISA, "Secretary-General Annual Report", 2020; ISA, "Observers", 2022.

### CCZ Governance

Deep-sea mining is the first extractive industry in history to adopt regulations before any extraction begins. TMC, through our subsidiaries, operates in international waters under the regulatory jurisdiction of the ISA and our sponsoring states. In the 29 years it has operated, the ISA has proven its stability and ability to develop contemporary regulations through transparent and inclusive negotiations.

The international framework that UNCLOS established specifically focuses on mitigating the historical North-South divide. By setting aside exploration areas for developing states, the ISA levels the playing field that usually favors states with resources, capital, and technology. While this unique legal framework provides a foundation to equitably share financial and other economic benefits, it requires strong private-sector partnerships for developing states to take advantage of these benefits. Nauru Ocean Resources Inc. (NORI) and Tonga Offshore Mining Ltd. (TOML)[1] with sponsorship from the Republic of Nauru and the Kingdom of Tonga, respectively, constitute the first private-sector entities to apply for exploration contracts in the Area. These applications also constitute the first applications for reserved areas based on developing state sponsorship. Since then, several nations have followed in their footsteps, such as Kiribati, the Cook Islands, Singapore, and Jamaica. Recently, Nigeria has expressed an interest in becoming a sponsoring state. We feel great pride in the partnerships that we have developed with our supporting states.

**MANDATE**

**United Nations Law of the Sea Convention (UNCLOS), 1982**

**UNCLOS Implementation Agreement, 1994**

- Organize, control and regulate all mineral-related activities in the international seabed on behalf of humankind
- Ensure effective protection of the marine environment

**TRACK RECORD**

✓ Established in 1994: 168 member states and the European Union
✓ Exploration regulations developed for three types of seabed resources
✓ 31 exploration contracts awarded
✓ Exploitation regulations, standards and guidelines nearing completion
✓ Developing states and marine environment prioritized

The ISA developed the exploration regime for polymetallic nodules in 2000 and further updated it in 2013[2]. Under this regime, contractors receive a 15-year contract divided into five-year work programs with the option to apply for five-year extensions. An exploration contract provides exclusive rights to explore and to apply for an exploitation contract. The ISA has been developing the regulatory code for exploiting seafloor minerals since 2014 and its framework appears in UNCLOS. In December 2021, the ISA Council adopted a roadmap for work during 2022 and 2023 for adopting the draft regulations and associated Phase 1 standards and guidelines by July 2023[3]. The Council revised the roadmap at the end of 2022 whereby it scheduled three meetings for 2023 and committed to working in good faith to complete the regulations. TMC has exploration and commercial rights to three ISA exploration contracts via sponsorship from three Pacific Island developing states through our local subsidiaries.

[1] Nauru Ocean Resources Inc (NORI) and Tonga Offshore Mining Ltd (TOML), wholly owned subsidiaries of The Metals Co.
[2] ISA, "The Mining Code".
[3] ISA, "ISA Council concludes in-person meetings under the 26th session with agreement on a roadmap for work for coming year", Dec. 14, 2021.

# Sponsoring States - State Profiles

Three developing states sponsor the two ISA exploration contracts and the commercial agreement to which TMC has rights: the Republic of Nauru, the Kingdom of Tonga, and the Republic of Kiribati. Specifically, TMC subsidiaries NORI and TOML hold the two exploration contracts, which Nauru and Tonga sponsor, respectively. TMC has an exclusive commercial agreement with Marawa, a Kiribati state-owned entity, to explore and develop its contract area.

Granting of **ISA Contracts**

| 2011 | 2012 | 2015 |
|---|---|---|
| **NORI Area** | **TOML Area** | **Marawa Area** |
| exploration contract granted to NORI, sponsored by Nauru[1] | exploration contract granted to TOML, sponsored by Tonga[2] | commercial rights secured by DGE through agreement with Marawa, sponsored by Kiribati[3] |

[1] Nauru Ocean Resources Inc (NORI), a wholly owned TMC subsidiary

[2] Tonga Offshore Mining Ltd (TOML), a wholly owned TMC subsidiary

[3] DGE DeepGreen Engineering, a wholly owned subsidiary of TMC The Metals Company, has secured exclusive exploration and commercial rights through an agreement with Marawa and Kiribati

Nauru and NORI first implemented this model where commercial companies partner with a developing state. It enables our sponsoring states to participate in this industry in a way that minimizes their risk via transferring the capital and technical requirements to their commercial partner.

In 2010, at NORI's and Nauru's request, the ISA sought an advisory opinion from the Seabed Disputes Chamber of the International Tribunal for the Law of the Sea (the Chamber) on issues pertaining to sponsoring states' responsibility.

> "… The original purpose was to provide developing States with a practical and realistic means of participating in seabed mining …"
>
> Nii Allotey Odunton, Secretary-General of the ISA, Speech given to the U.N. General Assembly in 2011

The Chamber confirmed that:

1. Sponsoring states do not have strict liability, and
2. For the sponsoring state's liability to arise, a causal link between its failure to meet its responsibilities and damage that its sponsored contractor caused must exist.

With the Chamber's opinion and commercial partners willing to take on the capital and technical requirements, it became possible for developing states to participate in this industry as UNCLOS envisions. NORI and Nauru constitute the first entities to ever access the reserved areas that the ISA sets aside specifically for developing states. Other states such as Tonga (in 2012), Singapore (in 2015), Cook Islands (in 2016), and Jamaica (in 2021) have since replicated this model.

At TMC, we have great pride in the joint leadership role that we have played with our sponsoring states in supporting developing states in line with UNCLOS. Note that Tonga, Nauru, and Kiribati have all implemented legislation that governs their participation in this industry.

## Overview of **Sponsoring States**

**Republic of Nauru**

2015 Nauru Seabed Minerals Act

2017 Sponsorship Agreement

**Kingdom of Tonga**

2014 Tonga Seabed Minerals Act

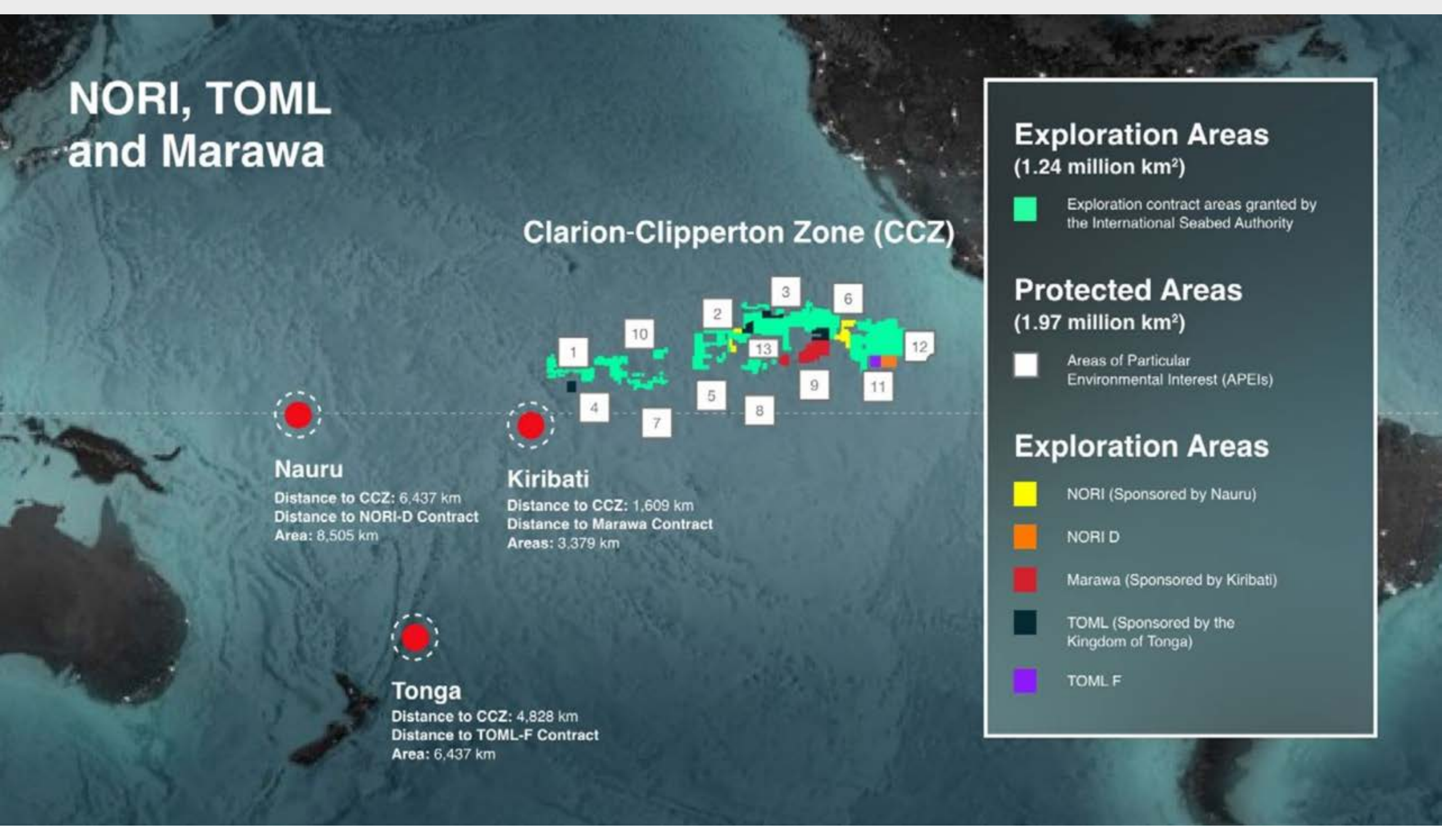
2008 Sponsorship Agreement

2021 Tonga and TOML Amended Sponsorship Agreement

**Republic of Kiribati**

2013 Services Agreement

2017 Kiribati Seabed Minerals Act




**Nauru**

| | |
|---|---|
| **Location** | Northeast of Australia in southeastern Micronesia |
| **Population** | ~12,500 |
| **Geography** | Uplifted limestone island with no harbors. The island is fringed by a coral reef, which acts as the island's main defense from rising sea levels. |
| **Impact of Climate Change** | Projected sea-level rise poses risks to Nauru's communities and key infrastructure, concentrated mainly in the coastal areas[1]. |
| **Economy** | Phosphate, mined on Nauru since 1907, first by Germans, until the British Phosphate Commission, a joint Australian, British and New Zealand enterprise took over the lucrative phosphate industry throughout the 20th century until Nauru became independent in 1968. Phosphate was the island's main export and dominated its economy until the late 20th century, when phosphate deposits became exhausted. In the 1990s, the country was near bankruptcy and struggled to develop other resources or alternative sources of income. In the 2000s, repairs and improvements to mining-related infrastructure allowed the more difficult extraction of secondary phosphate deposits. In 2001, Nauru agreed to house Australia-bound asylum seekers. The sale of commercial fishing licenses in the Nauruan exclusive economic zone (EEZ) that extends 200 miles offshore also brings in steady revenue. |
| **Challenges** | Given its size, remote location and narrow production base, Nauru faces many challenges. The lack of agricultural production and high costs of importing fresh, healthy food contribute to the high rates of obesity and diabetes on the island. Colonial exploitation of Nauru's rich phosphate reserves created a legacy of environmental degradation that left more than 80% of the island uninhabitable and unsuitable for agriculture. The economy is affected by the high cost of goods and services, inadequate infrastructure and the impact of climate change. Natural freshwater resources are limited. Roof storage tanks collect rainwater, but most people are dependent on the desalination plant for freshwater resources[2]. |
| **Other** | As a result of its history and challenges, Nauru is dedicated to ensuring that future extractive activities are done responsibly. Nauru is a party to UNCLOS and recognizes the important role of the ISA to put in place strict guidelines and protection measures before any extraction activities take place. Nauru is the first sponsoring state to access the developing state land bank and views polymetallic nodules as an opportunity to diversify its economy and contribute to the transition to clean energy. |

[1] Nauru, "Voluntary National Review on the Implementation of the 2030 Agenda", 2019.

[2] Ibid.

**Tonga**

| | |
|---|---|
| **Location** | East of Fiji, south of Samoa and north of New Zealand |
| **Population** | ~100,000 people, with 70% of residents living on the main island of Tongatapu |
| **Geography** | Archipelago of 172 South Pacific islands, of which 36 are inhabited |
| **Impact of Climate Change** | Tonga's groundwater supplies are tainted by salt-water intrusion from rising seas, threatening domestic agriculture. |
| **Economy** | Unlike many of its Pacific Island neighbors, Tonga never experienced the impacts of colonial resource extraction. Its economy is reliant on tourism and climate-sensitive sectors such as agriculture and fisheries. It also has a heavy dependence on remittances from the half of the country's population that lives abroad, chiefly in Australia, New Zealand and the United States, as well as foreign aid. |
| **Challenges** | As a small island state with limited natural resources and vulnerability to climate change and natural disasters, Tonga faces several development challenges. High unemployment (especially among the young), a continuing upturn in inflation and rising civil service expenditures are issues that face government[3]. On January 15, 2022, an undersea volcano, located about 40 miles north of Nuku'alofa, erupted, covering Tonga in thick volcanic ash. The eruption generated a devastating tsunami and significant flooding. |
| **Other** | The Kingdom of Tonga, the only remaining monarchy in the Pacific, is under a constitutional monarchy where the king acts as the head of state and chief commander of the armed forces, and the prime minister runs the government. |

[1] New World Encyclopedia, "Tonga".

**Kiribati (Pronounced, Kiri-Bass)**

| | |
|---|---|
| **Location** | Central Pacific Ocean, west of Hawaii and near the Equator |
| **Population** | ~119,000 |
| **Geography** | 33 atolls scattered over 3,500,000 square kilometers |
| **Impact of Climate Change** | Despite accounting for just 0.0002% of global $CO_2$ emissions, Kiribati is heavily impacted by climate change and already two of its islands have disappeared into the sea. Climate change is a serious challenge from acute water shortages, tidal inundation, seawater intrusion, and heat and storm events. |
| **Economy** | Until 1979, Kiribati's economy depended heavily on the export of phosphate from their Banaba island's deposit. The country now depends on foreign assistance and revenues from license fees from foreign fishing fleets, including a special tuna-fishing agreement with the European Union; the export of copra from coconuts, mostly produced in the village economy; work remittances; and tourism[4]. |
| **Challenges** | In addition to being one of the countries most affected by climate change, Kiribati is also constrained by geographic isolation, a highly dispersed population, high transport costs and a low population base. The relative infertility of its coral islands and distance to markets prohibits agricultural or industrial production on a large scale[5]. |
| **Other** | The nation is renowned for creating the world's first large open-ocean protected area, the Phoenix Islands Protected Area (PIPA), which achieved legal designation in 2008. PIPA is now a UNESCO World Heritage Site, protecting the pristine corals, reef fishes, sharks, manta rays, turtles, tuna stocks and ocean-dependent human communities in an area more than 400,000 square kilometers, approximately the size of California. On November 15, 2021, the Office of the President of Kiribati announced the decision to lift the closure of the PIPA for the sustainable use of marine resources[6]. |

[1] New World Encyclopedia, "Kiribati".

[2] Kiribati, "Voluntary National Review and Development Plan Mid-Term Review", 2018.

[3] UNESCO World Heritage Convention, "UNESCO Expresses Concern Over the Lifting of Fishing No-Take Zones in Kiribati's Phoenix Islands Protected Area", Dec. 2, 2021.

# ISA Mining Code

The Mining Code refers to the comprehensive set of rules, regulations, and procedures that the ISA issues to regulate efforts to prospect, explore, and exploit marine minerals in the international seabed area (the Area). The Mining Code comprises two major components: exploration and exploitation. The ISA adopted three sets of exploration regulations covering prospecting and exploration for polymetallic nodules (2000 and revised 2013), polymetallic sulfides (2010) and cobalt-rich ferromanganese crusts (2012), and, in 2014, began to develop regulations to govern efforts to exploit mineral resources in the Area.

To date, the ISA has issued exploration contracts only. The ISA targeted July 2020 as the date that it would complete and adopt its exploitation regulatory regime, but the coronavirus disease of 2019 (COVID-19) pandemic delayed its efforts. Despite the delay, it has continued to make significant progress on the exploitation regulatory regime's major components. The ISA Council revised its roadmap at the end of 2022 whereby it scheduled three meetings for 2023 and committed to work in good faith to complete the regulations.

The Mining Code's exploitation component has **three major parts:**

1. Exploitation regulations
2. Standards and guidelines
3. Benefit sharing

The work to develop regulations for exploitation of minerals resources in the Area started with preliminary work in expert workshops and involved various expert studies and discussion papers, which culminated in draft regulations for the ISA Legal and Technical Commission (LTC) and Council to consider. Stakeholders participated in drafting the regulations throughout a transparent process[1].

The draft regulations on exploitation of mineral resources in the Area require that various ISA organs develop certain standards and guidelines to help the ISA implement the regulations. The standards will be legally binding on contractors and the ISA, whereas the guidelines will be recommendatory in nature. The LTC recommended a three-phase approach for their development:

- **Phase 1:** Standards and guidelines deemed necessary to be in place by the time of adoption of the draft regulations on exploitation.
- **Phase 2:** Standards and guidelines deemed necessary to be in place prior to the receipt of an application of a plan of work for exploitation.
- **Phase 3:** Standards and guidelines deemed necessary to be in place before commercial mining activities commence in the Area[2].

Phase 1 generated 10 standards and guidelines, which remain with Council for final discussion and approval after undergoing revision based on stakeholder consultation.

The financial regime that the ISA will establish will require contractors to make payments and provide other economic benefits from mining to the ISA, which will then share it according to "equitable sharing criteria". The ISA has conducted research and consultation to consider mechanisms to share financial and other economic benefits.

[1] ISA, "The Mining Code: Draft Exploitation Regulations"

[2] ISA, "The Mining Code: Standards and Guidelines"

**Overview of Status of Preparation of the Exploitation Code**

| Mining Code - Exploitation | Under Development by the LTC | Stakeholder Consultation | Under Consideration for Approval by the LTC | Under Consideration by the Council |
|---|---|---|---|---|
| Exploitation Regulations | → | → | → | underway |
| Standards & Guidelines | | | | |
| Phase 1 | → | → | → | underway |
| Phase 2 | → | | | |
| Phase 3 | To be completed prior to commercial mining commence | | | |
| Benefit Sharing | Research and consultation complete | → | → | underway |



### Two-Year Notice: Section 1, Paragraph 15 of the 1994 Agreement

Section 1, paragraph 15 of the 1994 Agreement relating to the Implementation of Part XI of the UNCLOS allows a member state whose national intends to submit a plan of work for exploitation for approval to notify the ISA about its intention to do so. This notice obliges the ISA to complete the process to adopt the exploitation regulations within two years since the member state made the request.

On 25 June 2021, the Republic of Nauru submitted its notice to the ISA to request that, by 9 July 2023, the ISA complete the process to adopt regulations necessary to allow it to approve plans of work to commercially exploit polymetallic nodules. It is TMC's wholly-owned subsidiary, Nauru Ocean Resources Inc. (NORI) strong preference to submit an application for a plan of work for exploitation once the mining code has been adopted, but NORI reserves its right to submit an application for a plan of work in the absence of the adoption of a mining code pursuant to Section 1, Paragraph 15 of the Annex to the Agreement. ISA shall nonetheless consider and provisionally approve such a plan of work based on: 1 the provisions in UNCLOS; 2 any rules, regulations, and procedures that the ISA may have adopted provisionally at the time; 3 the basis of the norms in UNCLOS; and 4 the principle of non-discrimination among contractors. TMC appreciates the continued commitment from ISA council members to establish environmental regulations for the protection of the marine environment while setting out requirements for responsibly accessing resources critical to the fight against climate change. Together with the Republic of Nauru, our sponsoring state, NORI commits to only submitting an application for exploitation after we complete a comprehensive, science-driven environmental and social impact assessment. Once adopted, the regulations will create the legal and technical framework for exploiting polymetallic nodules in the NORI, TOML, and Marawa contract areas.

**APPLICATION**

- ✓ Certificate of Sponsorship
- ✓ Mining Plan
- ✓ Test Mining Report
- ✓ Financing Plan
- ✓ Environmental Impact Statement
- ✓ Emergency Response and Contingency Plan
- ✓ Health and Safety Plan & Maritime Security Plan
- ✓ Training Plan
- ✓ Environmental Management and Monitoring Plan
- ✓ Closure Plan

While the ISA has developed a work plan and road map to complete the final regulations, and while the draft regulations and several supporting standards and guidelines have reached an advanced stage, uncertainty remains regarding the final form that these will take and the impact that such regulations, standards, and guidelines will have on our ability to meet our objectives.

Find more: Government of the Republic of Nauru, "Nauru FAQ on two-year notice" Accessed in May 2023.

# Environmental Impact Statement

**ESIA PROCESS**

- ESIA Process
- Scoping
- Impact Assessment
- Mitigation
- Reporting
- Review
- Decision Making
- Monitoring
- EIA Audit

The International Seabed Authority (ISA) requires all exploitation contract applications to include an environmental impact statement (EIS). The EIS documents and reports result from an environmental and social impact assessment (ESIA), which refers to "the process of identifying, predicting, evaluating and mitigating the physicochemical, biological, socioeconomic, and other relevant effects of development proposals prior to major decisions being taken and commitments made". Thus, an ESIA covers all potential positive, negative, and neutral effects and encompasses both natural and anthropogenic receptors[1]. The respective environmental and social components of the ESIA are described below.

[1] ISA, "Draft Standard and Guidelines for the Environmental Impact Assessment Process", 31 Jan. 2022.

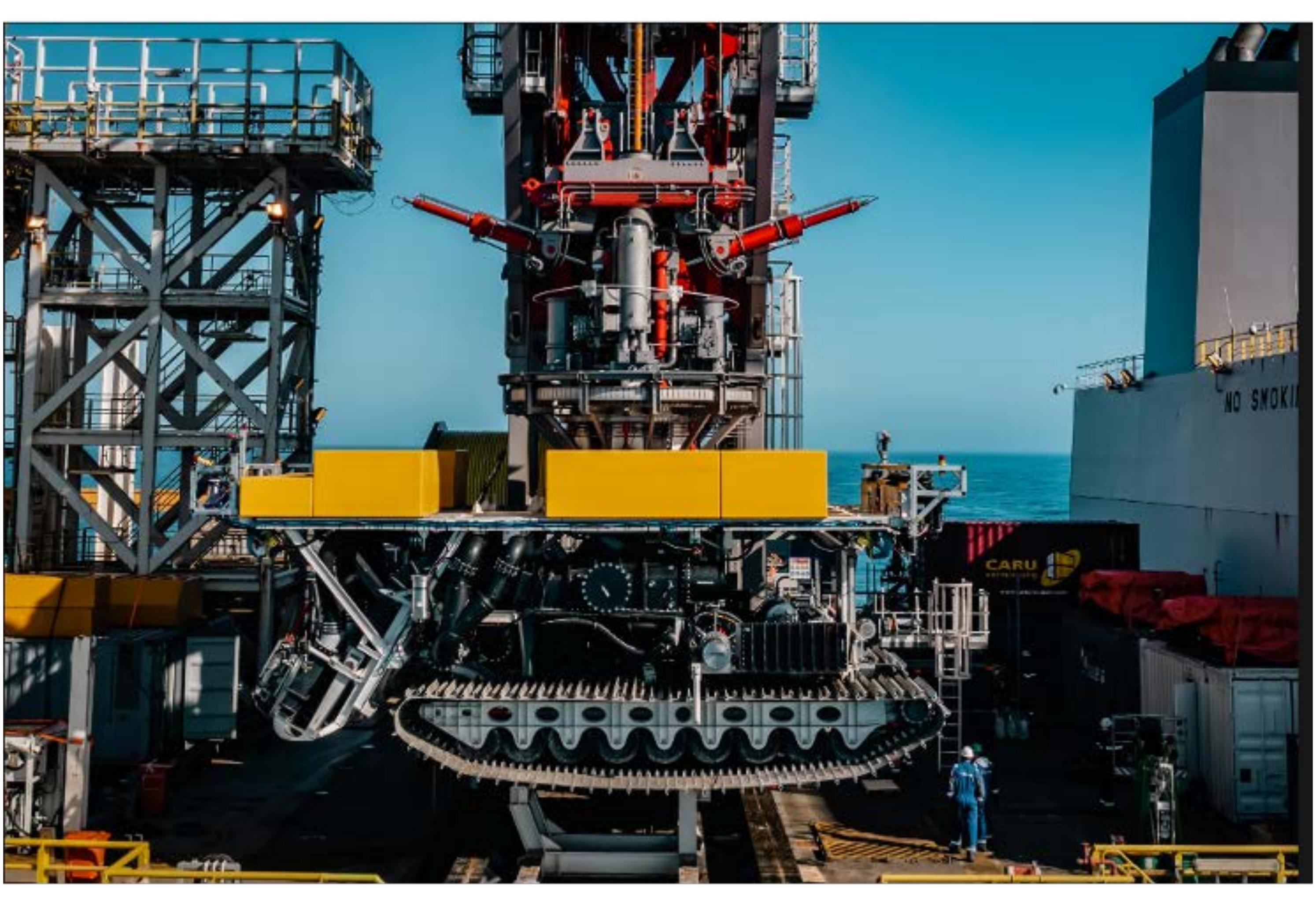
## Environmental Impact Assessment (EIA)

The ISA requires an application to seek approval for a plan of work for exploitation to assess the potential impact that the proposed activities may have on the environment and to describe a program for oceanographic and baseline environmental studies in accordance with ISA rules, regulations, and procedures. Environmental baseline studies characterize an area's biophysical components before developing a project. This understanding makes it possible to find ways to minimize impacts and establish measures for protection.

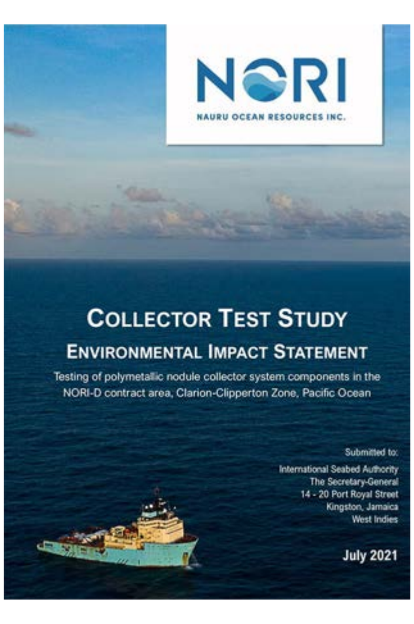
For NORI-D's EIA, we have designed a comprehensive seabed-to-surface research program to understand the effects our operations will have on the biota throughout the water column and its various zones and how such biota will respond to the impacts that potential future operations would generate. The information we gain from the program will add to the knowledge in this area that various entities have contributed since the 1960s. Indeed, since that time, over 150,000 published papers have discussed manganese or polymetallic nodules in general and over 40,000 have discussed nodules in the Clarion-Clipperton Zone (CCZ) in particular.

> TMC has commissioned some of the world's leading ocean scientists to conduct over 100 individual studies to characterize the biota throughout the water column and its various zones.

We have collected biological data from the NORI area since 2012. Since 2018, NORI has focused its efforts in NORI-D to better understand the resource and, since 2020, the priority shifted to collecting environmental baseline and impact data to inform the EIA. In 2021, we completed the campaigns related to our environmental baseline assessment, while, in 2022, we conducted four additional environmental research campaigns representing the first integrated polymetallic nodule-collection system test conducted in the Clarion-Clipperton Zone since the 1970s. During this trial, NORI and our partner Allseas lifted over 3,000 tonnes of nodules from a small test area in NORI-D up a 4.3km riser system to the surface production vessel, the Hidden Gem. Through our 2022 campaigns, we completed our objective to survey the pre-, during- and post-collection test environment and monitor the impacts during the trials.

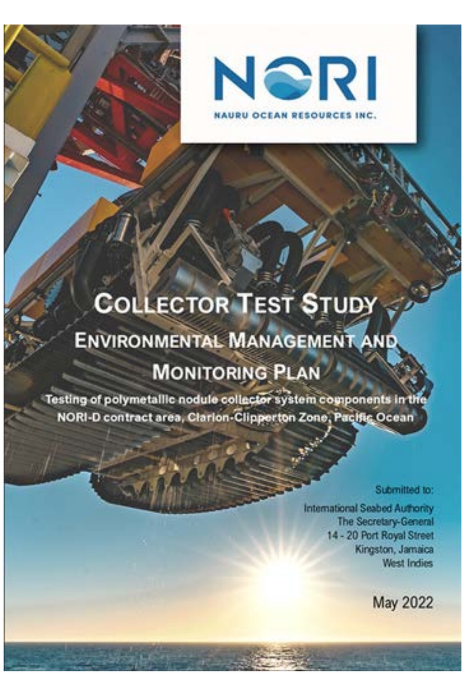



We conducted the NORI-D collector test campaigns where we collected impact data to compare against the baseline assessment. We operated and monitored a fully functional prototype collector vehicle (PCV) that measured 12 meters in length, 6 meters in width, and 5 meters in height (approximately half the proposed commercial size) at NORI-D to test our impact models and gather additional data to gain more insights on the potential impacts of our operations. With the knowledge that we continue to acquire from analyzing the terabytes of environmental data that we gathered before, during, and after the collection test, we have also begun developing a framework for our environmental management and monitoring plan (EMMP), designing a mitigation plan, making improvements in our equipment design, and adjusting our collection operations plans accordingly. This knowledge will form the backbone of the NORI-D EIA.




The ISA required a comprehensive EIA for these tests, and, accordingly, we submitted both an environmental impact statement (EIS) and an environmental monitoring and management plan (EMMP) for approval. NORI's sponsoring state, Nauru, facilitated an open stakeholder consultation to solicit comments and feedback on the EIS for the NORI-D collector test. In contrast to equipment tests on land, which usually do not require an EIS and stakeholders tend to be local and limited in number, we exhibited our NORI collector test EIS submission publicly to all interested stakeholders. Following the open stakeholder consultation period, we responded to over 600 comments and updated the EIS to address the most important issues. Subsequently, we held a public information session to present the feedback that we received and how we incorporated it into the updated EIS that we submitted to the ISA in March 2022.

> We responded to over 600 stakeholder comments on the EIS for the NORI-D collector test.




We submitted an environmental management and monitoring plan for the collector test study to the ISA in May 2022 and, in September, NORI received ISA's recommendation to commence pilot nodule collection trials in the CCZ.

Since 2012, we have collaborated with leading industry experts and independent scientists from marine research institutions from around the world on our ESIA, gathering data throughout 17 offshore campaigns, representing over 470 operational research days on the NORI-D area. In all of them we collected data from the marine habitats represented in NORI-D including tens of thousands of samples, specimens, and data points. We have dedicated significant effort to developing our EIA—from offshore data sample collection to analysis and publication— and the significant size of this research will continue to grow as we get closer to submitting the NORI-D EIS to the ISA. In early 2023, we have started uploading the environmental data (over 200 terabytes) that we have collected since 2011 to DeepData, an open database that the ISA manages

**100+ studies:** Seabed-to-surface ocean research program


Once completed, the NORI-D dataset will be one of the most comprehensive datasets ever gathered in the CCZ. We will also visit NORI-D annually to download data from monitoring equipment that we have in the area to continue to gather data trends.

