the metals company

impact report | 2021

Contents

2021 Sustainability Highlights

ENVIRONMENT

Contributing to deep-sea ecosystem knowledge

Completed our environmental baseline assessment

5 **exploration campaigns** and 170 **days at sea** with world-leading scientists

Supporting circularity

Retrofitting a 228-meter-long former drill ship into first subsea mining vessel

Enabling operational visibility for stakeholders

Entered agreement with Kongsberg Digital to **develop 3D visualization** of the deep-sea operating environment and adaptive management system to stay within ecological thresholds

Lowering carbon footprint of pyrometallurgical processing

Identified ways to reduce metcoal consumption by at least 10%

SOCIAL

Building tomorrow's STEM talent pipeline

2 students graduated with bachelor of science degrees through our full university scholarship program at The University of the South Pacific, Fiji

Tonga: 4 secondary school scholarships and an additional 4 technical scholarships at Tonga Maritime Polytechnic Institute were granted

Contributing to sponsoring state communities

Formalized a grant program in Nauru and Tonga, supporting 32 **community projects**

Engaging with global stakeholders

Received over 600 **comments from 19 distinct stakeholders** during an open stakeholder consultation on our environmental impact statement for planned 2022 collector test

Contributing to peer-reviewed literature

Published 2 peer-reviewed research papers, one on solid waste streams from producing critical metals and another on opportunities for ethically sourcing critical metals from CCZ nodules

GOVERNANCE

Achieving 50:50 gender parity in the boardroom

4 out of 8 board members are women

Strengthening oversight of ESG performance

Established a Sustainability & Innovation Committee at the board and appointed our first chief sustainability officer

Letter from the CEO

People say the future is green, but few realize a green future also is metallic. The challenge of climate change is a metal challenge. Electric cars, wind and solar power, batteries – they all need metal, often several times more metal than is now used by gas-guzzling cars, coal and natural gas-fired power plants. To build a green future, our generation will need to mine more metal than we have mined in our entire history.

Metal extraction comes with its own set of human and planetary costs. How do we make sure the required metals are extracted without harming local communities and without exceeding planetary ecological boundaries? After 10 years of exploration, technology development and environmental studies, we believe we have a way to obtain some of the critical metals – namely, nickel, copper, cobalt and manganese – without digging new mines, without cutting down rainforests and destroying natural carbon sinks, without generating toxic waste, and without poisoning terrestrial habitats and human communities. Instead of developing three different types of mines on land, we can get four critical metals from a single source – a polymetallic nodule. These potato-sized, metal-packed rocks sit unattached on the seafloor in a vast marine desert – the abyssal plains about 1,300 miles southwest of San Diego, Calif., at 4,000 to 6,000 meters depth. These nodule fields are the world's largest undeveloped source of battery metals on the planet. Just two of our contract areas are estimated to have in situ quantities of these metals to the requirement for 280 million electric vehicles (EVs), roughly the size of the entire U.S. passenger vehicle fleet on the road today.

In a world powered by fossil fuels, countries such as the United States have worked hard to secure energy independence by developing unconventional resources within their borders. As the world transitions from fossil fuels, oil and gas are being replaced by the flow of electrons inside batteries. Most battery metals are mined in challenging jurisdictions and processed and refined in China, leaving countries such as the United States with a strong reliance on imported battery materials and a 50,000-mile supply chain.[1] Hard-won energy independence is being replaced with near-complete mineral dependence. Developing a nodule resource can help secure mineral independence in several critical metals and reduce by 50 times the length of the battery material supply chain.[1] After collecting nodules in the international waters off the U.S. Pacific seaboard, we can transport them for processing and refining in plants next to the battery and EV manufacturers. Currently, we are piloting processing and refining technologies that will be used at these plants and assessing potential sites with a focus on having access to renewable power and exploring low-carbon alternatives to metallurgical coal. So, give us a few years and you might be able to buy and drive an electric car with a battery made from nodules processed in your home country instead of from metals imported from the other side of the world.

Gerard Barron
Chairman & CEO

Nodules in international waters are the common heritage of humankind. We believe the only justified use of such heritage is putting it to work for many generations to come. Our goal is to ensure that metals derived from nodules are part of a circular value chain and are used to build up recyclable metal stocks. Over time, as sufficient metal stocks are built up and global population growth peaks, we should be able to meet most of our needs with the metals we already have, so we can keep using and reusing them for millennia to come and stop taking them from the planet.

Value from our nodule projects will flow not only to our customers who are at the forefront of developing lower-carbon transportation and energy solutions and to future generations in need of metals, but it will also be shared with the Republic of Nauru, the Republic of Kiribati and the Kingdom of Tonga, developing countries that sponsor our work. These Pacific Island nations have done the least to cause climate change, yet they are first in line to suffer its impacts. These islands may be small in terms of land area and population size, but they are big in terms of their ocean area and spirit. Working with these island nations is an honor.

[1] Note: 50,000 miles describes the route, by land and sea, that some materials travel before reaching the car manufacturer as finished battery cells. Source: BNEF, "A Tesla Co-Founder Is Building a U.S. Battery Industry," 2021

Letter from the CEO, continued

Over the years, The Metals Company has been able to attract a purpose-driven team, including strategic partners and independent experts. Together, I am confident we have what it takes to achieve our goal to produce battery metals with a much lower planetary and social impact. Many of them have experienced first-hand the formidable challenges of mining on land. These experiences drive their dedication to take advantage of the unique potential of this nodule resource and inspires us to raise the bar for this new industry from the outset. It is a globally significant opportunity that comes with a big responsibility, and we do not take it lightly.

> Our goal is to ensure that metals derived from nodules are part of a circular value chain and are used to build up recyclable metal stocks.

Our generation has the unenviable job of breaking and reversing trendlines underlying crises such as climate change, biodiversity loss and rising inequality. The job is herculean, and the urgency is inescapable. It is too late for pure idealism, magical thinking or self-loathing over how we ended up here in the first place. When it comes to extracting minerals for climate change solutions, 2030 is already yesterday, and most solutions now present themselves as difficult trade-offs between competing priorities. To provide the metals needed for the green energy transition, there will be more emissions, more social displacement, more habitat destruction and more biodiversity loss. The questions are: How much? Where? Who will bear the brunt of the costs? Can we afford it? Can the planet? Working through these trade-offs will require realism, pragmatism and some courage. In this inaugural Impact Report, we share how we intend to navigate these choppy waters.

Gerard Barron
Chairman & CEO

Our mission

The Metals Company's (Nasdaq: TMC) mission is to build a carefully managed metal commons that will be used, recovered and reused again and again.

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.

Our intent is to build a carefully managed metal commons that will be used, recovered and reused – for millennia. No more metal taken from the planet. No more metal lost to landfills. No more mitigating 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.

Getting there is not a straight path, and that is why part of our plan involves recycling the metals we produce as we help build up sufficient metal stocks. Over time, we intend to sunset our primary extraction activities and transform ourselves into a recycling business. From there, we can expand our scope to recover a broader set of metals.

Our mission is to build a carefully managed metal commons that will be used, recovered and reused again and again.

Chapter 1	Chapter 2	Chapter 3
Supply critical metals with the least environmental and social impacts	Recycle the metals we produce	Recycle the rest

Exit primary production

Our challenge

The fight against climate change, or better described by the Pacific Island nations as climate crisis, requires an accelerated transition to renewables and electrification of transport, which comes with an exponential growth in demand for the critical metals used in these technologies. It will take a good part of this century to get to a place where we have enough metal stock in circulation to meet our needs without having to take more metal from the planet.

We see two main megatrends that are driving growth in metal demand:

- The world is embarking on a massive, multi-generational project of decarbonizing global energy and transport. These carbon-free systems will take billions of tons of metals to build it, and we just started.
- At the same time, the world's population continues to grow, urbanize and develop, with 2 billion net population growth expected by 2050.[2] This development will also require billions of tons of metals.

Add these needs up, and our generation will have to mine more metal than we have mined during all of human history. Much of this mining will happen in some of the most beautiful regions in the world, such as the lush rainforests in Indonesia, home to high biomass and rich biodiversity. Between where we are today, in terms of resources readily available and where we want to be in creating a circular economy, is a gap that we need to bridge. **So how do we build up a metals commons with the lowest possible environmental and social impacts? This is the global challenge we have made our own.**

[2] IISD SDG Knowledge Hub, "World Population to Reach 9.9 Billion by 2050," Aug. 6, 2020

Our responsibility

We believe that polymetallic nodules found far offshore in international waters offer a promising pathway to supply critical metals with the least environmental and social impact.[3] With the partnership and support of three Pacific Island nations as our sponsoring states, we've been exploring the seafloor of the Clarion-Clipperton Zone (CCZ) in the Pacific Ocean, where the planet's largest-known deposits of undeveloped battery-grade metals are located. In parallel, and with the help of key partners, our offshore engineering team is developing an offshore nodule collection system, and our onshore processing team is developing and successfully piloting a metallurgical process to derive certain battery metals from these remarkable rocks while generating near-zero solid processing waste. We have also invested in assessing the potential life cycle impacts of any future commercial operations.

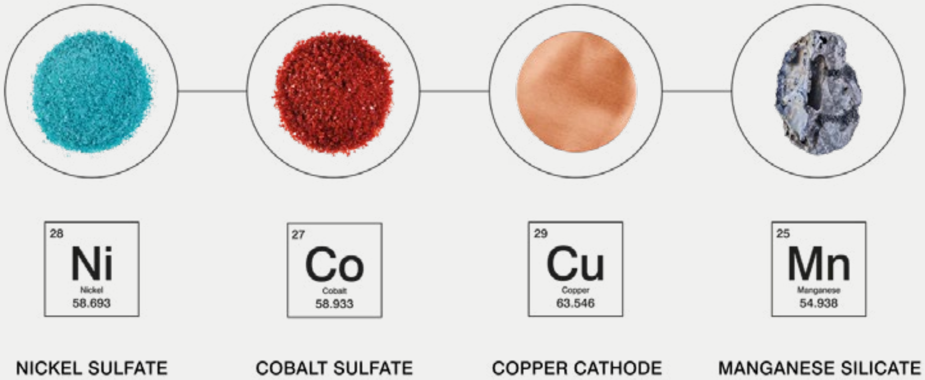
Clarion-Clipperton Zone (CCZ) Exploration Area

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.

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

We are still in the exploration phase of our development. Our potential first small-scale commercial production, when we will turn polymetallic rocks into metals that go into electric vehicles and renewable energy storage and infrastructure, is several years away. Our tangible impacts on people and planet today are limited to a handful of offshore exploration and environmental assessment expeditions, and the technology development work largely performed at our partners' facilities. **So why are we publishing an impact report now?**

Key battery metals contained in nodules



Most companies produce sustainability reports on their ongoing commercial operations. They list their positive contributions and impacts, and provide some commitments to improve their ESG performance and report progress against those commitments.

A timeline of **important milestones**

- **2011** — DeepGreen[1] 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
- **2023** — Expected to submit NORI-D area exploration contract application
- **2024** — Projected to start small-scale commercial production
- **2030** — Expected steady-state commercial production

[1]DeepGreen Resources predecessor of DeepGreen Metals

We believe it is our responsibility to start early with a forward-looking view of our potential future commercial operations and strive to improve before we start. That is why we are sharing our motivation, our approach, our expected impacts and how they compare to land-based mining, and an overview of the work we are doing now to eliminate or reduce our impacts – all before a single nodule has been collected from the seafloor for commercial purposes. The age of treating planetary and human costs as "negative externalities" is over. We must inventory the impacts of the choices ahead of us, be prepared to make difficult trade-offs between competing goals, and make sure our choices keep us within planetary boundaries. Taking metal from the planet will always cause some damage to the planet and can come with significant human costs, too. What are our options and what level of cost is acceptable? To make sure society arrives at the right decisions, it is our responsibility to account for the full stack of our impacts on planetary boundaries and social foundations, aim for net positive impacts on the planet and people, and be prepared to change course if our chosen path does not deliver on that aim.

There is another reason why we are sharing our journey now. It's a hackneyed notion, but it does not make it less true: There are more brilliant people in the world working outside of TMC than inside our company. So please keep reading, and consider yourself invited. If you see questionable assumptions, question them. If you have better ideas for solving our complex impact puzzle, please share them at: impact@metals.co. We welcome a science-driven dialogue with a focus on solutions that take into account the interconnectedness and complexities of planetary and social systems.

There is no way around it – our future operations will have a physical footprint on the planet. But being an exploration-stage company with a deep commitment to having a net positive impact on the world gives us an advantage to think, plan and achieve better than just do less harm. Instead, we can look at the planetary systems and craft our path to create value beyond the bottom line, to be part of the fight against climate change and to support the Pacific Island nations that feel its impacts the most. While we intend to collect nodules from the seafloor, we believe we can help improve the health of our oceans by supporting protection of areas with the greatest concentration of life, by advancing marine research and by eliminating waste, which inevitably is generated through the mining of these metals on land in the form of tailings that need to be managed indefinitely. We know we cannot do it alone, and that is why we are working on the many partnerships required for us to become a net positive company.

OUR RESPONSIBILITIES

#1: Full Stack

There are no "externalities." Account for the full stack of our impacts on planetary boundaries and social foundations.

#2: Net Positive

Use the common heritage of humankind resource to create a significant, lasting, net positive impact on people and planet.

#3: Course Correction

Change course if our chosen path does not deliver on our impact goal. We cannot afford path dependencies.

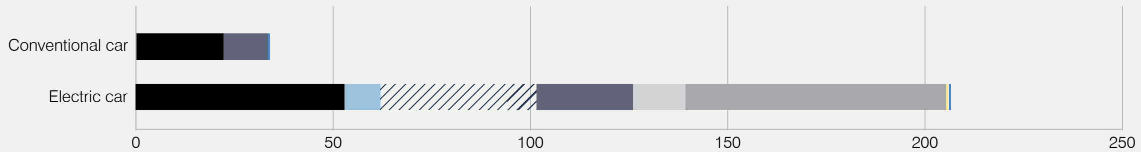
Why We Exist

Metal-intensive future

The global transition to clean energy is metal intensive. An offshore wind farm requires eight times more critical metals to build than a coal-fired plant;[1] an electric car six times more compared to a conventional one.[2]

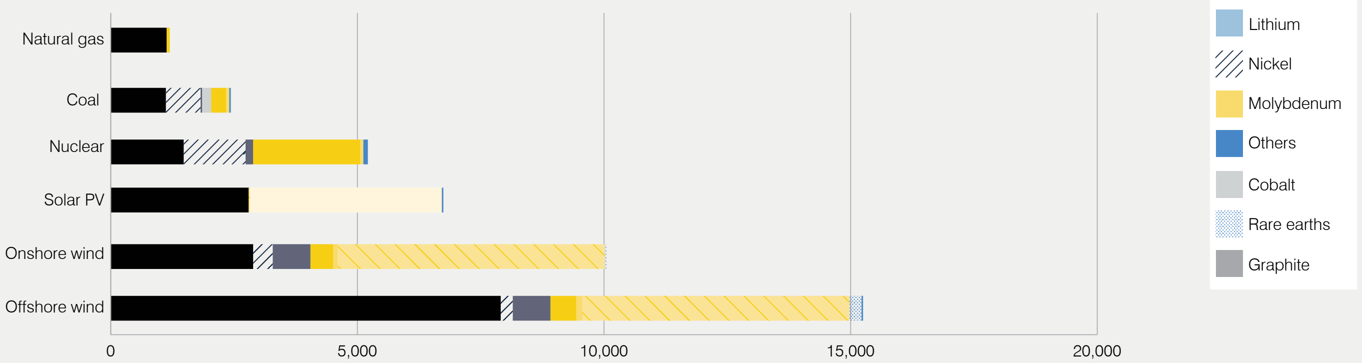
Minerals used in selected clean energy technologies

Transport (kg/vehicle)



Source: IEA, "Minerals used in electric cars compared to conventional cars," May 4, 2021

Power generation (kg/MW)

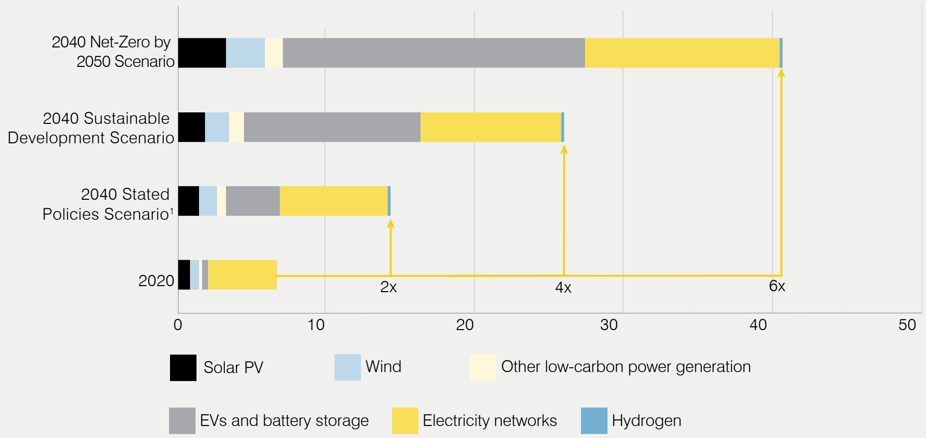


Source: IEA, "Minerals used in clean energy technologies compared to other power generation sources," May 5, 2021

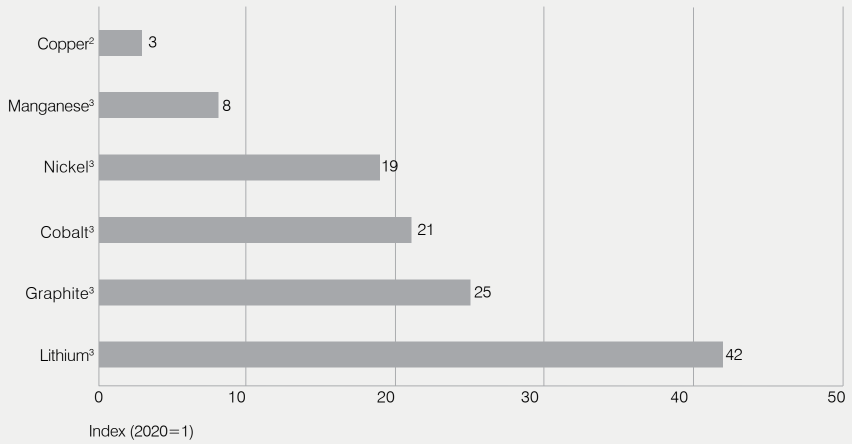
[1] IEA, "Minerals used in clean energy technologies compared to other power generation sources," May 5, 2021
[2] IEA, "Minerals used in electric cars compared to conventional cars," May 4, 2021

The likelihood of a more metal-intensive future has attracted considerable analytical effort from organizations including the World Bank,[3] the International Energy Agency (IEA)[4] and the International Monetary Fund (IMF).[5] On a global scale, a four to six times overall growth rate in mineral demand is widely predicted to be needed to support clean energy technologies by 2040. For certain critical metals, the growth in demand driven by transition to clean energy is predicted to be much higher – up to 42 times more for lithium, 25 times more for graphite, 21 times more for cobalt, 19 times more for nickel, 8 times more for manganese, and 2.7 times more for copper as compared to 2020.[6]

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

[3] World Bank, "The Mineral Intensity of the Clean Energy Transition," April 2020
[4] IEA, "The Role of Critical Minerals in Clean Energy Transitions," 2021
[5] Lukas Boer, et al., "Energy Transition Metals," Oct. 12, 2021
[6] IEA, "The Role of Critical Minerals in Clean Energy Transitions," 2021

Many of the commitments made by governments and industry last year at the U.N. Climate Change Conference (COP26) in Glasgow have focused on accelerating the transition to clean energy, further increasing the implied demand for metals.[7] For example, an agreement was reached between governments, cities, automotive original equipment manufacturers (OEMs), fleet owners and investors to rapidly accelerate the transition to zero-emissions vehicles, targeting 100% zero-emissions sales of new cars and vans by 2040 or earlier, or by no later than 2035 in leading markets.[8]

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 of nickel in nickel sulfate ($NiSO_4$)

28 **Ni** Nickel 58.693

7.1 kg of cobalt in cobalt sulfate ($CoSO_4$)

27 **Co** Cobalt 58.933

6.6 kg of manganese in manganese sulfate ($MnSO_4$)