> Research in the Area increases our knowledge about marine biodiversity and ecological processes and will play a critical role in realizing the blue economy.

With the wealth of knowledge that we have and continue to acquire, we can design our collector system in innovative ways that minimize environmental impacts. Examples include:

- Increasing the depth at which the return water outlet operates to the bathypelagic layer to minimize impacts on the more productive mesopelagic layer.
- Designing a height-adjustable collector head that picks up nodules using a water jet parallel to the seafloor to minimize sediment disturbance.
- Optimizing the air lift system to minimize acoustic disturbance to the water column.

## Social Impact Assessment (SIA)

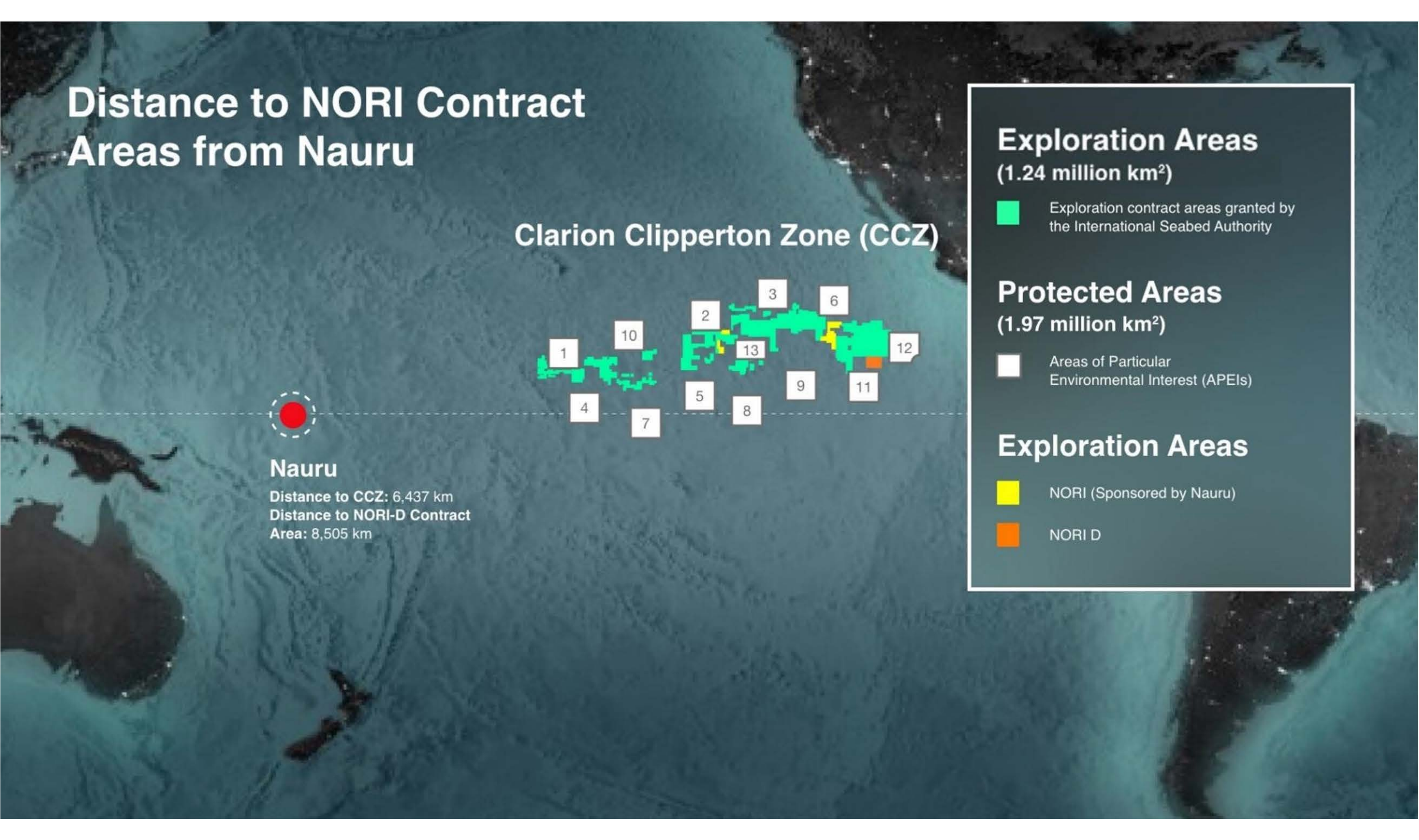
While the environmental component in the ESIA has attracted the most attention, the ISA also requires contractors to evaluate potential social impacts. Assessing the impact that our future operations may have on people and communities represents a challenging and unique task given polymetallic nodules reside far from human communities in international waters and their designation as a common heritage of humankind (CHH). Still, polymetallic nodules from NORI-D could offer an important and abundant source of energy transition metals that would come with social impacts that differ to those associated with land-based mining. On the one hand, land-based mining operations (and the large multi-year infrastructure projects that support them) generally create local social and economic development opportunities, which deep-sea nodule collection operations would likely not trigger on a comparable level. On the other hand, land-based mining operations also frequently entail tensions with local communities due to various factors such as the need to relocate human settlements, pollution generation, increased competition for water or other local resources, disruption to traditional ways and customs, and so on, which would not exist under a metals-production scenario based on deep-sea nodules. One could expect this latter scenario to create fewer but safer jobs and to have significantly lower social impact in terms of fatalities, injuries, illnesses, impacts to vulnerable populations, and toxicity potential[1]. However, given NORI-D's remoteness, we need to rethink how we assess social impact, which explains why we have taken a broad and inclusive approach to understand what social impact means for this emerging industry.

[1] Daina Paulikas et al, "Where Should Metals for the Green Transition Come From?", April 2020.

To undertake our SIA, we have engaged Prizma, an independent ESG, impact assessment, and sustainability advisory practice with demonstrated experience in natural resource projects. The SIA will examine the project's potential positive and negative impacts, engage with external stakeholders, and provide a management and monitoring plan that NORI will incorporate into its future operational and social performance-management plans. On 5 May 2022, NORI and Prizma co-hosted a scoping workshop open to the public in Vancouver, BC, to explore the challenges of conducting a social impact assessment for NORI-D. We developed and released a scoping document for stakeholder comments in December 2022 and have begun addressing and incorporating stakeholder feedback into the terms of reference (ToR) for the study's social impact assessment. We will publish a report that summarizes the consultation and engagement activities in the scoping phase and the resulting ToR on NORI's webpage.

**SEVERAL FACTORS MAKE THIS SIA UNIQUE:**

- **World first:** Our SIA represents the first SIA for a polymetallic nodule collection project in international waters.
- **Location:** NORI-D resides in the Pacific Ocean over 1,500km from the nearest populated landmass, which means that our operations will not directly impact any local communities.
- **Regulatory context:** NORI falls under ISA jurisdiction and the resource constitutes a common heritage of humankind.
- **Social impacts:** The NORI-D Project has different direct social impacts as compared to land-based mining projects on in national contexts.




For more information on the ESIA, please refer to the NORI-D Project – Nauru Ocean Resources Inc. webpage.

# What We Do


## Our operations

- Our Operations

## Offshore Operations

- Our Offshore Operations
- Resource Definition
- Collection System
- Collection System Trials
- Environmental Program
- Regulations and Contracts

## Onshore Operations

- Our Onshore Operations
- Processing System
- Plant Site Selection

## ESG Footprint

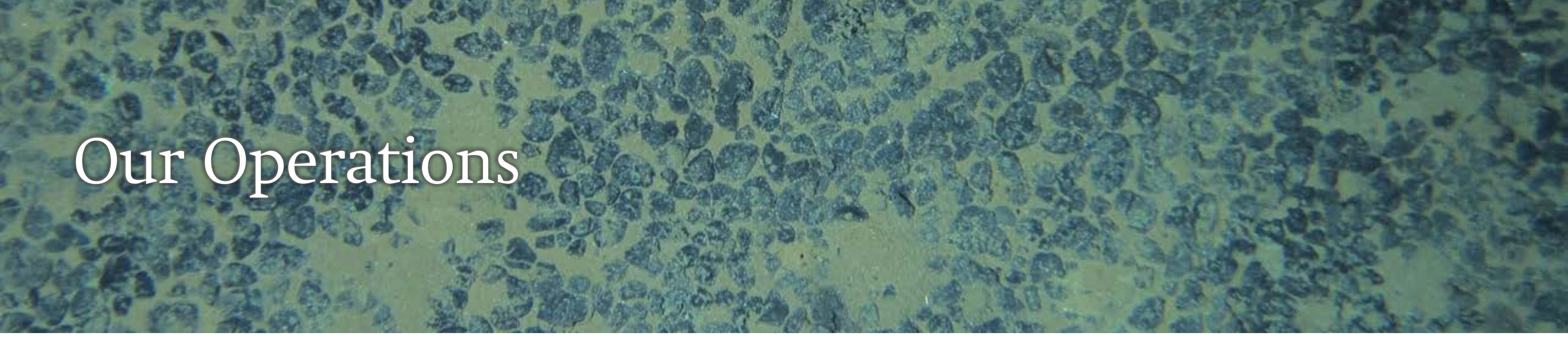
- Scope of Our Activities

## Environmental Footprint

- Energy and Emissions
- Water
- Waste

## Social Footprint

- Employees
- Health & Safety
- Sponsoring States



# Our Operations

From collecting nodules to producing battery metals, we have focused on developing **two main operation segments:** offshore operations and onshore operations.

## Offshore Operations

Involves all the activities required to collect nodules from the seafloor, lift them to surface, and transfer them to transport vessels for shipping to shore.

From technology development to environmental baseline studies and impact assessments, our offshore activities focus on **four main workstreams:**

Resource Definition | Collection System | Environmental Program | Regulations & Contracts

**In 2022**, we focused on completing the environmental baseline for NORI Area D (NORI-D), testing the integrated collection system and adaptive management system, monitoring and testing environmental impact data during in situ trials, and developing a social impact assessment for the NORI-D project.

## Onshore Operations

Our onshore operations involve developing and testing a near-zero waste flowsheet for nodule processing, and testing and eventually constructing processing plant(s), which will involve primary processing and refining.

Our onshore activities focus on **two main workstreams**:

Processing System | Plant Site Selection

**In 2022**, onshore activities focused on testing the hydrometallurgical refinery portion of the flowsheet, characterizing the properties of our manganese silicate product, and identifying the best potential partners for Project Zero and Project One.

TMC maintains an **experienced core team**, and **we work with our partners to deliver on our targets.** With our partnerships, we bring the required expertise to develop and implement nodule collection and processing in an effective and environmentally sound manner. Our work with our partners extends across the value chain from resource assessment to nodule processing.

We have **built strong partnerships** that allow us to move fast

OFFSHORE: Resource → Collect → Ship

ONSHORE: Process & Refine → Product

**RESOURCE ESTIMATION**

MAERSK

**Partner from 2017-2021**

Invested US$25 million in TMC 2017. Maersk provided project management services, such as vessel operations and supplier management, on all resource definition and environmental offshore campaigns until December 2021.

AMC consultants – mine smarter

Has independently estimated resources for both the NORI and TOML contract areas and conducted an independent economic analysis on the NORI Area D Project.

BECHTEL

Manages techno-economic studies.

**NODULE COLLECTION TECHNOLOGY DEVELOPMENT**

Allseas

Developed and tested a pilot nodule collection system, which is now being upgraded to the first commercial system.

**ENVIRONMENTAL IMPACT ASSESSMENT**

Several leading deep-sea research institutions around the world have contributed and continue to contribute to the offshore environmental and social impact assessment (ESIA) program that includes over 100 studies. Given their independence, these research institutions can freely publish their research in peer-reviewed journals.

**ENVIRONMENTAL MONITORING AND MANAGEMENT / ADAPTIVE MANAGMENT SYSTEM (AMS)**

CSIRO | NIWA | KONGSBERG

A group of leading organizations is also contributing to developing our ecosystem-based environmental monitoring and management framework and adaptive management system (AMS).

**FLOWSHEET DEVELOPMENT**

HATCH

TMC engaged the Canadian engineering consultancy to conduct concept engineering for its near-zero solid waste flowsheet and to provide pilot plant technical support.

**PILOT PLANT PROGRAM**

| | |
|---|---|
| Calcining | FLSmidth |
| Smelting, Sulfidation, Converting | XPS Expert Process Solutions |
| Hydromet refining | SGS |

**COMMERCIAL PRODUCTION**

PACIFIC METALS CO., LTD.

Non-binding MoU to process 1.3 Mtpa in Japan

**OFFTAKES**

GLENCORE

The Anglo-Swiss commodity trading and mining company invested in TMC in 2012.

It has an offtake agreement with TMC for:

- 28 Ni Nickel 58.693 — 50% of nickel production
- 29 Cu Copper 63.546 — 50% of copper production

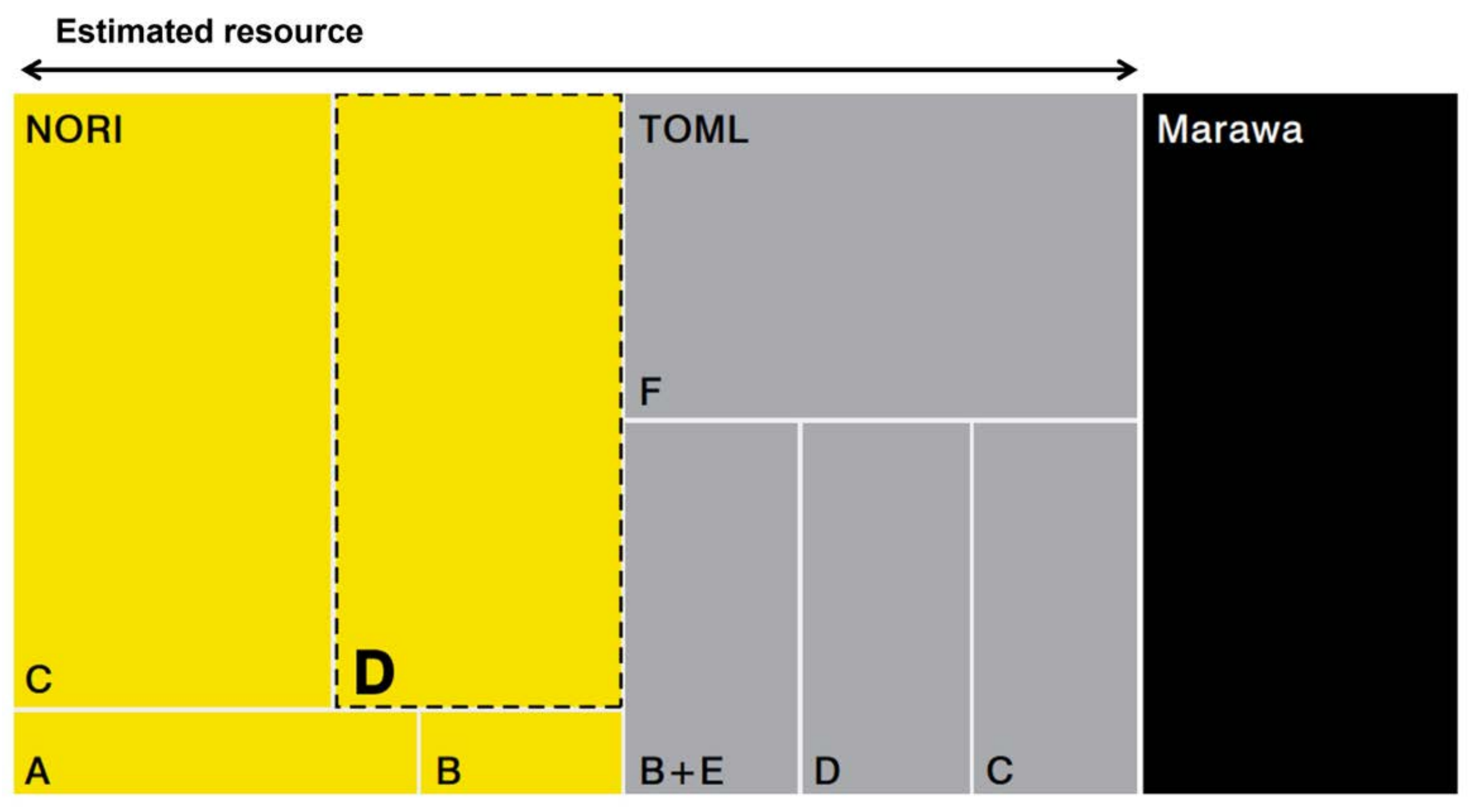
> Our partnerships make us stronger, because through them we can achieve a lot more than we could alone.

Please refer to the online version of this page for additional context about our workstreams and partnerships.

## Our First Project: NORI Area D

While TMC holds exploration rights to several areas in the Clarion-Clipperton Zone (CZZ), we have initially focused on NORI Area D (NORI-D), a 25,160 $km^2$ area that accounts for 11% of our contracted areas. The area, which resides on the CCZ's southeast margins, possesses an optimal combination of proximity to shore (1,500km from the coast of Mexico), water depth (4.3km), and high and consistent nodule abundance (15-20kg/$m^2$).

The NORI Area D Project has significant optionality not available to terrestrial deposits. Once one brings the nodules to the surface, one can ship them to a location with an existing port and industrial sites with natural gas, renewable power, and an existing skilled and specialized labor force.




Visual representation of sub-areas with TMC's CCZ permitted areas

> The NORI and TOML contract areas constitute the two largest undeveloped nickel projects on the planet[1].

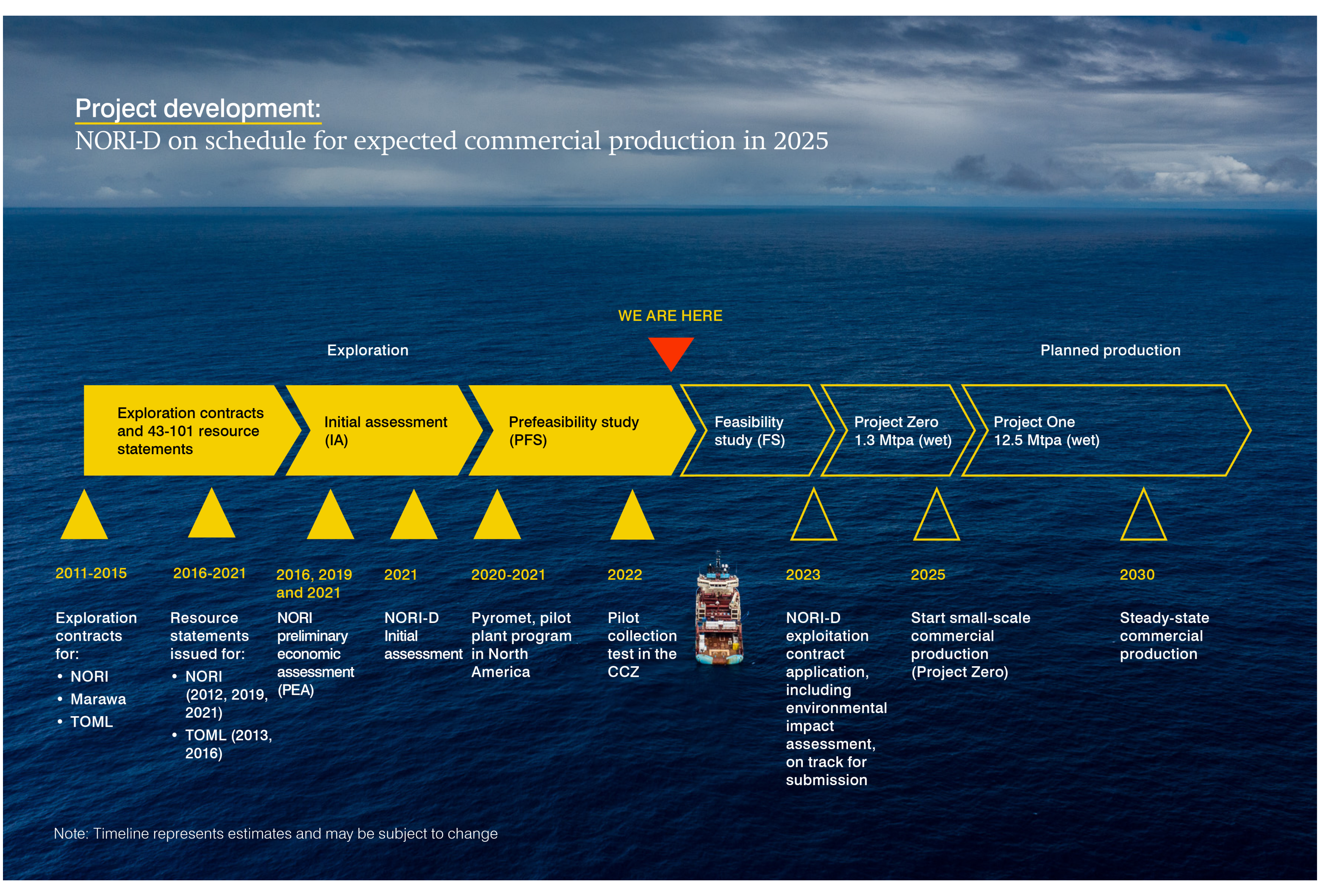
[1] Mining.com, "RANKED: World's biggest nickel projects", May 1, 2023

## **Project Development:** NORI Area D on Schedule for Expected Commercial Production in 2025

We currently expect to commence commercial operations in NORI Area D at the end of 2025. We refer to this operation as **Project Zero**. In Project Zero, we plan to collect 1.3 Mtpa of wet nodules to produce about 30,000 TPA of NiCuCo matte and 750,000 TPA of manganese silicate. We plan to process the nodules through existing third-party facilities on a tolling basis as we look for the future potential of a new RKEF facility to be constructed through a partnership.

In November 2022, we entered into a non-binding **memorandum of understanding ("MoU") with Pacific Metals Co Ltd (PAMCO)** in Japan to evaluate the toll treatment of an initial quantity of 1.3 Mtpa wet polymetallic nodules at PAMCO's Hachinohe smelting facility starting in 2025. Currently, the toll treatment will occur on a dedicated rotary kiln-electric arc furnace (RKEF) processing line and produce two products: NiCuCo alloy (an intermediate product that can be used as feedstock to produce lithium-ion battery cathodes) and a manganese silicate product (that can be used to make silico-manganese alloy, critical input for manufacturing steel).

Once in production, we plan to focus on scaling and increasing production in a manner that manages development and environmental risks as we build operational knowledge and experience. We refer to this operation as **Project One**. As the NORI-D Initial Assessment Technical Report Summary outlines, we expect to expand production with an additional converted drillship (Drill Ship 2), a subsequent upgrade to the Hidden Gem, and a newly constructed bespoke production vessel (Collector Ship 1).




> Our strategy involves a focus on using existing technologies and partnering with capable groups to realize the opportunity that this huge resource of critical minerals represents.

# Our Offshore Operations

Our offshore activities include all activities related to making sure that we can collect nodules in an efficient and environmentally sound manner in the Clarion-Clipperton Zone (CCZ). From technology development to environmental baseline and impact assessment, our offshore activities focus on four main workstreams.

## Resource Definition and Resource Economics

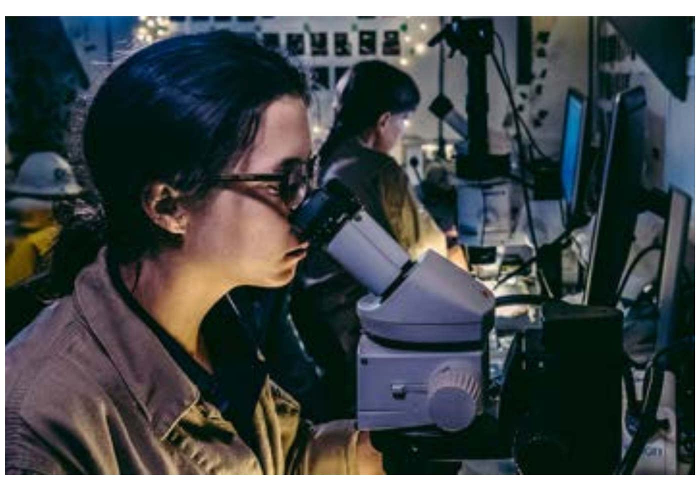
Understanding nodule abundance, composition, and metal content to define resource size and quality and demonstrate project economic viability.

- Exploration campaigns
- Indicated and measured resources

## Collection System

Designing, developing, and testing a collection system that includes subsea collector robots on the seafloor, an airlift riser system to transport nodules from seafloor collectors to the surface, a production vessel on the surface to dewater nodules and offload them to bulk cargo vessels to transport them to shore.

- Integrated system design
- Allseas partnership
- Pilot system design, fabrication and testing
- Production vessel



## Environmental Program

Gaining knowledge on the ecosystem, potential operational impacts, and mitigation strategies and developing an adaptive management system to monitor and ensure that we continuously meet established acceptable parameters.

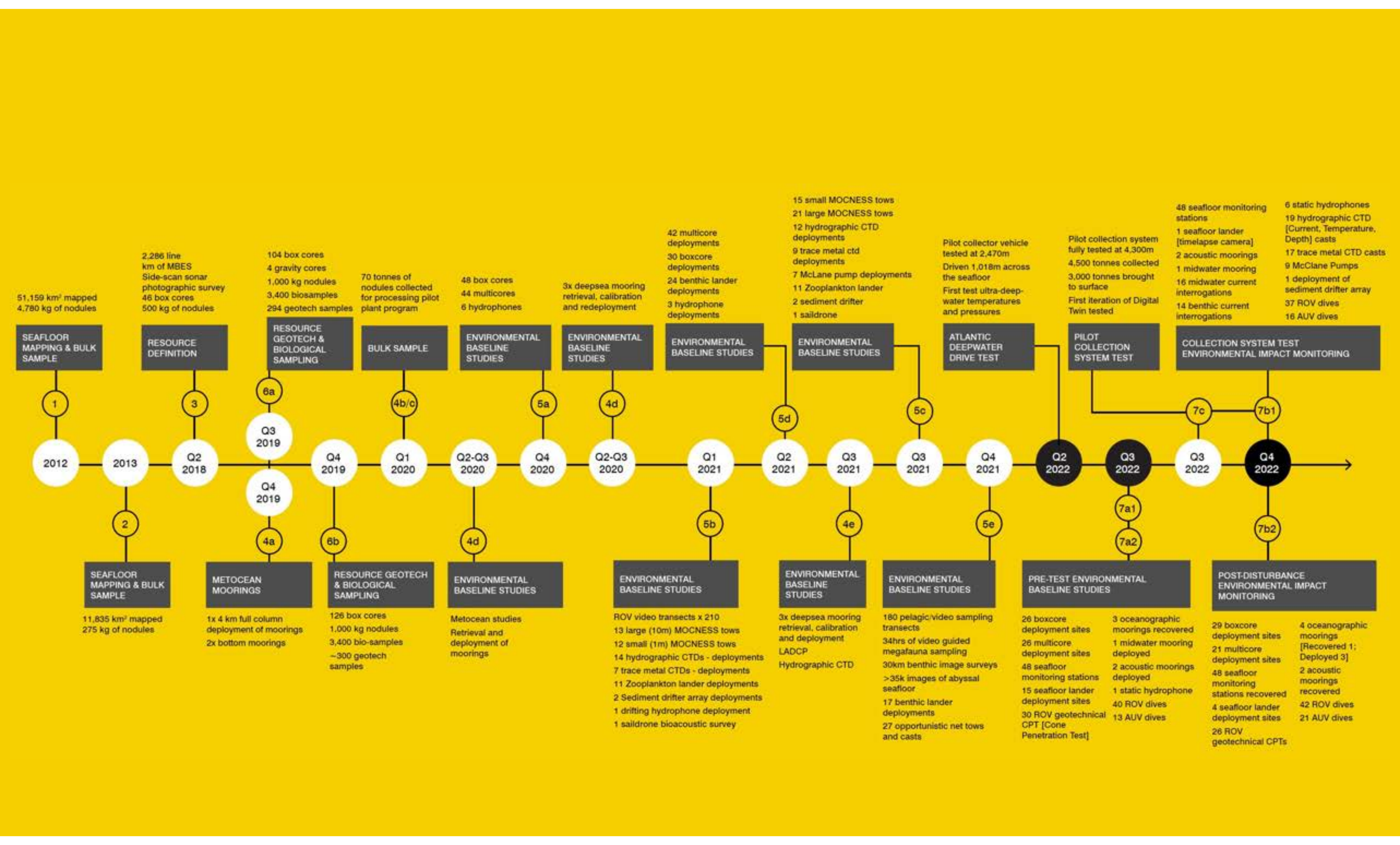
- Science advisory board
- Environmental baseline sampling
- Lifecycle assessments (LCAs), climate change, waste and biodiversity impacts studies
- Environmental impact statement (EIS) for collector test and production
- Adaptive management system (AMS)

## Regulation and Contracts

International Seabed Authority (ISA) permitting requirements include broad engagement with stakeholders and experts as we are developing a resource deemed a common heritage of humankind (CHH) via sponsorship from developing states.

- 15-year contract
- Five-year work programs and review cycle
- Annual reports cycle

To support all these workstreams, NORI has been collecting samples from NORI contract area in the Clarion-Clipperton Zone (CCZ) and analyzing them since 2012. The picture below shows the timeline for the campaigns that NORI has conducted to date and their focus.




For more information about the NORI exploration campaigns in 2012, 2013, 2018, 2019 and 2020, see Section 7 of the NORI Technical Report Summary.

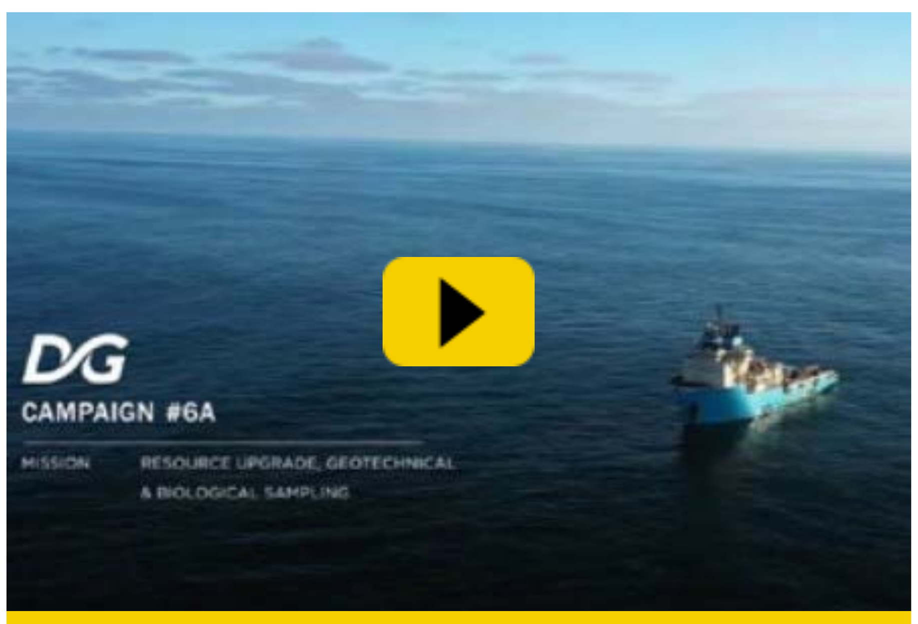
In addition to these NORI campaigns, before TMC acquired TOML in 2020, TOML conducted two bathymetric mapping, geological, and environmental sampling campaigns in the TOML contract area in the CCZ in 2013 and 2015. In its offshore exploration campaigns, TOML conducted sampling to support environmental studies, collected high-resolution imagery, and conducted environmental baseline studies. TOML also plans to conduct several future campaigns to collect data on ocean currents and water quality to assist plume modeling and environmental baseline studies and to conduct box core and multi-corer sampling focused on benthic ecology and sediment characteristics.