25 **Mn** Manganese 54.938

85 kg of copper cathode for the harness and connectors

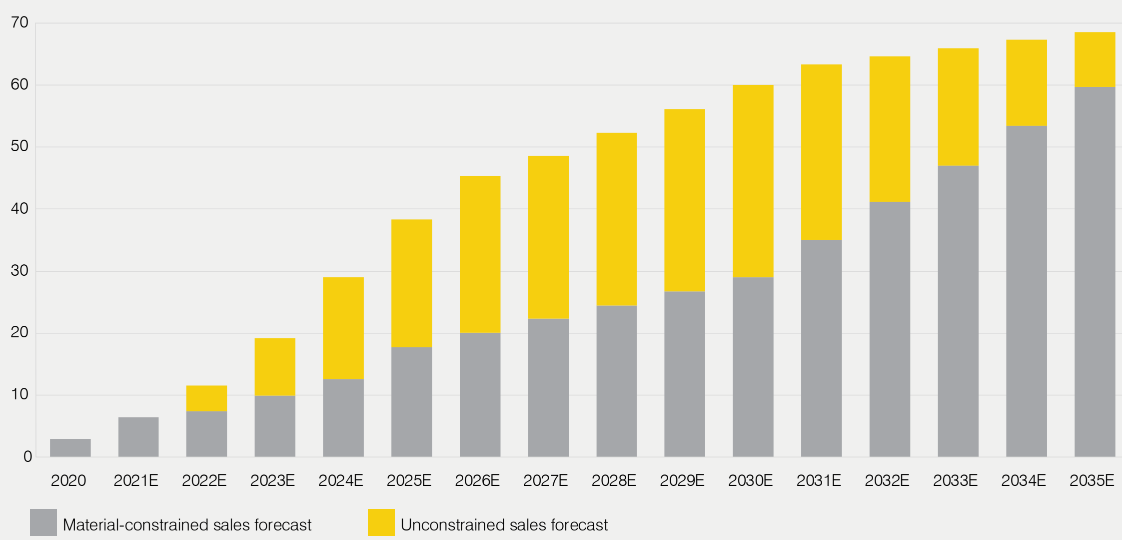
29 **Cu** Copper 63.546

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

To solve climate change, the world will have to produce more critical metals in the next 30 years than it has in all of human history.[9] 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."[10] Some market analysts already view supplying critical metals for accelerated decarbonization as "mission impossible,"[11] while others predict that by 2030 automakers will likely be giving up more than 30 million units of sales per year due to raw material underinvestment. Several auto OEMs have acknowledged the potential of critical metals to slow down their electrification efforts.[12]

By 2030, 30+ million EVs per year could be left unbuilt due to material shortages

EV sales forecast
Millions of units sold per year



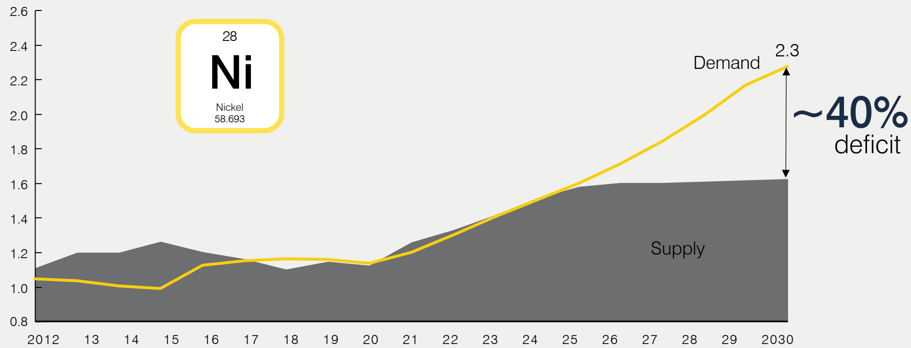
Source: Battery Materials Review, Westbeck Capital estimates

[7] U.N. Climate Change Conference (COP26) at the SEC Glasgow, "COP26 Outcomes," Dec. 20, 2021
[8] COP26, "COP26 Declaration on Accelerating the Transition to 100% Zero Emission Cars and Vans," April 8, 2022
[9] IEA, "The Role of Critical Minerals in Clean Energy Transitions," May 2021
[10] IEA, "World Energy Outlook – Topics," Oct. 1, 2021
[11] Wood Mackenzie, "COP26: Why Base Metals Should Be High on the Agenda," Oct. 6, 2021
[12] Reuters, "Mercedes-Benz CEO Says Raw Material Scarcity Could Delay e-Mobility - Die Zeit," Reuters," Feb. 2, 2022

The risks posed by the supply of critical metals needed for the clean energy transition can be boiled down to four issues: availability, security, price and ESG impacts.

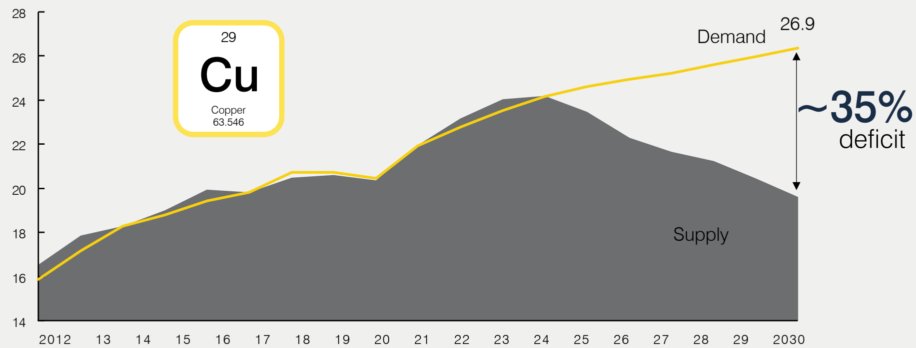
Availability: A significant portion of metal production capacity required after 2025 is currently unplanned, with potential shortages emerging for metals such as nickel,[13] copper[14] and cobalt[15] as early as 2024. Exploration pipelines are looking thin and, if major new discoveries are made, it takes a long time to assess, plan, develop and start production. Between 2010-2019, it took, on average, 16.5 years to move major mining projects from discovery to first production.[16]

Class 1 nickel supply and demand without greenfield developments
Global refined nickel supply and demand, in Mt



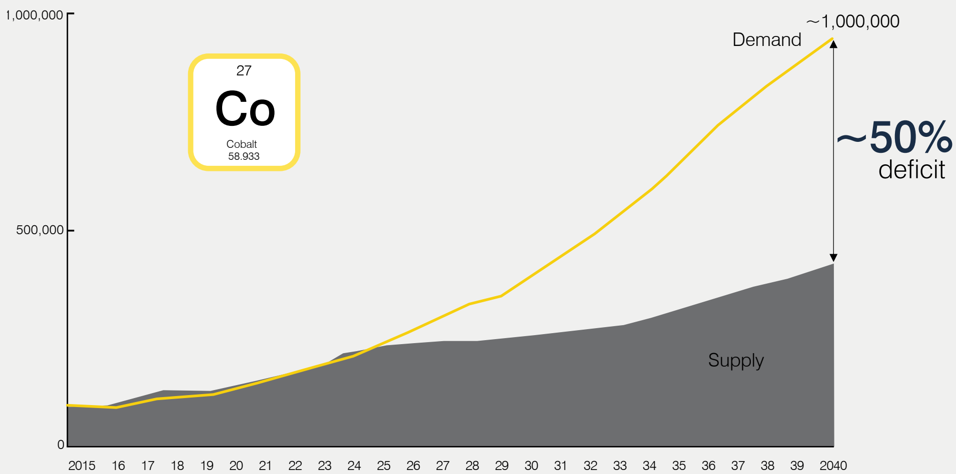
Source: Marcelo Azevedo et al., "How clean can the nickel industry become?" Sept. 11, 2020

Copper supply and demand without greenfield developments
Global copper mine supply and demand, in Mt



Source: Wood Mackenzie, Q4 2020 Copper Long Term Outlook, December 2020

Cobalt market balance
Global cobalt supply and demand, in tonnes

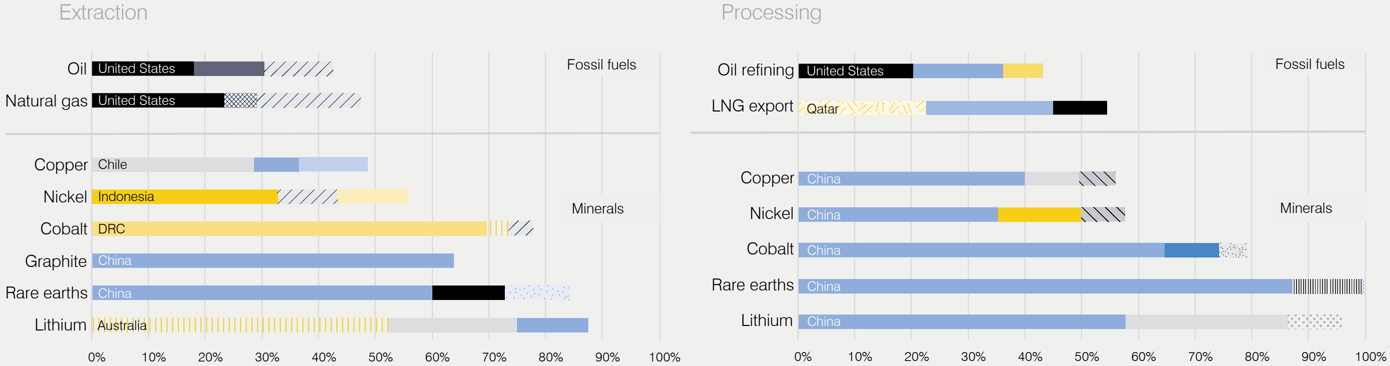


Source: Benchmark Minerals Intelligence Cobalt Forecast

[13] Marcelo Azevedo et al., "How clean can the nickel industry become?" Sept. 11, 2020
[14] Wood Mackenzie, Q4 2020 Copper Long Term Outlook, December 2020
[15] Pratima Desai and Mai Nguyen, "Shortages flagged for EV materials lithium and cobalt," July 1, 2021
[16] IEA, "The Role of Critical Minerals in Clean Energy Transitions," May 2021

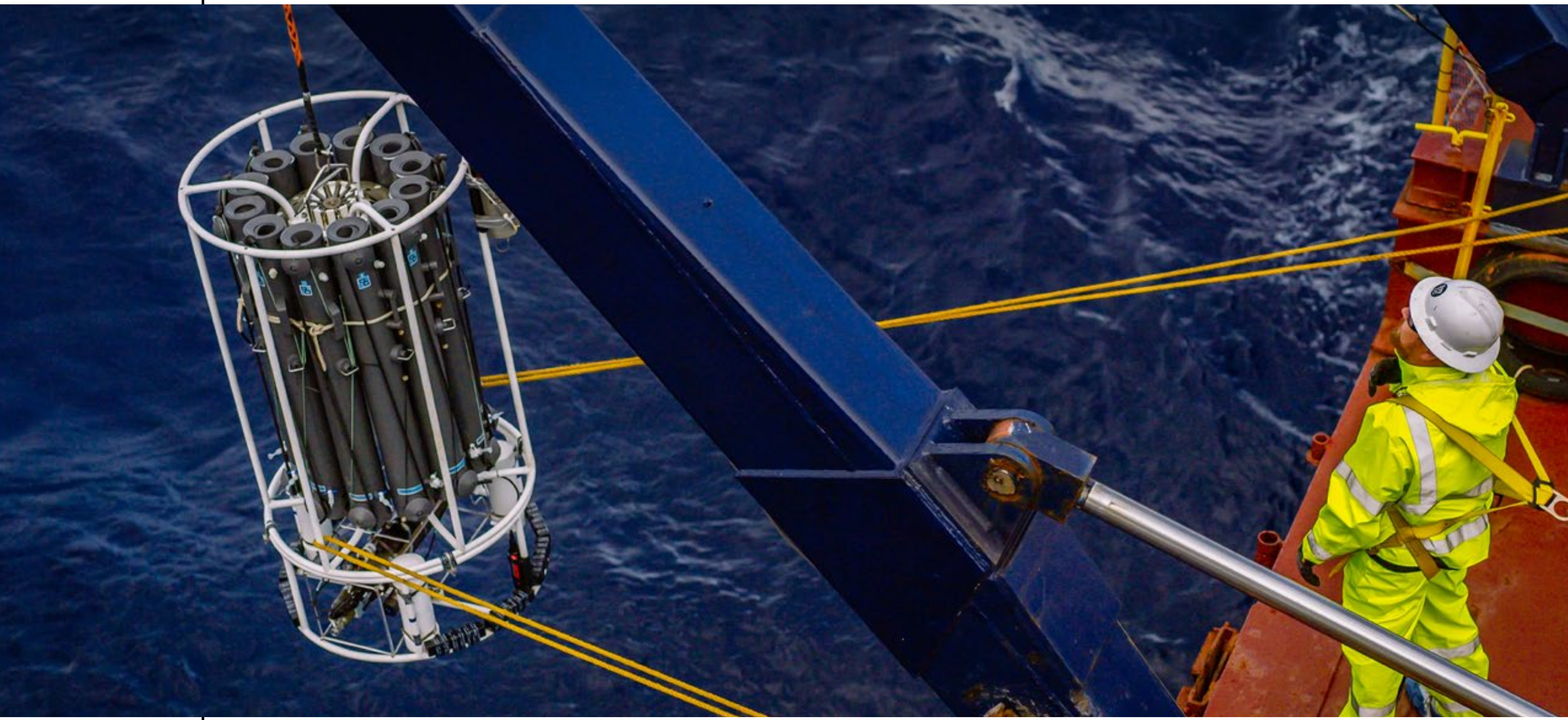
Security: After decades of strategic investment and industrial policy codified in the country's governing Five-Year Plans, China (dubbed the "Saudi Arabia of cleantech"[17]) dominates the battery materials supply chain and has effectively secured its role as the world's primary economic beneficiary of the clean energy transition. The lack of geographical diversity in metal extraction and processing operations creates a much more concentrated and vulnerable metal supply chain compared to the fossil fuel era from which we are transitioning.

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)

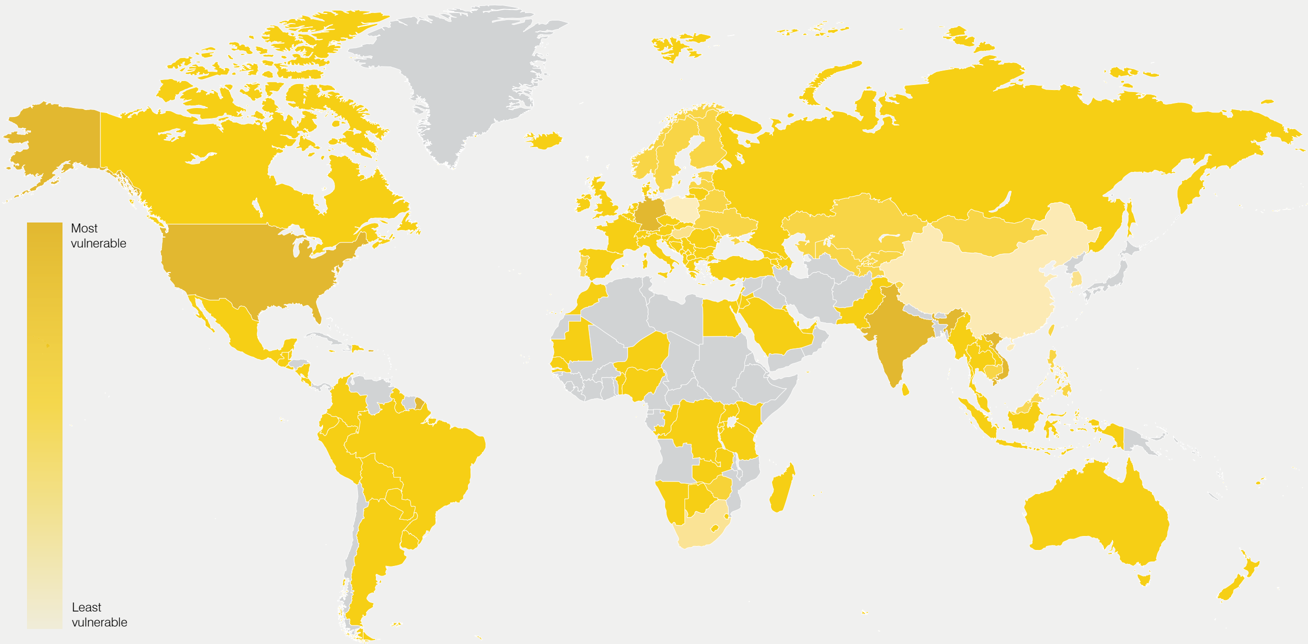


[17] Peter Sopher, "How a Minerals Shortage is Halting our Energy Transition," Feb. 16, 2022

A recent supply chain vulnerability assessment for battery EVs developed by GlobalData concluded that, with the noteworthy exception of China, countries with the biggest EV sales are also the countries with some of the biggest supply chain vulnerabilities.[18]

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 independence is now a geopolitical issue in countries like the United States. The White House's 100-day supply chain assessment report elevated nickel to critical status and the United States Geological Survey (USGS) formally added nickel to the critical minerals list, along with cobalt, manganese and lithium. The report also highlighted steps the United States needs to take to start building mineral independence while taking a more prominent role in the clean energy transition.

The Wilson Center in its Mosaic Approach report states it clearly: "The United States faces a troubling scenario when it comes to the supply chain for critical minerals. Rapidly increasing demand, under-developed national resources, intense international competition, and years of neglect in this issue area place the United States at a distinct disadvantage vis-à-vis China in securing access to the metals and rare earth elements that are vital for the energy transition and for geopolitical ambitions."

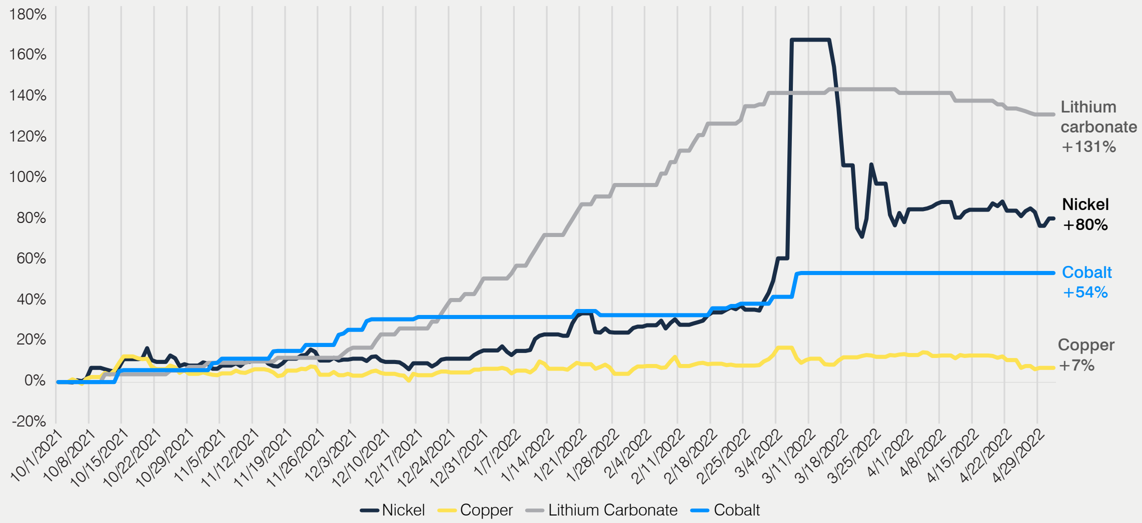
[18] Isabeau van Halm and Cathy Mullan, "Booming EV sales challenge critical mineral supply chains," Feb. 14, 2022

These concerns are echoed in the European Union, where only 1% of critical metal demand is met domestically and where politicians have stated that they cannot allow the replacement of Europe's current reliance on fossil fuels with a dependency on critical raw materials.[19]

Price. Mass adoption of EVs depends on price parity with conventional, internal combustion engine (ICE) cars. That price parity is generally expected to occur around a battery pack price of $100 per kilowatt-hour (kWh).[20] Since 2010 when lithium-ion battery pack prices exceeded $1,200/kWh, prices have been steadily falling due to better technology and economies of scale, hitting an all-time low of $132/kWh in 2021 and forecast to reach average-price parity by 2024.[21] However, with commodity prices for lithium, nickel and copper recently reaching multi-year highs, the industry now expects prices could rise in 2022.[22] In early March 2022, the London Metal Exchange (LME) suspended trading of nickel for a week after prices more than doubled to cross a record $100,000 per tonne.[23] With the IMF predicting sustained high commodity prices,[24] EV price parity with ICE vehicles is looking less assured, putting the mass adoption of EVs at risk.

Since the beginning of Q4 2021, prices for certain critical metals have skyrocketed

- Nickel price increases are still well below those of lithium carbonate, which have increased by nearly 600% since the beginning of 2021.
- Benchmark Mineral Intelligence reported in February 2022 that LFP cell cost per kilowatt-hour eclipsed those of higher-performing nickel batteries for the first time in a decade (prior to the recent nickel price increase).[1]



Source: Bloomberg as of May 2, 2022. Manganese 44% ore price assessment increased by approximately 40% since 9/30/21 on price.metal.com

[1] Benchmark Mineral Intelligence

[19] European Commission, "Keynote speech by Vice-President Maroš Šefčovič at the annual high-level conference of the European Innovation Partnership on Raw Materials," Nov. 17, 2021

[20] 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

[21] Isabeau van Halm and Cathy Mullan, "Booming EV sales challenge critical mineral supply chains," Feb. 14, 2022

[22] BloombergNEF, "Battery Pack Prices Fall to an Average of $132/kWh, But Rising Commodity Prices Start to Bite," Nov. 30, 2021

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

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

Breaking down the cost of an **EV battery cell**

Average Cell Cost In 2021: **$101/kWh**

80% of all cell manufacturing occurs in China.

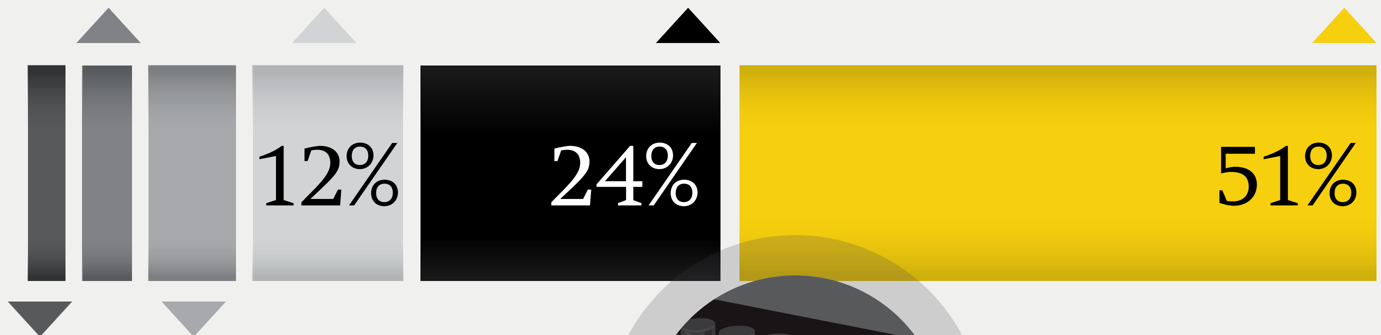
4%

Electrolyte
The medium that transports lithium ions from the cathode to the anode.

Anode
The negatively charged electrode, typically made of graphite.

Manufacturing & Depreciation
The largest EV battery manufacturers are all headquartered in Asia.

Cathode
The cathode material determines the capacity and power of a battery, typically composed of lithium and other battery metals.

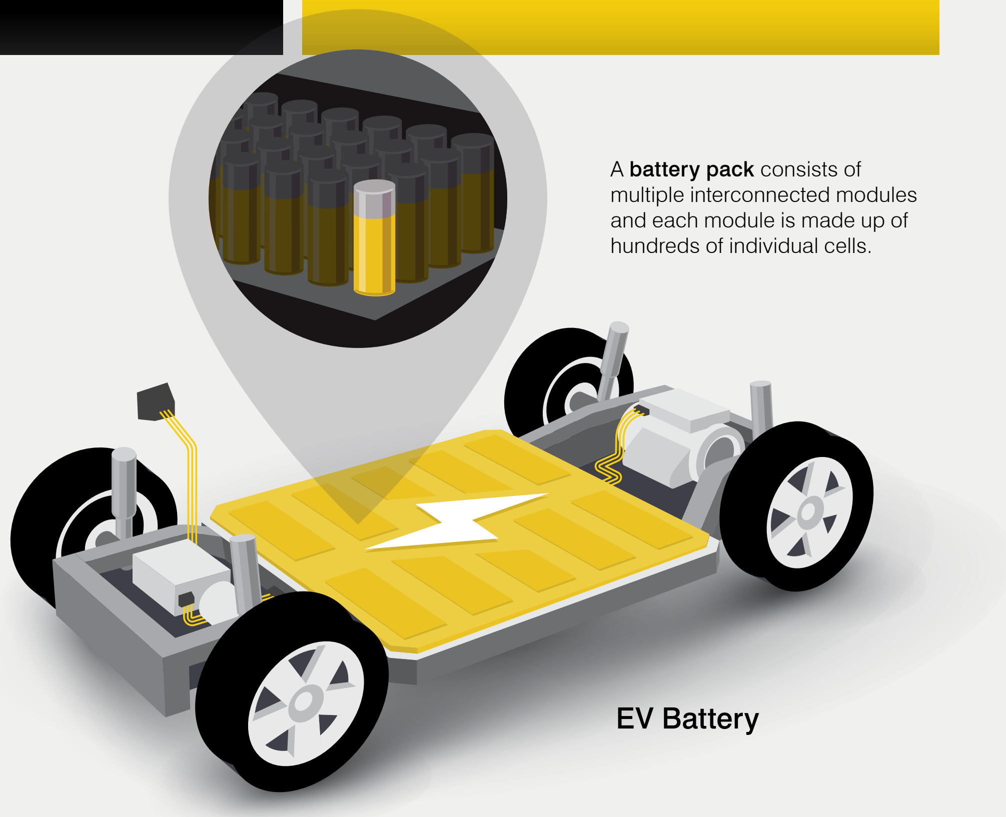


Battery Housings
Cases that contain and protect battery packs, usually made of steel or aluminum.

3%

Separator
Separators prevent electric contact between the cathode and the anode.

7%



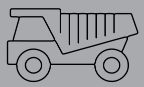
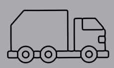
A **battery pack** consists of multiple interconnected modules and each module is made up of hundreds of individual cells.

EV Battery

Source: Visual Capitalist

ESG impacts. A long history of severe environmental and social impacts makes extracting required metal an uncomfortable fit with the ethos of the clean energy transition. Resource extraction is by nature a destructive process that often starts with the need to displace or change the land use of local communities and Indigenous people. Depending on the nature of the operation, it may involve deforestation and associated loss of carbon sinks and biodiversity – including flattening mountains, blasting giant holes and other large-scale disfigurement of landscapes. Acid mine drainage from exposure of sulfur minerals to air and water can pollute surface water, generate solid waste streams that dwarf any other human activity on Earth, and produce toxic slurries that must be isolated from the environment and managed indefinitely in engineered structures or placed underground or on the deep-sea floor.[25]

Metal ore extraction is usually an energy- and water-intensive business, generating its own significant carbon emissions and putting additional stress on freshwater resources. At its worst, small-scale mining can involve instances of child labor (with up to 40,000 children working in dangerous conditions in cobalt mines in the Democratic Republic of the Congo),[26] human rights abuses, shortening of miners' lifespans and even loss of life. Conflicts with traditional communities near mining sites pose a risk to their livelihood and cultural heritage. A report by MSCI found that the majority of U.S. reserves for critical minerals are located within 35 miles of Native American reservations: 68% of cobalt, 89% of copper, 79% of lithium and 97% of nickel reserves.[27]

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] Mining Waste Management – Global Market Trajectory & Analytics, April 2021
[2] World Bank, "What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050," Sept. 20, 2018

As a result, in some parts of the world, new mining projects have faced strong opposition on social and environmental grounds.[28] In the words of the IEA's executive director, "Left unaddressed, these potential vulnerabilities could make global progress toward a clean energy future slower and more costly – and therefore hamper international efforts to tackle climate change."[29]

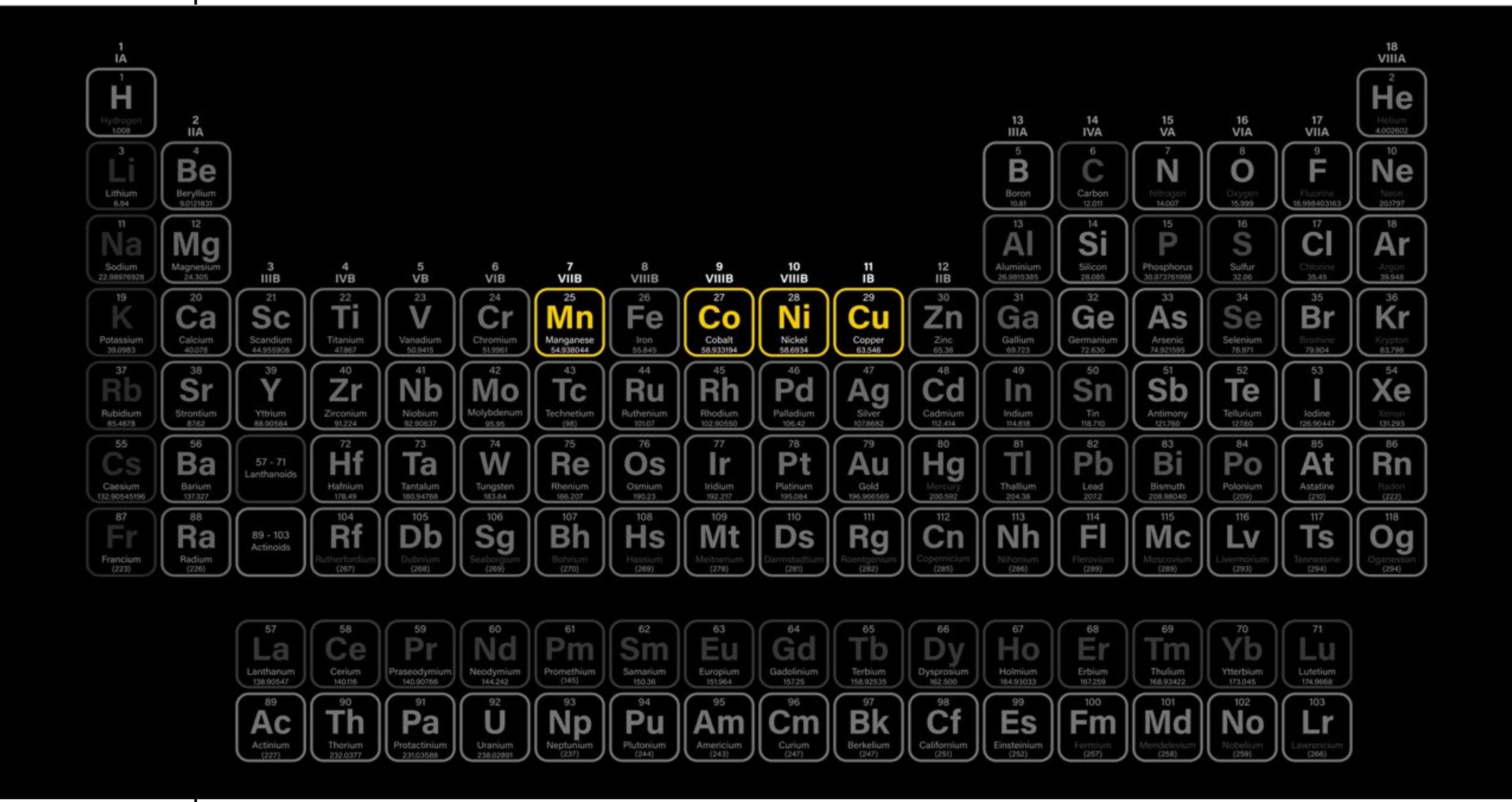

Child labor


Deforestation, loss of biodiversity and carbon sinks


Toxic tailings


CO_2, SO_x and NO_x emissions

[25] Lindsay L. Vare et al., "Scientific Considerations for the Assessment and Management of Mine Tailings Disposal in the Deep Sea," Feb. 5, 2018
[26] International Labour Organization, "Child Labour in Mining and Global Supply Chains," May 2019
[27] Samuel Block, "Mining Energy-Transition Metals: National Aims, Local Conflicts," June 3, 2021
[28] 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
[29] IEA, "Clean energy demand for critical minerals set to soar as the world pursues net zero goals," May 5, 2021



Metal metabolism

Metals are recyclable – that is the silver lining of 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 cycles of technological innovation while relying on the shared stock of metals (cradle-to-cradle). We can think of metals as "techno-nutrients" for the metal metabolism of our civilization. As long as our technological needs stay within the limits of existing metal stocks and we take good care of them, we won't need to take more metal from the planet.

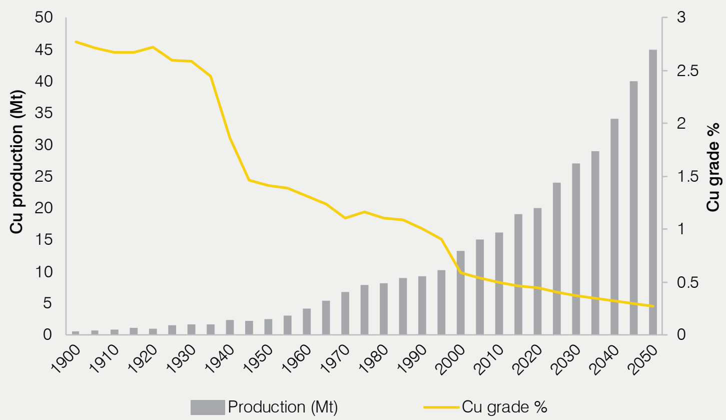
How close are we to this vision today? Take copper – a metal we have arguably been mining the longest, with archaeological findings of copper artifacts dating as far back as 8,000 years.[30] Our predicted copper needs for the next 30 years far outstrip the total amount of copper that humans are estimated to have taken from the planet to date and with declining ore grades, the projected tailings generation dwarfs those generated in the last century.[31] Add to this the fact that a big portion of extracted copper is tied up in long-term uses such as building wire, copper pipes and cables used by telecomms and power utilities, and copper stocks available for new uses are dramatically reduced.[32]

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

[31] Ayman Elshkaki et al., "Copper demand, supply, and associated energy use to 2050," July 2016

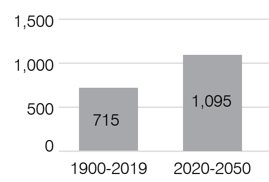
[32] UNEP, "Metal Stocks in Society: A Scientific Synthesis," 2010

Historical and projected copper production by year[1]



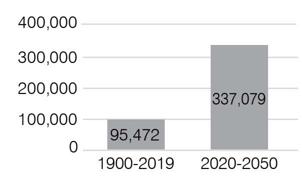
In the next 30 years, the world is expected to mine **1.5x more copper** than in the last 120 years.

Copper production (Mt)



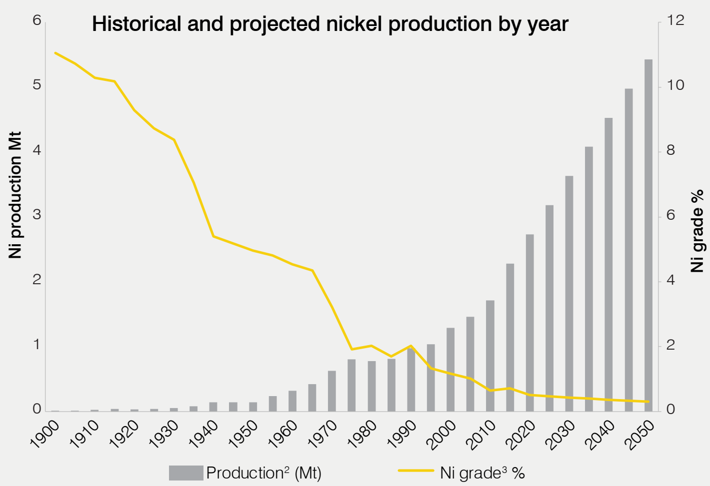
In the next 30 years, the world is expected to generate **3.5x more copper tailings** than in the last 120 years.

Copper tailings generation (Mt)



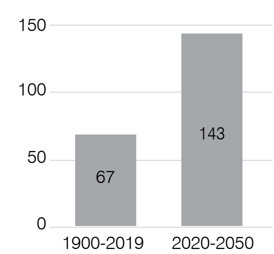
[1] Ayman Elshkaki et al., "Copper demand, supply, and associated energy use to 2050," July 2016

Historical and projected nickel production by year



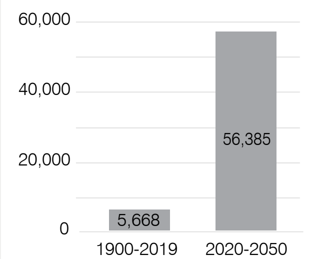
In the next 30 years, the world is expected to mine **2x more nickel** than in the last 120 years.

Nickel production (Mt)



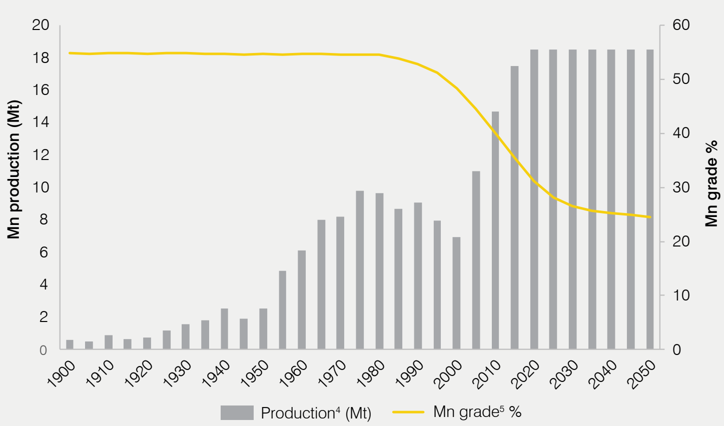
In the next 30 years, the world is expected to generate **9.9x more nickel tailings** than in the last 120 years.

Nickel tailings generation (Mt)



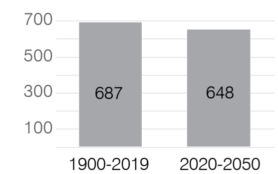
[2] Takuma Watari et al., "Review of critical metal dynamics to 2050 for 48 elements," April 2020
[3] Harald Ulrik Sverdrup et al., "Adaptation to a New Economic Reality," Nov. 30, 2019

Historical and projected manganese production by year



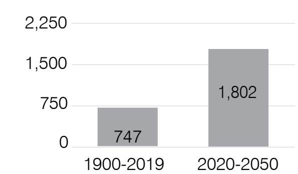
In the next 30 years, the world is expected to mine **close to the same amount of manganese** than in the last 120 years.

Manganese production (Mt)



In the next 30 years, the world is expected to generate **2.4x more manganese tailings** than in the last 120 years.

Manganese tailings generation (Mt)



[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

Metal recycling has been practiced for decades. Current global end-of-life recycling rates are estimated to be at 68% for cobalt, 53% for manganese,[33] 59% for nickel and 45% for copper globally.[34] Given the dynamic nature of metal flows, metals can be locked up for decades in durable consumer goods. Product lifespans differ and can be extended. For example, an EV battery may enter second-life applications in home or grid energy storage.[35] As a result, it might take a good part of this century to get to a place where we have enough metal stock in circulation to meet our needs without having to dig up more. According to analysis by the World Bank, if we currently were to recycle 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.[36] The 2021 IEA special report, titled "The Role of Critical Minerals in Clean Energy Transitions," modeled the numbers for two scenarios: Stated Policies Scenario (STEP) and the 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 STEPS and 10% in SDS, and recycled cobalt for 24% and 21%, respectively.[37] As long as the overall metal demand is growing, our reliance on mined metal will persist.

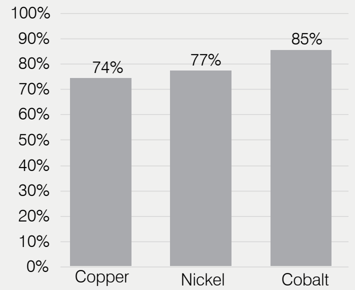
Getting as close as possible to the 100% end-of-life recycling rate is critical. Fortunately, real progress is being made across the world: China already requires its EV battery manufacturers to assign each battery a unique ID, which is tracked from production to end-of-life recycling.[38] Europe is working toward "battery passports" and mandating circular recovery of battery materials.[39,40] Blockchain solutions for supply chain tracking throughout the life cycle (e.g., Everledger, Circulor, ReSource) are being piloted, and dozens of established and new battery recycling companies (e.g., Umicore, Northvolt, Redwood Materials, Duesenfeld, Li-Cycle) are already recovering metal from production scrap.

All these developments notwithstanding, there is no way around this hard fact: Recycling alone cannot meet our current transitional metal needs for the next 30-50 years.[41]

And the clean energy transition is not the only driver of metal demand: The world's population is expected to grow by at least another 2 billion people by 2050,[42] and living standards are expected to improve in the developing world, further increasing demand.

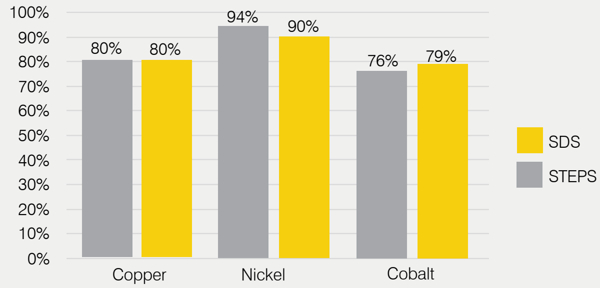
In the short to medium term, significant new extraction is unavoidable. But it does not mean we cannot do it much better.