For more information about the TOML exploration campaigns in 2013 and 2015, see Section 7 in the TOML Technical Report Summary.

To date, only limited offshore mineral resource definition activities in the Marawa contract area have occurred, and we expect to commit future resources as contractually agreed with Marawa to evaluate the future commercial viability of any project in the area.

# Resource Definition

- 5 campaigns
- Inferred, indicated & measured methodology
- NI 43-101 and SEC S-K 1300 resource statement
- NORI and TOML ranked the two largest undeveloped nickel projects on the planet[1]



Campaign #6a - Resource Upgrade

Among their many attractive attributes, nodules sit unattached on the seafloor with no overburden to remove and nothing to obstructs them from above. This same attribute makes resource assessment very efficient. We have carried out five campaigns to define the resource in the NORI contract area. By collecting samples and scanning the seafloor using an autonomous underwater vehicle (AUV) with geophysical instruments and cameras, we defined the resource's composition and quantity in the surveyed areas with a high level of confidence.

We commissioned AMC to estimate the resource in the NORI and TOML contract areas and evaluate the NORI Area D Project from a techno-economic perspective. This evaluation brought together contractors for the offshore shipping and processing work scopes as follows:

- AMC conducted the resource evaluation independently in compliance with SEC S-K 1300 standards
- DRT designed and performed costing for the offshore collection system and with inputs from Cellula Robotics and Herbert Marine Engineering
- Canadian Canadian Engineering Associates designed and performed costing for the onshore metallurgical plan
- CRU Group developed projections for metal product prices
- Pareto JGO Shipbrokers developed projections for shipping rates

TMC issued technical report summaries for NORI-D and for TOML in March 2021.

1. Mining.com, 'RANKED: World's biggest nickel projects", May 1, 2023

## **Resource Definition:** 2D Nature of the Resource Allows Effective Definition

BOX CORE SAMPLING[1]

**250**
box cores collected[2]

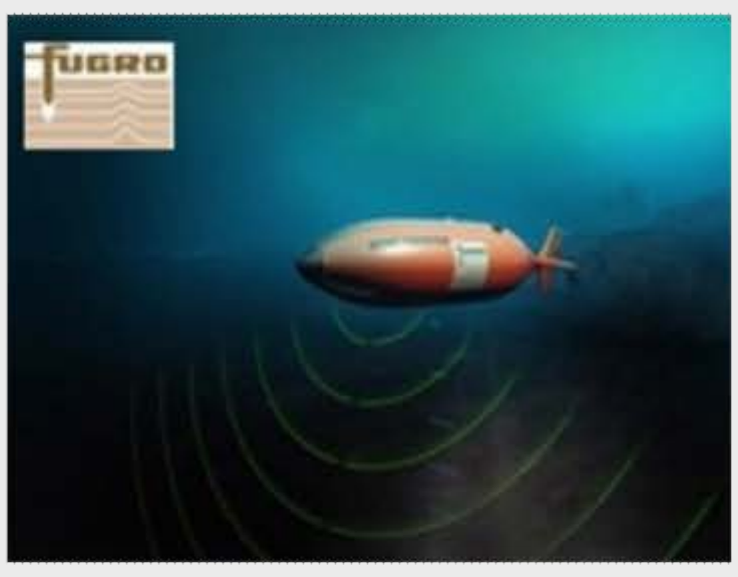
**82,000**
kg (wet) nodules collected[2]

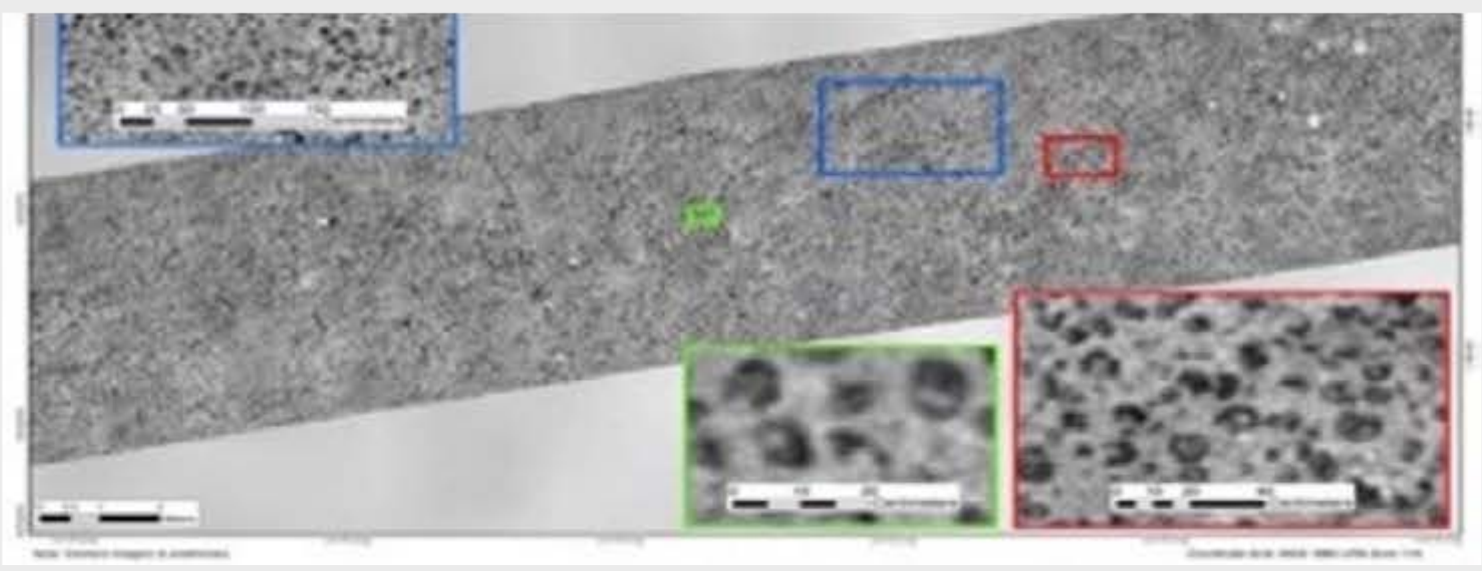
**13,950**
biological samples collected[2]

AUV CAMERA IMAGERY[1]

**178,591**
km² of high-res bathymetric survey[2]

**5,439**
km² detailed seafloor imagery[2]





[1] Images from DeepGreen's resource survey offshore campaigns in NORI contract area

[2] Boxcores, nodules collected, high-res bathymetry, detailed bathymetry - compiled by DeepGreen from Canadian NI 43-101 and SEC Regulation S-K (Subpart 1300) Compliant NORI Area-D Clarion-Clipperton Zone Mineral Resource Estimate and associated financial model, AMC, March 2021. Canadian NI 43-101 Compliant TOML Clarion-Clipperton-Zone Project Mineral Resource Estimate, AMC, July 2016 and DeepOcean NORI - D Bulk Sampling Report, 2020. Erias Cruise 6a Biological and Physiochemical Co-Sampling Report NORI Area-D post cruise, 2019; Erias Cruise 6b Biological and Physiochemical Co-Sampling Report NORI Area-D post cruise report, 2019.

# Collection System

- Integrated system design
- Allseas partnership
- Production vessel acquired, converted and tested
- Pilot collection-system design, fabrication and testing completed

In collaboration with many leading offshore engineers and designers around the world, we continue to develop a nodule-collection system that includes three main components:

- **Subsea collector vehicles**,
- **A riser and lift system**, and
- **A main production vessel**.

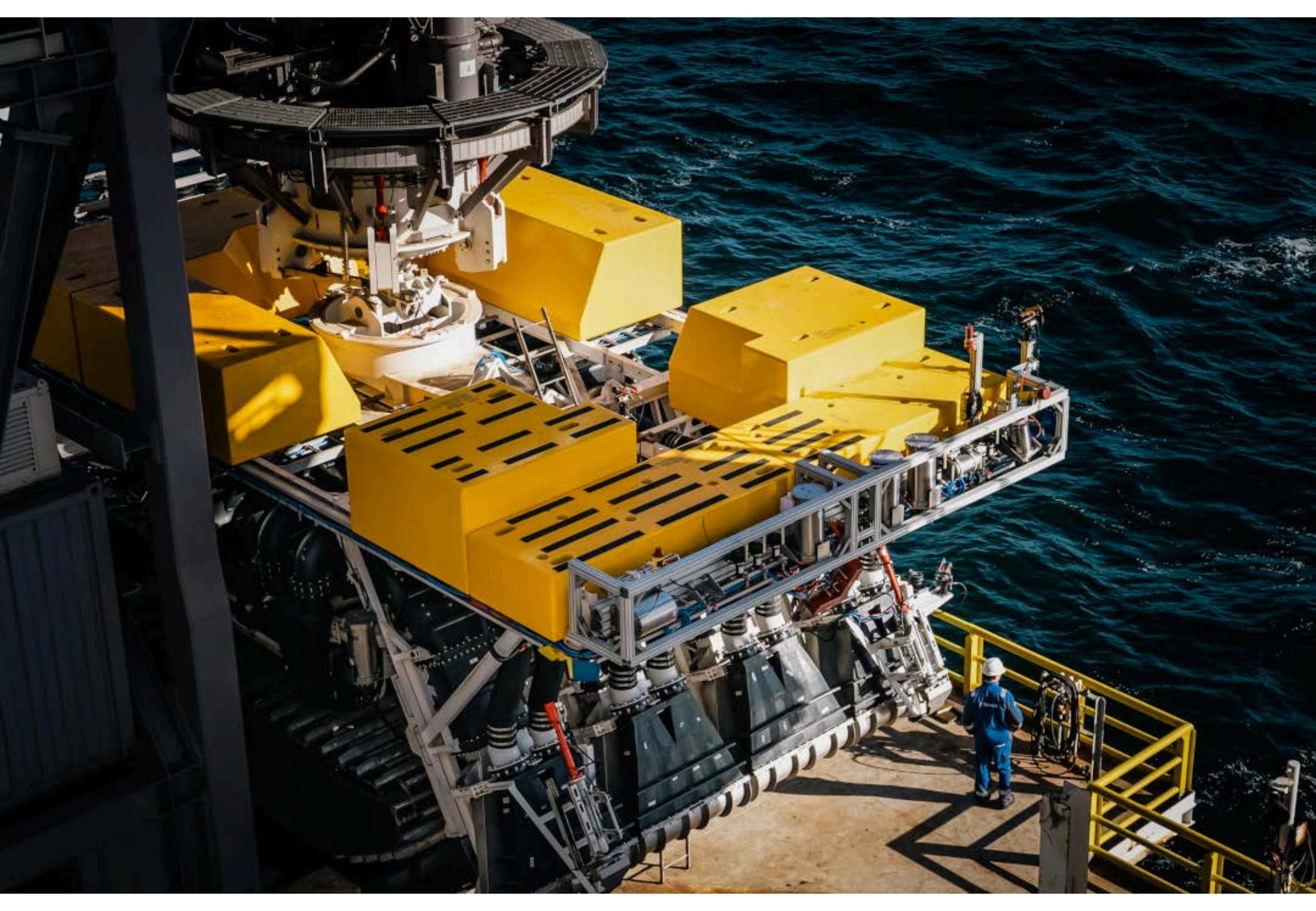
After the collection system collects and brings nodules up to the production vessel, the vessel then offloads them to a bulk carrier that can ship the nodules to any major port.

**Did You Know?**

A consortium that included leading global companies successfully piloted collector systems in 1970. However, as the United Nations Convention on the Law of the Sea and the ISA did not exist then, no legal framework could provide exploration and exploitation rights to the seafloor. While no one has yet exploited nodules in international waters to date, shallow-water mining for sand, tin, and diamonds already occurs in some locations around the world in the exclusive economic zones (EEZs) that belong to national jurisdictions[1]. Some examples include South Africa and Namibia and their offshore mining for diamonds, and the United Kingdom, whose marine marine-aggregate dredging industry (one of the largest in the world) collects many millions of tons of sand and gravel each year[2].

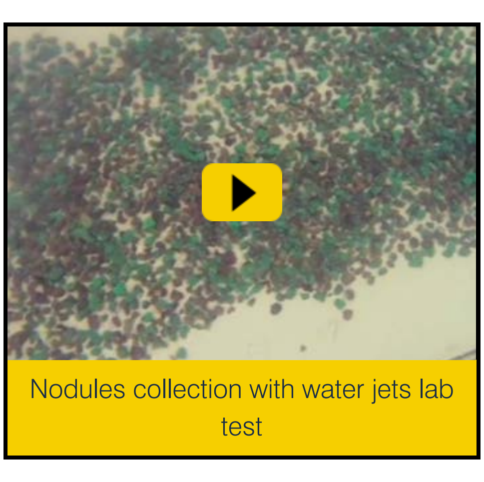
[1] Woods Hole Oceanographic Institution, "Deep-Sea Mining"

[2] European Dredging Association, "Reasons for Dredging"



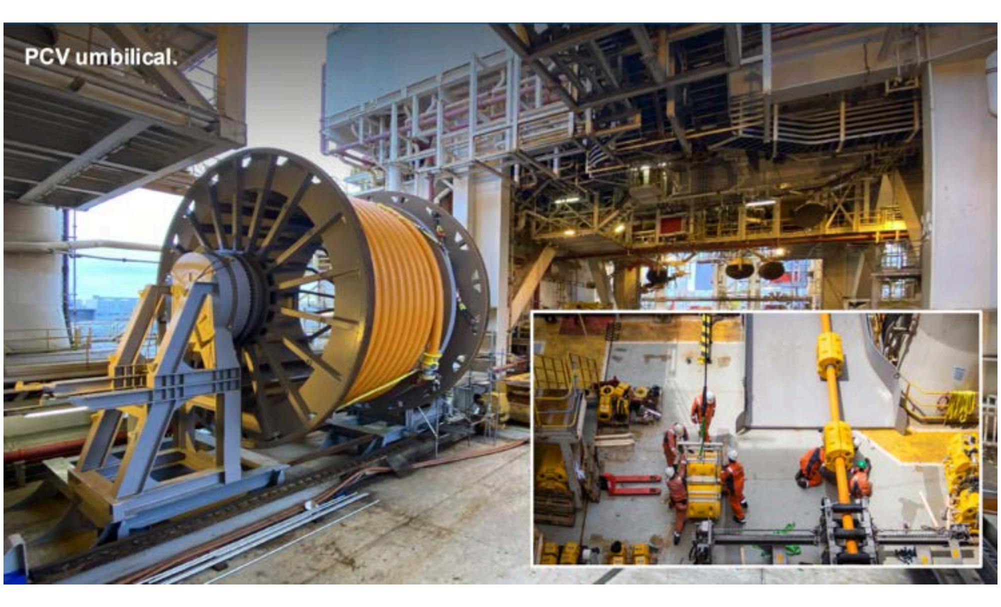
### Subsea Collector Vehicles

Self-propelled, tracked collector vehicles will collect nodules from the seafloor using seawater jets. The system involves no rock cutting, digging, drilling, blasting, or other breakage at the collection point. Umbilical cables connect the vehicle to the production vessel on the surface via which it receives power and personnel remotely control it.

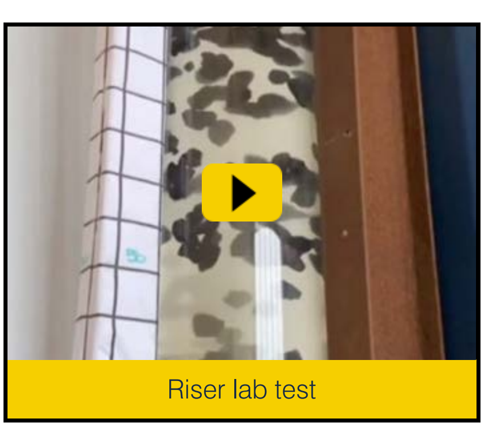


Nodules collection with water jets lab test

Track trials in lab




Rather than manipulating nodules from above, the collector vehicle applies a water jet horizontally to the seafloor to lift and collect nodules. This approach helps to minimize disturbance to seabed sediments. Laboratory testing confirmed our technical assumptions about the system's efficiency and productivity before we conducted our collection system trial in the CCZ. For example, by building a simulated analog of the seabed and the world's largest floating test tank, Allseas could test the nozzle pickup to achieve a high nodule-pickup efficiency and apply this knowledge to improve the collector vehicle's design before we tested it in the pilot collection-system trials in the CCZ.

Riser lab test

### Riser and Lift System

An airlift riser and lift system transports nodules from the abyssal depths to the surface via using ocean water. This 4.3km semi-rigid pipe pumps the nodules up from the collector vehicle to the production vessel. After a cyclone separator separates the nodules from the water on the vessel, the system returns seawater and a small amount of remaining sediment to the ocean through a return pipe.

Converted Hidden Gem that performed the pilot collection system trials

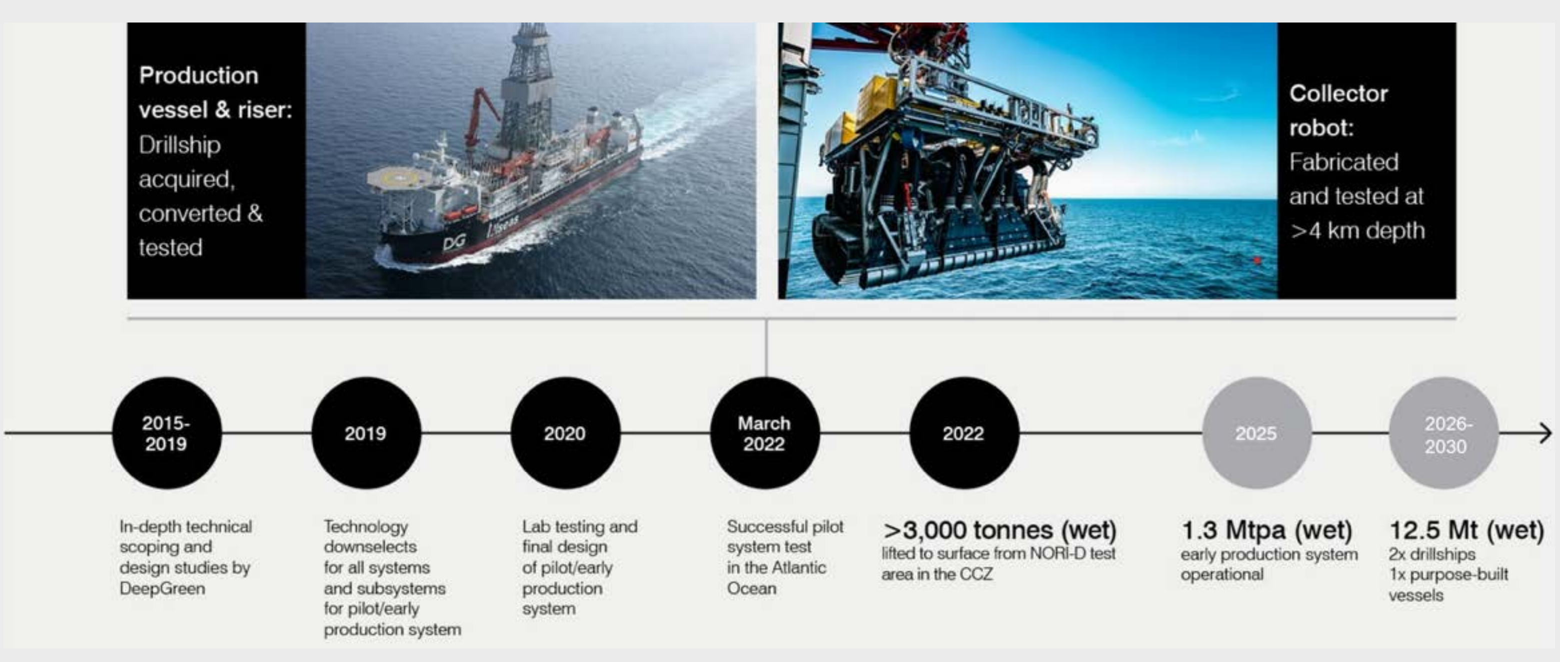
Hidden Gem arrives in Rotterdam

### Production Vessel

Through our strategic partnership with Allseas, we acquired the Hidden Gem, a former drillship vessel, in February 2020 and repurposed it into the world's first dedicated polymetallic nodule-production vessel. In 2022, we tested this 228m vessel in addition to a prototype collector, riser and lift system, and other systems in a pilot collection-system trials.

We use insights from environmental research to identify appropriate indicators and tolerance limits and, thus, to minimize impacts in our deep-sea operating environment. Once we obtain an exploitation contract, we would then expect Project Zero to commence after we have upgraded the Hidden Gem to become a production vessel that can produce up to 1.3 million tonnes per annum (Mtpa) of wet nodules.

### Offshore Development Milestones: Progress on Track




When it comes to mitigating impacts to deep-sea ecosystems, we can make many choices as we design our collection systems. For example, we can optimize the depth at which the return pipe returns water to the ocean, the nozzle head's design, and the collector vehicle to minimize how much subsea sediment the system lifts to the surface and subsequently discharges back into the midwater column. We continue to explore ways to reduce our impact on the CCZ and to improve the system's footprint. For example, because the airlift system and the dynamic positioning system that matches the vessel's position to the collector robots on the seabed consume more energy than any other system offshore, we continue to look for ways to optimize their energy efficiency and to research new technologies that can help us move away from fossil fuels.

### Next-Generation Collector Ship Design

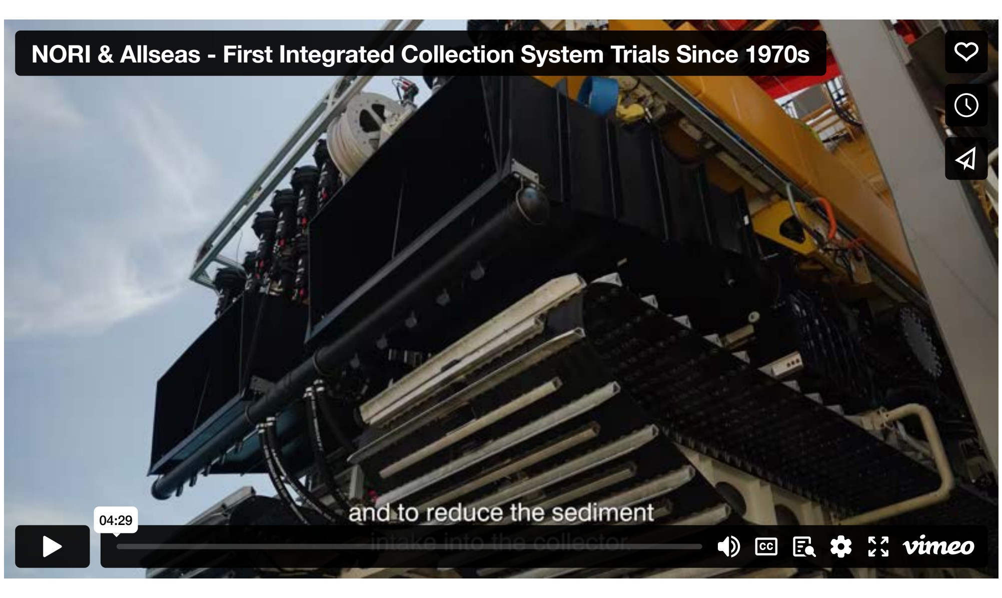
We worked with the BIG-Bjarke Ingels Group on an innovative aspirational offshore collection vessel concept that represents what the next generation of clean, efficient, marine work equipment could be. To give you a sense of scale, below is a rendering of what the operating deck of the support vessel could look like in future collector ships. This is an aspirational design concept that has not been engineered at this point.


Operating deck support vessel rendering

In this image, you can see the collector robots being sequentially launched and recovered through the central moon pool, which is designed to provide protection of sophisticated equipment from heavy seas. In this area, the collector robots can be maintained and serviced offline on the support vessel. They are designed to be replaced without shutting down production to keep any downtime to an absolute minimum. It is important to note that our first two systems will be using converted drillships where the collectors are deployed using a Launch and Recovery System (LARS) instead of moon pools.

# Collection System Trials

In November 2022, TMC's subsidiary NORI and offshore partner Allseas successfully concluded the first integrated system test in the Clarion Clipperton Zone (CCZ) since the 1970s and achieved all significant pilot milestones. In total, the operation collected approximately 4,500 tonnes of (wet) seafloor polymetallic nodules: it transported over 3,000 tonnes (wet) up a 4.3km riser system to the surface production vessel, the Hidden Gem, while purposely leaving the additional 1,500 tonnes of nodules behind on the seafloor. Our engineering partner, Allseas, spent three years developing and constructing the prototype polymetallic nodule-collection system for the test. Furthermore, TMC submitted a dedicated environmental impact statement (EIS) and environmental monitoring and management plan (EMMP) for this test. NORI distributed the EIS for stakeholder comments and revised the document based on the feedback before the ISA recommended the company could proceed with the test.

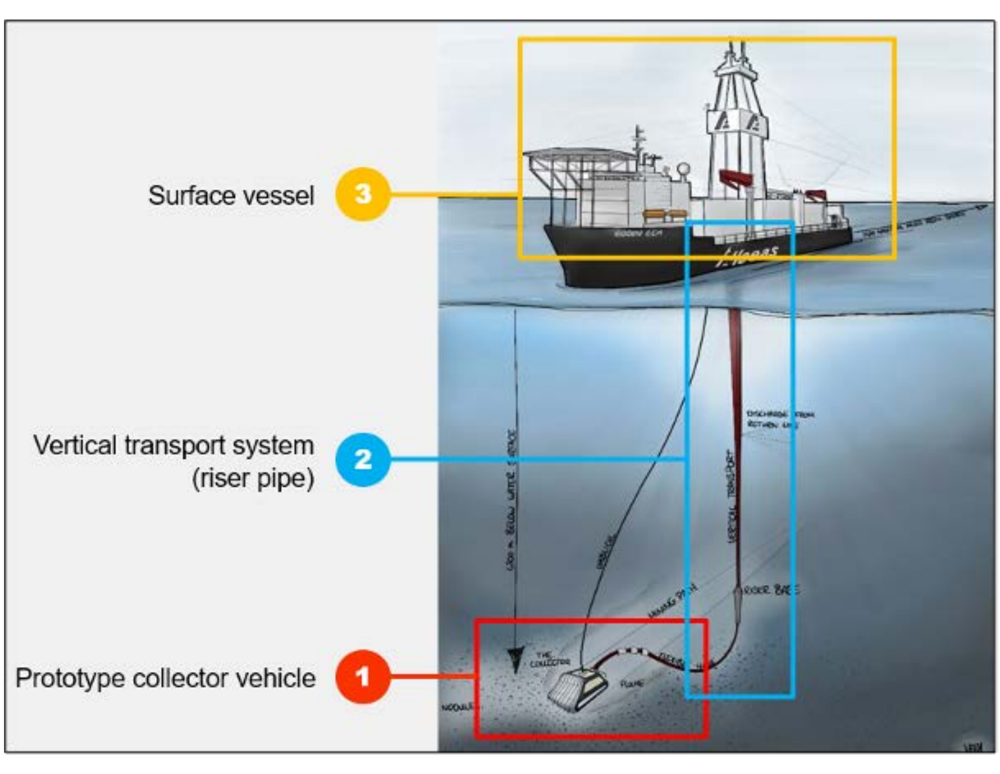



**The collection test had four main objectives:**

| | |
|---|---|
| Objective #1<br>**Demonstrate integrated pilot system capable of collecting and lifting nodules** | ✓ First successful integrated pilot system test in CCZ since 1970s |
| Objective #2<br>**Collect ~3,600 wet tonnes of polymetallic nodules** | ✓ 4,500 wet tonnes collected<br>✓ 3,021 wet tonnes lifted |
| Objective #3<br>**Test pilot system performance to inform future system optimizations and upgrade** | ✓ 86.4t/h production rate<br>Performance data acquired to be used to upgrade and optimize pilot system into Project Zero system with a targeted average production rate over 200t/h |
| Objective #4<br>**Monitor and survey pre-, during- and post-test environment** | ✓ Pre- and during surveys complete<br>✓ Post-test surveys complete |

During the integrated collection-system test, the prototype collector vehicle travelled over 80km across the seafloor in an 8km$^2$ section of NORI Area D allocated for the test. Allseas engineers put the pilot nodule collector through various tests and achieved a sustained production rate of 86.4 tonnes per hour (roughly equivalent to transporting 40 Tesla Model S vehicles to the surface every 60 minutes).