New metal supply still needed if recycling rate reaches 100% by 2050



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

% of metal supply from new production by 2040 under STEPS and SDS recycling scenarios



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

Global metal stocks and **future demand**

We'll need to mine more critical metals in the **next 30 years** than we have mined in all of history.

Source: T.E. Graedel, "Metal Stocks in Society: A Scientific Synthesis," UNEP, 2010

33 UNCTAD, Commodities at a Glance, May 2020
34 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
35 Jerad Ford and Jim West, "Known unknowns: the devil in the details of energy metals demand," Nov. 3, 2021
36 The World Bank, "Minerals for Climate Action: The Mineral Intensity of the Clean Energy Transition," April 2020
37 IEA, "The Role of Critical Minerals in Clean Energy Transitions," May 2021
38 Lukas Merkle, "Automotive Battery Tracking in China," Nov. 2019
39 World Economic Forum, "42 Global Organizations Agree on Guiding Principles for Batteries to Power Sustainable Energy Transition," Jan. 23, 2020
40 European Parliament, "Resolution of 10 July 2020 on a comprehensive European approach to energy storage"
41 Daniele La Porta Arrobas et al., "The Growing Role of Minerals and Metals for a Low Carbon Future," June 2017
42 IISD SDG Knowledge Hub, "World Population to Reach 9.9 Billion by 2050," Aug. 6, 2020

Doughnuts and getting more metal

Extracting and using our planet's resources without proper regard and accounting for environmental and social consequences is exactly what got us into our current predicament. As a global community, we are moving toward taking responsibility for negative externalities and to reforming human activities. In the last two decades, a new industry has emerged, focusing on producing sustainability principles, frameworks, standards, rankings and certifications. And while we are finally at a place of increased awareness about the urgent challenges facing the world, tangible progress has been limited to commitments that fall short of the change needed to prevent and reverse overshooting planetary boundaries while providing prosperity for all.

Today, carbon emissions are still rising, and ecosystems are seeing unprecedented biodiversity loss. According to the 2019 Intergovernmental Science-Policy Platform on Biodiversity and Ecosystems Services (IPBES) Global Assessment Report, an average of 2% of species in assessed animal and plant groups are under threat, and local varieties and breeds of domesticated plants and animals are disappearing, which poses a serious risk to global food security. Since 1970, the largest negative impact on nature comes from land-use change directly impacting terrestrial and freshwater ecosystems. Seventy-five percent of global land surface has been significantly altered, with one-third of the world's land and nearly three-quarters of available freshwater being used for crop and livestock production. This has come mostly at the expense of forest, grasslands and wetlands – 85% of wetlands in terms of area have been lost. While agriculture drives around 73% of deforestation and forest degradation,10% is driven by urban expansion, another 10% by infrastructure, and 7% by mining, for which indirect and cumulative impacts (e.g., development of road, rail and port infrastructure for the transport and export of minerals) can be more significant.[43]

Mining is expected to significantly grow to supply the materials needed for the transition to clean energy technologies and infrastructure growth needed for a growing population. Since 1992, we have seen a doubling of urban area that continues to bring an unprecedented expansion of infrastructure linked to growing population and consumption.[44] Soil erosion decreases soil fertility, and today soil is eroding more quickly than it is being formed, which reduces the soil's ability to store carbon dioxide.[45] After oceans, soil is the second largest natural carbon sink.[46] The ocean absorbs 30% of the carbon dioxide released in the atmosphere. As the amount of carbon dioxide increases in the atmosphere, so will ocean acidification. With the acidification of the ocean, many ocean species are impacted, "especially organisms like oysters and corals that make hard shells and skeletons by combining calcium and carbonate from seawater."[47] The ocean has more challenges – currently one-third of the global fish stocks are overfished and, in the last century, we have lost 90% of large ocean fish.[48]

One way to regain our bearings is to go back to the fundamentals. If the overarching goal is to meet the needs of all people (thriving people) within the means of a healthy, living planet (healthy planet), solutions for resource extraction have to be limited by two boundaries: ecological limits and social needs. Known as "doughnut economics," this construct was first proposed in 2012 by English economist Kate Raworth, who visualized an economic model with two concentric rings – an ecological ceiling and a social

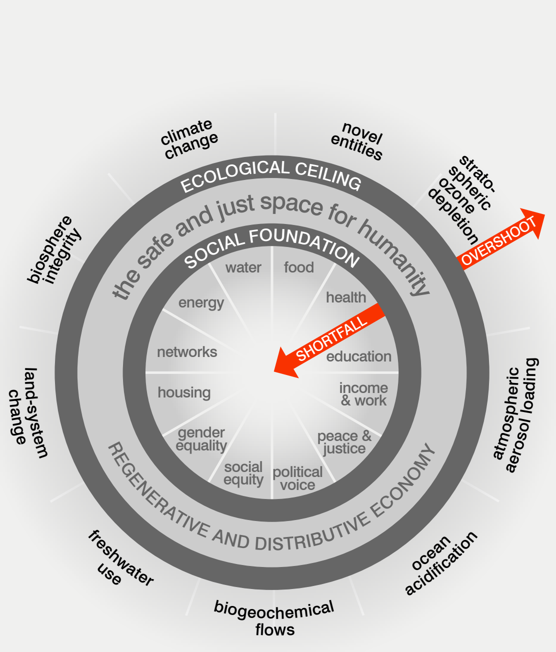
[43] Siân Bradley, "Mining's Impacts on Forests," Oct. 14, 2020
[44] IPBES, "Summary for policymakers of the global assessment report on biodiversity and ecosystem services," Nov. 25, 2019
[45] Dede Sulaeman and Thomas Westhoff, "The Causes and Effects of Soil Erosion, and How to Prevent It," Feb. 7, 2020
[46] European Environment Agency, "Soil, land and climate change," May 11, 2021
[47] NOAA, "Ocean acidification," April 1, 2020
[48] Campaign for Nature, "Why 30?"

foundation. Between these two boundaries lies a doughnut-shaped space that is both ecologically safe and socially just, a space in which humanity can thrive. In her words, the intent was "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."[49]

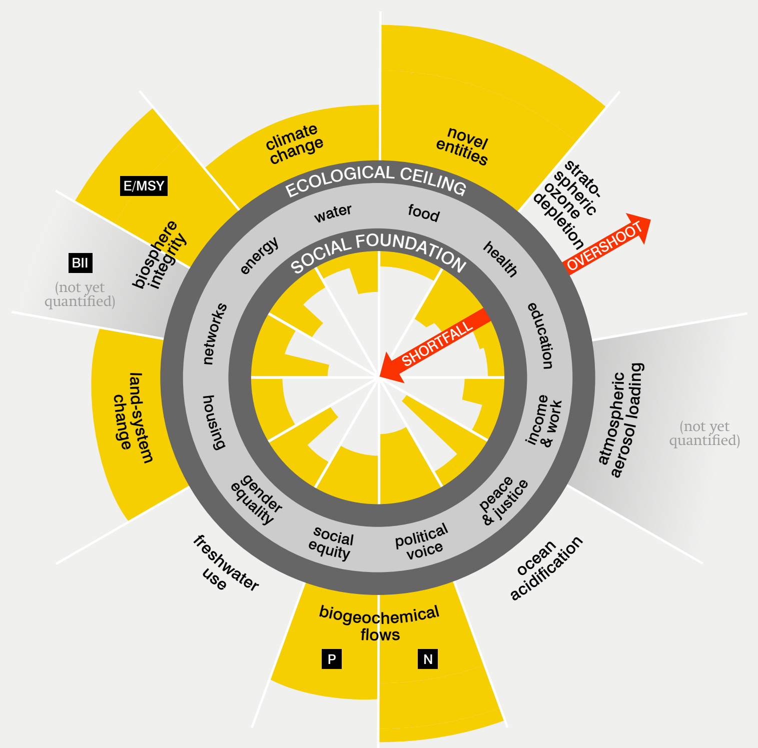
The doughnut offers a helpful conceptual framework to define the solution space for the new tsunami wave of metal extraction, but it only becomes meaningful when it is updated to reflect the current state of the planet and people. Raworth uses nine planetary boundaries, introduced in 2009 by a group of earth systems and environmental scientists led by Swedish scientist Johan Rockström and American chemist Will Steffen,[50] as the ecological ceiling, and she derives the social foundation from internationally agreed-upon minimum social standards identified by the U.N. Sustainable Development Goals. Each dimension is measured, and the wedges outside the doughnut show the shortfalls and overshoots of the doughnut's social and planetary boundaries. Humanity has already overshot five planetary boundaries. (Atmospheric aerosol loading [air pollution] and the biodiversity intactness index [BII] are not yet quantified.) In addition, millions of people still fall short on all 12 social dimensions.

As a global civilization, we have work ahead of us to rein in the ecological overshoots while improving social shortfalls until we eliminate all the red (beyond the boundary) and get into the doughnut-shaped, safe-operating space of humanity. A significant increase in net new mining poses a monumental challenge to achieving this goal. On the one hand, we cannot rein in the climate change overshoot without more metal extraction. On the other hand, metal extraction often involves large-scale modification of the environment, pushing us further into exceeding our ecological limits. It also comes with a mixed bag regarding social impacts.

Doughnut economics framework



Current situation



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

Beyond the boundary
Boundary not quantified

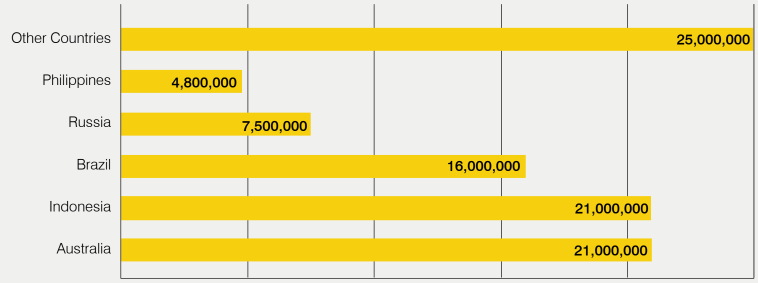
P: Phosphorus
N: Nitrogen
E/MSY: Extinction rate/Million species per year
BII: Biodiversity Intactness Index

[49] Kate Raworth, "Exploring Doughnut Economics"
[50] Johan Rockström et al., "A safe operating space for humanity," Sept. 23, 2009

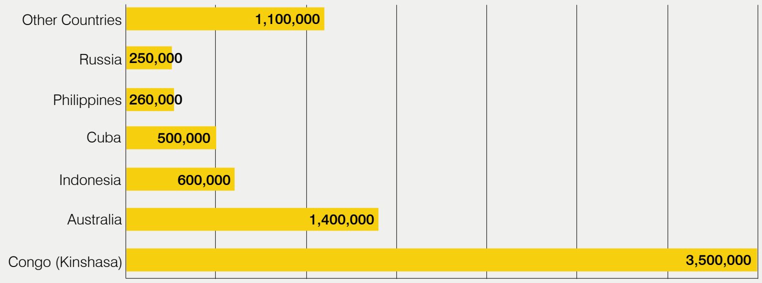
Looking ahead, several factors will make these impacts even harder to deal with.

a. **Deposit locations:** Where will the expected growth in critical metals come from? If we map our remaining known deposits of battery metals, we'll see mining expanding into places with higher geopolitical risk, higher biodiversity, and greater carbon sinks and carbon sequestration services. For example, most of the nickel and cobalt reserves and mines are found in equatorial regions[51] such as Indonesia and the Democratic Republic of the Congo (DRC), respectively, home to Indigenous communities and rainforests with rich biodiversity. In a country with widespread corruption[52] and political instability, the DRC's valuable cobalt industry has been linked to child labor, safety risks and environmental degradation.[53] For example, 20% of cobalt in the DRC comes from artisanal mines, where it is estimated that up to 40,000 children are working in extremely dangerous conditions with inadequate safety equipment and for very little money.[54] Public awareness has been created around blood diamonds and child labor-mined cobalt, but soon we should be talking of rainforest-clearing nickel.

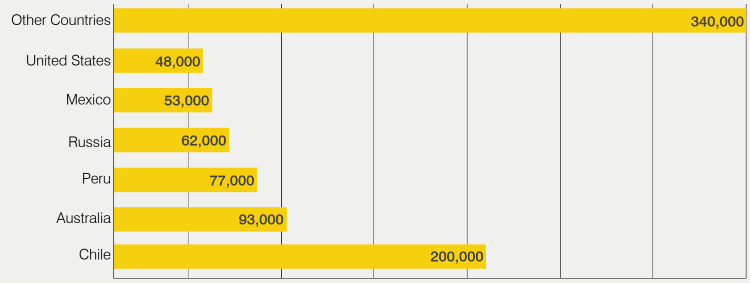
Nickel reserves (tonnes)
Total worldwide >95,000,000



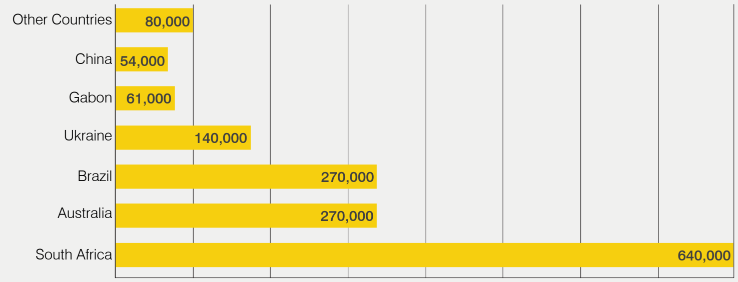
Cobalt reserves (tonnes)
Total worldwide >7,600,000



Copper reserves (thousand tonnes)
Total worldwide >880,000



Manganese reserves (thousand tonnes)
Total worldwide >1,500,000

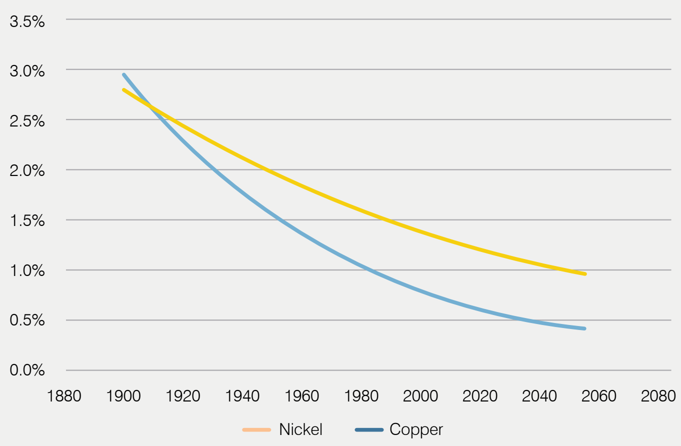


Source: USGS Mineral Commodity Summaries 2022

[51] Nickel Institute, "Is there enough nickel? Reserves, resources and recycling," Jan. 6, 2020
[52] Transparency International, "Corruption Perceptions Index"
[53] UNCTAD, "Commodities at a Glance," May 2020
[54] Michele Fabiola Lawson, "The DRC Mining Industry: Child Labor and Formalization of Small-Scale Mining," Sept. 1, 2021

b. **Falling grades:** Resource extraction follows a simple logic: We tend to take the easy and high-grade resources first. As a result, the amount of metal per ton of mined ore for nickel and copper has been decreasing. Back in 1900, we would dig up one ton of ore and get 30 kilograms of copper. Today to get that same amount of copper, we need to dig up five times more ore,[55] which means more land, more energy and more water used, and more waste generated to get the same amount of copper. This means that each kilogram of metal now comes with a mountain of waste, and that waste must be managed and contained.

Nickel and copper grades, fitted



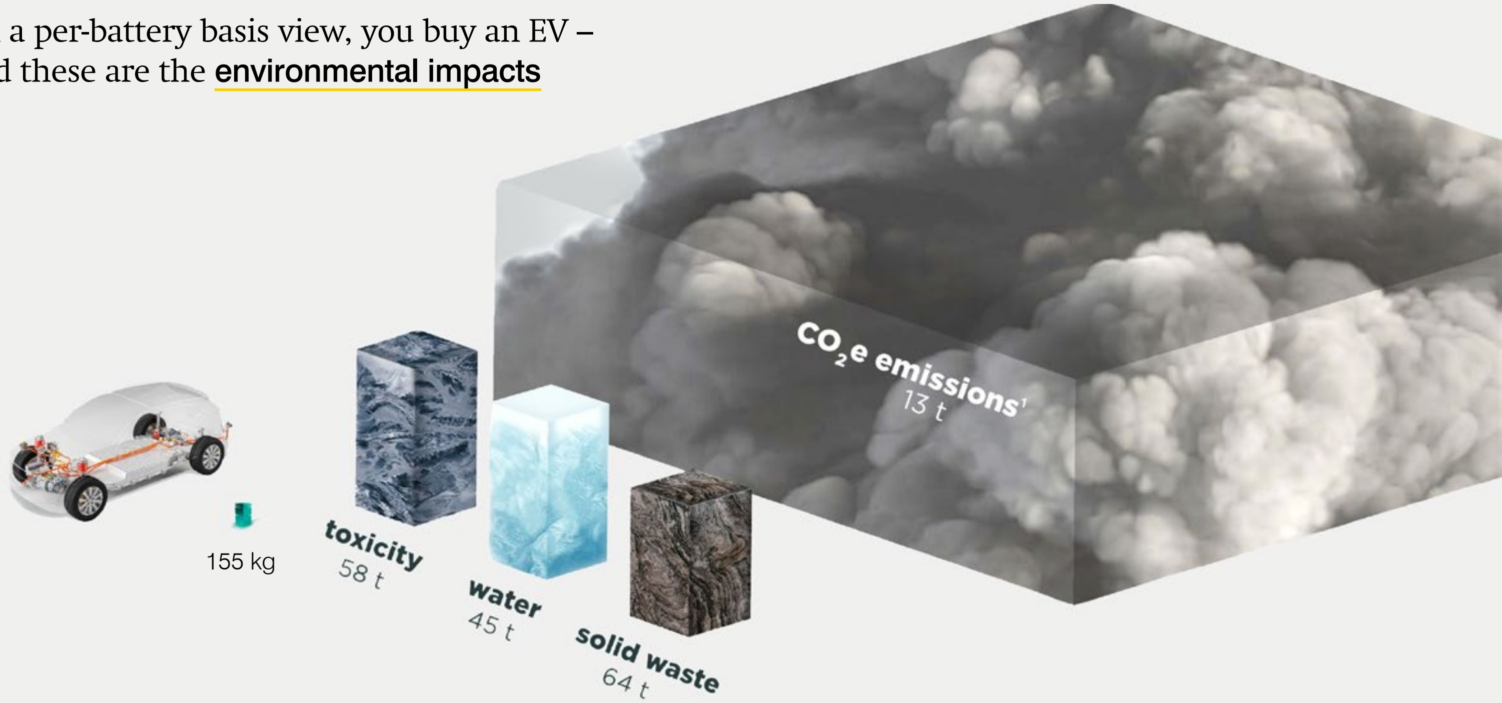
c. **Capital intensity:** This leaves land-based producers in a real predicament. They need to spend more capital to get to the same amount of metal, and then spend even more capital to decarbonize their operations, manage a runaway waste problem, and mitigate deforestation, biodiversity loss and water depletion. Often the areas where the deposits are located are remote and 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 on top of the capex/opex pressure stemming from falling grades.

Sustainable metal mining by definition is not possible. We are dealing with resources that are not renewable on human time scales. However, it does not mean that metal extraction cannot be done responsibly, with a strong focus on taking responsibility for the full stack of negative externalities on people and planet. In principle, impacted communities and Indigenous people can be resettled with their consent and through an equitable exchange of value; miners can be fairly compensated and looked after; and children can be kept out of mine sites and in classrooms. In addition, diesel-powered dump trucks can be replaced with electric ones; coal-fired plants could be powered with renewables; waste streams could be carefully captured and managed; stripped soils can be regenerated; and cleared forests can be replanted. 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 is environmental and social management, with a bit of metal extraction on the side. However, each new mining project comes with its own jurisdictional, geological, ecological, social and economic challenges. Ensuring every new project over the coming decades operates at the highest possible standard is not impossible but rather implausible.