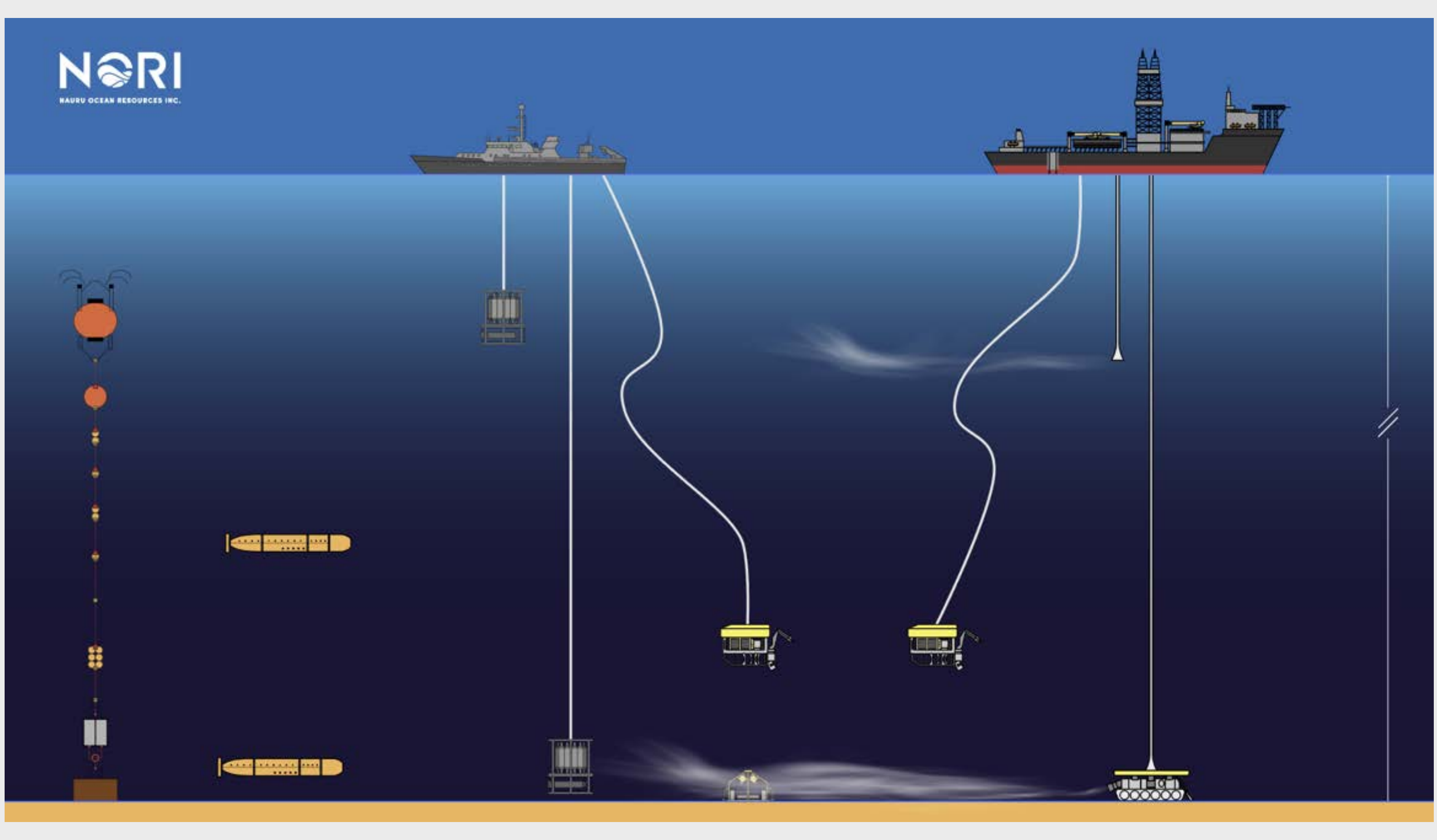
We used a nozzle design that employs water jets to entrain nodules while disturbing sediment at minimal amounts. The nozzle design reduced the benthic plume's size and extent to which it spread and also minimized the mid-water plume since it lowered the entrained sediment that the system transported along with the seawater and nodules to the surface. We injected compressed air into a 4.3km riser pipe approximately 2km below the surface to create a partial vacuum that lifted the nodules, seawater, and sediment onto the production vessel. In total, we lifted over 3,000 tonnes of wet nodules to the surface during the test.




Onboard the Hidden Gem, a cyclone separator slowed down the flow before separating out the nodules from the water and entrained sediment. A conveyor belt then transported the nodules to the vessel's hold, which stored them for transport to an onshore facility. The system returned the separated water, sediment, and fine nodule fragments to the water column at 1,200m below the surface.

During the production ramp-up sequence in October 2022, a temporary overflow that comprised seawater mixed with sediment and nodule fragments in small amounts occurred. We notified the ISA about the event, and both the ISA and independent reviewers determined it to have no potential to cause significant harm to the marine environment. Based on an assessment conducted in collaboration with subject matter experts, we made modifications to the cyclone separator, and no further overflows during subsequent test runs occurred. As we outline in the EIS for the NORI Area D collector test we conducted these trials to test an untried system and to identify opportunities to optimize the design of a full-size commercial system. Based on learnings from the test, Allseas will now scale up the collection system to include additional collector heads and a wider diameter riser pipe in preparation for NORI's Project Zero, which will target a production rate of over 200 tonnes per hour.

We also conducted the collection test to monitor the impact that the system had on the environment during operations. Specifically, the studies that NORI executed during the system test ranged from above the ocean surface (e.g., avian fauna flying above the water) down approximately 4km through the entire pelagic water column (epi-, meso-, and abyso-) into the abyssal sediments on the seafloor. These studies focused on characterizing the potential environmental impacts associated with the operation.




We collected near-field data (i.e., <200m from the collector system) from the Hidden Gem, whereas we collected far-field data (i.e., > 200m from the collector system) from a 103m research vessel—one among only a handful in the world with the equipment that one needs to perform autonomous underwater vehicle (AUV) surveys, multibeam seabed surveys, and remotely operated vehicles (ROV) surveys at depths greater than 4km.

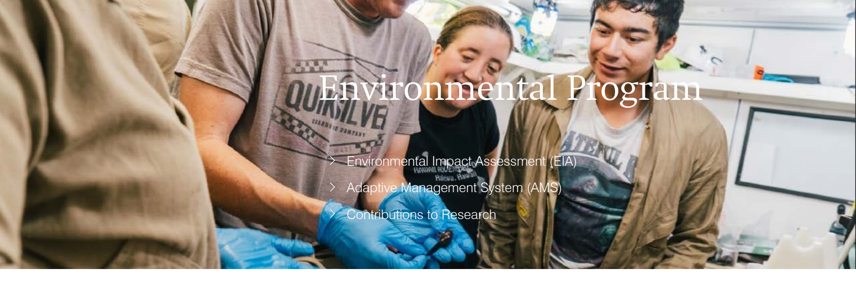
> We distributed 50 monitoring stations in and around the test field to monitor and map the far field in situ.

**We conducted the system test and environmental monitoring in three steps:**

- We conducted the first aboard a research vessel where scientists gathered critical data to help develop a pre-disturbance environment baseline. We deployed multiple subsea assets at the seafloor and throughout the mid-water column to assess the ecosystem prior to disturbance.
- The *Hidden Gem* then joined the research vessel at NORI Area D. We deployed the collection system and put it through its paces to test its overall performance and how efficiently it picked up and transported nodules. Simultaneously, independent scientists measured the system's environmental performance by monitoring the benthic and mid-water plumes' density, their physical and chemical composition, the extent to which they spread, and the noise that the system generated.
- We conducted the third step aboard the research vessel after we completed the successful collection system test and the Hidden Gem departed the area. Scientists repeated all the workstreams from the initial baseline studies to assess the state of the ecosystem after the disturbance. They took low-altitude camera images with an AUV to compare the seabed topography and faunal communities before and after disturbance. They also took box core and multicore samples from the disturbed areas to compare if and how the epifauna, infauna communities, and sediment geochemistry may have changed due to the disturbance. Finally, the scientists visually assessed sedimentation plates to determine the extent to which sedimentation spread from the point of disturbance.

Independent world-leading deep-sea research institutions have contributed to the environmental baseline and impact studies that will form the basis of the NORI Area D environmental impact assessment (EIA) in our application for an exploitation contract, which we plan to submit in 2024. We also expect these institutions to openly publish their research in peer-reviewed journals.

**Collaborating with Leading Research Institutions and Industry Experts** to Understand Our Environmental Impacts




- Science advisory board
- Environmental baseline sampling
- Environmental monitoring of nodule-collection trials
- LCA on NORI-D environmental impacts
- LCA on climate change, waste, and white paper
- EIS for collector test and production
- Adaptive management system

Environmental Baseline Expeditions:

5A 5B 5C 5D 5E

Resource Definition:

6A 6B

Collector Test Environmental Surveys:

7A1 7A2 7B2

Collector Test Monitoring:

7B1

The environmental program forms the foundation of our environmental impact assessment (EIA), itself the largest component of our application for a commercial nodule-collection license. We have conducted the program to ensure we sufficiently understand the deep-sea ecosystem to mitigate the harm that our operations could cause to the environment. With help from experts, which includes an external science advisory board, we have been able to answer many questions and more clearly understand our contract areas in the CCZ. We have already begun using this knowledge to inform the EIA and the design of the commercial collector system and adaptive management system (AMS).

Scientists have established that the sedimented abyssal seafloor where polymetallic nodules reside constitutes the most common habitat type on Earth and covers approximately 70% of the ocean floor[1]. They have also established less than 10% of all marine organisms live below 4km[2]. Through the work being done in our environmental program, we have developed baseline knowledge about the marine organisms that live in the water column and on the seabed and begun analyzing how our activities might impact them.

We have designed the most comprehensive seabed-to-surface research program that anyone has ever conducted in the region to date. We have commissioned the world's leading ocean scientists to conduct more than 100 individual studies to characterize the biota throughout the zones in the water column and on the seabed.

[1] NOAA, "Ocean Floor Features"

[2] Yinon M. Bar-On et al., "The Biomass Distribution on Earth", May 21, 2018

## 100+ Studies: Seabed-to-Surface Ocean Research Program

**SURFACE BIOLOGY**
Surface fauna logbook (PelagOS)
Remote sensing, hydrophone acoustics

**PELAGIC BIOLOGY**
Microbial community characterization
Phytoplankton community characterization
Zooplankton community characterization
Gelatinous zooplankton characterization
Micronekton characterization
Trophic analysis (stable isotopes)
Temporal variability of pelagic communities
Trace element profiles in water column
Particulate profiles in water column
Discharge plume characterization (physical)
Discharge plume characterization (biological)
Midwater discharge (food webs particle composition)

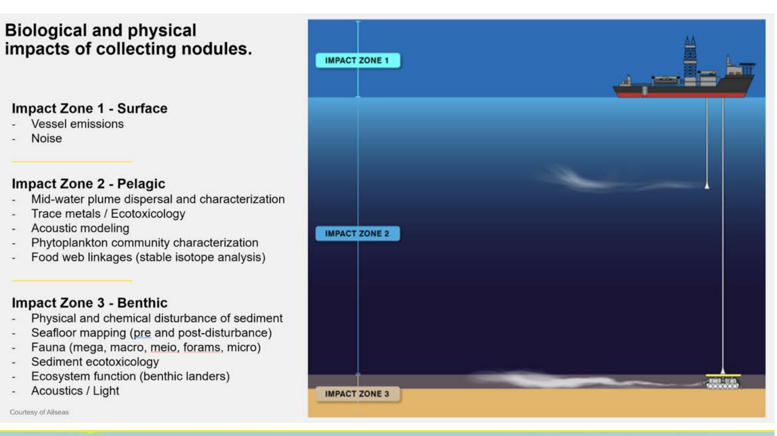
**BENTHIC BIOLOGY**
Megafauna characterization (photo transects)
Megafauna characterization (time lapse)
Macrofauna characterization
Microfauna characterization
Mesofauna characterization

**SEDIMENT ANALYSIS**
Baited camera and traps
Benthic respiration and nutrient cycling
Seafloor metabolic activities
Bioturbation, sediment characteristics
Porewater sampling
Exposure toxicology studies
Metals determination by ICP analysis
Induction of gene transcripts (metals)

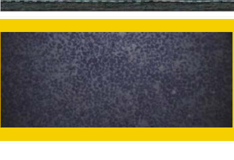
**COLLECTOR IMPACT STUDIES**
Metocean studies
Bathymetry (seabed mapping)
Habitat mapping
Database development
Digital twin development
Collector test near-field studies
Collector test far-field modeling
Plume modeling
Existing resource utilization study
Noise & light study
Meteorology & air quality study
Hazard & risk assessment
Emergency response planning
Cultural & historical resources
Waste management
Cumulative impacts

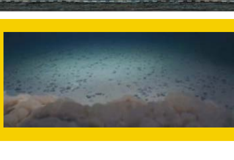

### Environmental Impact Assessment

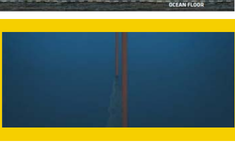
We have identified three main impact zones from which there are three key ways our operations will have an impact on the environment: nodule removal, the benthic plume, and the mid-water plume.











### 1 Nodule removal

Nodules serve as a hard-surface habitat to which some sessile invertebrates attach. Nodule collection will permanently remove most nodules and the organisms attached to them.

**Mitigation action:** we have begun researching the distribution of organisms that live in the seabed sediment and on nodules to understand the overall impact that nodule removal will have in the CCZ. Some organisms need hard nodule surfaces to sustain their critical life functions, but many others live in the sediment itself. To protect and enable repopulation:

- The ISA has set aside 43% of the CCZ as areas of particular environmental interest (APEI) that mining will never touch[1].
- TMC will set aside approximately 10% of the CCZ as additional "no-take zones" or preservation reference zones (PRZs) in its contracted areas.
- TMC also expects to leave behind approximately 15% of nodules in our operational areas.

For comparison, protected areas safeguard only 8% of global oceans today[2], though the Global Biodiversity Framework that the international community adopted in December 2022 set 30% as a target to reach by 2030[3].

### 2 Benthic plume

As the collector vehicle moves across the seafloor, it will disturb and entrain a thin surface layer of the seafloor sediment. The collector vehicle will separate the majority of the sediment that it entrains and discharge it back to the seafloor within meters from its origin, which will generate a plume. This plume may spread to other areas, and the fine sediment may clog filter feeding organisms' feeding and respiratory structures. Sedimentation may also bury nodules and, thus, make it hard or impossible for animal larvae to attach to them. Several studies have begun to model how the benthic plume behaves, and, to date, initial findings suggest that the plume may not have as widespread impacts as previously thought. Peer-reviewed research based on field studies on seafloor and mid-water plumes that MIT and Scripps published in 2022 found that 92-98% of the plume from pilot nodule-collector vehicle rose only 2 meters above the seafloor[4]. Study co-author Thomas Peacock from MIT commented: "It's quite a different picture of what these plumes look like, compared to some of the conjecture"[5].

**Mitigation action:** Plume models predict that plume would resettle within days in a 100-1,000m radius from the origin. Field studies were realized as part of the collector vehicle testing that took place in 2022 to model actual plume generation and analysis is being completed. With in field knowledge of plume behavior, we continue to explore reduction solutions via discharge parameters and mining patterns, and to find ways to accelerate particle flocculation, which will speed up sediment resettlement on the seabed[6]. The dredging industry has developed significant knowledge on plume dynamics over the years, which we also use to design and establish the best parameters to mitigate the benthic plume that the collector vehicle generates.

### 3 Return water plume

Nodules, seawater, and any residual sediment that eludes separation inside the collector vehicle will enter the riser pipe and travel to the surface vessel. Once aboard the vessel, a cyclone separator will dewater the nodules and the seawater that the riser system used to transport nodules along with any residual sediment and nodule fines (from nodules breakage in transport) will return to the water column at depth below the measured oxygen minimum zones where it will form a highly dilute plume (the "mid-water plume"). Key risks to the biotic environment from the mid-water plume include clogging pelagic nekton's respiratory and filter-feeding structures and remobilizing heavy metals and toxins that the sediment previously sequestered and possibly making them available for bioaccumulation in the food chain.

**Mitigation action:** We continue to research optimal reinjection points that will cause minimal disruption to marine wildlife. In a study on the mid-water plume, MIT found that modeling can reliably predict a mid-water plume's properties in the vicinity of its discharge[7].

[1] ISA, "Decision of the Council of the International Seabed Authority relating to the review of the environmental management plan for the Clarion-Clipperton Zone", Dec. 10, 2021

[2] United Nations, "UN Ocean Conference 2022: 'Fleet' of solutions to be launched", 2022

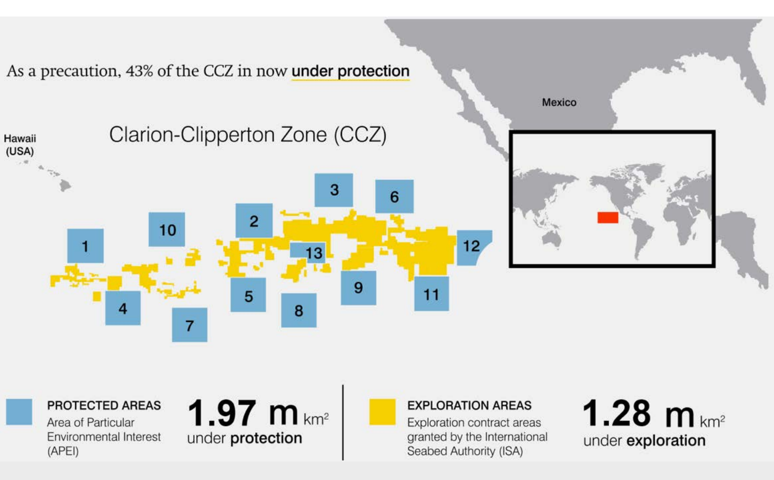
[3] Convention on Biological Diversity, "COP15: Nations adopt four goals, 23 targets for 2030 in landmark UN Biodiversity Agreement", 19 Dec. 2022

[4] Carlos Muñoz-Royo et al., "An in situ study of abyssal turbidity-current sediment plumes generated by a deep seabed polymetallic nodule mining preprototype collector vehicle", 21 Sep. 2022

[5] Science Daily, "Ocean scientists measure sediment plume stirred up by deep-sea-mining vehicle", Sep. 21, 2022

[6] Modeling completed by DHI. Source: Company's ESIA program

[7] Carlos Muñoz-Royo et al, "Extent of impact of deep-sea nodule mining midwater plumes is influenced by sediment loading, turbulence and thresholds", July 27, 2021

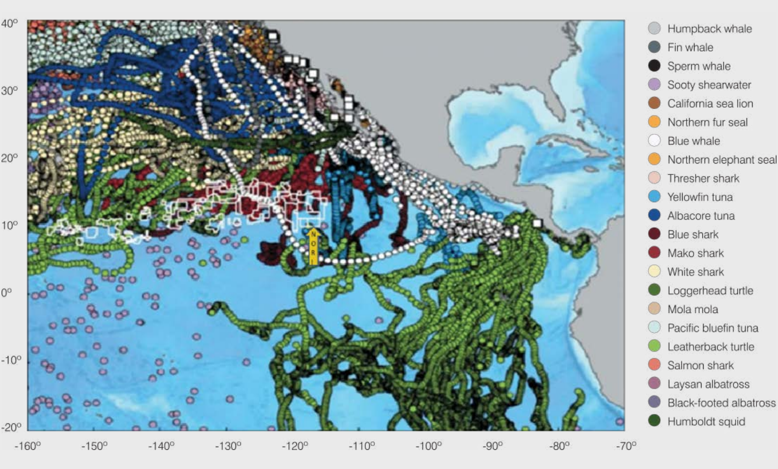



Source: ISA, "Decision of the Council of the International Seabed Authority relating to the review of the environmental management plan for the Clarion-Clipperton Zone", Dec. 10, 2021

We expect to be able to avoid or minimize many impacts that our operations may have on the marine environment by designing the collection system in clever ways. For example:

- Increasing the depth at which the return pipe returns water to the ocean can minimize the impacts on the more productive mesopelagic layer. Since most marine life lives in the upper layers, placing the discharge in bathypelagic zone contributes significantly to minimizing impacts. Also, an adjustable collector head can adapt the water jet that the collector vehicle uses to pick up nodules to minimize sediment disturbance and, with it, the size of the benthic and mid-water plumes.
- We also want to design a system that minimizes acoustic disturbance to the water column since the cetaceans such as whales and dolphins that occasionally traverse the CCZ rely on sound for many activities, such as communicating, navigating and feeding. Fortunately, tracking data for key migratory species in the eastern Pacific exists. It shows that NORI Area D falls outside the known migratory routes for many shark, whale, turtle, bird, and commercially important fish species found in the eastern tropical Pacific.

### Tracking Data for Migratory Species in the Eastern Tropical Pacific[1]

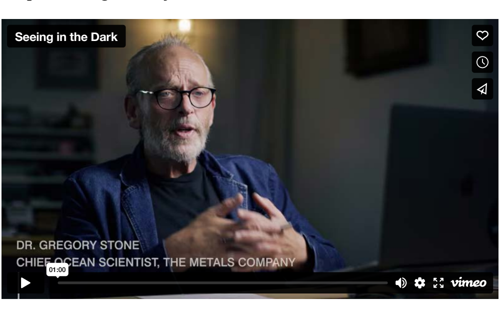



[1] Fathom Pacific (2020b) adapted from Block et al., Tracking apex marine predator movements in dynamic ocean, June 22, 2011

Importantly, our operations in the CCZ will disturb each area we collect nodules from only once. After nodule collection, we will leave the area alone to recover. The CCZ resides in such a remote location that we expect there would be few, if any, cumulative impacts from other activities. While we have yet to obtain completed research on recovery rates, we expect to report on recovery rates at a species level. We expect mobile species such as fish to return soon after mining, whereas we expect some microbes and larger organisms that live in the sediments to potentially take longer to recover (anywhere from tens to hundreds of years). We do not expect the organisms that rely on the nodules for habitat to recolonize areas where we have removed them. Anticipating this outcome, the ISA has established an APEI network in the CCZ to create a reservoir with protected species that could re-colonize mined areas if and when conditions become favorable.

Beyond effective design, we will also be able to fine-tune our operations via using an adaptive management system (AMS) that will allow us to monitor the precise conditions in the deep sea.

### Adaptive Management System




To support deep-sea operations, we have begun developing and testing an AMS with leading organizations around the world. This state-of-the-art predictive system will use environmental and operational data and will enable TMC to mitigate operational impacts in the deep-sea environment as much as possible. It has **three main objectives:**

**Transparency**
Provide eyes and ears to a secluded & extreme environment

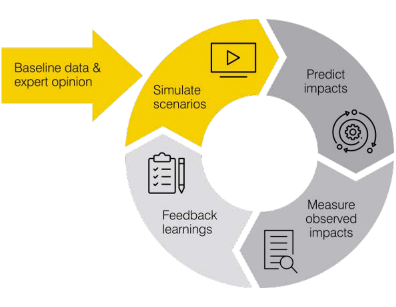
**Regulations**
Meet UN-ISA draft regulations on exploitation of mineral resources in the Area

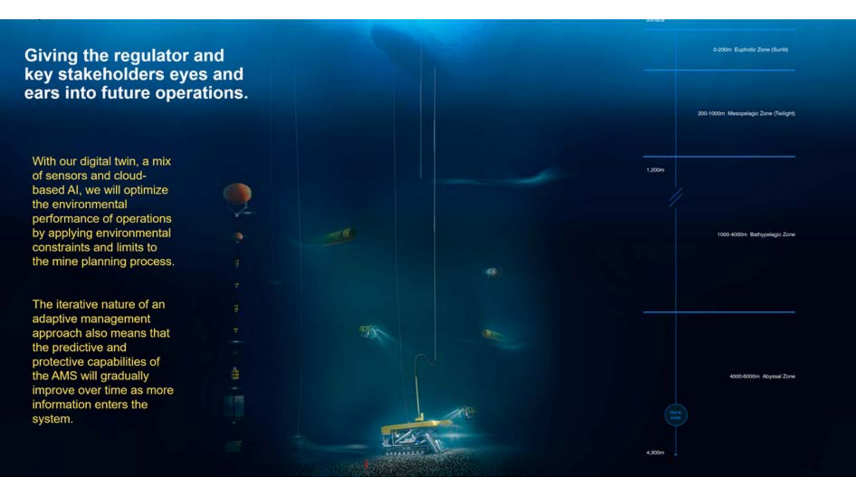
**Env Impact**
Minimize, mitigate, and avoid environmental impacts where possible.

A structured, iterative, and robust decision-making system, the AMS will allow TMC to simulate planned operational scenarios and predict their environmental impact with an increasing level of certainty over time via continuous system monitoring and adjustments. In particular, the system will connect key incoming data (e.g., research, expert opinion, data from sensors) with a simulation and prediction platform. This data will continually update a digital twin of the collector system, which will enable TMC to make near real-time and informed environmental management decisions[1]. Like guardrails on a highway, the AMS will help ensure that TMC adheres to environmental regulations.

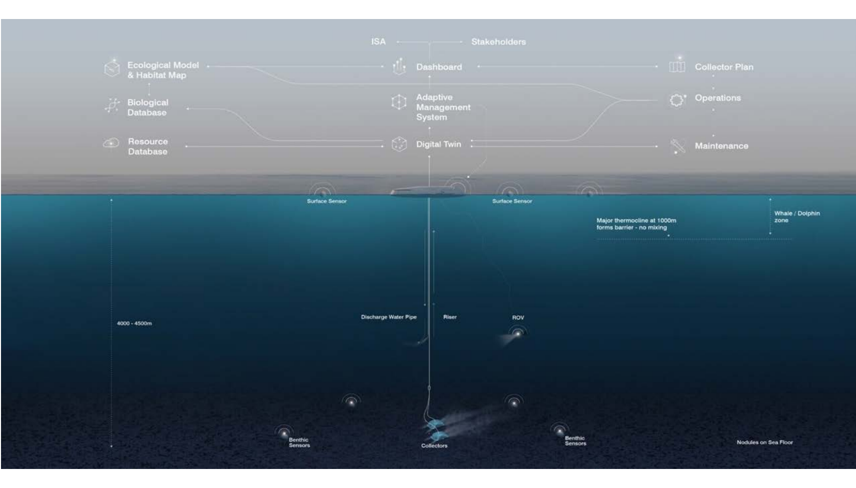
[1] Buckley et al, "Use of an Adaptive Management System to Minimize Impacts of Deep-Sea Nodule Collection", Dec. 30, 2021

AMS Loop




At its core, the AMS technology stack has a digital twin that will virtually represent the deep-sea operational environment and enable TMC to visualize its deep-sea operations in 3D. With this component, TMC will be able to track underwater robots and vehicles in near real time with data coming in from many different deep-sea sensors. As the digital twin ingests data, it will rely on models that environmental and data scientists have developed using state-of-the-art methods to simulate the future and generate plans or make contingencies. We have partnered with Kongsberg Digital, a world-class provider of high-technology systems and solutions for the oil and gas, merchant marine, defense, and aerospace industries, to power this core AMS element.




As part of TMC's commitment to transparency and accountability in this new industry, we have developed an initial **public dashboard** concept that we intend to make available in the future for all stakeholders to view, analyze, and download operational data. The dashboard will provide information such as the collection system's locality and activity in the CCZ along with tracked ecosystem variables and their comparison to baseline environmental values as determined by our offshore research.

Together, the AMS and digital twin will form key components of an integrated **environmental management system (EMS)**. The digital twin will optimize our operations' environmental performance by applying environmental constraints and limits to the mine-planning process.


> We will share data from the AMS with researchers and academic institutions to improve humanity's knowledge about the world's oceans and aid efforts to conserve deep-sea and connected ecosystems.

We tested a first iteration of the AMS during the 2022 collection system trials. It performed as designed and tracked equipment's location in near real time (e.g., vessel, collector, remotely operated vehicles, and riser), monitored operational parameters (e.g., pickup rate, slurry flow rate, nodule conveyor rate, total tonnage collected), and tracked the actual collector vehicle's trajectory compared to the planned path.

The next steps for the AMS development include:

- Integrate data between environmental monitoring vessels and operations vessels
- Add simulation capacity to model plume semi-regularly
- Add more playback features for historical data (e.g., collector vehicle and ROVs footage and trajectory)

**Contributions to Research**

Ocean Research: Partnering to Increase Human Knowledge

We feel proud to contribute to society's knowledge about the deep ocean through our comprehensive environmental program. We have invested over US$100 million in research to understand the CCZ from the surface down through the water column to the abyssal plain. For instance, we have focused on better understanding habitat connectivity and how it relates to the distribution and function of deep-sea organisms and the overall structure of their communities.

Overall, we also see untapped potential for ocean science, which includes our own research, to make significant contributions to science, medicine, and technology more widely and, thus, humanity in general. Indeed, in recent years, new ocean discoveries have had unimagined implications—from compounds found in marine microbes with antiviral properties to ocean bacteria with the potential to clean polluted soil and water[1]. We view this potential as motivation to continue funding such an extensive scientific program and to conduct it in a transparent and collaborative way.

Accordingly, we continue to develop active partnerships with leading researchers, share our vast catalog of deep-sea biological and sediment samples with labs for study, and share the data we collect with the ISA and the international community. Related to this last point, the ISA has developed an open-source database called DeepData to house all scientific and environmental data that companies collect to benefit the scientific community. Scientists who derive work from these samples can freely publish their findings.

With the help of research institutions around the world, we have supported over 100 original studies across several primary work packages:

- Sediment analysis
- Surface biology
- Benthic biology
- Pelagic biology
- Collector impact studies

Ongoing support studies that contribute to these work packages include:

- Metocean studies
- Collector test near-field studies
- Collector test far-field modeling
- Plume modeling
- Habitat mapping
- Collector test ESIA
- Database development
- Digital twin development

Marine Genetic Resources: Contributing to Human Knowledge

We have built a library of deep-sea biological samples and preserved them for the day when the ISA establishes the final regulatory framework. Deep-sea organisms represent a wealth of genetic material from which we could source new drug and treatment ideas for humans. The U.S. Food and Drug Administration has approved six deep-sea-derived drugs to date, which have generated US$2.3 billion per year in global pharmaceutical services[2]. While most marine genetic research has focused on creatures that dwell in shallow and tropical ocean water, attention has increasingly shifted to the deep sea where organisms have adapted over thousands of years to survive in cold, dark, and highly pressurized environments. Ziconotide, a synthetic form of peptide extracted from the venom of predatory tropical cone snails Conus magus that live 2km deep in the sea, represents a particularly successful example. Under the brand name Prialt™, the European Medicines Agency licensed ziconotide as a non-narcotic anti-pain drug[3].

[1] Fuad Ameen et al., "Marine microorganisms as an untapped source of bioactive compounds", Jan. 2021

[2] D. Ottaviani, "Economic value of ecosystem services from the deep seas and the areas beyond national jurisdiction", 2020

[3] Patrizia Russo, "Deep sea as a source of novel-anticancer drugs: update on discovery and preclinical/clinical evaluation in a systems medicine perspective", Feb. 20, 2015

# Regulations and Contracts

- 15-year contract
- Five-year work programs and review cycle
- Annual reports cycle

The ISA grants exploration contracts for a 15-year period with the option to apply for five-year extensions. However, a private contractor can only apply with sponsorship from an ISA member state. In our case, the Republic of Nauru sponsors NORI and the Kingdom of Tonga sponsors TOML. All contractors need to provide information to enable the ISA Council to determine their financial and technical capabilities to carry out proposed activities. Contractors must submit a five-year program of work and report annually to the ISA. Every five years, the contractor must then review its program and propose a subsequent five-year program to the ISA.

The regulations on prospecting and exploration set out the ISA's and contractors' duties and obligations regarding the seabed activities under contract and follow a standard formula that requires signatories to abide by the provisions in the 1982 UNCLOS and the 1994 Agreement relating to the Implementation of Part XI of the Convention. The Legal and Technical Commission (LTC) also issues and periodically updates various recommendations as a supplement to the regulations as guidance for contractors and sponsoring states.

After signing a contract with the ISA, **contractors commit to several requirements**:

- Providing an annual report to the ISA on the activities in the Area. The ISA monitors these reports through the LTC, and evaluations cover exploration work, environmental studies, work on developing mining technology, and legal and financial issues.
- Preventing, reducing, and controlling pollution and other hazards to the marine environment arising from exploration activities. This requirement means that contractors must not only monitor their activities but also collect baseline data to establish the local environment's natural conditions before any human intervention occurs.
- Proposing a program for training developing state nationals. The contract incorporates the agreed training program once the ISA approves it.
- Submitting a contingency plan to respond effectively to incidents arising from activities in the exploration area, prior to beginning activities under the contract.

As the Mining Code section in this report notes, the ISA developed the regulations on exploration and prospecting in 2000 and updated them in 2013, while it has been developing the regulations on exploitation since 2014. The ISA has made solid progress on these regulations thus far, and the process remains open to stakeholder consultation. While the coronavirus disease of 2019 (COVID-19) pandemic delayed efforts to complete the regulations, the ISA has recently adopted a new project work plan and work continues. More certainty around when the ISA will complete this work has emerged since the Republic of Nauru submitted a two-year notice in accordance with the 1994 implementation Agreement.

We currently focus on applying for our first exploitation contract from the ISA on the NORI Area D with a goal to begin commercial production in 2025. To that end, we have a particular focus on completing our ESIA.

# Our Onshore Operations

Our onshore activities include all activities related to converting nodules into products once shipped to a port from the CCZ. Our onshore activities focus on two major workstreams: developing our processing system and constructing/selecting sites for plants.

## Processing System Development

**Concept development and engineering:** metallurgical concept development, mass and energy balances, equipment selection and sizing, developing capital and operating cost estimates.

- Flowsheet design with Hatch
- Near-zero waste, renewable energy

**Test work and piloting**: metallurgical test work and equipment pilot demonstration of the flowsheet processing steps.

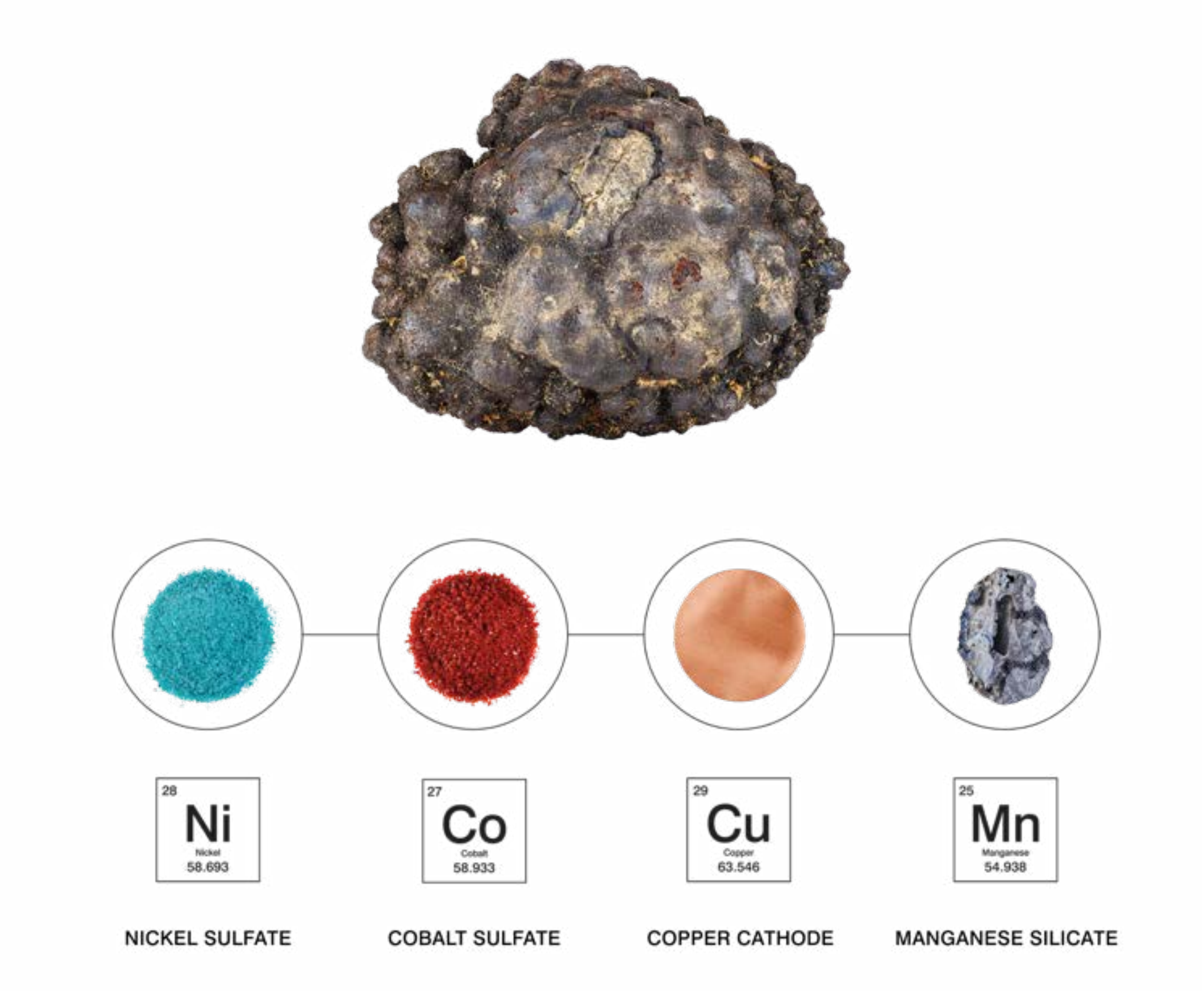
- Lab tests with Kingston Process Metallurgy (KPM)
- Pilot plant program with FLSmidth, XPS/Glencore, and SGS

## Plant Site Selection and Construction

Our approach to selecting plant sites depends on the NORI Area D Project's development phase. For Project Zero, we seek to leverage existing facilities. In November 2022, we entered into a non-binding memorandum of understanding ("MoU") with Pacific Metals Co Ltd (PAMCO) in Japan to evaluate the toll treatment of an initial quantity of 1.3 million tonnes per annum (Mtpa) of wet nodules at PAMCO's Hachinohe smelting facility starting in 2025. In parallel, we have begun to assess potential locations and partners for constructing a plant for Project One, which involves projects such as:

- Conducting a global location study
- Creating a shortlist to determine appropriate jurisdictions
- Assessing site requirements (e.g., market proximity, port, renewables)
- Selecting partners
- Assessing constructability

TMC intends to supply high-value products (i.e., nickel sulfate, cobalt sulfate, and/or NiCuCo matte) to the rapidly growing electric vehicle battery market along with copper cathode for which demand continues to grow. We also intend to sell manganese silicate with which one can make silico-manganese alloy, a critical input for manufacturing steel.




## Achieving Timeline: Focus on High-Value Intermediates


1. 11.3 Mtpa (wet) for NORI-D and 54.5 Mtpa (wet) in full field development scenario for NORI+TOML. Disclaimer: the conceptual design of the processing plant has not been engineered and is provided for visual illustration only.

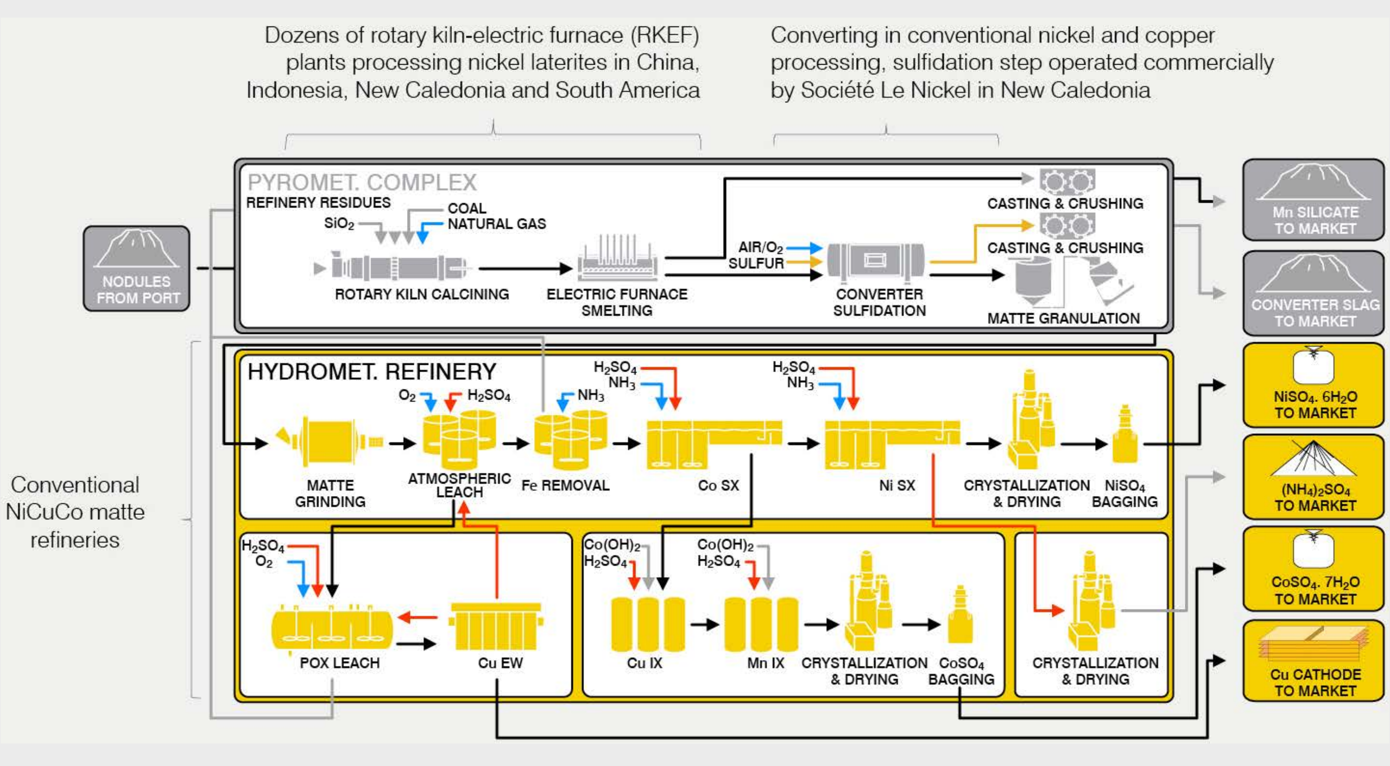
# Processing System: Flowsheet Development

- Product definition
- Near-zero-waste metallurgical process flowsheet development
- Concept engineering by Hatch
- Lab test with KPM
- Pilot plant program with FLS, XPS/Glencore and SGS
- Product development testwork
- Marketing strategy

To process and refine collected nodules into critical metals, we have developed a near-zero solid-waste flowsheet together with our consultants Hatch, a metallurgical process design firm, and Kingston Process Metallurgy (KPM). We selected our flowsheet because it met the project objectives for near-zero solid-waste, high-pay metal recovery, the ability to produce high-value products, and low costs compared to alternative technologies. This flowsheet uses conventional equipment with modifications to account for the polymetallic nodule resource, which means we can leverage existing rotary kiln electric furnace (RKEF) operations.

This process flowsheet generates nickel sulfate, cobalt sulfate, copper cathode, manganese silicate, and fertilizer-grade ammonium sulfate as key products. The processing flowsheet also provides the potential to generate intermediate product, a nickel-copper-cobalt alloy or nickel-copper-cobalt matte. We expect nickel to account for almost half of our future production revenue.

## Low-Risk flowsheet: Using Conventional Equipment and Generating Near-Zero Solid Waste




By using a conventional flowsheet, we can streamline the development costs and timeline, and, since each technology component has substantial commercial precedence, we can be reasonably confident in our capital estimates. Based on this approach, we expect to generate cash flow with a low capital requirement—a key component in TMC's strategy.

We believe we have designed an onshore system with the lowest possible solid metals waste stream, leveraging the benefits that the nodules themselves provide (i.e., they contain useful high-grade metals with very low amounts of undesirable elements toxic to human health and/or the environment). For instance, our flowsheet design means we can recycle the relatively small stream of residue from the refinery process into the smelting process, which will increase our recoveries (i.e., how much metal we extract from nodules as a percentage of their actual metal content). Similarly, we have intentionally made decisions to ensure we produce byproducts rather than waste. An example includes the inert converter slag that we will produce, which the construction industry can use to, for example, pave local roads. Overall, we have deliberately decided to embrace strong ESG standards as we believe that the benefits outweigh the costs.

### Key Process Inputs

**Pyrometallurgical Plant**
- Nodules
- Electricity
- Natural gas
- Coal

**Hydrometallurgical Refinery**
- Air
- Natural gas
- Sulfuric acid
- Ammonia
- Water

### Key Process Outputs

**Pyrometallurgical Plant**
- Manganese silicate
- NiCuCo alloy or NiCuCo matte
- Byproduct – converter slag/aggregate

**Hydrometallurgical Refinery**
- Nickel sulfate
- Cobalt sulfate
- Copper cathode
- Byproduct – ammonium sulfate

## Near-Zero Solid Waste: How We Achieve It

We start with nodules that have remarkably low levels of harmful elements

Dual pyro/hydro process allows for residues to be recycled to smelter

We select plant sites based on proximity to markets for byproducts and access to renewable energy

We select reagents that produce products instead of waste

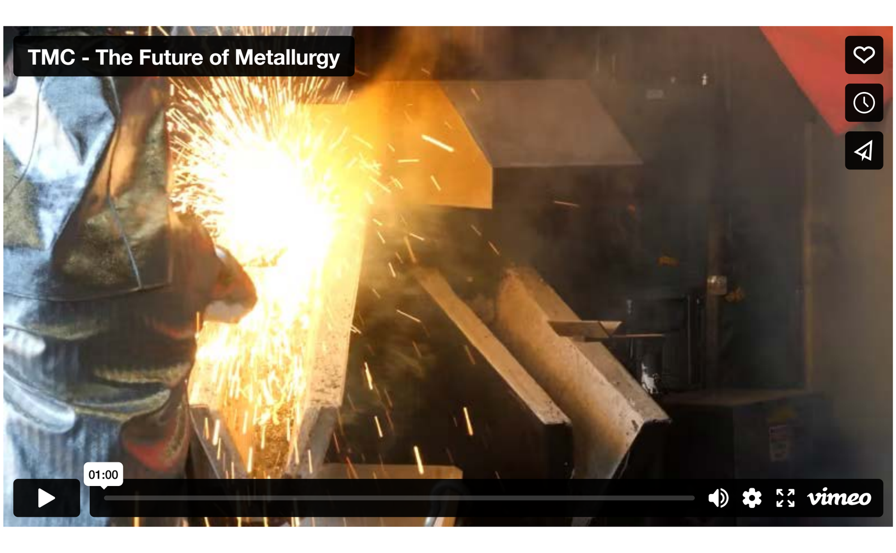
### Key Developments

We have completed lab-scale test work and pilot-scale pyrometallurgical testing with assistance from our world-class partners Kingston Process Metallurgy (KPM), FLSmidth, SGS Canada, and Expert Processing Solutions (XPS) (a Glencore subsidiary). As we advance our onshore program, we continue to validate that we can scale the custom-designed flowsheet relatively easily while maintaining suitable recoveries of products consistent with those observed during testing.


Specifically, in 2021, we completed our pyrometallurgical pilot testing on the polymetallic nodules with FLSmidth and XPS. The smelting, sulfidation, and converting pilot-scale campaigns successfully created two distinct products:

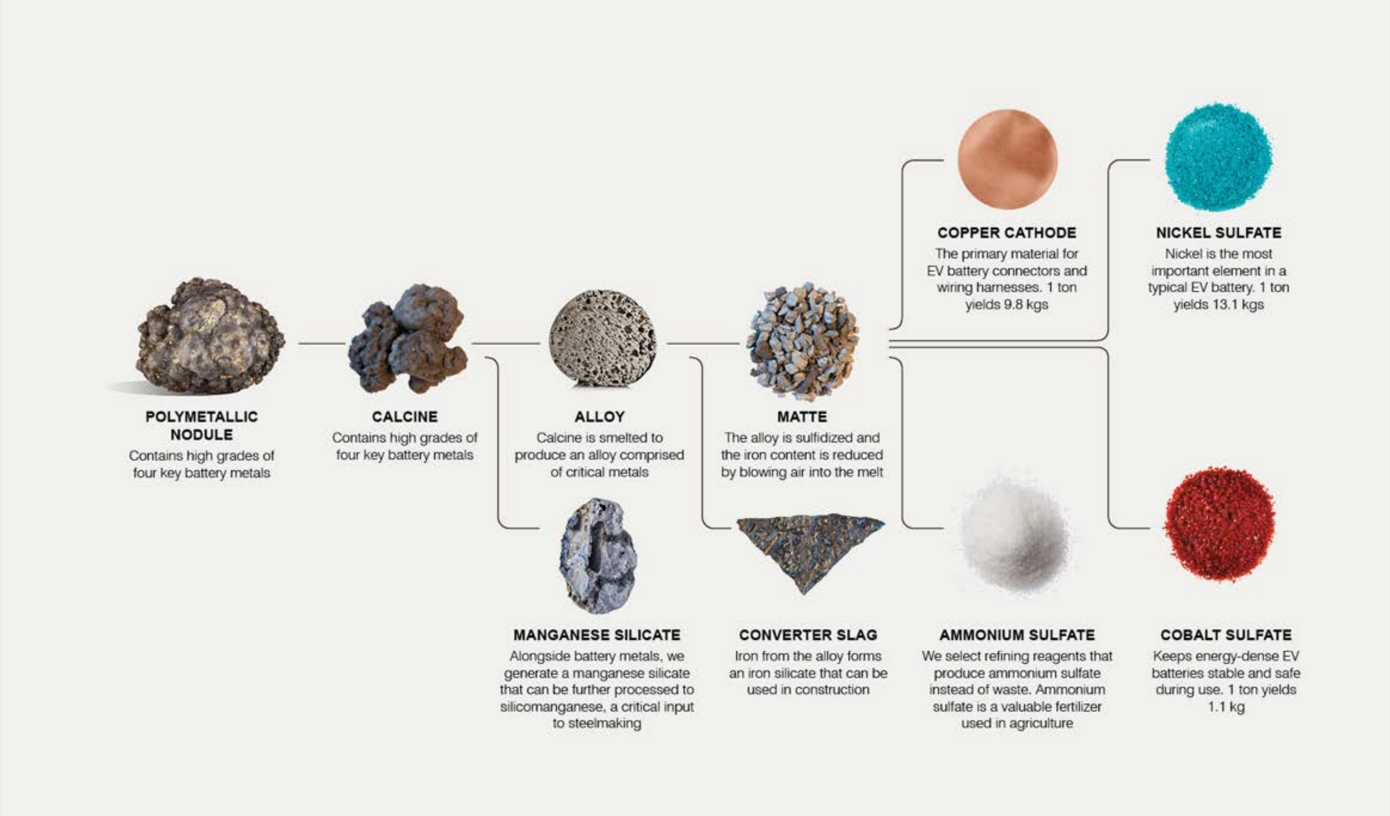
- **A nickel, copper, and cobalt (NiCuCo) matte product** via sulfidizing an intermediate NiCuCo alloy. We expect the matte product to serve as feedstock for producing critical metals that EV batteries and wiring require.
- A **manganese silicate product** that we can sell directly to market and that can undergo further processing to become a manganese alloy, a critical input for producing steel.

In 2022, one of Europe's largest independent research institutions, SINTEF, studied TMC's manganese silicate product and found that it behaves similarly to traditional manganese sources. TMC's high-grade nodule-derived manganese silicate product appears to offer significant advantages over conventional manganese ores both in cost and carbon footprint. As a pre-reduced product, TMC's manganese silicate product effectively offers downstream clients the opportunity to decrease the energy that the carbon-intensive reduction step requires for producing manganese alloy and, thus, yield significant emissions savings.

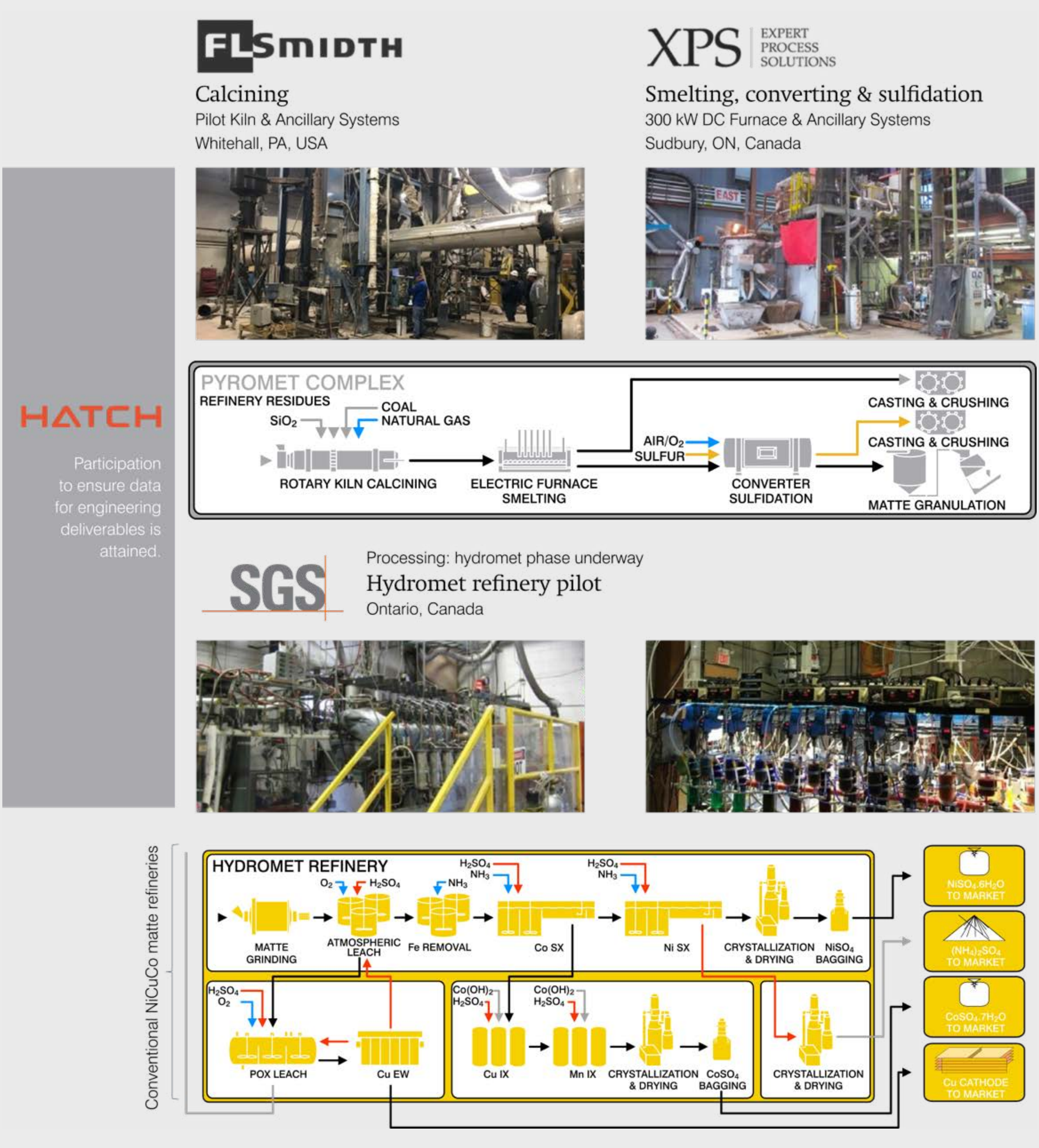



We transported the matte that XPS generated to Lakefield, Ontario, Canada, where SGS Canada Inc used it as a feed for a hydrometallurgical refinery bench-scale test work program designed to produce nickel sulfate, cobalt sulfate, copper cathode and fertilizer-grade ammonium sulfate. All tests conducted to date have yielded zero solid waste, and we anticipate that we will fully demonstrate the proposed flowsheet by end-2023.

## Zero Toxic Tailing, Near-Zero-Waste Metallurgical Process that Uses Entire Nodule Mass




## Flowsheet Development: Working With Best-in-Class Service Providers




For **Project Zero**, our strategy focuses on getting into a business scenario that leverages existing operations to create high-value intermediate products. This strategy will create a capital-light path to production.

In November 2022, we entered into a non-binding memorandum of understanding ("MoU") with Pacific Metals Co Ltd (PAMCO) in Japan to evaluate the toll treatment of an initial quantity of 1.3 Mtpa of wet nodules at PAMCO's Hachinohe smelting facility starting in 2025. Currently, the toll treatment will occur on a dedicated rotary kiln-electric arc furnace (RKEF) processing line and produce two products: NiCuCo alloy (an intermediate product that can be used as feedstock to produce lithium-ion battery cathodes) and a manganese silicate product (that can be used to make silico-manganese alloy, critical input for manufacturing steel). Located on the coast in northern Japan, PAMCO's Hachinohe facility possesses the necessary port and processing infrastructure to receive and process polymetallic nodules and to ship products to customers.

Under the MoU, PAMCO will undertake studies to estimate the cost to process polymetallic nodules through existing facilities and identify any additional equipment requirements, which we currently expect to be minimal. This work will inform expected nodule throughput, process operating conditions, and product specifications for PAMCO's dedicated production line. PAMCO has received a 22-tonne polymetallic nodule sample for use in the evaluations. In parallel, PAMCO has begun studying whether it can add a facility to process the intermediate alloy to a nickel, copper, and cobalt matte, an upgraded intermediate battery supply chain feedstock.

## Achieving Timeline: Focus on High-Value Intermediates


**2011-2018** — Hydromet flowsheet developed and lab-tested by DeepGreen

**2019** — **20 kg** — New lower-cost, lower-risk flowsheet developed (based on conventional nickel processing), modeled and lab-tested

**2020-2021** — **70 tonnes** — Pilot plant program with FLSmidth in Whitehall, PA, and XPS (Glencore) in Sudbury, Canada

**2025** — **1.3 Mtpa (wet)** — Project Zero – small-scale commercial production using existing or partner facilities

**2026-2030** — **11.3-54.5 Mt (wet)**[1] — Tolling through existing facilities and possibly constructing new RKEF plants and refineries

[1] 11.3 Mtpa (wet) for NORI-D and 54.5 Mtpa (wet) in full field development scenario for NORI+TOML. Disclaimer: the conceptual design of the processing plant has not been engineered and is provided for visual illustration only.

# Plant Site Selection: Choosing the Right Site

**Projects for selecting a site for Project One:**

- Conducting a global location study
- Creating a shortlist to determine appropriate jurisdictions
- Assessing site requirements (e.g., market proximity, port, renewables)
- Selecting partners
- Assessing constructability

We need to ensure we find the right site for our plant to further mitigate ESG impacts and help diversify the battery metal supply chain. Currently, land-based mining companies primarily extract ore from remote regions, process it on site, and then transport the derived product to a port before shipping it mainly to Asia for processing and battery manufacturing. From there, the end product then proceeds across the world to battery end markets. TMC seeks to help reshore global metal supply chains. Several major automakers have already committed to build gigafactories to manufacture batteries and electric vehicles closer to their markets, and TMC intends to be able to bring nodules to a major port close to them to provide a supply alternative while also significantly reducing the carbon footprint of today's lengthy supply chains.

TMC has a prime opportunity to locate its processing facilities anywhere—a strategic advantage with inherent ESG benefits. In our global location study, some requirements we set included proximity to the end market; access to renewable power, natural gas, and a suitably sized port; and an available local, skilled workforce. The study identified 13 possible jurisdictions, and we shortlisted six for further review. In 2021, we completed logistics and scoping studies to examine each shortlisted jurisdiction and better understand what capital and operational costs we will need to consider during the final site-selection process.

We expect our flowsheet design to eliminate waste and be energy efficient. Ultimately, however, renewable energy and alternative metallurgical reductants will enable TMC to get as close to net-zero emissions as possible. Since our onshore metallurgical plant will consume more energy compared to any other aspect in our entire operations (see TCFD & TNFD page), where we site our plant will play a key role in addressing our future carbon footprint. One alternative to metallurgical coal that we have tested at lab scale is a torrefied spruce chip reductant. We conducted the test smoothly and found no difference compared to other smelting tests. We will continue to test reductant alternatives that can help us decarbonize, and, once we have confirmed a site location, we will be able to better assess viability.

Onshore metallurgical plant rendering

We have worked with Bjarke Ingels Group (BIG) to envision what a full-scale nodule processing facility could look like. We want to rethink the typical industrialized design that today's metallurgical facilities adopt and to build something that belongs in the surrounding environment and provides value to communities. For example, we could rehabilitate old port lands and ecosystems and build community spaces such as hiking paths and education centers for school tours and science, technology, engineering, and mathematics (STEM) education.

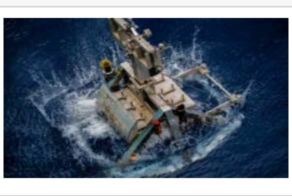
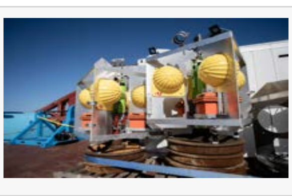
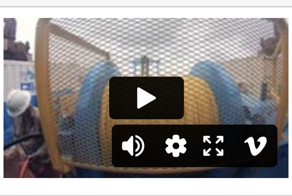
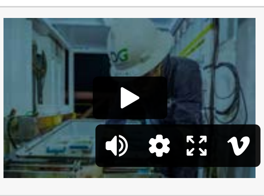
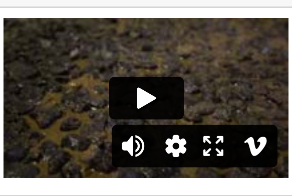
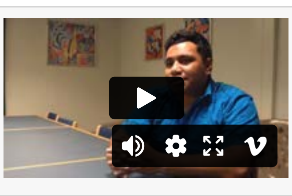
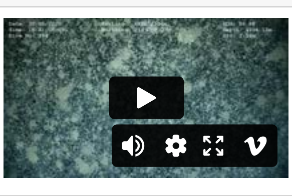
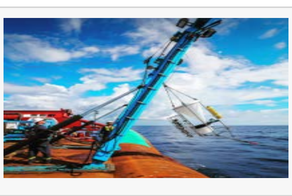
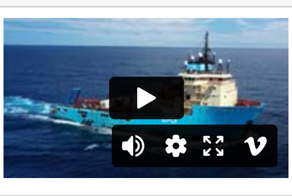
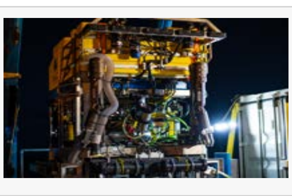
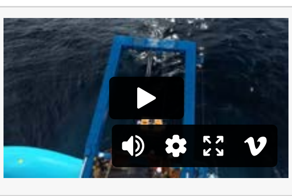
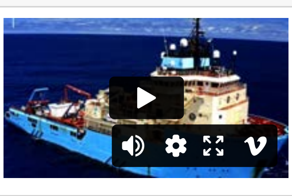
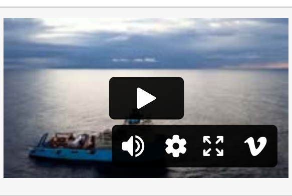
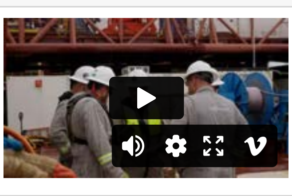
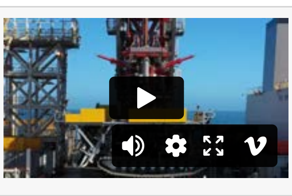
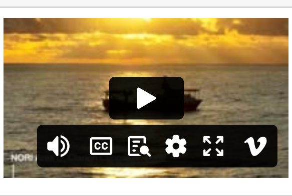
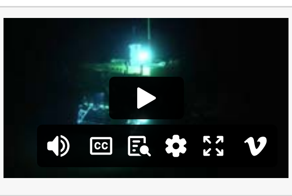
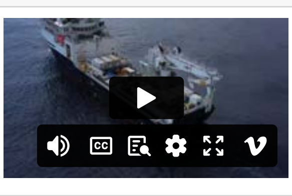
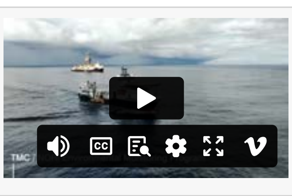
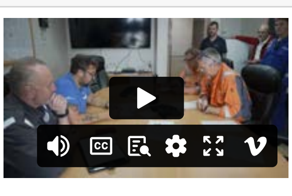
Disclaimer: the conceptual design of the processing plant has not been engineered and is provided for visual illustration only.