To understand the scale of the challenge in quantitative terms, we commissioned a study to look at the life cycle impacts of producing nickel, cobalt, manganese and copper for an electric vehicle with an NMC811 battery. The 155 kilograms of metals (85 kilograms of copper, 56 kilograms of nickel, 7.1 kilograms of cobalt, and 6.6 kilograms of manganese) required per battery was estimated to generate on average 64 tonnes of waste, 58 tonnes of toxic outputs, and 13 tonnes of CO_2 emissions, while using 45,000 liters of water.[56]

[55] Calvo et al., "Decreasing Ore Grades in Global Metallic Mining: A Theoretical Issue or a Global Reality?" Nov. 7, 2017
[56] Daina Paulikas et al., "Where Should Metals for the Green Transition Come From?" April 2020

On a per-battery basis view, you buy an EV – and these are the **environmental impacts**



Source: Daina Paulikas et al., "Where Should Metals for the Green Transition Come From?" April 2020

[1] Includes direct emissions from metal mining, processing & refining; release of carbon stored in vegetation, detritus & soil; and emissions from land use change

Life cycle impact assessment; per 1 billion-EV basis

Demand scenario: Battery cathode precursor materials and copper for 1 billion electric cars

Key assumptions: Cradle-to-gate production of nickel sulfate, manganese sulfate, cobalt sulfate and copper cathode assuming NMC811 cathode chemistry and 75 kWh battery size

Supply scenario: Conventional land ores (land)

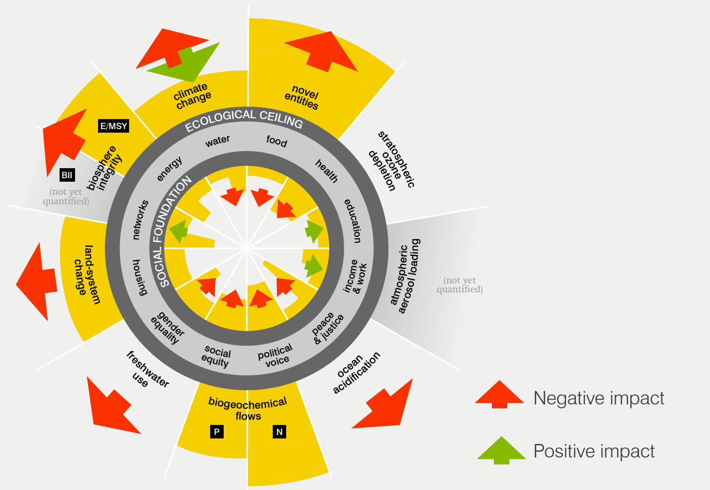
	Land
Climate change	
GWP – CO_2 equivalent emissions, Gt	1.47
Carbon sinks at risk, Gt	9.30
Disrupted carbon sequestration, Gt	2.06
Resource use	
Ore, Gt	25
Land, km^2	156,000
Forests, km^2	66,000
Seafloor, km^2	2,000
Water, km^3	45
Primary and secondary energy, PJ	24,500
Waste	
Mining, processing & refining waste (onshore), Gt	63
Entrained seafloor sediment (offshore), Gt	0
Terrestrial ecotoxicity, 1,4-DCB equivalent Mt	33
Freshwater ecotoxicity, 1,4-DCB equivalent Gt	21
Eutrophication potential, PO4 equivalent, Mt	80
Human & wildlife health	
Human toxicity, 1,4-DCB equivalent, Mt	37,000
SO_x and NO_x emissions, Mt	180
Human lives at risk, number	1,800
Megafauna at risk, trillion organisms	47
Biomass at risk, Mt	568
Biodiversity loss risk	Present

Sources: Daina Paulikas et al., "Where Should Metals for the Green Transition Come From?" April 2020; Dain Paulikis et al., "Life cycle climate change impacts of producing battery metals from land ores versus deep-sea polymetallic nodules," Aug. 28, 2020; Daina Paulikas et al., "Deep-sea nodules versus land ores: A comparative systems analysis of mining and processing wastes for battery-metal supply chains," Jan. 13, 2020

It is a catch-22 situation: To mitigate the impacts of climate change and support the infrastructure development required for a growing population, we need to promptly transition to lower-carbon technologies. However, implementing these technologies involve large amounts of mineral resources that put additional pressure on the Earth's life-supporting systems on which we depend and can lead to negative social consequences.

Getting these resources in the same way we do today will require us to continue to destroy forests, which will release additional greenhouse gas (GHG) emissions currently stored in these forests' carbon sinks. This is exactly what we are looking to avoid. It also will severely impact wildlife and people living in these forested areas. Most of these mining operations happen in developing countries that are looking to attract investment while addressing their own challenges such as poverty, violence, and poor governance. This adds complexity to achieving reforms, especially in jurisdictions where governments are unable – or unwilling – to safeguard against severe social and environmental externalities.[57] Land mining can have positive impacts on humans and societies by becoming a source of local employment contributing to the local economies. But it also tends to exacerbate pre-existing vulnerabilities of the host community, which then continues to fall short on fundamental social foundations such as peace and justice, equality, health and education. Some of the negative impacts include deforestation, erosion, pollution, human rights violations, displacement of communities, conflicts over land and water allocation, and the displacement of traditional practices of Indigenous peoples.[58]

Terrestrial mining



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

[57] Éléonore Lèbre et al., "The social and environmental complexities of extracting energy transition metals," Sept. 24, 2020
[58] Ibid

Our hypothesis

How do we get the metal we need to rein in climate change without further blowing out other planetary boundaries and worsening social shortfalls? As a team, we started with a premise that if high-grade (and, as a result, often lower-impact) metal deposits have been largely exhausted on land, it might be preferrable to look at the seafloor.

Many people who are justifiably worried about the health of our oceans might find this idea counterintuitive at best and downright irresponsible at worst. Indeed, our oceans are under enormous pressure from overfishing, marine pollution and ocean acidification, and the ecosystem services they provide are under more serious threat than ever before. Climate change drives acidification and warming of seas, which are causing widespread destruction of coral reefs. These reefs occupy less than 1% of the ocean floor but are home to more than 25% of marine life.[59] According to the Food and Agriculture Organization of the United Nations (FAO), 34.2% of fish stocks have been fished beyond sustainable limits,[60] and overfishing and illegal and unreported fishing continue to be a major challenge. The global community is pushing hard to protect nature, and during the Ocean Summit in February 2022, many countries joined the initiative set forward by the High Ambition Coalition (HAC) for Nature and People, an intergovernmental group of more than 80 countries, to protect 30% of land and marine areas under national jurisdiction by 2030, also known as the 30x30 target.[61] During the last two years, the Convention on Biological Diversity (CBD) has drafted a new global biodiversity framework, which includes the 30x30 target, to guide actions worldwide through 2030[62] and to be negotiated at the upcoming COP15. There is also work being done to protect the ocean in international waters. Conversations continued during the U.N. Intergovernmental Conference on Marine Biodiversity of Areas Beyond National Jurisdiction (BBNJ), which focused around the creation of an international legally binding instrument under United Nations Convention on the Law of the Sea (UNCLOS) to govern the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction.[63] So, why would we put additional pressure on our oceans by even contemplating to start mining, which historically has been one of the industrial activities on land with significant negative environmental impacts?

Despite life likely originating in the ocean and oceans accounting for 70% of our planet's surface, most life on our planet lives on land. Only 3% of biomass resides in the oceans while 97% resides on land.[64] While oceans are vast, most of their area lacks vegetation and, as a result, the opportunities for life to evolve are limited. The ocean represents an expanse of similar habitats, while on land, there's a much wider range of smaller habitats and ecological niches mainly due to the huge diversity of plants and trees.[65] This translates into greater biodiversity overall on land than in the oceans.

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

[59] UNEP, "Life Below Water," 2020
[60] FAO, "The State of World Fisheries and Aquaculture 2020"
[61] Ocean & Climate Platform, "Looking back at the One Ocean Summit," Feb. 12, 2022
[62] CBD, "A New Global Framework For Managing Nature Through 2030," March 3, 2020
[63] U.N., Intergovernmental Conference on Marine Biodiversity of Areas Beyond National Jurisdiction, March 16, 2022
[64] Yinon M. Bar-On et al., "The Biomass Distribution on Earth," May 21, 2018
[65] Yinon M. Bar-On and Ron Milo, "The Biomass Composition of the Oceans: A Blueprint of Our Blue Planet," Dec. 12, 2019

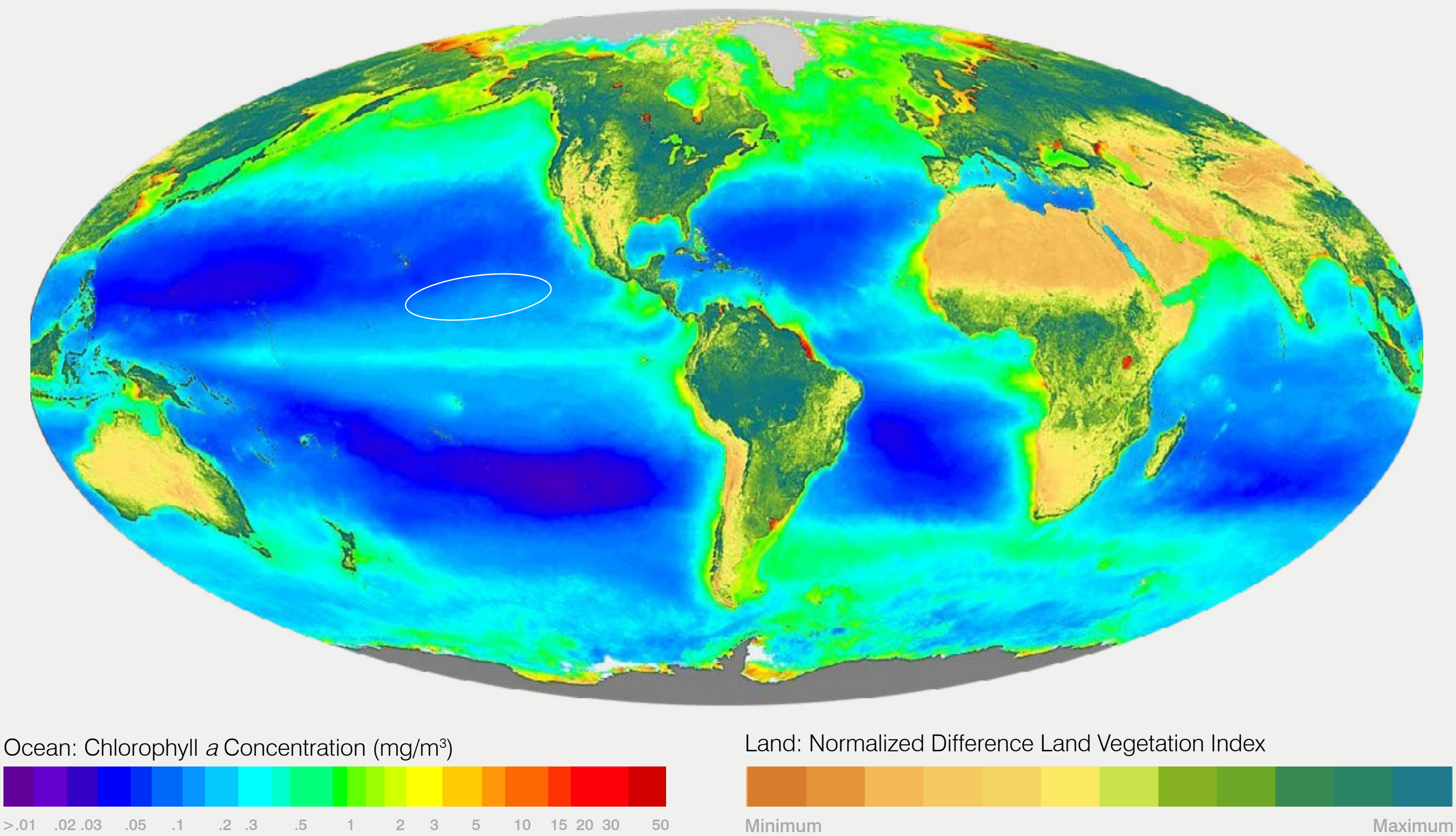
Not unlike different biomes on land (deserts vs. tropical rainforests), the ocean is made of areas with varying productivity, with coral reefs hosting among the highest levels of biodiversity in the ocean as is found in the magnificent coral triangle in the Indo-Pacific region. We decided to focus on areas with the lowest ocean productivity, far away from human coastal communities, coral reefs and fisheries.

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

It is important to acknowledge the key role the ocean plays for over 3 billion people in the world who, according to the U.N., "depend on marine and coastal biodiversity for their livelihoods."[66] The ocean also plays a prominent role in shaping the cultural and spiritual identity, home and common heritage of Pacific Islanders. As explained by Pacific scholar Epeli Hau'ofa, "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."[67]

Global surface ocean **primary productivity**

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

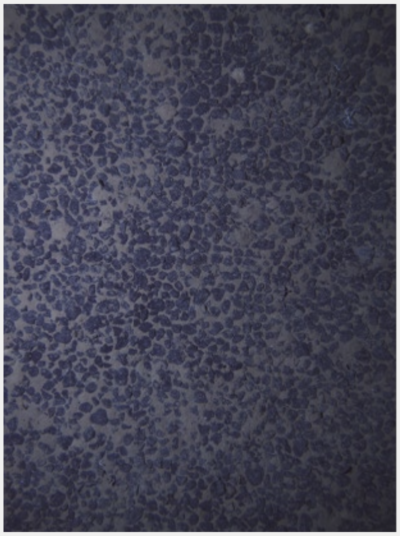


Source: NASA Ocean Color

[66] UNSDGs, Goal 14: Conserve and sustainably use the oceans, seas and marine resources
[67] Epeli Hau'ofa, "The Ocean in Us," Fall 1998

This decision took us into the deep sea in international waters, home to three types of metal deposits: polymetallic nodules found on the abyssal plains, cobalt crusts found on slopes of seamounts (underwater mountains), and seafloor massive sulfides found around hydrothermal vents.

Marine minerals: why we only focus on nodules



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.

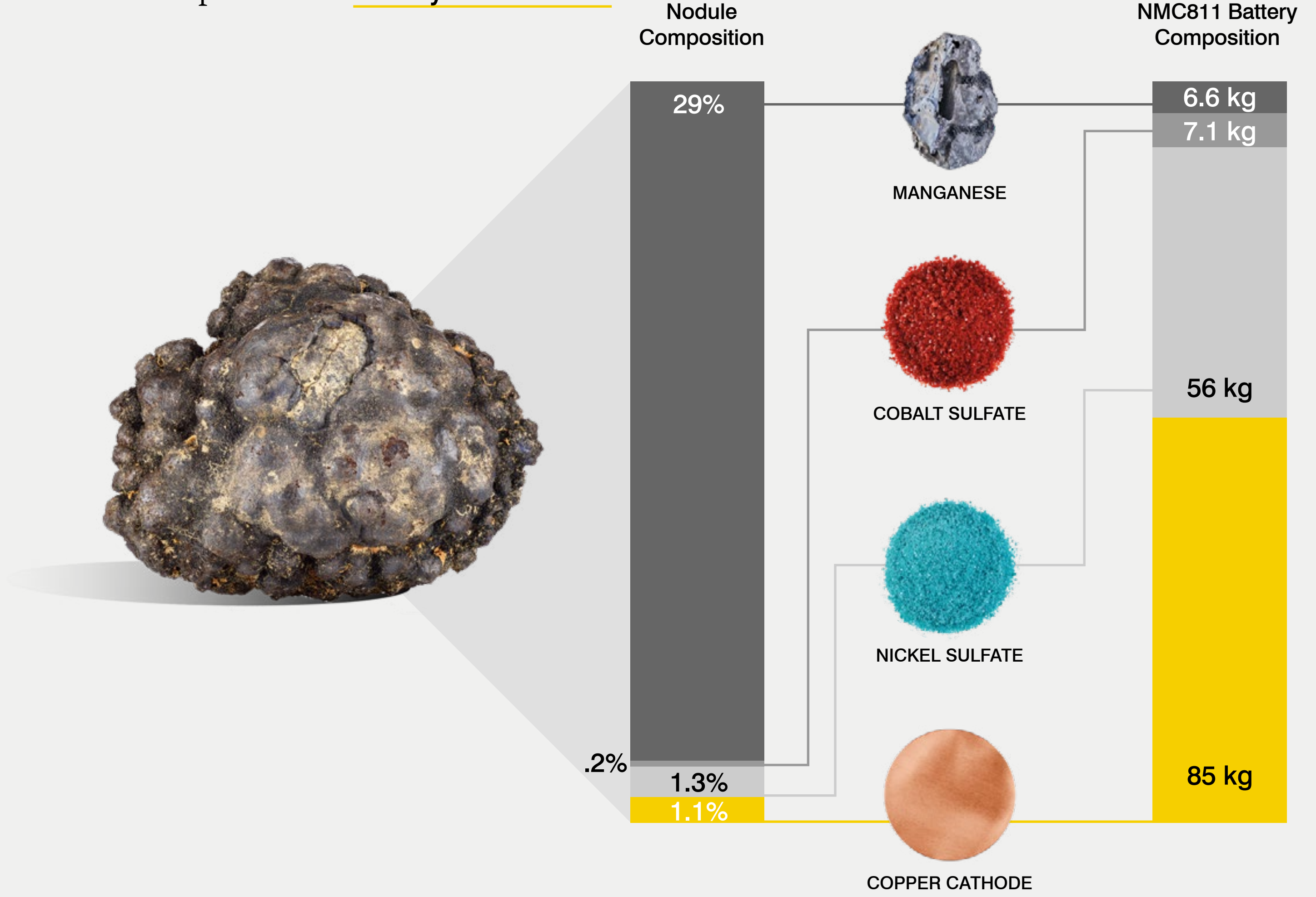
- Integral part of the seafloor that requires hard-rock cutting to break the ore from the substrate.
- Abundant food supplied by chemoautotrophic bacteria that exploit energy-rich chemical compounds from the vents.
- **100x biomass vs. abyssal plain**

Source: 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 stood out to us because they have high grades of four critical metals required for the clean energy transition in a single rock. In addition, the abyssal plain where they are found is one of the lowest-biomass places on the planet (akin to deserts on land), and the nodules are loose-sitting rocks that do not require any cutting into the seafloor. That is why we chose to call our potential future operations "nodule collection" instead of "nodule mining." In contrast, cobalt crusts and seafloor massive sulfides are an integral part of the seafloor and would need to be mined conventionally – by breaking and cutting hard rock.

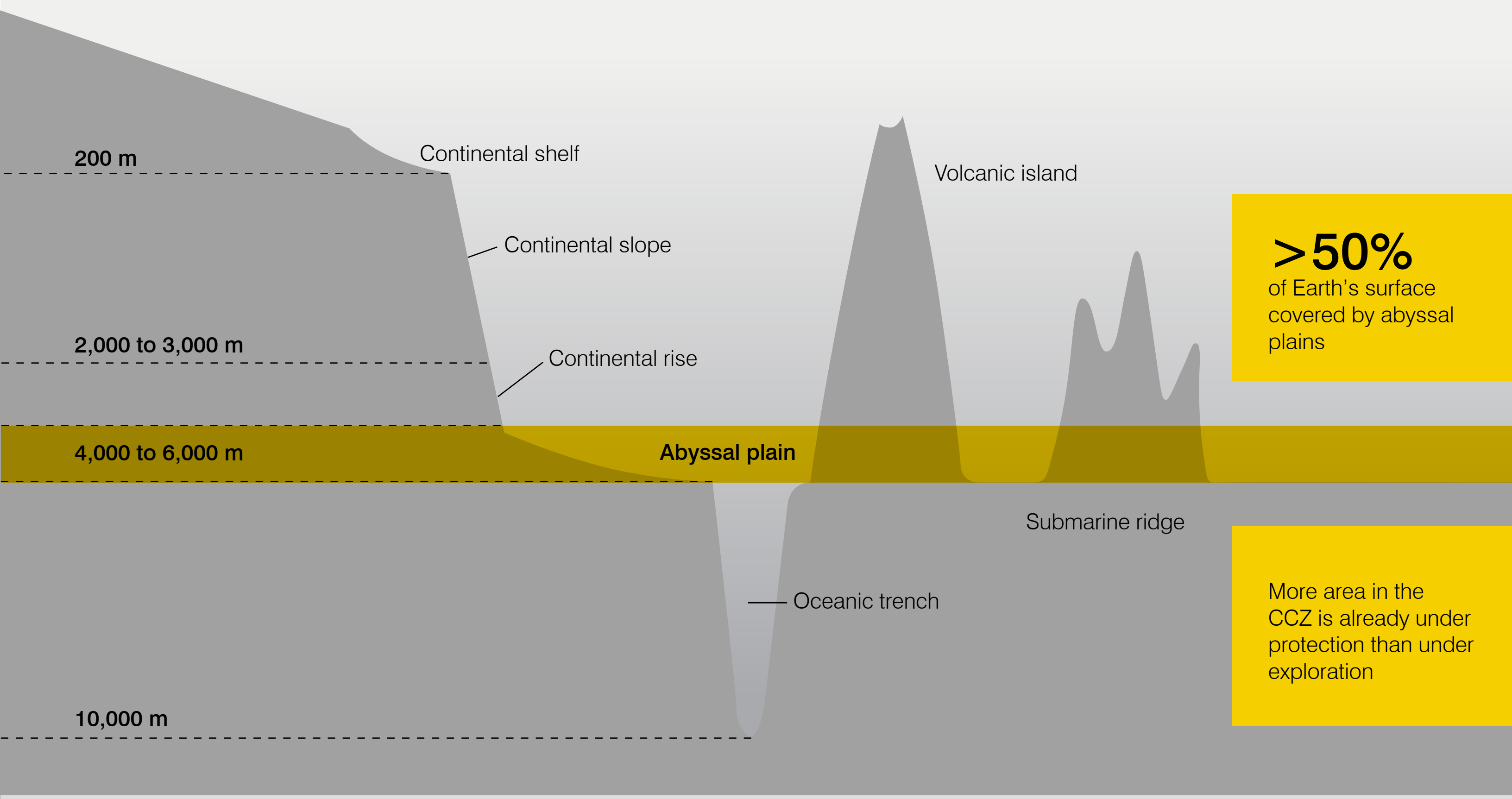
Nodule composition vs. battery metal needs



These decisions landed us in the abyss at 4-6-kilometer depths. While the challenges of operating far offshore at these depths are hard to overstate, the abyssal plains come with advantages. Abyssal plains cover more than 50%[68] of the Earth's surface and 70% of the ocean floor, making it easier to set aside vast areas for protection.[69]

The abyssal plain: the **most common biogeographical area** on the planet

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



Visual representation not to scale
Source: Craig R. Smith et al.; "Abyssal food limitation, ecosystem structure and climate change," Sept. 2008

[68] Craig R. Smith et al., "Abyssal food limitation, ecosystem structure and climate change," Sept. 2008
[69] NOAA, "Ocean Floor Features"

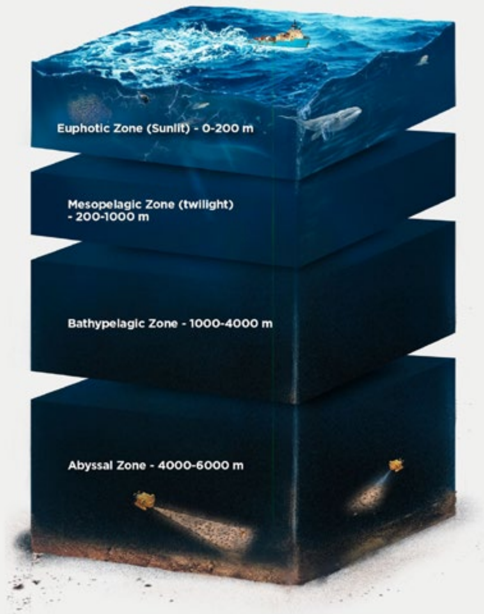
Despite the vast area of the global seafloor, its sediments contain up to 15 times less carbon than all vegetation and soil on land – a much better starting point compared to terrestrial mining. Although nodule collection operations can disturb the top 5 centimeters of the seafloor sediments, these seafloor sediments resettle relatively quickly and within a short distance from their origin and have no known pathway for floating 4 kilometers upwards and reaching the atmosphere. As a result, nodule collection is not expected to release significant amounts of carbon sequestered in seafloor sediments. We commissioned a peer-reviewed life cycle study to assess direct and indirect emissions, calculating the global warming potential (GWP) value, and disruptions to carbon-sequestration stocks and cycles of metal production from nodules and terrestrial ores.[70] The findings in the study suggest that nodule collection and processing operations are unlikely to release substantial amounts of already-sequestered carbon into the atmosphere. Amounts at risk of release are an order of magnitude lower compared to land-ore mining methods and are almost entirely attributable to the land footprint of processing nodules onshore.

[70] Daina Paulikas et al., "Life cycle climate change impacts of producing battery metals from land ores versus deep-sea polymetallic nodules," Dec. 1, 2020

Less than 10% of all marine life lives below 4,000 meters.[71] The abyssal plain is a very challenging place for organisms to live because of the enormous pressure, the lack of light and the poor availability of food at these depths. There are no plants. If you line 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 like 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. This translates to the abyssal CCZ being home to 300 times less biomass than an average biome on land, and up to 3,000 times less compared to rainforest regions where a lot of nickel mining takes place.[72]

The abyssal plain: home to **less than 10%** of ocean life

The abyssal plain is a vast sedimentary seabed, oxic to 2 m. It has gentle depressions, troughs and ridges. There is intense pressure (5,700-8,500 psi) and no sound or light except the ones made by animals. This environment is food-poor and stable.



28% of ocean life

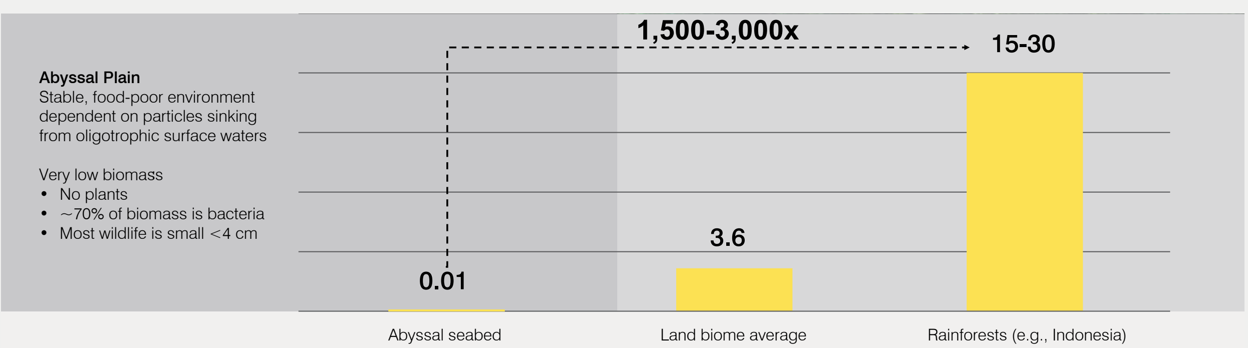
65% of ocean life

7% of ocean life

Most impacts from nodule collection are expected to occur on the abyssal zone seafloor

The abyssal plain advantage: one of the **lowest biomass & carbon sequestration environments** on the planet

Biomass on Earth
Contained carbon kg/m²



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
Source: Bar-On, Phillips, & Milo, 2018; Wei, et al., 2010

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

Approximately 70% of the life in the abyssal plain is bacteria, as measured by biomass. The creatures we find in the abyssal CCZ are invertebrates that filter organic matter from the sediments or overlying water. The main source of food 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 of the animals we find are not very big, usually no bigger than 4 centimeters long and mostly microscopic. A few 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 disturbed by nodule collection. We do find many of these species fascinating, and the more we learn about them, we can see the potential they can bring to areas such as marine genetics. That is why we have built a library of deep-sea biological samples that are being preserved. To learn more, please view the Marine Genetics Resource section.

The abyssal plain: home to a handful of **fascinating wildlife**

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 exploration and exploitation of 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) – going beyond the 30x30 target for ocean protection currently being promoted to protect at least 30% of the Earth by 2030.[73]

Earth:
510 million km^2

Global ocean:
362 million km^2 (71% of Earth's surface)[1]

Pacific Ocean:
162 million km^2 (45% of the global ocean)

Deep sea (>200m depth):
360 million km^2 (70% of the Earth's surface)

International waters/high seas (generally >200 nautical miles or 370 km from a country's shoreline):
230 million km^2 (>60% of the ocean)

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

Clarion-Clipperton Zone (CCZ):
4.56 million km^2 (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 km^2 (27% of CCZ)[3]

CCZ Areas of Particular Environmental Interest (APEI):
1.97 million km^2 never to be mined (43% of the CCZ)

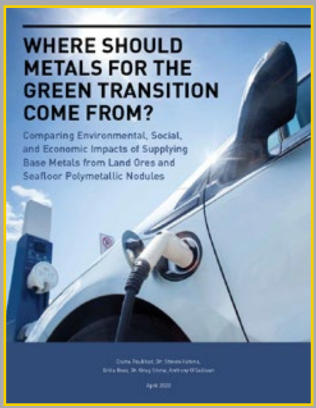
TMC's exploration area:
224,000 km^2 (5% of CCZ)

Source: Report of the Chair of the Legal and Technical Commission on the work of the Commission at its twenty-sixth session: 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, SBA/26/C/58

[1] NOAA, ETOPO1
[2] NOAA Ocean Floor Features
[3] ISA, Annual Report 2020

[73] Campaign for Nature, "Why 30%?"

LIFE CYCLE STUDIES COMMISSIONED BY THE METALS COMPANY:



WHERE SHOULD METALS FOR THE GREEN TRANSITION COME FROM?

Comparing Environmental, Social, and Economic Impacts of Supplying Base Metals from Land Ores and Seafloor Polymetallic Nodules

Journal of Cleaner Production

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

Daina Paulikas, Steven Katona, Erika Ilves, Saleem H. Ali

RESEARCH AND ANALYSIS

WILEY

Deep-sea nodules versus land ores

A comparative systems analysis of mining and processing wastes for battery-metal supply chains

Daina Paulikas | Steven Katona | Erika Ilves | Saleem H. Ali

While nodules on the abyssal seafloor are not in anyone's backyard, it does not mean their extraction is free of social impacts. Some of the positive impacts are economic through nodule collection royalties and fees; others are related to capacity building and training through education, jobs and knowledge sharing with the people of our sponsoring states. You can find more on this in our social impact section.

As part of the life cycle studies we have commissioned – a 2020 white paper looking at 19 ESG indicators, a 2021 peer-reviewed paper looking at climate-change impacts and a 2022 peer-reviewed paper looking at waste streams – the impacts of producing four metals from polymetallic nodules were quantified for 1 billion EVs as compared to the impacts of land-based metals for the same number of EVs.

These life cycle studies suggest that using nodules to produce four critical metals provides an opportunity to significantly compress most life cycle ESG impacts associated with conventional metal production from land-based ores. The life cycle ESG impacts of conventional metal production that can be avoided by using nodules include child labor, displacement of local communities, deforestation, destruction of carbon sinks and generation of toxic processing tailings. In addition, several impacts can be significantly reduced, including emissions of greenhouse gases (GHG), sulfur oxide (SOx) and nitrogen oxide (NOx), freshwater use and land competition. Given that these benefits stem from the intrinsic properties of the polymetallic resource, its location and over a decade of technology development and testing by TMC, we have a reasonably high level of confidence about our ability to deliver them.

Life cycle impact assessment

Demand scenario: Battery cathode precursor materials and copper for 1 billion electric cars

Key assumptions: Cradle-to-gate production of nickel sulfate, manganese sulfate, cobalt sulfate and copper cathode assuming NMC811 cathode chemistry and 75 kWh battery size

Supply scenarios: (1) Conventional land ores (land) and (2) Polymetallic nodules found on the seafloor in the Clarion-Clipperton Zone (nodules)

Change: % impact reduction nodules relative to land ores or land ores relative to nodules

	Land	Nodules	% change[1]
Climate change			
GWP – CO_2 equivalent emissions, Gt	1.47	0.45	-70%
Carbon sinks at risk, Gt	9.30	0.58	-94%
Disrupted carbon sequestration, Gt	2.06	0.24	-88%
Resource use			
Ore, Gt	25	6	-75%
Land, km^2	156,000	9,800	-94%
Forests, km^2	66,000	5,200	-92%
Seafloor, km^2	2,000	508,000	+99.6%
Water, km^3	45	5	-89%
Primary and secondary energy, PJ	24,500	25,300	+3%
Waste			
Mining, processing & refining waste (onshore), Gt	63	0	-100%
Entrained seafloor sediment (offshore), Gt	0	9	+100%
Terrestrial ecotoxicity, 1,4-DCB equivalent Mt	33	0.5	-98%
Freshwater ecotoxicity, 1,4-DCB equivalent Gt	21	0.1	-99%
Eutrophication potential, PO4 equivalent, Mt	80	0.6	-99%
Human & wildlife health			
Human toxicity, 1,4-DCB equivalent, Mt	37,000	286	-99%
SO_x and NO_x emissions, Mt	180	18	-90%
Human lives at risk, number	1,800	47	-97%
Megafauna at risk, trillion organisms	47	3	-93%
Biomass at risk, Mt	568	42	-93%
Biodiversity loss risk	Present	Present	No change

[1]Reduction of impacts nodules relative to land ores or land ores relative to nodules.

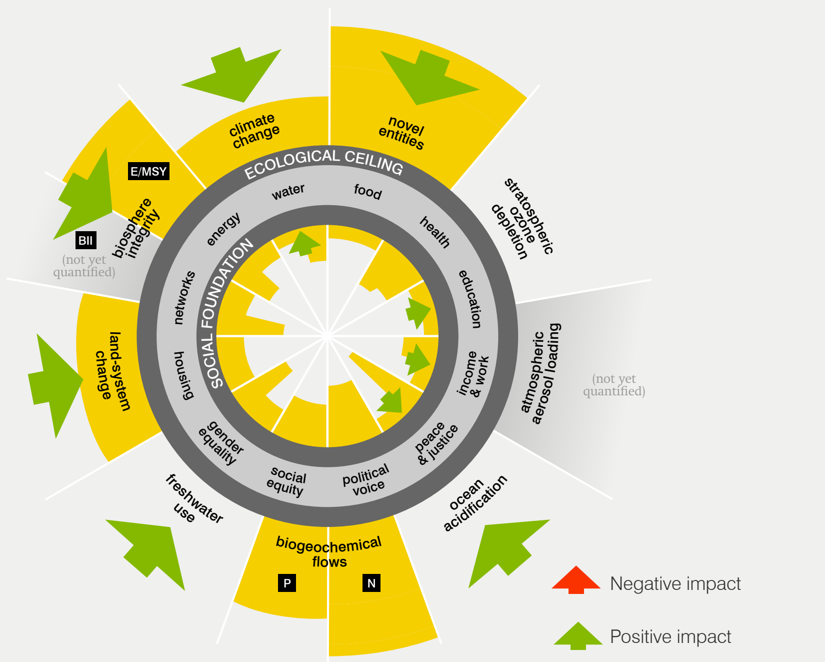
Sources: Daina Paulikas et al., "Where Should Metals for the Green Transition Come From?" April 2020; Dain Paulikis et al., "Life cycle climate change impacts of producing battery metals from land ores versus deep-sea polymetallic nodules," Aug. 28, 2020; Daina Paulikas et al., "Deep-sea nodules versus land ores: A comparative systems analysis of mining and processing wastes for battery-metal supply chains," Jan. 13, 2020

There are uncertainties regarding the potential impact of commercial-scale nodule-collection operations on the biodiversity and ecosystem function of the CCZ abyssal seafloor and overlying water column. Unlike biomass, biodiversity (defined as species richness) is much harder to measure or compare. Some level of uncertainty about the full inventory of local and regional biodiversity will always remain. The situation is not dissimilar to measuring biodiversity on land, where a large portion of species remains undescribed despite 250 years of taxonomic classification. More than 13,000 papers have been published on polymetallic nodules in general, and more than 1,500 papers on CCZ nodules in particular. Still, more research is underway. Research has been carried out in the past 10 years, with several academic institutions contributing to TMC's Environmental & Social Impact Assessment (ESIA) program that consists of approximately 100 discrete studies throughout the water column, from seafloor to surface. We will continue with this research and the expansion of 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

Nodules



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

Metal production from nodules would lead to a novel use of the seafloor. However, unlike "land-system change," seafloor use has not been identified as a planetary boundary at this time. As a reference, annual seafloor use by the future nodule collection industry is expected to be two orders of magnitude less than the current annual seafloor use by the global trawling and dredging industry.

The above reasoning is the basis for our hypothesis that nodules could be a viable source of critical metals for the clean energy transition – a source that could allow us to move forward without significant overshoots on several planetary boundaries and without worsening the shortfalls of our social foundations.

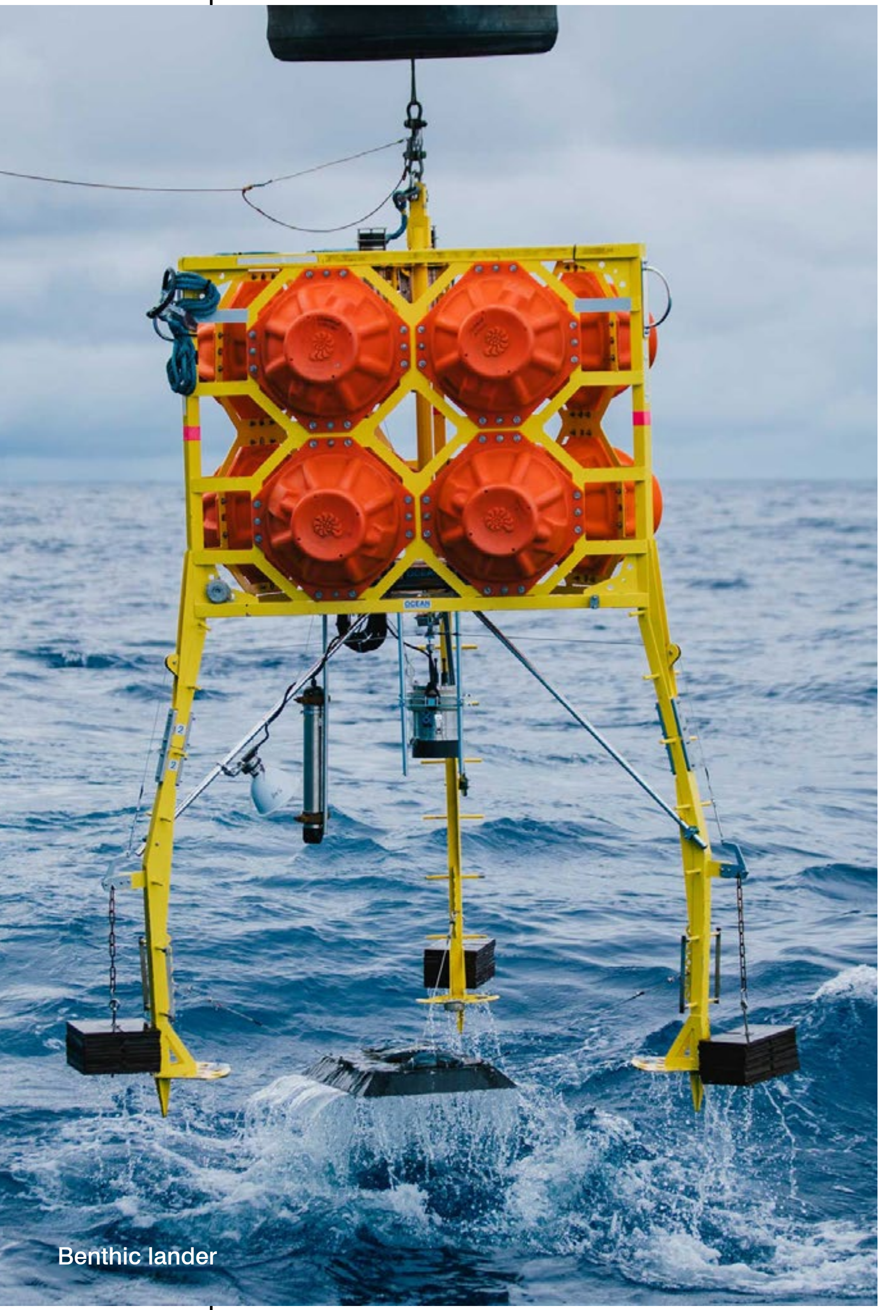
Even if this hypothesis proves correct, the collection of polymetallic nodules would only reduce the load of negative externalities. It can be responsible and the best option we have, but it cannot be sustainable. It's still taking from the planet. That is why part of our master plan includes a goal 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 with the goal of transforming ourselves into a recycling business. From there, we intend to expand our scope to possibly recover a broader set of metals, with the aim to build a carefully managed metal commons that will be used, recovered and reused again and again – for millennia.

How We Do It

Governance

The Metal Company's mission is grounded in addressing a key sustainability challenge: How to build up and maintain a global metal commons with the least possible environmental and social impact?

Whether we are designing an offshore nodule collection system or an onshore processing plant, engaging with our sponsoring states or developing a decarbonization strategy prior to production, our team is focused on addressing key ESG risks and opportunities as we work toward commercial production. Developing a resource deemed common heritage of humankind (CHH) requires us to embrace the responsibility that comes with it. The CHH principle represents the notion that certain globally important resources should be managed and protected for the benefit of all humankind, taking into account future generations and the needs of developing countries.