# Scope of our Activities – Pre-Commercial

Since 2012, our subsidiaries have carried out 23 offshore campaigns, which represent TMC's major activities. In addition, we have completed pilot-scale demonstrations for the first three onshore processing steps: calcination, smelting, and sulfidation/converting. These demonstrations produced a small footprint, which we report on below.

### List of Offshore Campaigns

In the table below, we list all exploration campaigns that we have conducted to date. Note that we include the exploration campaigns that TOML conducted before TMC acquired it and one campaign that TMC conducted on Marawa's behalf based on an existing agreement.

| Year | Area | Campaign | Scope | Length of Campaign (days) | Media |
|---|---|---|---|---|---|
| 2012 | NORI | Campaign 1 | Exploration \| NORI bathymetric mapping, geological and environmental sampling | 42 |  |
| 2013 | NORI | Campaign 2 [1] | Exploration \| NORI bathymetric mapping, geological and environmental sampling | 62 |  |
| | TOML | CCZ13 [1] | Exploration \| TOML bathymetric mapping, geological and environmental sampling | - |  |
| 2015 | TOML | CCZ15 | Exploration \| TOML bathymetric mapping, geological and environmental sampling | 97 |  |
| 2017 | TOML | CCZ17 [3] | Exploration \| TOML mooring deployment | 2 |  |
| 2018 | NORI | Campaign 3 | Exploration \| NORI-D Bathymetric mapping, geological, geotechnical, and environmental sampling | 60 |  |
| 2019 | Marawa | Marawa [2] | Exploration \| MARAWA bathymetric mapping, geological and environmental sampling | - |  |
| | NORI | Campaign 4a | Exploration \| NORI-D environmental baseline—metocean studies #1 | 22 |  |
| | | Campaign 6a | Exploration \| NORI-D geological, geotechnical and environmental sampling | 45 |  |
| | | Campaign 6b [2] | Exploration \| NORI-D geological, geotechnical and environmental sampling | 40 |  |
| 2020 | NORI | Campaign 4b | Exploration \| NORI-D nodule bulk sampling, seafloor geotechnical evaluation | 34 |  |
| | | Campaign 4c | Exploration \| NORI-D nodule bulk sampling, seafloor geotechnical evaluation | 36 |  |
| | | Campaign 4d | Exploration \| NORI-D environmental baseline—metocean studies #2 | 24 |  |
| | | Campaign 5a | Exploration \| NORI-D environmental baseline—benthic #1 | 49 |  |
| | | OI [3] | Exploration \| NORI-D benthic environmental baseline—ROV/ AUV survey | 10 |  |
| 2021 | NORI | Campaign 4e | Exploration \| NORI-D environmental baseline—metocean studies #3 | 23 |  |
| | | Campaign 5b | Exploration \| NORI-D environmental baseline—pelagic #1 | 54 |  |
| | | Campaign 5c | Exploration \| NORI-D environmental baseline—pelagic #2 | 45 |  |
| | | Campaign 5d | Exploration \| NORI-D environmental baseline—benthic #2 | 45 |  |
| | | Campaign 5e | Exploration \| NORI-D environmental baseline—benthic and pelagic (ROV and benthic landers) | 50 |  |
| 2022 | NORI | Pre-Collection Test | Exploration \| NORI-D \| Hidden Gem conversion works, collector vehicle deep water test in the Atlantic Ocean, and transit to Campaign 7c departure point | 192 |  |
| | | Campaign 7a1 | Exploration \| NORI-D pre-collector campaign | 36 |  |
| | | Campaign 7a2 | Exploration \| NORI-D pre-collector campaign | 41 |  |
| | | Campaign 7c | Exploration \| NORI-D collector campaign (Hidden Gem) | 71 |  |
| | | Campaign 7b1 | Exploration \| NORI-D collector monitoring campaign | 43 |  |
| | | Campaign 7b2 | Exploration \| NORI-D post-collector campaign | 43 |  |

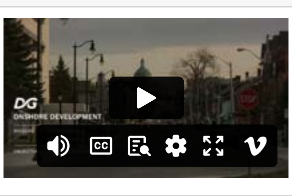
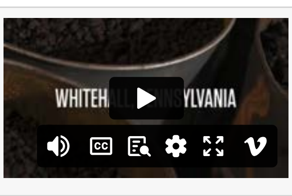
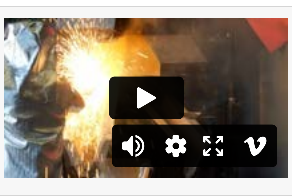
[1] Campaign shared by NORI (Campaign 2) and TOML (CCZ13)

[2] Campaign shared by NORI (6b) and Marawa

[3] Short campaigns done by third parties traveling through the CCZ

[4] Note that these testing and transit activities are not technically considered a Campaign

### List of Onshore Projects

| Year | Business Partner | Project | Scope | Media |
|---|---|---|---|---|
| 2016 | KPM | Decomposing manganese nitrate concept study | Identify solutions with a strong potential to produce manganese dioxide from manganese nitrate and compare against previously determined success criteria. | - |
| 2019 | KPM | Bench-scale pyrometallurgical test work | Perform lab-scale testing to inform a heat and mass balance model, a pilot plant program work plan, and a pre-feasibility study. |  |
| 2020 | FLSmidth | Rotary kiln calcining pilot program | Process TMC's polymetallic nodules through a pilot scale rotary kiln to prove concept of first stage of TMC's proposed flowsheet, create a calcine intermediate for downstream testing, and compile data to inform pre-feasibility study. Identify potential process issues. |  |
| | Hatch | Onshore processing scoping study | Complete scoping level trade-off studies to validate design and identify improvements for proposed TMC flowsheet. | HATCH |
| 2021 | XPS | Smelting, sulfidation, and converting pilot program | Process TMC's calcine intermediate product to create an alloy and matte intermediate products used for downstream testing and to prove concept of TMC's selected flowsheet. Gather data to inform pre-feasibility study and identify potential process issues. |  |
| 2022 | SINTEF | Manganese product development | Evaluate the feasibility of TMC's manganese silicate product as manganese source for silico-manganese production. |  |

A key driver for why we explore polymetallic nodules, concerns the significant potential that they provide to supply nickel, cobalt, copper, and manganese with a lower environmental and social footprint as compared to land-based mining. To that end, we commit to make science-based decisions and choose paths that will result in a lower environmental and social impact. For example, we strive to find ways to systematically decarbonize our operations and develop a process flow that results in as near to zero waste as possible.

Environmental Footprint

- Energy and Emissions
- Water
- Waste

Social Footprint

- Employees
- Health and Safety
- Sponsoring States

# Energy and Emissions

Currently, we remain in an exploration phase and do not conduct any commercial activities. In 2022, our greenhouse gases (GHG) emissions mostly came from marine gas oil that the vessels that supported our offshore campaigns used. However, in alignment with TMC's defined responsibilities, we account for the full stack of our impacts our operations could have, which includes the emissions derived from key activities that third parties conduct on our behalf. We report them under TMC's scope 1 emissions in line with the guidance from the GHG Protocol under the operational control approach. We estimate and report air travel emissions from offshore campaigns participants, whether TMC employees or contractors, as scope 3 emissions. Given our small workforce who mostly work remotely (we employed 39 employees and consultants as of 31 December 2022) and limited activities carried out currently by the company, we estimate other emissions to lack significance.

In this report, we share the emissions from all the offshore campaigns we have done since starting them in 2012. We decided to collect and report our historical carbon footprint data as we plan to offset these emissions. TMC continues to research and evaluate potential carbon offset initiatives as we advance towards commercial operations to ensure we create as much positive impact as possible.

Our activities have had relatively little emissions to date, and we are working on decarbonization paths to stay as close to zero as possible. To calculate our emissions, we have used emission factors from the United Kingdom's Department for Environment, Food, and Rural Affairs (DEFRA) as they provide the most conservative footprint for marine gas oil. In the table below, we summarize our estimated onshore and offshore emissions.

| TMC | Historical Total (2012-2020) Tonnes of CO2e | | 2021 | | 2022 | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Total Energy Consumption (GJ) | Total GHG Emissions ($tCO_2e$) | Air Pollution (tonne) | | |
| | Total Energy Consumption (GJ) | Total GHG Emissions ($tCO_2e$) | Total Energy Consumption (GJ) | Total GHG Emissions ($tCO_2e$) | | | $NO_x$[1] | $SO_x$ | Other Air Pollutan |
| OFFSHORE | 327,891 | 26,078 | 157,033 | 12,378 | 425,991 | 34,823 | 140 | 27 | 16 |
| ONSHORE | 259 | 24 | 90 | 0 | 0 | 0 | 0 | 0 | 0 |
| **TOTAL** | **328,150** | **26,102** | **157,123** | **12,378** | **425,991** | **34,823** | **140** | **27** | **16** |

**NA:** Not applicable. Vessel was already fully staffed traveling through the CCZ

[1] Includes NO and $NO_2$, but excludes $N_2O$

[2] Includes carbon monoxide (CO), non-methane volatile organic compounds (VOCs), and particulate matter ($PM_{10}$ and $PM_{2.5}$), and black carbon

### Offshore

Vessels and all supporting offshore operations use marine gas oil, which currently constitutes our main emissions source. We have decided to account for all possible impacts our operations could have, which includes emissions from the three campaigns that TOML conducted before TMC acquired it in 2020. Note that NORI and TOML jointly conducted Campaign 2 in 2013 and TMC conducted shared Campaign 6b for NORI and on Marawa's behalf in 2019. Also, in two instances, TMC has taken advantage of other vessels already traveling through the CCZ and contracted them for several days: once in 2020 to conduct a photographic survey and once in 2017 to deploy moorings. We base emissions for these two instances and for Campaign 1 on fuel-usage estimates.

We had more intensive energy consumption and a larger carbon footprint in 2022 than in previous years. The activities that we completed throughout the year involved over 250 people and two vessels, amounted to 426 operating days, and involved a travel distance that reached almost 31,000 nautical miles—considerably more than any other given year. The Hidden Gem, a 228m former drillship that Allseas converted into a polymetallic nodule-collection vessel, concluded the first integrated system test in the CCZ since the 1970s, while a 103m survey vessel performed the four accompanying environmental studies. In November, a supply vessel from Allseas that was conducting activities in the region made a detour to deliver equipment to the Hidden Gem. We conservatively calculated the associated fuel consumption and GHG emissions from these activities and added them to Campaign 7c. We also report the footprint of pre-collection test activities (including conversion works for the Hidden Gem, the collector vehicle deep-water test in the Atlantic Ocean, and the Hidden Gem's transit from Europe to the Campaign 7c departure point).

ESG Footprint – Offshore Emissions

| Offshore | Campaign Name | Vessels | | Air Travel | | Total Offshore | |
|---|---|---|---|---|---|---|---|
| | | Marine Gas Oil Consumption (tonnes) | GHG Emissions ($tCO_2e$) | Air Distance Traveled (km) | GHG Emissions ($tCO_2e$) | Energy Consumption[3] (GJ) | GHG Emissions ($tCO_2e$) |
| 2012 | Campaign 1[1] | 200 | 650 | 780,000 | 110 | 8,560 | 760 |
| 2013 | Campaign 2 and CCZ13 | 281 | 913 | 780,000 | 110 | 12,027 | 1,023 |
| 2015 | CCZ15 | 772 | 2,509 | 1,514,376 | 213 | 33,042 | 2,722 |
| 2017 | CCZ17[2] | 56 | 182 | NA | - | 2,397 | 182 |
| 2018 | Campaign 3 | 1,549 | 5,034 | 543,734 | 76 | 66,297 | 5,110 |
| 2019 | Campaign 4a | 367 | 1,193 | 489,400 | 69 | 15,708 | 1,262 |
| | Campaign 6a | 705 | 2,291 | 834,032 | 117 | 30,174 | 2,408 |
| | Campaign 6b and Marawa | 493 | 1,602 | 864,070 | 122 | 21,100 | 1,724 |
| 2020 | Campaign 4b | 625 | 2,031 | 647,140 | 91 | 26,750 | 2,122 |
| | Campaign 4c | 872 | 2,834 | 671,904 | 94 | 37,322 | 2,928 |
| | Campaign 4d | 694 | 2,255 | 444,102 | 62 | 29,703 | 2,317 |
| | Campaign 5a | 846 | 2,749 | 813,308 | 114 | 36,209 | 2,863 |
| | OI[2] | 201 | 653 | NA | - | 8,603 | 653 |
| 2021 | Campaign 4e | 385 | 1,251 | 407,448 | 57 | 16,478 | 1,308 |
| | Campaign 5b | 1,040 | 3,380 | 642,918 | 90 | 44,512 | 3,470 |
| | Campaign 5c | 788 | 2,561 | 587,778 | 83 | 33,726 | 2,644 |
| | Campaign 5d | 616 | 2,002 | 813,308 | 114 | 26,365 | 2,116 |
| | Campaign 5e | 840 | 2,730 | 776,614 | 109 | 35,952 | 2,839 |
| 2022 | Pre-Collection Test | 6,148 | 19,981 | 9,711,000 | 1,587 | 263,138 | 21,568 |
| | Campaign 7a1 | 558 | 1,814 | 797,019 | 189 | 23,894 | 2,003 |
| | Campaign 7a2 | 360 | 1,170 | 265,097 | 63 | 15,411 | 1,233 |
| | Campaign 7c | 2,156 | 7,006 | 2705354 | 460 | 92,264 | 7,466 |
| | Campaign 7b1 | 367 | 1,193 | 213,040 | 50 | 15,717 | 1,244 |
| | Campaign 7b2 | 364 | 1,182 | 537,192 | 127 | 15,566 | 1,309 |
| **Total** | | **21,283** | **69,170** | **25,838,834** | **4,107** | **910,915** | **73,277** |

**NA:** Not applicable. Vessel was already fully staffed traveling through the CCZ

[1] Limited records exist for Campaign 1, fuel usage and air distance traveled are estimates based on Campaign 2

[2] Short campaigns done by third party traveling through the CCZ

[3] Estimated based on marine gas oil consumption

### Onshore

We have little onshore-related emissions as our pilot testing used a small-scale kiln and furnace. Onshore pilot test work started in 2020.

| Onshore | Coal | | Natural Gas | | Electricity | | Total Onshore | |
|---|---|---|---|---|---|---|---|---|
| | Consumption (tonnes) | GHG Emissions ($tCO_2e$) | Consumption (GJ) | GHG Emissions ($tCO_2e$) | Consumption (kWh) | GHG Emissions ($tCO_2e$) | Consumption (GJ) | Emissions ($tCO_2e$) |
| **2020** | 6.5 | 20.5 | 70.2 | 3.7 | 0 | 0.0 | 258.4 | 24.2 |
| **2021** | 0.0 | 0.0 | 0.0 | 0.0 | 25,000 | 0.4 | 90.0 | 0.4 |
| **2022** | 0.0 | 0.0 | 0.0 | 0.0 | 100 | 0.0 | 0.4 | 0.0 |
| **Total** | **6.5** | **20.5** | **70.2** | **3.7** | **25,100** | **0.4** | **348.8** | **24.6** |

# Water

To date, our water use has mainly come from facilities on vessels. These vessels produce most water that they use on board via desalination, though they do load a small amount when at harbor for longer periods as their freshwater generators do not run at harbor (representing 17% of all water used in 2022). Most of this water is consumed on the vessel, but some of it is also discharged at sea in compliance with applicable regulations (e.g., treated grey, black, and vessel-operations water). When collecting samples offshore, vessels collect water in small amounts before returning it to the ocean. During the collection test we conducted in 2022, we airlifted nodules with seawater through a riser pipe from the collector vehicle on the seabed to the production vessel on the surface. After dewatering the nodules, we returned residual water with sediment and nodules fines in small amounts to the ocean through a pipe approximately 1.2km deep in the water column. We do not report that data below but will disclose it in the environmental impact assessment (EIA) for NORI Area D's commercial license application that we will submit to the International Seabed Authority (ISA). For our future operations, the onshore metallurgical process will require significant amounts of water, which explains why we seek to use closed loop water systems to minimize the need for new water intake. We continue to optimize our process flow to mitigate freshwater use.

| Category | 2020 ($m^3$) | 2021 ($m^3$) | 2022 ($m^3$) |
|---|---|---|---|
| **Total Water Withdrawals** | 1,140 | 1,172 | 2,195 |
| **Fresh Water Produced[1] (via Desalination on Vessel)** | 1,277 | 1,884 | 10,584 |
| **Total Water Discharges** | 49 | 492 | 2,133 |

[1] Refers to freshwater produced on vessels via desalination process

Offshore

| Year | Campaign Name | Freshwater Withdrawn (Bunkered at Port) ($m^3$) | Fresh Water Produced (on Vessel via Desalination Process) ($m^3$) | Water Discharged[1] ($m^3$) |
|---|---|---|---|---|
| 2012 | Campaign 1 | LR | LR | LR |
| 2013 | Campaign 2 and CCZ13 | LR | LR | LR |
| 2015 | CCZ15 | LR | LR | LR |
| 2017 | CCZ17 | NA | NA | NA |
| 2018 | Campaign 3 | 498 | 336 | 18 |
| 2019 | Campaign 4a | 109 | 99 | 0 |
| | Campaign 6a | 533 | 465 | 22 |
| | Campaign 6b and Marawa | 312 | 315 | 4 |
| 2020 | Campaign 4b | 172 | 233 | 13 |
| | Campaign 4c | 298 | 336 | 8 |
| | Campaign 4d | 110 | 102 | 8 |
| | Campaign 5a | 558 | 606 | 18 |
| | OI | NA | NA | NA |
| 2021 | Campaign 4e | 149 | 126 | 14 |
| | Campaign 5b | 398 | 449 | 7 |
| | Campaign 5c | 150 | 370 | 237 |
| | Campaign 5d | 475 | 457 | 24 |
| | Campaign 5e | 0 | 482 | 210 |
| 2022 | Pre-Collection Test | 1,389 | 5,174 | 1,251 |
| | Campaign 7a1 | 0 | 525 | 34 |
| | Campaign 7a2 | 0 | 598 | 39 |
| | Campaign 7c | 806 | 3,003 | 726 |
| | Campaign 7b1 | 0 | 642 | 42 |
| | Campaign 7b2 | 0 | 642 | 42 |
| **Total** | | **5,957** | **14,960** | **2,716** |

[1] Refers to treated grey, black and vessels-operations water

**NA:** Not applicable. Vessel was already fully staffed traveling through the CCZ

**LR:** Limited records

Onshore

| Onshore | 2020 ($m^3$) | 2021 ($m^3$) | 2022 ($m^3$) |
|---|---|---|---|
| Water Withdrawn[1] | 2 | 0 | 1 |
| Water Discharged[2] | 2 | 0 | 1 |

[1] Freshwater supplied through third parties.

[2] Treated and discharged through third parties in compliance with applicable regulations.

# Waste

To date, the waste we have generated largely comes from crew activities on our vessels during offshore campaigns. In compliance with applicable regulations, these vessels incinerated some of this waste via their certified incinerators, while they sent the remaining waste back to shore for an approved disposal processing company to treat it. Works related to converting the Hidden Gem from a drillship to a polymetallic nodule-collection vessel largely contributed to the waste that we generated in 2022.

We also achieved a critical objective for our future metallurgical processes in developing a near-zero solid-waste flowsheet through which we transform nodules in their entirety into usable materials. Nodules have useful high-grade metals with very low amounts of elements toxic to human health or the environment, so we can produce a byproduct aggregate rather than tailings. Additionally, with the designed pyrometallurgical-refinery combination, we can recycle the relatively small stream of residue from the refinery process to the smelter, which will increase our recoveries (i.e., how much metal we extract from nodules as a percentage of their actual metal content). We based the reagent we have chosen on our decision to produce byproducts rather than waste. We commit to advancing ESG values and believe the environmental benefits outweigh the costs.

| TMC | 2020 (tonnes) | 2021 (tonnes) | 2022 (tonnes) |
|---|---|---|---|
| TOTAL WASTE GENERATED | 82 | 105 | 184 |
| Non-Hazardous Waste | 80 | 103 | 162 |
| Food Waste Discharged at Sea | - | - | 1 % |
| Disposed of Through Third-Party[1] | 100 % | 100 % | 85 % |
| Incinerated Onsite[2] | - | - | 14 % |
| Hazardous Waste | 2 | 2 | 23 |
| Disposed of Through Third-Party[3] | 100 % | 100 % | 95 % |
| Incinerated Onsite[4] | - | - | 5 % |

[1] Mostly includes paper, glass, metals and other types of residual waste

[2] Mostly includes food waste, packaging, and other types of residual waste incinerated on vessels.

[3] Includes waste types such as e-waste, incinerator ashes, batteries, plastic, etc.

[4] Includes operational waste (e.g. oily rags and filters) incinerated on vessel in compliance with MARPOL regulations

Waste Generated Offshore

| Year | Campaign Name | Non-Hazardous Waste[2] (tonnes) | Hazardous Waste[1] (tonnes) |
|---|---|---|---|
| 2012 | Campaign 1 | LR | LR |
| 2013 | Campaign 2 and CCZ13 | LR | LR |
| 2015 | CCZ15 | LR | LR |
| 2017 | CCZ17 | NA | NA |
| 2018 | Campaign 3 | 15.0 | 0.4 |
| 2019 | Campaign 4a | 7.0 | 0.4 |
| | Campaign 6a | 19.0 | 0.4 |
| | Campaign 6b and Marawa | 13.0 | 0.4 |
| 2020 | Campaign 4b | 25.0 | 0.4 |
| | Campaign 4c | 19.0 | 0.4 |
| | Campaign 4d | 13.0 | 0.4 |
| | Campaign 5a | 20.0 | 0.4 |
| | OI | NA | NA |
| 2021 | Campaign 4e | 18.0 | 0.4 |
| | Campaign 5b | 22.0 | 0.4 |
| | Campaign 5c | 18.0 | 0.4 |
| | Campaign 5d | 25.0 | 0.4 |
| | Campaign 5e | 20.0 | 0.4 |
| 2022 | Pre-Collection Test | 79.9 | 13.2 |
| | Campaign 7a1 | 14.2 | 1.6 |
| | Campaign 7a2 | 6.9 | 0.9 |
| | Campaign 7c | 46.4 | 4.7 |
| | Campaign 7b1 | 6.6 | 1.1 |
| | Campaign 7b2 | 7.8 | 1.2 |
| **Total** | | **396** | **28** |

**NA:** Not applicable. Vessel was already fully staffed traveling through the CCZ

**LR:** Limited records

1. Hazardous waste (e.g. cooking oil, incinerator ashes, e-waste, operational waste such as rags and filters, paint waste) is minimal. For campaigns completed before 2022, our vessel contractor provided a conservative estimate of a consistent 0.4 tonnes per campaign.

2. Total mass of waste produced before incineration or offload in port

Waste Generated Onshore

| Waste Type | 2020 | 2021 | 2022 |
|---|---|---|---|
| Non-Hazardous Waste (tonnes) | 3 | 0 | 0 |
| Hazardous Waste (tonnes) | 0 | 0 | 0 |

# Employees

## Our Employees

TMC has purpose-driven team members who, together, focus on creating a hard-working, impact-driven culture with high tolerance for change, uncertainty, and adversity.

As of 31 December 2022, we employed 39 employees and consultants. Collective bargaining agreements do not cover any TMC staff member. Geographically, our staff resides in Tonga, Nauru, the United States, Canada, Australia, the United Kingdom, and the United Arab Emirates. In addition, we work with almost 300 partners and contractors. TMC's leadership team and, indeed, all our employees bring relevant professional backgrounds and diverse perspectives to the company.

## Our Team

### Experienced leadership team

*39 people*
Working for
The Metals Company

*~300 business partners*
Working on the project

**Gerard Barron**
Chairman & Chief Executive Officier

**Craig Shesky**
Chief Financial Officer

**Anthony O'Sullivan**
Chief Development Officer

**Ryan Coombes**
General Counsel & Corporate Secretary

**Erika Ilves**
Chief Strategy Officer

**Corey McLachlan**
Head of Sponsoring State and ISA Relations

**Erica Ocampo**
Chief Sustainability Officer

**Andy Jones**
Chief Technology Officer

**Claude Plourde**
Chief Accounting Officer

**Dr Greg Stone**
Chief Ocean Scientist

**Grant Lindner**
NORI Project Director

**Dr Mike Clarke**
Environmental Program Manager

**Dr Jeffrey Donald**
Head of Onshore Development

**Jon Machin**
Head of Offshore Engineering

**Scott Wilson**
Head of Offshore Operations

| Executive Management by Gender * (as of 31 December 2022) | Gender Breakdown | |
|---|---|---|
| | Male | Female |
| Total number | 5 | 2 |
| Percentage | 63 % | 25 % |

Scope: TMC plus its wholly owned subsidiaries NORI and TOML

* Executive management is defined as the CEO plus officers

| Diversity Metrics[1] | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|
| Total Employees & Consultants | 9 | 14 | 16 | 18 | 20 | 32 | 39 |
| **New Hires & Turnover** | | | | | | | |
| New hires | - | - | - | - | - | - | 11 |
| Turnover | - | - | - | - | - | - | 5 % |
| **Gender Breakdown** | | | | | | | |
| Men | 67 % | 71 % | 81 % | 90 % | 90 % | 68 % | 73 % |
| Women | 33 % | 29 % | 19 % | 10 % | 10 % | 32 % | 27 % |
| **Generation Breakdown** | | | | | | | |
| 1997 – 2012 \| Gen Z | - | - | - | - | - | - | 2 % |
| 1981 – 1996 \| Millennials | - | - | - | - | - | - | 41 % |
| 1965 – 1980 \| Gen X | - | - | - | - | - | - | 49 % |
| 1946 – 1964 \| Boomers | - | - | - | - | - | - | 7 % |
| **Education Breakdown** | | | | | | | |
| Post-Graduate | 33 % | 29 % | 38 % | 50 % | 60 % | 56 % | 61 % |
| Under-Graduate | 67 % | 71 % | 63 % | 50 % | 40 % | 44 % | 39 % |
| **Location Breakdown** | | | | | | | |
| North America | - | - | - | - | - | - | 44 % |
| Asia | - | - | - | - | - | - | 7 % |
| Europe | - | - | - | - | - | - | 12 % |
| Oceania | - | - | - | - | - | - | 37 % |
| **Ethnic Background** | | | | | | | |
| Ethnic Diversity[2] | 11 % | 7 % | 0 % | 10 % | 25 % | 32 % | 29 % |

Scope: TMC plus its wholly owned subsidiaries NORI and TOML.

[1] As of 31 December 2022

[2] Refers to people self identifying as being part of an ethnic diversity group (i.e. people connected with or relating to different cultural background or place of origin). For us, includes Middle Eastern, Pacific Islander, Hispanic and Asian.

## Diversity and Inclusion

We have committed to attracting, developing, and retaining diverse talent cross every age, gender, gender identity, race, sexual orientation, physical capability, ethnicity, beliefs, and perspective. We seek to develop cultural competency by seeking knowledge, increasing awareness, modeling respect, and promoting inclusion. Our team comprises highly skilled individuals among whom 61% hold post-graduate degrees. Moreover, our team comprises 23% women and 26% individuals from ethnically diverse backgrounds.

We also seek to contribute to diversity and inclusion through the work we do with our sponsoring states and partners. For example, we requested that females comprise at least half of all trainees that the ISA provides as part of our contract requirements. The offshore industry today is predominantly male, and we strive to not only foster women to participate in the industry but also provide them with a work environment offshore that makes them feel safe and welcomed.

TMC has also partnered with the ISA to support its Promoting Women Empowerment and Leadership in Marine Scientific Research initiative. We share the ISA's vision for women from developing states to play a central role in marine scientific research and for these states to have stronger scientific and technological capabilities. We also seek to build capacity in our sponsoring states and the Pacific region by engaging young professionals and by funding science scholarships that create opportunities for students to develop skills that benefit society.


## People Engagement

As a company working to pioneer a new industry and new ways to do things, our success depends on attracting and retaining strong, independent, entrepreneurial and multi-talented team that can deal with uncertainty and adversity. Our team is distributed across several continents and several time zones. Thus, most staff members work remotely as the norm. Despite physical and temporal separation, we maintain strong cohesion by attracting people with an intrinsic motivation to fulfill our mission. We cultivate a flat organizational structure and a culture built on mutual respect and care for one another. We rely on regular management and company meetings, ongoing communication flows across different technology platforms, frequent ad hoc video communication, and opportunities for in-person gatherings. We offer our people flexible work schedules and autonomy in managing their time while encouraging them to set boundaries between their work and their home lives.

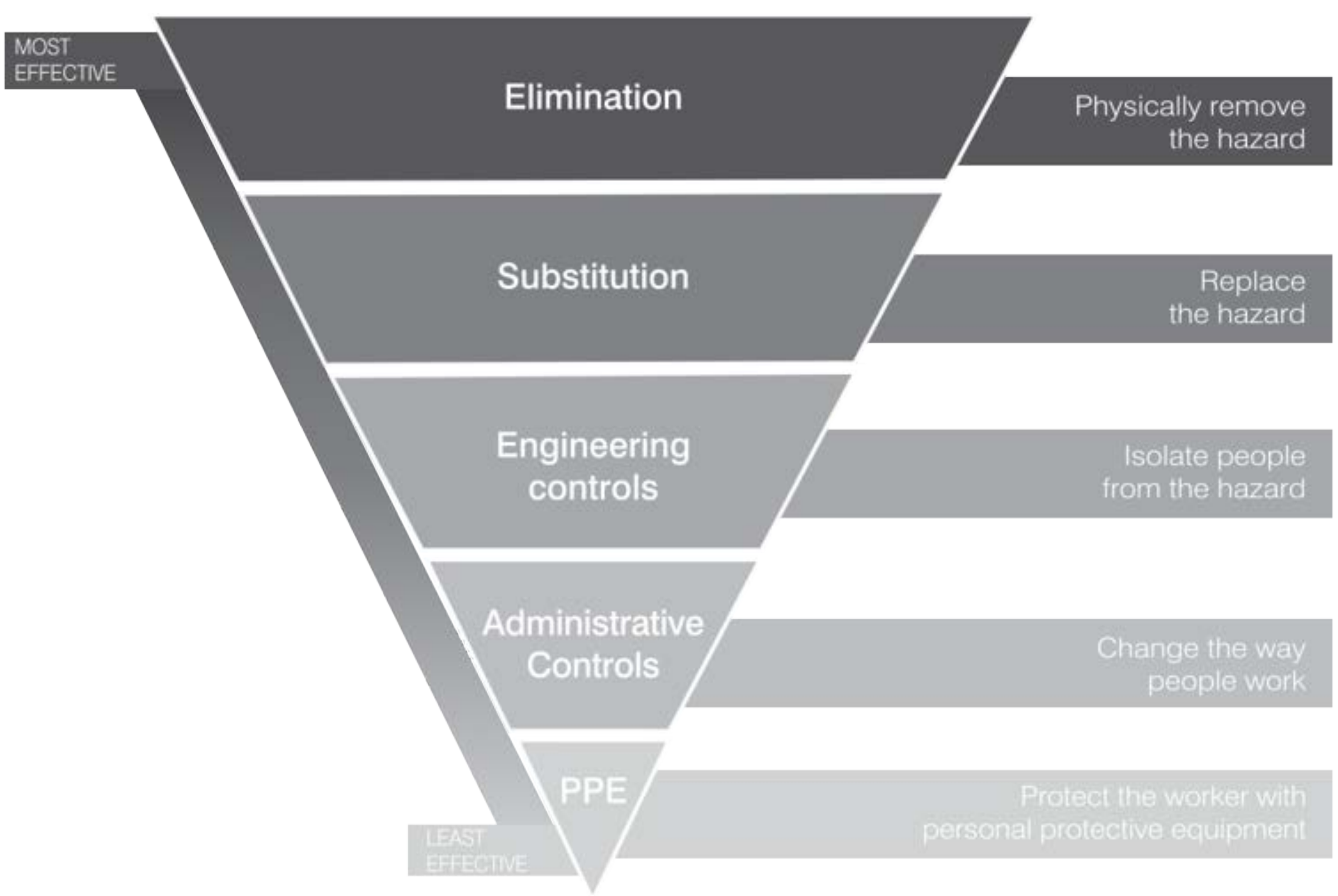
## Compensation and Benefits

We strive to compensate our staff competitively. In addition to salaries, our compensation and benefits program includes annual discretionary bonuses, equity awards, an employee stock purchase plan, a 401(k) contribution/superannuation or RRSP benefit contribution (as applicable jurisdictionally), healthcare and insurance benefits, health savings, and flexible spending accounts. Our annual equity compensation focuses on company priorities that we believe create long-term value for our stakeholders.

# Environment, Health and Safety (EHS)

Our EHS vision is to fully integrate environment, health, and safety into our operations and to create a workplace free of significant incidents. We have worked with our offshore suppliers and partners, including Allseas and Maersk Supply Services (MSS) (the latter until December 2021) to deliver safe worksites as our major EHS exposure has involved our operations with them. We work with partners who constitute experts in their respective fields and who share our commitment to ensuring the safety and wellbeing of everyone who works for and with us. The vessels that conducted offshore campaigns in 2022 used environment, health, and safety management systems that align with the ISO 14,001 and ISO 45,001 standards, and third parties periodically audit them. Our safety commitment is simple: everyone should return home safely.

Knowing that the mining industry has one of the highest injury and fatality rates of any industry[1], we need to find ways to mitigate employee exposure to safety risks. For our offshore exploration activities and onshore pilot testing, we work with our partners to implement EHS systems that incorporate thorough training, planning, risk assessment, and disciplined control implementation. On average, our partner Allseas provides 27.5 hours of EHS training for every 1,000 man-hours worked. Additionally, Allseas continuously implements safety talks and drills. We also have put in place culturally based safety observation systems such as safe act observations and obligation to stop work if it becomes unsafe for workers to proceed.




With our partners, we actively use the control hierarchy to manage EHS risk for our people and the environment. We also use technology to help eliminate employees' exposure to potentially life-changing accidents. For instance, we use autonomous robots to collect nodules, which minimizes risks to workers. And, since we produce no tailings from collecting polymetallic nodules, we fully eliminate the risks associated with tailings storage dams, which include the potential for fatalities and environmental catastrophes[2].

[1] US Bureau of Labor Statistics, 'Industry Injury and Illness Data', 2020

[2] Warren Cornwall, 'A Dam Big Problem', Aug. 2020


We have collected safety data from organizations that do work for us. As the table below shows, we have noted no lost-time injury in any offshore exploration campaigns or onshore projects that we have conducted to date. The few incidents that have occurred have been minor first-aid cases. We investigate incidents and treat them as valuable lessons that we incorporate into future practices. In the table below, we summarize how many work hours TMC personnel (which includes our subsidiaries) and our contractors have performed and provide trailing and behavioral statistics, which relate to contractors and participants in our offshore campaigns.

| TMC Safety Statistics | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|
| TMC Personnel Hours * | 27,181 | 30,561 | 36,580 | 50,804 | 75,152 |
| Contractor Hours ** | 26,317 | 45,814 | 96,160 | 663,724 | 743,294 |
| Trailing Statistics *** | | | | | |
| Fatalities | 0 | 0 | 0 | 0 | 0 |
| Lost-Time Incidents | 0 | 0 | 0 | 0 | 0 |
| Medical Treatment Cases | 0 | 0 | 0 | 2 | 2 |
| First-Aid Cases | 1 | 1 | 3 | 2 | 4 |
| Environmental Incidents | 0 | 0 | 0 | 2 | 1 |
| Security Incidents | 1 | 0 | 0 | 1 | 0 |
| Lost Time Injury Frequency Rate (LTIFR) | 0 | 0 | 0 | 0 | 0 |
| Behavioral Statistics *** | | | | | |
| Hazard Identification and Risk Assessments (HIRAs) Completed | 1 | 3 | 10 | 17 | 753 |
| Drills | 6 | 9 | 8 | 13 | 154 |
| Inductions | 50 | 73 | 80 | 152 | 215 |
| Safety Observations | 633 | 3,136 | 5,801 | 16,047 | 753 |
| Stop Work Authority Used | 19 | 0 | 18 | 40 | 1 |
| Job Safety Analysis | 275 | 25 | 22 | 44 | 6,635 |

* Includes worked hours by personnel working for DeepGreen Metals, which later became TMC and its subsidiaries NORI and TOML after acquisition in 2020

** Includes the hours worked by Maersk Supply Services, and, starting in 2020, hours from Allseas, KPM, XPS, SGS and Hatch. Year 2022 also includes hours worked aboard our supplier's vessel for campaigns 7a1, 7a2, 7b1 and 7b2

*** All trailing and behavioral statistics relate to contractors

During the collector system trials in October 2022, a temporary overflow that comprised seawater mixed with sediment and nodule fragments in small amounts occurred. We notified the ISA about the event, and both the ISA and independent reviewers determined it to have no potential to cause significant harm to the marine environment. Based on an assessment conducted in collaboration with subject matter experts, we made modifications to the cyclone separator, and no further overflows during subsequent test runs occurred. The trials made it possible to test the nodule-collector system's performance, challenge the prototype system's design, and identify opportunities to optimize the full-sized commercial system's design.

# Sponsoring States

To create shared value with developing countries through our business and, in particular with our sponsoring states, we must fulfill the intent set out in UNCLOS. This industry has the potential to provide a large positive impact for our sponsoring states.

> Although we have not yet begun commercial operations, we have started building the foundation for our positive impact.

Currently, to create this value, we focus on three areas:

- Training Opportunities
- Scholarships
- Community Programs

## Training Opportunities

As TMC grows and expands, so too will our support for training and capacity building. TMC and its subsidiaries have supported training opportunities since 2011, which includes sponsoring offshore campaign training and attendance at workshops and conferences. We see significant value in these opportunities since they will help develop highly skilled professionals who will advance our deep-sea knowledge.

### Offshore Traineeships

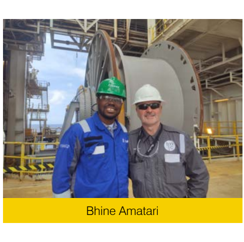
In 2022, we created opportunities for four offshore traineeships who took part in our collector test program on both our production vessel (Hidden Gem) and environmental monitoring vessel. In addition to support for candidates to complete safety prerequisites before going offshore, candidates also gained direct exposure, experience, and training from world-class engineers and scientists working on the collector test campaign.

Through the ISA Contractor Training Program, the ISA's Legal and Technical Commission selected all trainees, and they came from various countries such as Nigeria, Colombia, the Philippines, and Bangladesh.

*Offshore Engineering*

Two trainees, Bhine Amatari, a marine engineer from Nigeria, and Jameal Magno, a geological engineer from the Philippines, completed at-sea engineering training placements in 2022. These training placements occurred on NORI's collector vessel, the Hidden Gem, with NORI's strategic offshore engineering partner, Allseas.

Bhine completed his offshore training during which he rotated across different departments in Q2 during the Atlantic trials to assess the risker pipes and jumper hose for the integrated test. Below, Bhine summarizes his experience:



Bhine Amatari

"*The awareness that the Hidden Gem is the first deep-sea mining vessel that will deploy the pilot polymetallic nodule-collection system as far as 4000m in the CCZ, gave me the feeling of potentially creating [a] historic moment with a vessel that may eventually be the first to mine polymetallic nodules in commercial quantity to ultimately support the much-needed switch to clean energy…. This experience will stay with me forever and it has changed my perspective in terms of career direction. I have ISA, NORI/TMC and Allseas to thank for these memories.*"

During the integrated collector test campaign in 2022, Jameal learned many new skills while on board the Hidden Gem. For instance, he learned about remotely operated vehicles (ROVs), the land and recovery system (LARS), the riser system, the prototype collector vehicle (PCV), and other deep-sea mining workflows. As a researcher in the geomechanics field with a particular interest in soil behavior in extreme environments, he also had the opportunity to learn about sediment plumes and gained skills in offshore sediment and water sampling for physical-chemical studies.

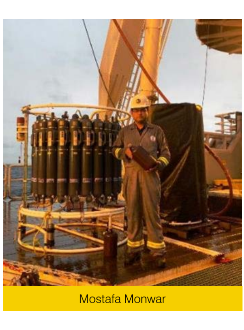

*Offshore Geological and Environmental*

Two additional trainees participated as geological and environmental trainees on the environmental monitoring vessel: Paola Andrea Quintero, a geologist from Colombia and Mostafa Monwar, a Professor of Marine Sciences from the University of Chittagong in Bangladesh.

Paola Andrea Quintero

Paola joined the science teams in their work to quantify the geological, chemical, biological, and oceanographic conditions in NORI Area D and assisted with deploying box cores and multi-cores. Below, Paola discusses her motivations for joining the campaign:

"*Being a woman and having been born in Latin America are conditions that hinder professional and personal development in science, however, society has advanced in gender equality and my family has always supported me to get ahead despite the adversity. For myself, for my family and for a better society, I want to take the most of this opportunity and show that you can do it too!*"



Mostafa Monwar

Monwar assisted the science teams as they began their work characterizing the post-disturbance impact that the Allseas-designed collection system had on the environment. Below, Monwar speaks to his experience working on the campaign:

"*From the very beginning of my professional career, I have aimed to specialize in aquatic resource management and have nurtured a sustained interest in acquiring deeper theoretical knowledge and practical skills in this area, especially in the adoption of advanced technologies. The knowledge acquired during these six weeks of traineeship has been detailed and comprehensive enough to get a clear idea and hands-on experience about the environmental impact monitoring of deep seabed mining. Moreover, I had a chance to meet with scientists from different cultures and countries, offering me different points of view and thus contributing to my flexibility and creativity in research. I am very thankful for the ISA, NORI, and TMC for giving me this opportunity.*"

## Scholarships

At TMC, we prioritize educational opportunities and recognize that scholarships play an important role in building capacity in developing nations. Accordingly, we continue to provide technical training and secondary school, undergraduate, and graduate scholarships; to foster science, technology, engineering, and mathematics (STEM) education; and, in particular, to promote women's participation in these opportunities.

In 2022, we awarded eight undergraduate bachelor's degree scholarships and one master's degree scholarship to students from Nauru, Tonga, Fiji, Kiribati, the Solomon Islands, and Nigeria. The scholarships provide tuition, accommodation, annual return airfare, university fees and books, a new laptop, and a living allowance for the three-year or four-year degree program. In Nauru, we also signed an agreement in 2021 with the local University of the South Pacific (USP) campus to support 20 science-related scholarships at pre-degree levels in 2022 and 2023. Four Nauruan students received these scholarships in 2022. Additionally, in Tonga, we developed a program that started in 2021 to support secondary school scholarships to cover tuition costs. Five students started in 2022. We commit to provide at least five new scholarships each year with a view to support 15 scholarships annually by 2023.

**Sera Lewanuya from Fiji, NORI graduate scholarship recipient, M.A. in Marine Management.**

Originally from Naroi, Moala, on the Lau archipelago in Fiji, Sera now lives in Suva, Fiji, and received a NORI scholarship to pursue a master's degree in marine management from the University of the South Pacific (USP) in Fiji. The scholarship pays for her tuition and living expenses and also provides her with the money she needs to complete her MA fieldwork.

For Sera, growing up on an island surrounded by the ocean represents an important part of her identity as the ocean serves as her and her people's lifeline. She eventually hopes to work for a regional organization that supports sustainable ecological and socioeconomic benefits. She also hopes to further her studies and pursue a doctorate degree.


| TMC and Subsidiaries | 2020 | 2021 | 2022 |
|---|---|---|---|
| **Total Number of Trainings and Scholarships Implemented** | 22 | 17 | 24 |
| Vocational Trainings | 16 | 8 | 6 |
| At-sea Trainings | 11 | 8 | 4 |
| Workshops / Courses | 5 | 0 | 0 |
| Sponsoring States Capacity Building[1] | 0 | 0 | 2 |
| Scholarships | 6 | 9 | 18 |
| Secondary School / Academic Upgrading | 0 | 4 | 9 |
| Trades | 6 | 4 | 0 |
| Bachelor Degree | 0 | 1 | 8 |
| Postgraduate Degree | 0 | 0 | 1 |
| Breakdown by Educational Field | | | |
| Engineering | 0 % | 0 % | 8 % |
| Environmental Sciences | 73 % | 47 % | 21 % |
| Geology | 0 % | 0 % | 4 % |
| Marine Science | 0 % | 0 % | 29 % |
| Trades | 27 % | 24 % | 0 % |
| Other Sciences[2] | 0 % | 29 % | 38 % |
| Breakdown of Beneficiaries by Gender and Origin | | | |
| Male | 50 % | 35 % | 42 % |
| Female | 50 % | 65 % | 58 % |
| From Developed Countries | 41 % | 6 % | 0 % |
| From Developing Countries | 59 % | 94 % | 100 % |

[1] Encompasses all trainings offered to sponsoring states representatives

## Community Programs

We have formalized a grant program in Nauru and Tonga for community-led initiatives focused on six themes: 1) ocean health and the environment, 2) women's empowerment, 3) youth programs, 4) sanitation and health, 5) education, and 6) agriculture. In Tonga, we created a special priority area to support disaster-relief projects following the devastating earthquake and tsunami that occurred on 15 January 2022. We selected 11 new projects in Nauru in 2022 and 26 in Tonga (9 of which were disaster-assistance programs). Additionally, we provided continued support to two multiyear projects in Nauru and one in Tonga.

| Community Programs | 2022 |
|---|---|
| Total Number of Grants Awarded | 40 |
| NORI | 13 |
| TOML | 27 |
| Priority Areas of Community Programs (% of Total USD Grants Donations) | |
| Agriculture and Food Security | 40 % |
| Disaster Assistance | 23 % |
| Education | 13 % |
| Women Empowerment | 20 % |
| Ocean Health & the Environment | 15 % |
| Sanitation & Water | 8 % |
| Youth and Healthy Living | 10 % |
| **Total Estimated Number of People Benefitted** | **76,037** |

### NAURU: COMMUNITY ASSISTANCE GRANTS

Among the 13 projects we have supported in Nauru, five projects selected in the first phase grant selection have already commenced their work, while the other six projects begun implementation in early 2023. NORI also continues to support two multi-year sponsorships: the Breadfruit Project and the NORI Cup Powerlifting Championship.

The **Breadfruit Project** focuses on addressing the food security issue in Nauru. As part of this initiative, we have begun introducing 1,000 breadfruit saplings in 2022 and 2023. NORI engaged with the Pacific Community's secretariat to provide the young plants, which a laboratory in Suva, Fiji, cultured and NORI and the Nauru Farmers and Growers Association distributed at no cost to households. We introduced 250 saplings in 2022.

Cultured breadfruit saplings at the lab in Suva, Fiji.

> Breadfruit is an important food crop in Nauru for several reasons. It is a staple food that people have grown on the small island nation for centuries, it has high nutritional and cultural value that people often use in traditional dishes and ceremonies, and it possesses significant resilience to climate change (e.g., it can withstand droughts and salt water).

NORI also sponsors the **NORI Cup Powerlifting Championship** for both male and female lifters. As the second most popular sport in Nauru, NORI feels proud to support an initiative that promotes healthy living and empowers women. The sport attracts participants across all genders and ages—from teenagers to the elderly.

CNORI Cup Powerlifting Championship 2022

**In 2022**, NORI provided grants for the following projects:

- ***Women and healthy lifestyle:*** Ms. Sheeva Cook, a former senior police officer and weightlifting champion and a highly respected role model on the island, founded this project. It targets women in the Bauda District Community—especially mothers with families—to address three main priority areas: exercising and physically training, sharing knowledge and experience, and educating mothers on child development.
- ***School of Ten—building a new classroom:*** part of the Lovoni Baptist Church on Nauru, the School of Ten had just ten students a decade ago. Fast forward ten years and the school now has 120 students across all ages (including scholarship winners and university graduates) who continue to excel. NORI assisted the school via building a new classroom in 2022.
- ***Piggery farm shelter for the Bauda community:*** NORI supported the Bauda Community's project to build a piggery that benefits its members' families and strengthens the community and other Nauruans' food security.
- ***Safety fishing gear for outboard artisanal fishers from the Meneng community:*** NORI supported the Meneng District community fishing association in their application for safety gear such as flares, oars, tents, water containers, life jackets, first-aid equipment, and other equipment to enable its members and their boats to travel out into open waters and to ensure that they can continue to support their families.
- ***Edetang Eoning Project (early childhood education through Jolly Phonics for teachers, parents, and children):*** Edetang Eoning means "star children" in Nauruan. In this program, NORI supports parents and teachers in their efforts to enhance young children's learning ability and skills by training parents and teachers in using the virtual education system, Jolly Phonics, as part of our 2022 Community Initiative Program. A tutor in Papua New Guinea will provide training virtually, which will lay the foundation for other households and communities to learn these new techniques.

Project beneficiaries from the Meneng Community

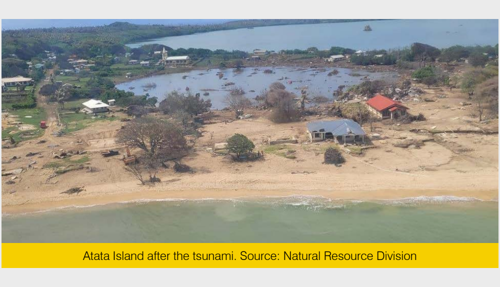
Edetang Eoning Project beneficiaries receiving their certificates on course completion

**We selected six additional projects later in 2022** during the second funding phase and have begun implementing them in 2023:

- *Ubenide Community English course*
- *Anabar well-water project*
- *Educational Lifeskills at Sea*
- *Early Literacy – Parents Information Workshop*
- *Continuing Education for the Youth of Nauru*
- *Nauru Rugby (U18)*

### TONGA: COMMUNITY ASSISTANCE GRANTS

On 15 January 2022, Tonga's Hunga Tonga Hunga Ha'apai volcano erupted, which triggered a large local tsunami that devastated villages and resorts along the western shore of Tongatapu (main island), Ha'apai Island group and Eua Island. Three recorded deaths occurred, and hundreds of people lost their homes. Tonga lost all Internet connectivity and communications for a few months. Ash covered all of Tonga and hundreds of people had to evacuate from badly affected islands to the main island Tongatapu.



Atata Island after the tsunami. Source: Natural Resource Division

**In 2022, TOML funded 26 community projects:** nine through our Disaster Assistance Program (DAP) and 17 through our Community Assistance Program.

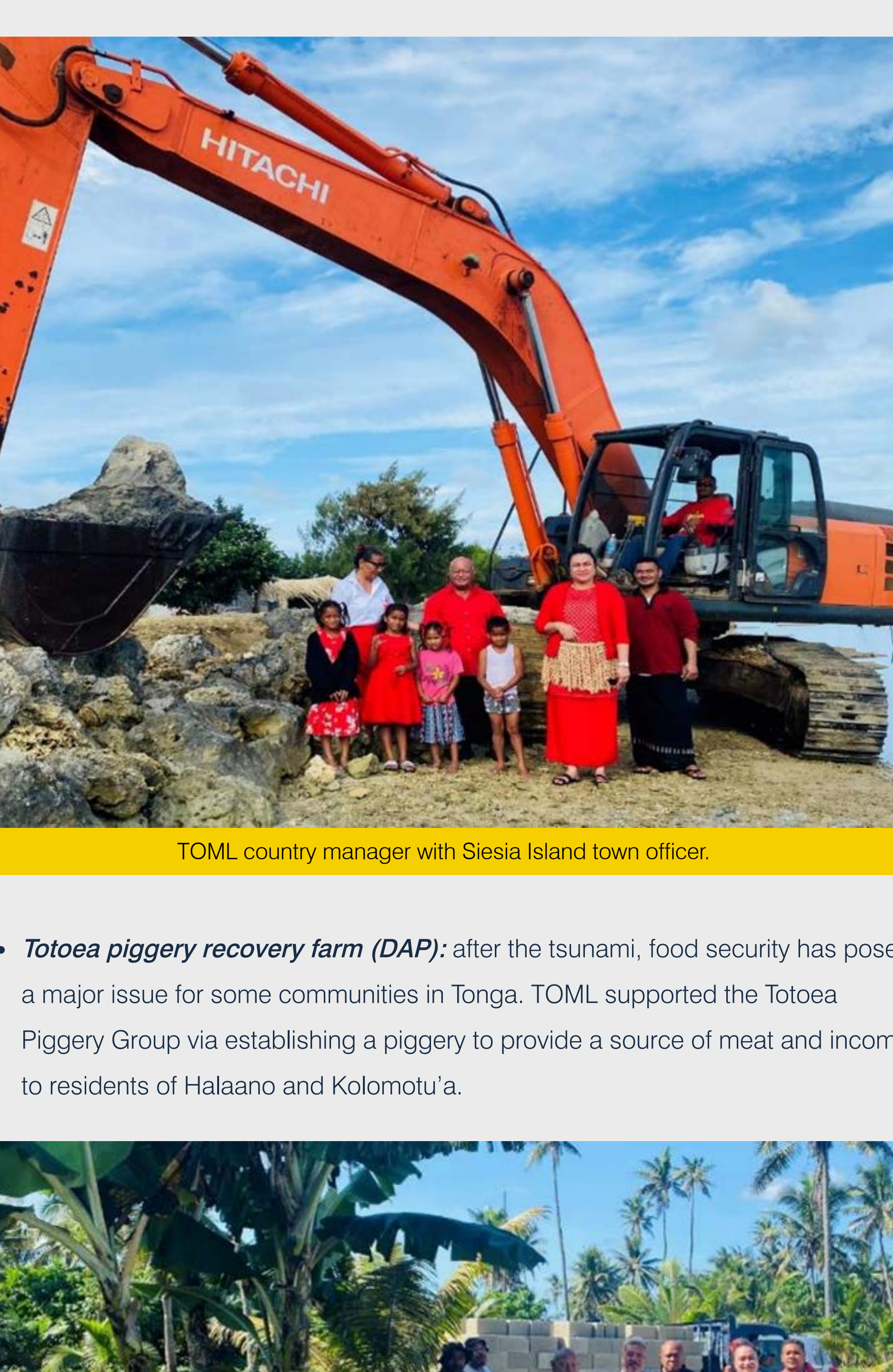
- ***New beginning for Ha'afeva Island (DAP):*** January's tsunami had a severe impact on thousands of homes with many families losing everything. TOML helped people in Ha'afeva Island purchase much-needed items such as freezers (for food storage), radio systems, washing machines, and other items to help get them back on their feet.

TOML country manager with the government representative for the Ha'apai Islands group

- ***Kolovai recovery project (DAP):*** low-lying coastal communities bore the brunt of the tsunami's impact in Tonga. The tsunami completely destroyed Ton Kolovai, the Good Samaritan beachfront. To help better protect the residents, TOML helped rebuild the beach via planting new trees.

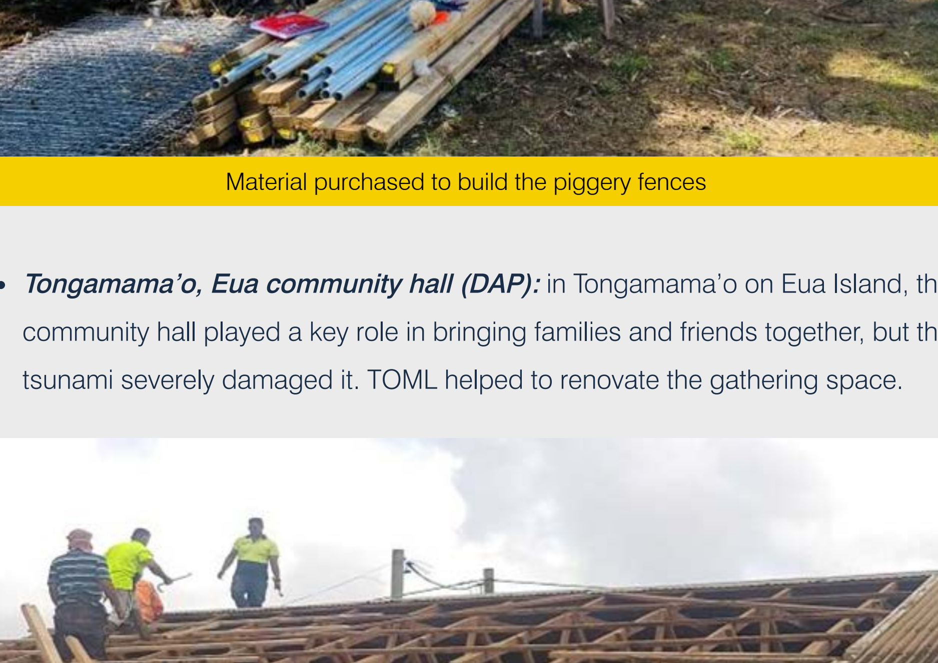
Kolovai beach after replanting of trees

- ***Manuka bus stops (DAP):*** in Manuka village on Tongatapu, the tsunami severely damaged local bus shelters that residents used. As part of our Disaster Assistance Program, TOML helped to rebuild new shelters to ensure locals could commute safely.
- ***Kotu Island water security (DAP):*** extreme weather events such as tsunamis pose a significant threat to water security. Accordingly, TOML delivered five water tanks for residents on Kotu Island in the Ha'apai Island Groups to provide a more resilient and secure supply.
- ***Ahau village (DAP):*** the tsunami deposited waste and rubbish in significant quantities into the community. TOML purchased 30 bins to aid every family collect waste as they cleaned their community.
- ***Nukunukumotu Island (DAP):*** the recent tsunami destroyed the island's local berm. TOML supported its reconstruction to protect the island from rising seas and extreme weather events.



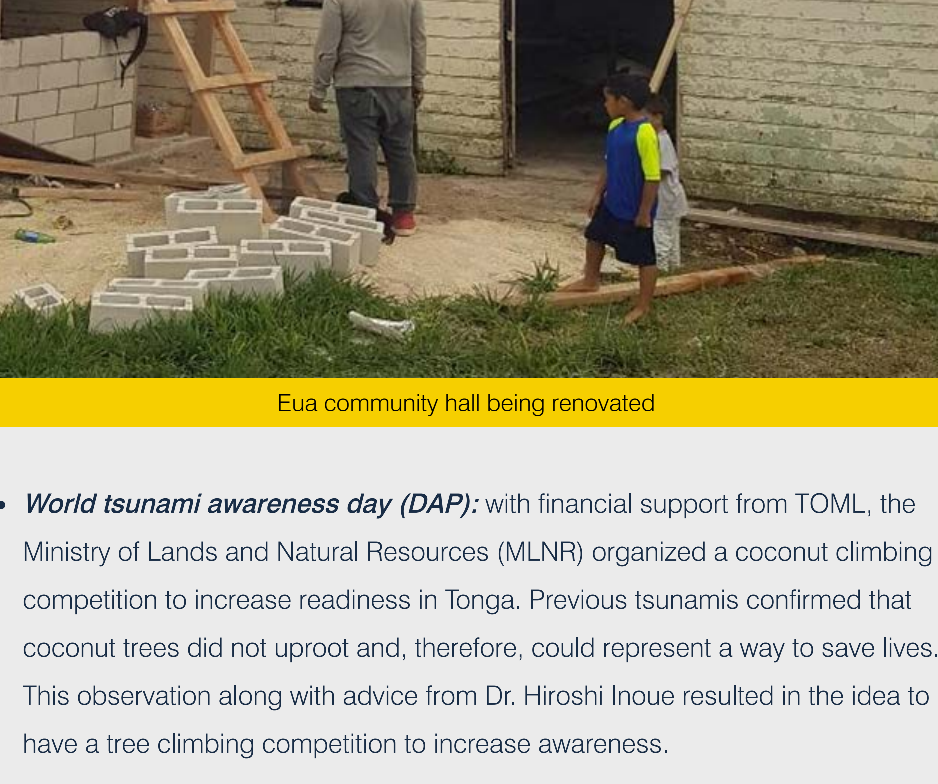

TOML country manager with Siesia Island town officer.

- ***Totoea piggery recovery farm (DAP):*** after the tsunami, food security has posed a major issue for some communities in Tonga. TOML supported the Totoea Piggery Group via establishing a piggery to provide a source of meat and income to residents of Halaano and Kolomotu'a.



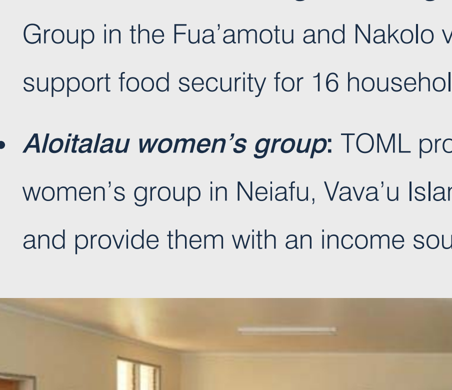
Material purchased to build the piggery fences

- ***Tongamama'o, Eua community hall (DAP):*** in Tongamama'o on Eua Island, the community hall played a key role in bringing families and friends together, but the tsunami severely damaged it. TOML helped to renovate the gathering space.