Benthic lander

A CLOSER LOOK AT THE COMMON HERITAGE OF HUMANKIND

The CHH principle represents the notion that certain global commons or elements regarded as beneficial to humanity as a whole should not be unilaterally exploited by individual states or their nationals, nor by corporations or other entities, but rather should be exploited under an international arrangement or regime for the benefit of humankind as a whole. This principle is contained in 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 the realization of a just and equitable international economic order that takes into account the interests and needs of humankind as a whole and, in particular, the special interests and needs of developing countries. While there is no concise fully agreed-upon definition of CHH, there are core elements of how to manage global commons and these are used in UNCLOS.[1]

- **Non-appropriation:** No state or person can claim sovereignty or sovereign rights over any area deemed CHH or its resources.
- **Cooperative management:** The use of CHH shall be carried out in accordance with a system of cooperative management for the common good.
- **Sharing of benefits:** There will be an active and equitable sharing of benefits (including financial, technological and scientific) derived from activities in an area deemed CHH.
- **Peaceful purposes:** The use of resources deemed CHH are reserved for non-military uses.
- **Preservation for future generations:** CHH includes a strong focus on intergenerational equity.

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

We are developing a governance structure to ensure that ESG topics are actively embedded in our business. Accountability for ESG-related performance is an open and iterative exercise across all levels of the company. TMC's CEO is ultimately responsible for our overall sustainability performance, while the board is responsible for the sustainability strategy, which is brought forward by our chief sustainability officer and vetted by the board's Sustainability & Innovation Committee. In addition, we are working on creating a Sustainability & Innovation External Advisory Council to help challenge us 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, informed by active engagement with stakeholders, promotes accountability, transparency and sound decision-making that fosters sustainable business growth over the long term. This is particularly relevant to TMC, as we are in an emerging industry and developing a mineral resource declared the common heritage of humankind. Our board of directors sets high standards for the company's employees, officers and directors, and provides oversight of key risks, including strategic, financial, operational, environmental and legal compliance matters.

Gerard Barron
Chairman & CEO

Andrew Hall
Lead Independent Director

Kathleen McAllister
Audit Committee Chair

Sheila Khama
Sustainability & Innovation Committee Chair

Amelia Kinahoi Siamomua
Sustainability & Innovation Committee Member

Gina Stryker
Audit/Compensation Committees Member

Christian Madsbjerg
Nominating & Governing Committee Chair

Andrei Karkar
Compensation Committee Chair

Board Composition, Responsibilities and Commitments

TMC's plan to deliver on our mission includes first expanding metal stocks through primary metal production, then exiting primary metal production and fully transitioning to a circular business model focusing on secondary metals. This plan requires a board willing to commit to a long-term strategy while balancing the interests of a broad range of stakeholders.

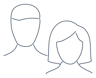
The board (together with management) is focused on getting the polymetallic nodule resource into commercial production, scaling rapidly to meet demand with the lowest ESG footprint, and setting the company up for long-term growth and profitability, including decisions to:

- Set a new bar for a metals business that is aligned with the principle of the common heritage of humankind.
- 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 clean energy transition and development.

The board is directly and regularly engaged 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 February 10, 2022, our board achieved gender parity with a composition of four males and four females, representing six nationalities. Board members are from Australia, South Africa, Botswana, Denmark, the Kingdom of Tonga and the United States.

Our board has equal gender representation



Board Committees

The board has four standing committees:

1. Audit Committee
2. Nominating & Governance Committee
3. Compensation Committee
4. Sustainability & Innovation Committee

Name	Function	Year joined	Audit Committee	Nominating & Governance Committee	Compensation Committee	Sustainability & Innovation Committee
Gerard Barron	Executive chair & CEO	2017[1]				
Andrew Hall	Lead independent director	2021	Member			
Kathleen McAllister	Independent director	2022	Chair			
Gina Stryker	Independent director	2021	Member		Member	
Sheila Khama	Independent director	2021		Member	Member	Chair
Christian Madsbjerg	Independent director	2021		Chair		Member
Andrei Karkar	Independent director	2019[1]		Member	Chair	
Amelia Kinahoi Siamomua	Independent director	2021				Member

● Member ● Chair

[1] Start of service on DeepGreen Board

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

The committees' main responsibilities are:

Sustainability & Innovation Committee

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

Audit Committee

- Oversight of auditors
- Review financial reporting policies and process
- Risk management (e.g., enterprise risk management), related party transactions, legal compliance and ethics
- Regulatory oversight and other financial matters
- Whistleblower policy administration

Nominating & Governance Committee

- Nomination of directors
- Corporate governance oversight and policy review
- Code of ethics policy and administration

Compensation Committee

- Establishment of corporate performance scorecard
- CEO performance review
- Oversight of executive compensation and administration of the equity-incentive plan

Business Ethics & Transparency

TMC aspires to do well by doing good for the planet and people for generations to come. Our Code of Business Conduct and Ethics (the "Code") sets out basic principles that guide those working at or for TMC, to prevent any improper behavior.

Any person who becomes aware of any suspected or actual violation of this Code is required to report the violation to our ethics hotline, the board chairman or the chief legal officer. The hotline is operated by a third-party service provider, and reports can be completely anonymous and confidential. Any person who in good faith reports a suspected violation of the Code by any person is encouraged to do so without fear of being fired, demoted, reprimanded or otherwise harmed for reporting it.

Conductivity, temperature and depth sensor

Stakeholder Engagement

We are on a mission to bring about systems change to the metals value chain. We are in business to help advance solutions that will support the transition to a circular and net-zero carbon economy in a way that has the least amount of damage to our planet and without undercutting the prospects for equitable development. Along the way, we are building a culture that is safe, diverse and inclusive for our workforce, partners, contractors, independent researchers, sponsoring states communities and other stakeholders.

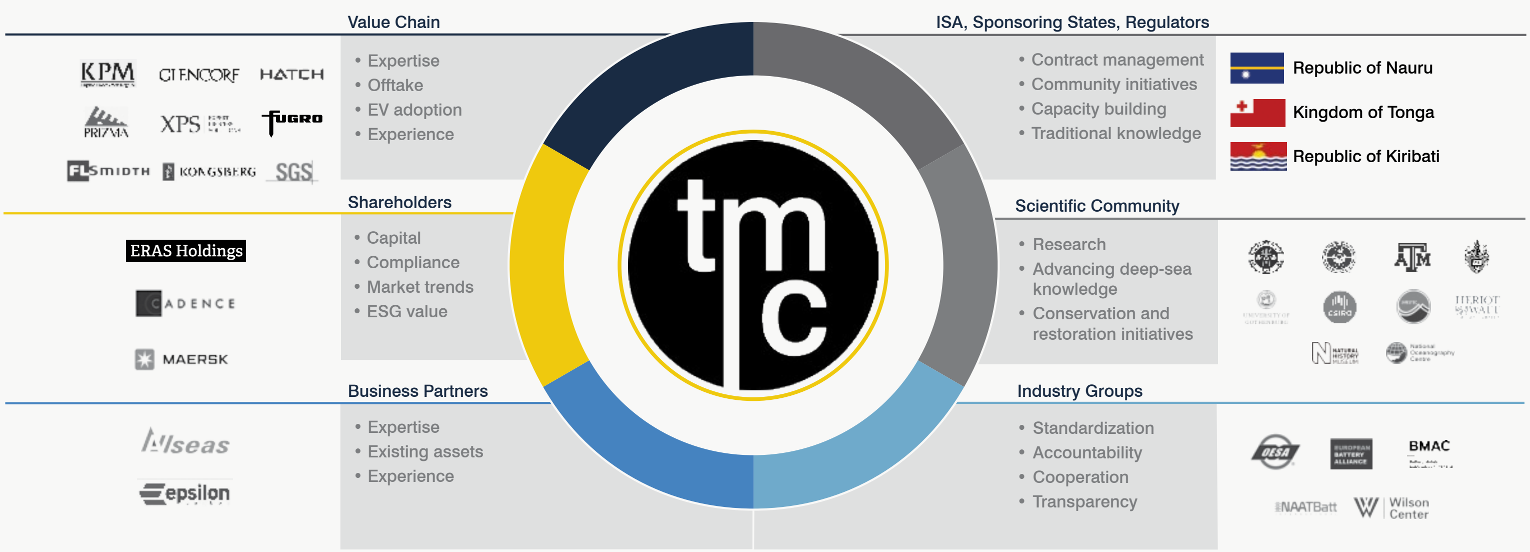
We are aware that several environmental NGOs strongly oppose our project, and we welcome engagement and open dialogue with them. Although these NGOs might not agree with our approach, we share the vision of a thriving planet for all. The need to halt climate change and biodiversity loss while, at the same time, delivering on equitable development goals, needs partnerships of unlikely allies. Now is the time to act, to share knowledge and together deliver the solutions that will get us to that vision.

We are committed 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. We work with leading scientific research institutions and universities to increase knowledge of the deep sea by collecting environmental baseline data during our exploration campaigns, monitoring environmental impacts during collector tests and paving the way for independent peer-reviewed research. We also are engaging with NGOs and civil society to ensure our activities and plans are transparent and open for feedback. For example, we received more than 600 comments from 19 distinct stakeholders around the world – including ISA member state governments, research institutions, NGOs and individuals – as part of the open stakeholder consultation facilitated by TMC's wholly owned subsidiary NORI's sponsoring state Nauru on the submitted environmental impact statement (EIS) for the planned 2022 collector test in the NORI-D area in the CCZ. We invested considerable resources to respond to these comments, addressed all the material issues raised and updated the EIS submission.

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

Below is a high-level, non-exhaustive view of the ecosystem network we are currently working with:

Building ecosystems to **create shared value**



Given that the polymetallic nodule resource in international waters is deemed to be part of the common heritage of humankind, we define our stakeholders as any interested individual or organization. This global view requires us to engage and partner with a broad set of stakeholders across the world that reflects the unique characteristic of seabed resources in international waters.

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 shows broadly the main groups of stakeholders we engage with and the key topics discussed.

Stakeholder	Engagement Method	Key Topics	Objectives
Employees	Townhalls, company chat "AllHandsOnDeck," emails, internal committees for topics such as the ESIA program, ESG and Pacific Islands engagement	Mission, strategy, company values, projects performance and updates, climate change, ESG performance expectations and progress	• Communicate strategy and progress • Gain feedback and insights • 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 • Leverage expertise • Mitigate risk • Deliver science-based solutions • Foster innovation to decarbonize value chain
Regional and Local Communities of Sponsoring States	Regional and local meetings and townhalls, website, social media, newsletter, events, community programs, consultation, press releases	Acknowledgement and understanding of the Pacific Islanders' connection to the ocean, governance, shared value, climate change, capacity building, education, initiatives, grants	• Be a good partner • Develop and access talent • Understand community priorities • 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 • Learn market trends and expectations • 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
Scientific Community	Meetings, emails, reports, webinars	Environmental management and impact assessments, innovation, climate change, carbon offsets, blue economy, climate change, conservation, transparency, deep-sea knowledge	• Promote open and healthy debate and understanding that drive science-based decisions • Advance deep-sea research and understanding of impacts • 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 • Foster collaboration • Enable electric vehicle (EV) adoption • Build ESG focus and transparency • Leverage expertise • Decarbonize value chain
NGOs and Global Community	Meetings, website, social media, press releases, reports, consultation	Transparency, accountability, shared value, ESG, climate change, best practices	• Promote transparency, inclusivity • Foster collaboration • Drive science-based understanding of impacts and receive feedback to understand and address concerns

Task Force on Climate-related Financial Disclosures (TCFD)

Getting to net zero by 2050 requires an accelerated transition to renewables and electrification of vehicles. This, in turn, will lead to an exponential growth in demand for the critical metals used in these technologies. Addressing the challenges of supplying the minerals needed with the lowest environmental and social impacts to achieve a low-carbon economy is one of the reasons TMC exists, and we are committed to adopting TCFD recommendations.

Governance

TMC's board of directors is ultimately responsible for the oversight of risks and opportunities including those related to climate change. Within the board, TMC has a Sustainability & Innovation 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 meets at least once a quarter to address these and other issues. The S&I Committee works with TMC's leadership team and, in particular, with the chief sustainability officer to guide sustainability strategy. The S&I Committee is currently focused on establishing ESG goals and discussing business plans, budgets and the implementation of those sustainability goals. At the management level, the chief sustainability officer is responsible for monitoring and bringing to the S&I Committee climate-related issues.

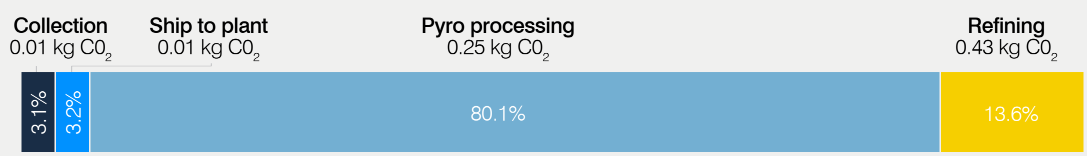
TMC is in the process of establishing a Sustainability & Innovation External Advisory Council to bring in diverse, outside-in perspectives and provide insight and advice on our sustainability strategy and impact report. (See TMC Board Composition graph)

Strategy

Our mission is to develop a metal commons with the lowest environmental and social impacts that will help close the rapidly growing supply gap of battery metals needed for the clean energy transition. With a strong alignment to sustainable development and the transition to a lower-carbon society, we see a lot of opportunities to build economic, environmental and societal value, including supplying lower-carbon battery metals, helping reduce battery costs, providing a more stable and secure supply of these metals currently dominated by China, and contributing to a circular metals economy. We are intentional and methodical in our approach to building a sustainable business. That is why this year, along with Science Based Targets initiative (SBTi) and climate-change scenario analysis, we will be working on developing a climate-change-related risks and opportunities register. We intend to reuse existing metallurgical facilities and partner to build new plants – in both scenarios, future onshore processing operations will undergo a rigorous environmental and social impact assessment.

We are continuously looking for ways to reduce our environmental impact. Being a few years away from commercial production gives us time to experiment, test and plan to do even better than the base case impact scenario we developed. Eighty percent of life cycle carbon emissions in our base case scenario for Project One is expected to come from the pyrometallurgical processing of nodules. 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 the consumption of metallurgical coal by at least 10%. We also tested potential replacements for metallurgical coal to further improve the carbon footprint of our future onshore operations. Knowing that our onshore nodule processing will be the most carbon-intensive step makes the energy sources available a top consideration when deciding where to site the plant. We are also exploring approaches for maritime decarbonization with our offshore vessel provider and our offshore system designer.

CO_2e to produce metals from one kg of nodule: dominated by pyrometallurgical step



Risk 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 mission, we are continuously acquiring insights through research and third-party engagement:

- Continuous scanning for key risk is performed by the leadership team. For example, the leadership team uses reports by the International Energy Agency (IEA) and World Economic Forum, as well as Benchmark Minerals Intelligence, and industry reports and research, among other sources, to acquire more insights. Potential significant insights are reviewed and escalated to the S&I Committee as needed.
- We work with like-minded members of the value chain with the right skillset and resources to help us achieve better performance from the beginning of commercial operations.
- A science-driven approach helps us understand and mitigate the potential impacts of our operations in the CCZ. To that end, we have implemented a robust science program and are developing an environmental management program aided by technology such as the adaptive management system (AMS).
- Consistent engagement with external stakeholders keeps us up to date of the areas of most concern for them. From engagement with our sponsoring states to NGOs, we connect with key stakeholders who help us identify climate-related risks and opportunities.

Metrics and Targets

This is our first impact report. Since we are still in the exploration phase, we are disclosing the emissions our offshore exploration campaigns, whether directly by us or through our subsidiaries, have created since their 2012 launch. It is a modest figure that does not represent the potential future carbon profile of our commercial operations. However, we are committed to taking full responsibility for our impacts and we are working with partners to help us identify the most value-added ways to offset our emissions, including emissions generated by entities we have acquired along the way until we become commercial, prioritizing 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, focusing on issues that are of most importance to them.

The ultimate goal is to achieve net zero as soon as practically feasible. We are reviewing technologies that could get us there. Locating our onshore processing plants close to renewable power and replacing metallurgical coal with carbon-neutral or carbon-negative alternatives will be key. The development of SBTi Net Zero will help us depict a clear path.

Taskforce on Nature-Related Financial Disclosures (TNFD)

We welcomed the launch of the TNFD in June 2021, as we understand how nature loss presents financial risks to organizations. We look forward to adopting TNFD's disclosure recommendations once they have been developed and integrating them in our risk management process. Shifting financial flows away from nature-negative outcomes and toward nature-positive outcomes is something we believe in. For such a complex and nuanced subject, quantification and comparability of impacts on nature are a challenge. We understand the value of having a structured approach to assessing nature-related risks and opportunities to drive action, and we welcome a common language to disclose our progress.

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

For the first time in human history, we are developing a resource that is deemed to be part of the common heritage of humankind (CCH) rather than an endowment of any nation state. While there is no precedent for us to follow, we believe the spirit of the CHH principle calls for radical transparency, strong partnerships and broad stakeholder engagement. We realize CHH requires us to do more and be better than what has been done in traditional resource exploitation. Therefore, TMC is committed to exploring new ways of conducting business in collaboration with our stakeholders.

The following is an overview of the CHH principle, its governance and its relevance to the development of deep seabed minerals.

In 1967, Arvid Pardo, the Maltese ambassador to the United Nations, delivered a speech at the United Nations General Assembly calling for the deep seabed beyond national jurisdictions and the resources contained therein to be declared the common heritage of mankind. His speech provided the most comprehensive proposal on the concept and was motivated by reports of rich resources in this part of the sea and by concerns that wealthy, technologically advanced nations would unilaterally exploit the resources to the exclusion of poorer nations.

The freedom-of-the-seas doctrine – a principle where the sea beyond a narrow belt surrounding a nation's coastline was proclaimed to be free to all and belonging to none – prevailed into the 20th century. During his speech in 1967, Pardo spoke of the superpower rivalry that was spreading to the oceans, of the pollution that was poisoning the seas, of the conflicting legal claims and their implications for a stable order, and of the rich resource potential that lay on the seabed.[2] Pardo asked the nations of the world to look around them and open their eyes to a looming conflict that could devastate the oceans, the lifeline of humankind's very survival.

Pardo urged the development of an international regime over the seabed to avoid escalating tensions. His call-to-action came at the right time, as many recognized the need for updating the freedom-of-the-seas doctrine to consider the technological changes that had altered humanity's relationship to the oceans. This led to the creation of an ad hoc committee by the General Assembly the same year, which became the United Nations Seabed Committee.[3] In 1970, the General Assembly declared that the seabed and ocean floor, and the subsoil therof, beyond the limits of national jurisdiction, as well as the resources of the area, are the common heritage of mankind.[4]

Initially, the common heritage of mankind concept was associated solely with the United Nations Convention on the Law of the Sea (UNCLOS), but it has since been expanded to other domains, such as outer space, the Moon, Antarctica, human rights, human genomes and plant genetic resources.[5]

International Seabed Authority (ISA)

Historical background

The realization that the problems of ocean space are interrelated and need to be considered as a whole led to heightened interest in the question of establishing a legal-economic regime to govern the exploration for and exploitation of the non-living resources of the seabed beyond the limits of national jurisdiction.

Based on its 1970 declaration and provisions surrounding the common heritage of mankind 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, in which 160 sovereign states participated, held 11 sessions between 1973 and 1982. During these years, representatives of sovereign states discussed the issues, negotiated and prepared a draft convention on the law of the sea. These negotiations resulted in the 1982 adoption of UNCLOS, containing 320 articles and nine annexes governing all aspects of ocean space, including environmental control, marine scientific research, economic and commercial activities, transfer of technology and the settlement of disputes relating to ocean matters.[6] UNCLOS ensures the development of seabed mineral resources beyond national jurisdiction will benefit developing states, not just wealthy countries.

[2] UNCLOS, "A historical perspective, originally prepared for the International Year of the Ocean," 1998
[3] UNCLOS, "United Nations Convention on the Law of the Sea," Dec. 10, 1982
[4] United Nations General Assembly Resolution 2749 (XXV)
[5] Oxford Bibliographies, "Common Heritage of Mankind," May 12, 2017
[6] U.N., "UNCLOS Overview"

UNCLOS included provisions for the establishment of 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.[7] The ISA is entrusted with the supervision and regulation of exploration and exploitation of the resources derived from the established complex regime. The ISA was established with the 1994 Implementation Agreement relating to the Implementation of Part XI of UNCLOS.