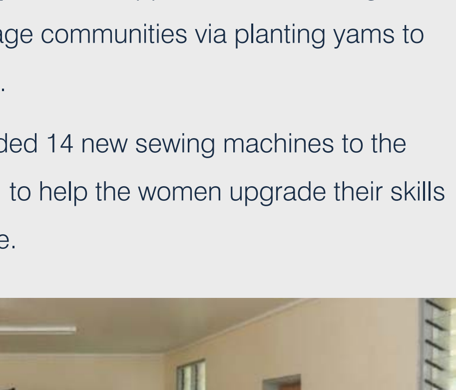


Eua community hall being renovated

- ***World tsunami awareness day (DAP):*** with financial support from TOML, the Ministry of Lands and Natural Resources (MLNR) organized a coconut climbing competition to increase readiness in Tonga. Previous tsunamis confirmed that coconut trees did not uproot and, therefore, could represent a way to save lives. This observation along with advice from Dr. Hiroshi Inoue resulted in the idea to have a tree climbing competition to increase awareness.



Siosiua Metui, the winner of men's category 2.



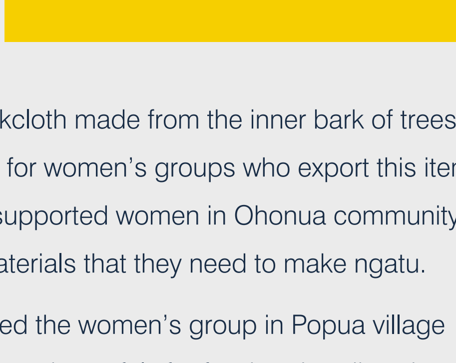

Siotasia Malolo, the winner of women's category 3.

- ***Fua'amotu & Nakolo agricultural group:*** TOML supported the Ha'alangoau Group in the Fua'amotu and Nakolo village communities via planting yams to support food security for 16 households.
- ***Aloitalau women's group***: TOML provided 14 new sewing machines to the women's group in Neiafu, Vava'u Island, to help the women upgrade their skills and provide them with an income source.

TOML country manager with Aloitalau women's group in Neiafu, Vava'u

- ***Theresa He Ofa group:*** TOML helped several households in Vaini community plant yams, taro, and hiapo plants to provide a secure food and income source.
- ***Houma Village, Vava'u:*** Tonga's Vava'u Island is renowned for its natural beauty and, to help maintain a healthy and clean environment for residents in Houma village, TOML purchased various tools and equipment to help residents keep the community looking its best.
- ***Nakolo women's group:*** TOML helped to construct new shelters to help a women's group in Nakolo rear animals in a clean, healthy way and provide them with an additional income and food source.
- ***Vaini greenhouse:*** extreme weather events have highlighted the essential need for food security in Tonga. TOML helped construct a greenhouse in Otukie block in Vaini to provide a more stable source of fruit, vegetables, and medicinal plants for the local community.

New constructed greenhouse



New constructed greenhouse

- ***Amanaki Ki Siamelie***: Tapa cloth (a barkcloth made from the inner bark of trees) provides an important source of income for women's groups who export this item (known also as ngatu in Tonga). TOML supported women in Ohonua community on Eua Island via purchasing the raw materials that they need to make ngatu.
- ***Popua women's group***: TOML supported the women's group in Popua village via constructing fencing to help them raise pigs safely for food and to diversity their income.
- ***Sopu Fishing Association***: the community along the waterfront in Kolomotu'a and Sopu o Taufaahau relies heavily on fishing for its income and livelihoods, but the volcanic eruption and tsunami in January devastated the coastline and destroyed the only fish market. TOML supported its reconstruction ensuring families can continue to sell their catch.
- ***Anglican Church Hall/Fasi community hall:*** in Fasi-Moe-Afi A Tungi community, people use the local Anglican church hall for various social events, such as church and youth meetings and events, and as an evacuation center during storms. TOML purchased 20 plastic tables and 100 chairs to help the church welcome as many as possible.


## Economic Contributions to Governments

As part of the exploration regulatory regime, we need to provide annual payments to the ISA and our sponsoring states, and we expect benefits to increase as we near commercial operations and begin collecting nodules.

The ISA's exploitation regulations will stipulate royalties and taxes payable on any future production from the CCZ. While the ISA has yet to set the payment rates, the 1994 Implementation Agreement (Section 8(1)(b)) prescribes that such payments "shall be within the range of those prevailing in respect of land-based mining of the same or similar minerals in order to avoid giving deep seabed miners an artificial competitive advantage or imposing on them a competitive disadvantage".

| Fees and Contributions (USD) | 2021 | 2022 |
|---|---|---|
| ISA Fees | $ 132,000 | $ 278,396 |
| ISA Training Programs | $ 23,082 | $ 69,043 |
| Sponsoring State Community Programs | $ 140,600 | $ 149,183 |
| Sponsoring State Fee (Administrative) | $ 445,000 | $ 464,109 |
| Sponsoring States Training Programs | $ 41,218 | $ 70,786 |
| TOTAL | **$ 781,900** | **$ 1,031,517** |

Under the NORI sponsorship agreement between Nauru and NORI and under the TOML sponsorship agreement between Tonga and TOML, after reaching a minimum recovery level in the tenement areas, NORI and TOML have agreed to pay Nauru and Tonga a seabed mineral recovery payment for polymetallic nodules recovered from the tenement area, annually adjusted (from the fifth production year) on a compounding basis based on the official inflation rate in the United States. In addition, NORI and TOML will also pay corporate income tax and both pay an administration fee each year to Nauru and Tonga for such administration and sponsorship, which is subject to review and increase in the event that the ISA grant NORI or TOML an exploitation contract. NORI and TOML have both committed to paying corporate income tax in Nauru and Tonga, respectively.

# About this report

## General Information


- Scope and Boundary
- Abbreviations


## Framework Indexes


- GRI
- SASB Metals and Mining
- SASB Marine Transportation
- Ocean Stewardship Coalition


# Scope and Boundary

We present the information in this report on behalf of The Metals Company (TMC) and all of its consolidated subsidiaries covering exploration activities from 2012 until 31 December 2022.

We have prepared this report using the Global Reporting Initiative (GRI) Standards as guidance – GRI referenced. In addition to GRI, the report references additional frameworks, such as Task Force on Climate-related Financial Disclosures (TCFD), the Task Force on Nature-related Financial Disclosures (TNFD) and Sustainability Accounting Standards Board (SASB) for the metals and mining sector in addition to the marine transportation sector. This report also serves as a complement to TMC's U.N. Global Compact Communication of Progress for 2022 and illustrates our contribution to the Ocean Stewardship Principles.

# Abbreviations

| Acronyms | |
|---|---|
| APEIs | Areas of Particular Environmental Interest |
| AMS | Adaptive Management System |
| BBNJ | U.N. Intergovernmental Conference on Marine Biodiversity of Areas Beyond National Jurisdiction |
| CBD | Convention on Biological Diversity |
| CCZ | Clarion-Clipperton Zone |
| CHH | Common Heritage of Humankind |
| Co | Cobalt |
| $CO_2$ | Carbon dioxide |
| $CO_2e$ | Carbon dioxide equivalent |
| Cu | Copper |
| DRC | Democratic Republic of the Congo |
| DSM | Deep-Sea Mining |
| EEZ | Exclusive Economic Zone |
| EHS | Environment, Health & Safety |
| EIA | Environmental Impact Assessment |
| EIS | Environmental Impact Statement – used interchangeably with ESIA |
| EMS | Environmental Management System |
| EPRP | Emergency Preparedness and Response Plan |
| ESG | Environmental, Social and Governance |
| ESIA | Environmental and Social Impact Assessment - used interchangeably with EIS |
| ES | Ecosystem Services |
| EV | Electric Vehicle |
| FAO | Food and Agriculture Organization of the United Nations |
| GHG | Greenhouse gas |
| Gt | Gigaton |
| GRI | Global Reporting Initiative |
| GWP | Global Warming Potential |
| HAC | High Ambition Coalition |
| HIRAs | Hazard Identification and Risk Assessments |
| ICE | Internal Combustion Engine |
| IEA | International Energy Agency |
| ILO | International Labour Organization |
| IPBES | Intergovernmental Science-Policy Platform on Biodiversity and Ecosystems Services |
| IPCC | Intergovernmental Panel on Climate Change |
| ISA | International Seabed Authority |
| JAMSTEC | Japan Agency for Marine-Earth Science & Technology |
| KPM | Kingston Process Metallurgy |
| kg | Kilogram |
| km | Kilometer |
| KWh | Kilowatt hour |
| ktpa | Kilotons per annum |
| LCA | Life cycle assessment |
| LTC | Legal and Technical Commission |
| LTIFR | Lost Time Injury Frequency Rate |
| $m^2$ | Square meter |
| $m^3$ | Cubic meter |
| Mn | Manganese |
| Mt | Megaton |
| Mtpa | Million ton per annum |
| MSS | Maersk Supply Services |
| Nauru | Republic of Nauru |
| NMFR | Near-Miss Frequency Rate |
| NORI | Nauru Ocean Resources Inc. |
| NORI-D | Nauru Ocean Resources Inc. Contract Area D |
| Ni | Nickel |
| NiCuCo | Nickel-Copper-Cobalt |
| NOx | Nitrogen oxides |
| MoU | Memorandum of Understanding |
| PFR | Pre-Feasibility Report |
| PIPA | Phoenix Islands Protected Area |
| PM | Particulate Matter |
| PRZs | Preservation Reference Zones |
| PSIDS | Pacific Small Island Developing States |
| RALS | Riser And Lifting System |
| RKEF | Rotary Kiln-Electric Furnace |
| RRSP | Registered Retirement Savings Plan |
| S&I | Sustainability & Innovation Committee |
| SASB | Sustainability Accounting Standards Board |
| SIA | Social Impact Assessment |
| SIDS | Small Island Developing States |
| SMS | Seafloor Massive Sulfides |
| $SO_2$ | Sulfur dioxide |
| $SO_4$ | Sulfate |
| SOx | Sulfur oxide |
| TCFD | Task Force on Climate-related Financial Disclosures |
| TMC | The Metals Company |
| TMPI | Tonga Maritime Polytechnic Institute |
| TNFD | Task Force on Nature-related Financial Disclosures |
| TOML | Tonga Offshore Mining Ltd. |
| Tpa | Ton per annum |
| UN | United Nations |
| UNCLOS | United Nations Convention on the Law of the Sea |
| UNEP | United Nations Environment Programme |
| USP | University of the South Pacific |
| UN SDG | United Nations Sustainable Development Goals |
| VOCs | Volatile Organic Compounds |
| WEF | World Economic Forum |
| WEO | World Energy Outlook |
| XPS | Expert Process Solutions |

# GRI Content Index

**Global Reporting Initiative (GRI) 2 General Disclosures 2021**

| GRI Disclosure | | Page/Location |
|---|---|---|
| **The organization and its reporting practices** | | |
| 2-1 | Organizational details | Our Vision - Our challenge ; Our Responsibility ; Our Key Milestones . Currently, The Metals Company (TMC) does not have heaquarters as we are a global virtual workforce with individuals located mainly in Tonga, Nauru, the United States, Canada, Australia, the United Kingdom and the United Arab Emirates |
| 2-2 | Entities included in the organization's sustainability reporting | 10-K |
| 2-3 | Reporting period, frequency and contact point | Scope and Boundary . This is TMC's second impact report and we will report annually. Erica Ocampo, CSO impact@metals.co |
| 2-4 | Restatement of information | None |
| 2-5 | External assurance | There was no external assurance |
| **Activities and workers** | | |
| 2-6 | Activities, value chain and other business relationships | Metal-Intensive future |
| 2-7 | Employees | Our Employees |
| 2-8 | Workers who are not employees | Our Employees |
| **Governance** | | |
| 2-9 | Governance structure and composition | How We Do It ; TMC's Governance Structure ; Business Ethics & Transparency |
| 2-10 | Nomination and selection of the highest governance body | TMC's Governance Structure; Nominating Committee Charter |
| 2-11 | Chair of the highest governance body | TMC's Governance Structure |
| 2-12 | Role of the highest governance body in overseeing the management impacts | TMC's Governance Structure |
| 2-13 | Delegation of responsibility for managing impacts | How We Do It ; TMC's Governance Structure ; Business Ethics & Transparency |
| 2-14 | Role of highest governance body in sustainability reporting | TMC's Governance Structure ; Sustainability and Innovation Committee Charter |
| 2-15 | Conflicts of interest | 10-K |
| 2-16 | Communication of critical concerns | Stakeholder Engagement ; 10-K |
| 2-17 | Collective knowledge of the highest governance body | TMC's Governance Structure ; 10-K |
| 2-18 | Evaluation of the performance of the highest governance body | 10-K ; Compensation Committee Charter |
| 2-19 | Remuneration policies | 10-K ; Compensation Committee Charter |
| 2-20 | Process to determine remuneration | 10-K |
| 2-21 | Annual total compensation ratio | Our Employees ; 10-K . We have not yet assessed compensation ratio |
| **Strategy, policies and practices** | | |
| 2-22 | Statement on sustainable development strategy | Letter From the CEO ; Sustainability Approach ; Other Initiatives We Support |
| 2-23 | Policy commitment | Our Responsibility; Doughnut-Shaped Solution Space ; TMC's Governance Structure ; Sustainability Approach ; TCFD and TNFD |
| 2-24 | Embedding policy commitments | TMC's Governance Structure ; Sustainability Approach |
| 2-25 | Process to remediate negative impacts | Our Responsibility ; Business Ethics & Transparency ; Other Initiatives We Support |
| 2-26 | Mechanisms for seeking advice and raising concerns | Business Ethics & Transparency ; Stakeholder Engagement |
| 2-27 | Compliance with laws and regulations | None |
| 2-28 | Membership and associations | Stakeholder Engagement |
| **Stakeholder engagement** | | |
| 2-29 | Approach to stakeholder engagement | Stakeholder Engagement |
| 2-30 | Collective bargaining agreements | Our Employees |

# SASB Metals & Mining Content Index

**Sustainability Accounting Standards Board (SASB) Metals & Mining, Industry Standard, Version 2021 - 12**

| Topic | Accounting Metric | SASB Indicator | Page / Location |
|---|---|---|---|
| **Greenhouse Gas Emissions** | | | |
| | Gross global Scope 1 emissions, percentage covered under emissions-limiting regulations | EM-MM-110a.1 | Energy and Emissions |
| | Discussion of long-term and short-term strategy or plan to manage Scope 1 emissions, emissions reduction targets, and an analysis of performance against those targets | EM-MM-110a.2 | TCFD & TNFD |
| **Air Quality** | | | |
| | Air emissions of the following pollutants: (1) CO, (2) NOx (excluding N2 O), (3) SOx, (4) particulate matter (PM10), (5) mercury (Hg), (6) lead (Pb), and (7) volatile organic compounds (VOCs) | EM-MM-120a.1 | Energy and Emissions |
| **Energy Management** | | | |
| | (1) Total energy consumed, (2) percentage grid electricity, (3) percentage renewable | EM-MM-130a.1 | TCFD & TNFD; Energy and Emissions |
| **Water Management** | | | |
| | (1) Total freshwater withdrawn, (2) total freshwater consumed, percentage of each in regions with high or extremely high baseline water stress | EM-MM-140a.1 | Water |
| | Number of incidents of non-compliance associated with water quality permits, standards and regulations | EM-MM-140a.2 | None |
| **Waste & Hazardous Materials Management** | | | |
| | Total weight of non-mineral waste generated | EM-MM-150a.4 | Waste |
| | Total weight of tailings produced recycled | EM-MM-150a.5 | We are currently in the exploration stage of our development; in addition, the collection of polymetallic nodules does not generate tailings, which is a key advantage of this resource |
| | Total weight of waste rock generated | EM-MM-150a.6 | Not applicable |
| | Total weight of hazardous waste generated | EM-MM-150a.7 | Waste |
| | Total weight of hazardous waste recycled | EM-MM-150a.8 | Waste |
| | Number of significant incidents associated with hazardous materials and waste management | EM-MM-150a.9 | None |
| | Description of waste and hazardous materials management policies and procedures for active and inactive operations | EM-MM-150a.10 | Environment, Health & Safety (EHS); Waste; Currently in the exploration stage of our development |
| **Biodiversity Impacts** | | | |
| | Description of environmental management policies and practices for active sites | EM-MM-160a.1 | No current active sites; however, a robust environmental program is currently underway |
| | Percentage of mine sites where acid rock drainage is: (1) predicted to occur, (2) actively mitigated, and (3) under treatment or remediation | EM-MM-160a.2 | No current active sites; however, a robust environmental program is currently underway |
| | Percentage of (1) proved and (2) probable reserves in or near sites with protected conservation status or endangered species habitat | EM-MM-160a.3 | None |
| **Security, Human Rights & Rights of Indigenous Peoples** | | | |
| | Percentage of (1) proved and (2) probable reserves in or near areas of conflict | EM-MM-210a.1 | None. The CCZ and Abyssal Plains; International Treaty for the High Seas |
| | Percentage of (1) proved and (2) probable reserves in or near Indigenous land | EM-MM-210a.2 | None. The CCZ and Abyssal Plains; International Treaty for the High Seas |
| | Discussion of engagement processes and due diligence practices with respect to human rights, Indigenous rights and operation in areas of conflict | EM-MM-210a.3 | The contracted areas are located in the CCZ, which is international waters; no human settlements exist there. The CCZ and Abyssal Plains; International Treaty for the High Seas; Stakeholder Engagement |
| **Community Relations** | | | |
| | Discussion of process to manage risks and opportunities associated with community rights and interests | EM-MM-210b.1 | Stakeholder Engagement; Environmental Impact Statement (EIS); Sponsoring States |
| | Number and duration of non-technical delays | EM-MM-210b.2 | Zero |
| **Labor Relations** | | | |
| | Percentage of active workforce covered under collective bargaining agreements, broken down by U.S. and foreign employees | EM-MM-310a.1 | Our Employees |
| | Number and duration of strikes and lockouts | EM-MM-310a.2 | Zero |
| **Workforce Health & Safety** | | | |
| | (1) MSHA all-incidence rate, (2) fatality rate, (3) near-miss frequency rate (NMFR) and (4) average hours of health, safety, and emergency response training for (a) full-time employees and (b) contract employees | EM-MM-320a.1 | Environment, Health & Safety (EHS) |
| **Business Ethics & Transparency** | | | |
| | Description of the management system for prevention of corruption and bribery throughout the value chain | EM-MM-510a.1 | Anti-Corruption and Anti-Bribery Compliance Policy |
| | Production in countries that have the 20 lowest rankings in Transparency International's Corruption Perception Index | EM-MM-510a.2 | None |
| **Tailings Storage Facilities Management** | | | |
| | Tailings storage facility inventory table: (1) facility name, (2) location, (3) ownership status, (4) operational status, (5) construction method, (6) maximum permitted storage capacity, (7) current amount of tailings stored, (8) consequence classification, (9) date of most recent independent technical review, (10) material findings, (11) mitigation measures, (12) site-specific Emergency Preparedness and Response Plan (EPRP) | EM-MM-540a.1 | Not applicable. We are currently in the exploration stage of our development. In addition, the collection of polymetallic nodules does not generate tailings, which is a key advantage |
| | Summary of tailings management systems and governance structure used to monitor and maintain the stability of tailings storage facilities | EM-MM-540a.2 | Not applicable. We are currently in the exploration stage of our development. In addition, the collection of polymetallic nodules does not generate tailings, which is a key advantage |
| | Approach to development of EPRPs for tailings storage facilities | EM-MM-540a.3 | Not applicable. We are currently in the exploration stage of our development. In addition, the collection of polymetallic nodules does not generate tailings, which is a key advantage |
| **Activity Metrics** | | | |
| | Production of (1) metal ores and (2) finished metal products | EM-MM-000.A | We are currently in the exploration stage of our development and there is no production of metals ores or finished metal products |
| | Total number of employees, percentage contractors | EM-MM-000.B | Our Employees |

# SASB Marine Transportation Content Index

**Sustainability Accounting Standards Board (SASB) Marine Transportation, Industry Standard, Version 2018 - 10**

| Topic | Accounting Metric | SASB Indicator | Page / Location |
|---|---|---|---|
| **Greenhouse Gas Emissions** | | | |
| | Gross global Scope 1 emissions | TR-MT-110a.1 | Energy and Emissions |
| | Discussion of long-term and short-term strategy or plan to manage Scope 1 emissions, emissions reduction targets, and an analysis of performance against those targets | TR-MT-110a.2 | TCFD & TNFD |
| | (1) Total energy consumed, (2) percentage heavy fuel oil, (3) percentage renewable | TR-MT-110a.3 | (1) Energy and Emissions; (2) 100%; (3) 0% |
| | Average Energy Efficiency Design Index (EEDI) for new ships | TR-MT-110a.4 | Not applicable. Vessels that participated in the 2022 campaigns are not classified as new ships according to the applicable regulations of the International Maritime Organization (IMO) |
| **Air Quality** | | | |
| | Air emissions of the following pollutants: (1) $NO_X$ (excluding $N_2O$), (2) $SO_X$, and (3) particulate matter ($PM_{10}$) | TR-MT-320a.1 | Energy and Emissions |
| **Ecological Impacts** | | | |
| | Shipping duration in marine protected areas or areas of protected conservation status | TR-MT-160a.1 | Data unavailable at present. We continue to collaborate with our contractors to gather this information and incorporate it into forthcoming disclosures. |
| | Percentage of fleet implementing ballast water (1) exchange and (2) treatment | TR-MT-160a.2 | 100% |
| | (1) Number and (2) aggregate volume of spills and releases to the environment | TR-MT-160a.3 | None as per SASB's definition of this indicator. A temporary overflow that comprised seawater mixed sediments and nodule fines in small amounts occurred during the nodule-collection test in 2022. We notified the ISA about the event, and both the ISA and independent reviewers determined it to have no potential to cause significant harm to the marine environment. |
| **Employee Health and Safety** | | | |
| | Lost time incident rate (LTIR) | TR-MT-320a.1 | Health and Safety |
| **Business Ethics** | | | |
| | Number of calls at ports in countries that have the 20 lowest rankings in Transparency International's Corruption Perception Index | TR-MT-510a.1 | None |
| | Total amount of monetary losses as a result of legal proceedings associated with bribery or corruption | TR-MT-510a.2 | None |
| **Accident & Safety Management** | | | |
| | Number of marine casualties, percentage classified as very serious | TR-MT-540a.1 | None |
| | Number of Conditions of Class or Recommendations | TR-MT-540a.2 | None |
| | Number of port state control (1) deficiencies and (2) detentions | TR-MT-540a.3 | None |
| **Activity Metrics** | | | |
| | Number of shipboard employees | TR-MT-000.A | Our supplier's vessel had 39 to 42 shipboard employees for Campaigns 7a1, 7a2, 7b1, and 7b2, while the pre-collection test activities and the collection system trials (Campaign 7c) involved 117 people from Allseas. |
| | Total distance traveled by vessels | TR-MT-000.B | About 31,000 nautical miles. |
| | Operating days | TR-MT-000.C | Not applicable. We remain in an exploration stage and do not currently generate revenue. However, the two vessels that completed the six exploration-driven campaigns that we conducted in 2022 operated for 426 days in total. |
| | Deadweight tonnage | TR-MT-000.D | 65,642 metric tonnes |
| | Number of vessels in total shipping fleet | TR-MT-000.E | Two vessels took part in our offshore campaigns in 2022. |
| | Number of vessel port calls | TR-MT-000.F | 17 |
| | Twenty-foot equivalent unit (TEU) capacity | TR-MT-000.G | Not applicable. The vessels that took part to our 2022 offshore campaigns do not transport containers. |

# Ocean Stewardship Coalition

At first glance, it might seem counterintuitive that a company looking to develop seafloor minerals can directly and positively contribute to healthy and productive ocean, but we do seek to add value in this area. In 2022, TMC became a signatory to the Ocean Stewardship Coalition because we firmly support and promote the nine principles that the initiative proposes and because we believe it provides a useful framework to report how our actions contribute to these principles, the U.N. Sustainable Development Goal (SDG) 14: "Life Below Water", and the SDGs in general.

| Sustainable Ocean Principles | | TMC Actions Examples (and page location) |
|---|---|---|
| **Ocean Health and Productivity** | | |
| Principle 1 | Assess the short and long-term impact of their activities on ocean health and incorporate such impacts into their strategy and policies. | • Commissioned 100+ studies to better understand deep-sea and marine environment (EIS).<br>• Performed a nodule-collection system test in the CCZ to better understand the potential impact that our operations could have on the environment (Collection System Trials).<br>• Developing an environmental impact assessment (EIA) and environmental management and monitoring program (EMMP) for the NORI Area D Project (EIS) to minimize the impact that our operations have on ocean ecosystems.<br>• Commissioned several environmental impact lifecycle assessments associated with our onshore and offshore operations, such as our impact on marine euthrophication (Comparative Life-Cycle Studies). |
| Principle 2 | Consider sustainable business opportunities that promote or contribute to restoring, protecting or maintaining ocean health and productivity and livelihoods dependent on the ocean. | • Mineral extraction on land impacts ocean health in coastal areas indirectly via rain runoffs that leach exposed rock chemicals to the ocean or directly via deep sea tailings disposal among others. While our offshore operations occur in the ocean, we focus on the abyssal seafloor—the most common habitat type on Earth and one of the least productive areas in the ocean. As our operations leave more productive marine ecosystems untouched, mitigating terrestrial mining also helps to mitigate impacts on more productive and biodiverse areas on the planet. (Our Hypothesis; Why We Focus Only on Nodules; The CCZ and Abyssal Plains).<br>• The ISA has set aside at least 43% of the Clarion-Clipperton Zone (CCZ) as areas of particular environmental interest (APEIs) that no one can ever exploit, and TMC expects to set aside approximately 10% of its contracted areas as additional "no-take zones" or preservation reference zones (PRZs) (Environmental Program)<br>• We have and will continue to protect and enhance ocean-dependent livelihoods by creating shared value with our sponsoring states (e.g., revenue generation, community initiatives and sponsorships, education, training, and capacity-building opportunities) and support their efforts to increase their resilience against challenges (e.g., natural disasters). (Sponsoring States - State Profiles; Sponsoring States) |
| Principle 3 | Take action to prevent pollution affecting the ocean, reduce greenhouse gas emissions in their operations to prevent ocean warming and acidification, and work towards a circular economy. | • Circular economy and decarbonization are key to the company's vision to build a carefully managed metal commons that will be used, recovered and reused again and again—for millennia. To get there, we first need to supply metals for the energy transition with the least possible negative environmental and social impact as we build up enough metals stocks to transition to a circular business model that focuses on secondary metals (Our Vision - Our Challenge)<br>• We study our operations' lifecycle impacts, which include impacts related to pollution and emissions, and continuously look for ways to prevent or minimize adverse impacts (Comparative Life-Cycle Studies; TCFD & TNFD)<br>• Our sustainability goals include "systematically implement path toward net-zero emissions" and "drive circularity of critical minerals" (Sustainability Approach) |
| Principle 4 | Plan and manage their use of and impact on marine resources and space in a manner that ensures long-term sustainability and take precautionary measures where their activities may impact vulnerable marine and coastal areas and the communities that are dependent upon them. | • We have commissioned 100+ studies to better understand deep-sea environments (EIS)<br>• Developing an EIA and EMMP to eliminate or mitigate the adverse impacts from our operations (EIS; Environmental Program);<br>• Aiming for net-positive impact on people and the planet and committed to change course if our path does not deliver on that aim (Our Vision - Our Challenge)<br>• Creating shared value with sponsoring states (e.g., revenue generation, community initiatives and sponsorships, education, training, and capacity-building opportunities) (Sponsoring States - State Profiles; Sponsoring States)<br>• Undertaking the first-ever social impact assessment (SIA) for a deep-sea resource exploitation project (EIS) |
| **Governance and Engagement** | | |
| Principle 5 | Engage responsibly with relevant regulatory or enforcement bodies on ocean-related laws, regulations and other frameworks. | • We base our stakeholder engagement approach on the IFC engagement principles, which we commit to implementing throughout our projects' entire lifetime (Other Initiatives We Support)<br>• We commit to working openly and collaboratively with our stakeholders. As a result, we engage proactively and transparently with our regulatory bodies—the ISA and our sponsoring states' governments (Stakeholder Engagement) |
| Principle 6 | Follow and support the development of standards and best practices that are recognized in the relevant sector or market contributing to a healthy and productive ocean and secure livelihoods. | • We strive to embrace and develop best practices to manage environmental and social risks, which includes risks to a healthy and productive ocean (EIS; Sustainability Approach; TCFD & TNFD; Environmental Program)<br>• TMC joined an international consortium to develop the first ESG Handbook for Marine Minerals<br>• In partnership with our island nation sponsoring states, we create opportunities that contribute to secure, diversify, and enhance livelihoods that depend on a healthy and productive ocean (Sponsoring States - State Profiles; Sponsoring States) |
| Principle 7 | Respect human-, labour- and indigenous peoples' rights in the company's ocean-related activities, including exercise appropriate due diligence in their supply-chain, consult and engage with relevant stakeholders and communities in a timely, transparent and inclusive manner, and address identified impacts. | • We are undertaking the world's first Social Impact Assessment (SIA) for a nodule project in international waters, which focusses on these issues (EIS)<br>• Our stakeholder engagement approach is based on the IFC principles of engagement, which we are committed to implement throughout the entire lifetime of our projects (Other Initiatives We Support)<br>• Our sustainability goals support Principle 7 (Sustainability Approach) |
| **Data and Transparency** | | |
| Principle 8 | Where appropriate, share relevant scientific data to support research on and mapping of relevance to the ocean. | • We contribute to society's knowledge of the deep ocean through our comprehensive environmental program. With the help of research institutions around the world, we have supported over 100 original studies which analyse the CCZ from the surface down through the water column to the abyssal plain. These organizations are independent, and researchers contractually retain their academic freedom to reach conclusions on findings and publish results (Our Operations, Environmental Program; Contribution to Research)<br>• We are sharing the data we collect with the ISA and the international community, and we are providing deep-sea samples to labs around the world. The environmental baseline and monitoring campaigns we have conducted in NORI Area D since 2020 are expected to grow multiple times the number of biological specimens stored in the ISA's DeepData Database - an open-source database that houses all the scientific and environmental data collected by companies for the benefit of the scientific community (Environmental Program; Contribution to Research) |
| Principle 9 | Be transparent about their ocean-related activities, impacts and dependencies in line with relevant reporting frameworks. | • By publishing an impact report since 2021 (before any commercial operations start), we focus on communicating transparently and proactively about our ocean-related activities, impacts, and dependencies (Our Responsibility).<br>• We are using a variety of reporting and disclosure recommendations frameworks with the intent to provide relevant, standardized and quality information to our stakeholders (e.g. GRI; SASB; TCFD; TNFD). |