Today, the ISA is composed of 167 member states and the European Union, and it is mandated under UNCLOS to organize, regulate and control all mineral-related activities in the international seabed area for the benefit of mankind as a whole.[8] A key component of the allocation of sites is the mechanism of "reserved areas," which are areas held in a site bank to be accessed by developing countries. These reserved areas are contributed by developed states when they apply to the ISA for exploration rights after surveying these areas and returning half of the surveyed areas by value.[9]

A timeline of **important milestones**

1967
U.N. General Assembly, Pardo's speech

U.N. Seabed Committee established

1973
Third United Nations Conference of the Law of the Sea

1982
United Nations Convention of the Law of the Sea

1994
Agreement establishes the International Seabed Authority (ISA)

2001

2013

2001-2013
Three sets of exploration regulations covering polymetallic nodules, polymetallic sulfides and cobalt-rich ferromanganese crusts were developed

First exploration contracts granted to government institutions

2014
Work to develop regulations to govern exploitation started

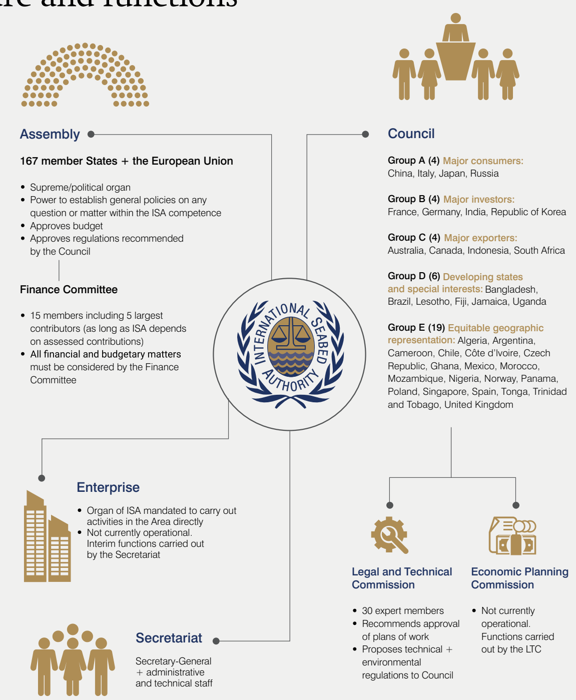
2017
First draft Exploitation Regulations issued by the ISA

2021
Final Exploitation Regulations were expected to be in place in 2020 but were delayed due to COVID-19

The ISA has proposed and adopted a workplan to complete and adopt the code, with a July 2023 target, following the two-year notice submitted by Nauru in June 2021

ISA principal organs: structure and functions

Assembly
ISA's "supreme organ," the Assembly is empowered to establish the general policies. It is responsible for making decisions on the equitable sharing of financial and other economic benefits deriving from activities in the Area, and on compensation or other economic adjustments to developing countries whose export earnings from their land-based mineral extraction are diminished by seabed production.



Source: ISA, Secretary-General Annual Report 2020

The ISA provides an **international and transparent forum** to regulate and manage all mineral resources related activities and ensure **protection of the marine environment** in the Area, the deep seabed and subsoil beyond national jurisdiction, for the benefit of all humanity.

Observers
As of December 2021, the ISA has granted observer status to 30 states that are not party to UNCLOS, 32 U.N. and Intergovernmental Organizations and 32 NGOs. They are allowed to participate in the work of the Assembly and the Council, with some limitations.

[7] Ibid
[8] ISA
[9] ISA Reserved Areas

CCZ Governance

Deep-sea mining is the first extractive industry in history that is being regulated before any extraction has begun. TMC through our subsidiaries operates in international waters under the regulatory jurisdiction of the ISA and our sponsoring states. The ISA is an autonomous international body that was established in 1994, with the dual mandate of regulating all mineral-related activities in international waters and ensuring the effective protection of the marine environment on behalf of humankind. The ISA has a proven 28-year track record of developing modern regulations through transparent and inclusive negotiations, and is a stable regulatory organization.

The international framework established by UNCLOS was specifically designed to mitigate the historical North-South divide. By setting aside exploration areas for developing states, the ISA levels the playing field that is usually heavily biased toward states with resources, capital and technology. While this unique legal framework provides a foundation for the equitable sharing of financial and other economic benefits, it requires strong private-sector partnerships for developing states to take advantage of these benefits. The applications submitted by Nauru Ocean Resources Inc. (NORI), sponsored by the Republic of Nauru, and by Tonga Offshore Mining Ltd. (TOML)[10], sponsored by the Kingdom of Tonga, were the first applications for exploration contracts in the Area by private-sector entities, and also the first applications to have been made for reserved areas, on the basis of sponsorship by developing states. Since then, several developing nations have followed in their footsteps, including Kiribati, the Cook Islands, Singapore and Jamaica. We are proud of the partnerships developed, and we strive to constantly do better because of the weight of responsibility toward our developing states.

We have invested approximately $75 million in baseline research to understand the water column from seafloor to surface, as well as the potential environmental and social impacts of our future operations. Learning from mistakes made in the past by other extractive industries is informing the development of the international regulatory environment. The exploration regime for polymetallic nodules was developed in 2000 and further updated in 2013.[11] Under this regime, contractors are provided with a 15-year contract that is 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 regulatory code for exploitation of the seafloor minerals has been in development since 2014 and its framework is outlined in UNCLOS. In December 2021, the Council adopted the roadmap for work during 2022 and 2023 for the adoption of the draft regulations and associated Phase 1 standards and guidelines by July 2023.[12] TMC has exploration and commercial rights to three ISA exploration contracts sponsored by three Pacific Island developing states through our local subsidiaries.

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 1994:167 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

[10] Nauru Ocean Resources Inc (NORI) and Tonga Offshore Mining Ltd (TOML), wholly owned subsidiaries of The Metals Co
[11] ISA, "The Mining Code"
[12] ISA, "Statement by the President of the Council on the work of the Council during its twenty-sixth session," Dec. 14, 2021

Sponsoring States

The two ISA exploration contracts and the commercial agreement to which TMC has rights are sponsored by three developing states: the Republic of Nauru, the Kingdom of Tonga and the Republic of Kiribati.

The NORI and TOML contracts are held by TMC subsidiaries registered in Nauru and Tonga, 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 subsidiary of TMC The Metals Company

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

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

This model, where commercial companies partner with a developing state, was first implemented by Nauru and NORI. It enables our sponsoring states to participate in this industry while reducing their risk of entering the industry by 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 state 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, there must be a causal link between the failure of that state to meet its responsibilities and the damage caused by the sponsored contractor.

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 was always envisioned by UNCLOS. NORI and Nauru were the first to access the reserved areas set aside by the ISA specifically for use by developing states. This model has been replicated since NORI and Nauru's leadership by:

- Tonga in 2012
- Singapore in 2015
- Cook Islands in 2016
- Jamaica in 2021

At TMC, we are proud of the joint leadership role we have played with our sponsoring states in helping bring to life UNCLOS's vision of supporting developing states. It is important to 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

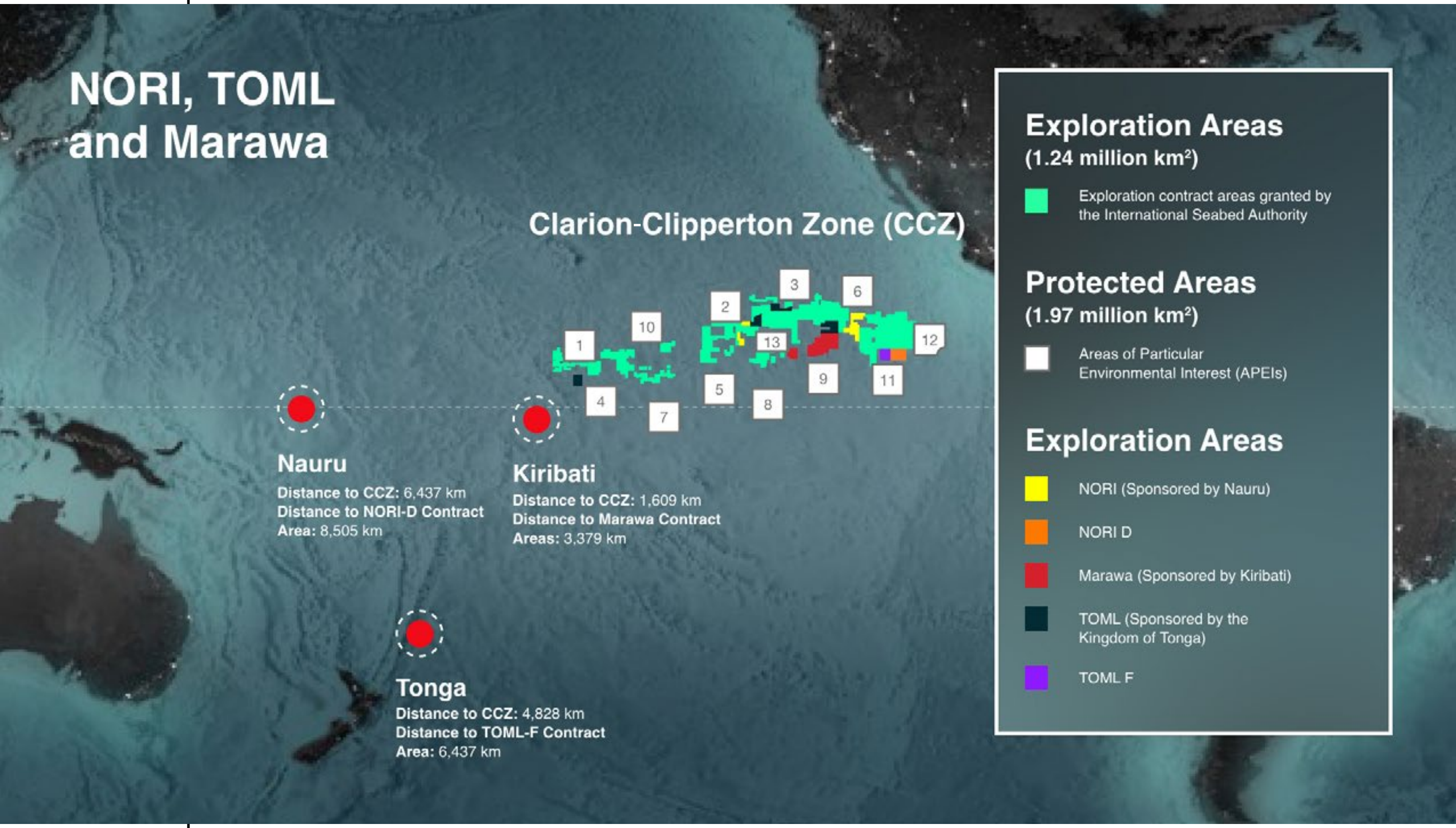
2008 Sponsorship Agreement

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.[13]
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.[14]
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.

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.[15] 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.

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.[16]
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.[17]
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.[18]

13 Nauru, "Voluntary National Review on the implementation of the 2030 agenda," 2019
14 Ibid
15 New World Encyclopedia, "Tonga"
16 New World Encyclopedia, "Kiribati"
17 Kiribati, "Voluntary National Review and Development Plan Mid-Term Review," 2018
18 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 "Code")

All contracts to date are for exploration only. The ISA targeted July 2020 for the completion and adoption of its exploitation regulatory regime, but COVID has delayed negotiation and adoption. Despite the delay, significant progress has continued to be made on the major components of the exploitation regulatory regime with an updated schedule agreed by the Council during their last meeting in December 2021.

> Current contracts are for exploration only. We are a couple of years away before commercial production begins.

The Mining Code refers to the comprehensive set of rules, regulations and procedures issued by the ISA to regulate prospecting, exploration and exploitation of marine minerals in the international seabed area. The Code is composed of 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 exploitation of mineral resources in the Area. The exploitation component of the Code consists of 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 the context of expert workshops and involved the preparation of a number of expert studies and discussion papers, and culminated in the development of draft regulations considered by the Legal and Technical Commission (LTC) and the Council. Stakeholders have been involved throughout the transparent process.[19]

The draft regulations on exploitation of mineral resources in the Area require that certain standards and guidelines be developed by the organs of the ISA to support the implementation of the regulations. The standards will be legally binding on contractors and 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.[20]

Phase 1 generated 10 standards and guidelines, which are currently with Council for final discussion and approval after being revised based on stakeholder consultations.

The financial regime to be established requires a portion of the financial rewards and other economic benefits from mining to be paid to the ISA and then be shared according to "equitable sharing criteria." Research and consultation has been undertaken to consider mechanisms for benefit sharing of financial and other economic benefits.

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	Target completion: July 2023			
Phase 3	To be completed prior to commercial mining commence			
Benefit sharing	Research and consultation complete	→	→	underway

[19] ISA, "The Mining Code: Draft Exploitation Regulations"
[20] ISA, "The Mining Code: Standards and Guidelines"

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 apply for approval of a plan of work for exploitation to notify the ISA of such intention. This notice obliges the ISA to complete the adoption of exploitation regulations within two years of the request made by the member state.

On June 25, 2021, the Republic of Nauru submitted its notice to the ISA requesting that it complete, by July 9, 2023, the adoption of regulations necessary to facilitate the approval of plans of work for the commercial exploitation of polymetallic nodules. The notice submitted by the Republic of Nauru to the ISA has increased the likelihood regulations will be adopted that will govern and enable commercial scale polymetallic nodule collection by mid-2023. If the ISA has not completed the adoption of such regulations within the prescribed time and an application for approval of a plan of work for exploitation is pending before the ISA, the ISA shall nonetheless consider and provisionally approve such plan of work based on: (i) the provisions of the UNCLOS; (ii) any rules, regulations and procedures that the ISA may have adopted provisionally at the time; (iii) the basis of the norms contained in the UNCLOS; and (iv) the principle of non-discrimination among contractors.

In December 2021, the ISA held face-to-face meetings in Kingston, Jamaica, and established an ambitious work plan and road map to finalize regulations by July 2023 for the commercial exploitation of seabed minerals, including those necessary for the collection of polymetallic nodules. The road map includes two two-week Council sessions and one week of Assembly meetings that will be focused primarily on the finalization of the regulations in 2022. The road map also provides for a third two-week Council session in the fourth quarter of 2022, if required, and subject to resources. Once adopted, these regulations will create the legal and technical framework for exploitation of the polymetallic nodules in the NORI, TOML and Marawa contract areas.

While the ISA has developed a work plan and road map to complete the final regulations by July 2023, there can be no assurance that such regulations will be approved then, if at all. The draft regulations and several supporting standards and guidelines are at an advanced stage, but there remains uncertainty regarding the final form that these will take, as well as the impact that such regulations, standards and guidelines will have on our ability to meet our objectives.

Find more: Nauru FAQ on two-year notice.

APPLICATION

- ✓ Certificate of Sponsorship
- ✓ Mining Plan
- ✓ 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

Environmental Impact Statement (EIS)

A key requirement of an ISA exploitation contract application is the submission of an EIS. The purpose of the EIS is to document and report the results of the **Environmental and Social Impact Assessment (ESIA). ESIA** is "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." This includes all potential effects, positive, negative and neutral, and encompasses natural and anthropogenic receptors.[21]

The ISA requires that an application for approval of a plan of work shall be accompanied by an assessment of the potential environmental impacts of the proposed activities and by a description of a program for oceanographic and baseline environmental studies in accordance with ISA rules, regulations and procedures. Environmental baseline study surveys, which determine the characterization of an area prior to project development, establish the initial environmental status. This understanding will enable us to find ways to minimize impact and establish measures for protection.

ESIA PROCESS

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

For the first NORI-D EIS, we have designed a comprehensive seabed-to-surface research program. This program will enable us to understand the effects of our operations on the biota of each of zone of the ocean and how they will respond to the impacts that potential future operations would generate.

> **TMC has commissioned the world's leading ocean scientists to conduct over 100 individual studies to characterize the biota of all the zones of the water column.**

We have commissioned some of the world's leading deep-sea scientists to conduct over 100 individual studies to characterize the biota of all the zones of the water column. Still more research is underway to add to the pool of knowledge that has been in development since 1960s, with over 13,000 papers published on polymetallic nodules in general and over 1,500 on CCZ nodules alone to date.

The new information we collect informs the EIS that will be submitted to the ISA as part of our application for an exploitation contract. We have been collecting biological data from the NORI and TOML areas, with a particular focus on the NORI-D area since 2012. Since 2018, NORI has focused its efforts in NORI-D to understand better the resource and, since 2020, has been concentrating efforts on the collection of data to inform the environmental impact assessment. In 2021, we complete the campaigns related to our environmental baseline assessment.

> **The research undertaken as part of exploration contracts in the Area is critical to realizing all aspects of the Blue Economy, including knowledge of marine biodiversity and ecological processes.**

This has required 15 dedicated campaigns to the CCZ, each lasting between 21 and 45 days as we collected data from the marine habitats represented on the NORI-D area. At the end of this effort, we have generated tens of thousands of samples, specimens and data points. The size of this research effort dedicated to developing our ESIA – from offshore sample collection to analysis and publication – is significant and will continue to grow as we get closer to submitting the NORI-D EIS for assessment by the ISA.

[21] ISA, "Draft regulations on exploitation of mineral resources in the Area"

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

UNIVERSITY OF GOTHENBURG · HERIOT WATT UNIVERSITY · National Oceanography Centre · NATURAL HISTORY MUSEUM · UNIVERSITY OF LEEDS

> Once completed, this research will represent the most comprehensive integrated study of ocean life ever conducted in the CCZ to date.

We have completed initial baseline data collection and are in the planning phases of the NORI-D collector test monitoring campaign. We will also visit the area annually to download data from monitoring equipment that we have in the NORI-D area to continue to gather data trends.

The upcoming NORI-D collector test campaigns are designed to collect impact data that can be compared against the baseline assessment. A fully functioning one-fifth scale prototype of the commercial system will be operated at NORI-D and monitored to test our impact models and gather additional data to gain more insights on the potential impacts of our operations. These data comparisons will allow us to design a mitigation plan, make improvements in our equipment design and adapt our collection operations plans. The collector tests are a requirement for the EIS submission along with the mitigation plan. Although it is a small-scale test, a dedicated EIS submission for the collector test is also required. We have submitted the NORI-D Collector Test EIS to the ISA in July 2021.

The wealth of knowledge we have and are acquiring, allows us to develop innovative designs of our collector system that can minimize environmental impacts. Examples include:

- Increasing the depth of the return water outlet and placing it into the bathypelagic layer to minimize the impacts on the more productive mesopelagic layer.
- Designing a collector head that is height adjustable and picks up nodules using a water jet parallel to the seafloor to minimize sediment disturbance.
- Designing a subsea separator to minimize the amount of sediment that is transferred to the surface.

NORI's sponsoring state Nauru facilitated an open stakeholder consultation to solicit comments and feedback on the submitted EIS for the planned 2022 NORI-D collector test. In contrast to equipment tests on land, where such tests do not usually require an EIS and stakeholders tend to be local and limited in number, our NORI Collector Test EIS submission was open to consultation to anybody interested. We invested our resources to update the EIS submission, respond to comments and address the most important issues raised.

While the environmental impact assessment of the ESIA has attracted the most attention, a social impact assessment (SIA) is also required. Assessing the social impacts of our future operations is a challenging and unique task given the location of the resource and its designation as a common heritage of humankind. Lying far from human communities in international waters, polymetallic nodules from our NORI-D area could help reduce many of the human impacts associated with terrestrial mining. The remoteness of NORI-D, however, requires rethinking how we assess the social impacts of future operations. That is why we are taking a broad and inclusive approach of what social impact means for this emerging industry. We have engaged Prizma Solutions to lead our SIA and are currently going through a scoping study. The SIA is required to determine the project's potential socio-economic contributions, engage with external stakeholders, and provide a measuring and monitoring framework that would be incorporated into NORI's future operational and social performance management plans. In 2022, the team will engage with stakeholders, conduct a scoping study and complete an SIA of the NORI-D project, as well as help us to identify opportunities to enhance social benefits.

United Nations Sustainable Development Goals (U.N. SDGs)

We share the vision set forward by the U.N. SDGs of a thriving world for all, and we believe we have a role to play in contributing to a more sustainable planet. While the idea of deep-sea mining has attracted intense ideological debates and strong opposition from several environmental NGOs, we are committed to follow the path of science-driven decisions and open dialogue. We will continue to partner with experts, share what we learn and course-correct accordingly, because we believe that the clean energy transition must not compromise the health and safety of people and planet.

Currently, we are in the middle of our materiality assessment, which entails broad internal and external consultation. Once completed, we will use these insights to consolidate our sustainability ambitions and goals. We look forward to providing specific targets. In the meantime, we mapped the U.N. SDGs that are most relevant to our business and where there is the greatest potential for positive impact. These goals will serve as one of the pieces that will guide us as we build our sustainability framework.

Direct Contribution to SDGs

Goal 8: Decent Work and Economic Growth

We are working on providing training and employment opportunities to nationals of our sponsoring states. The construction of potential new metallurgical plants would support the development of battery manufacturing while generating decent work and economic growth, which is the aim of Goal 8. We are also committed to equal pay for equal work, continuing to have a strong health and safety record, and progressively improving resource efficiency in consumption and production to support the decoupling of economic growth from environmental degradation.

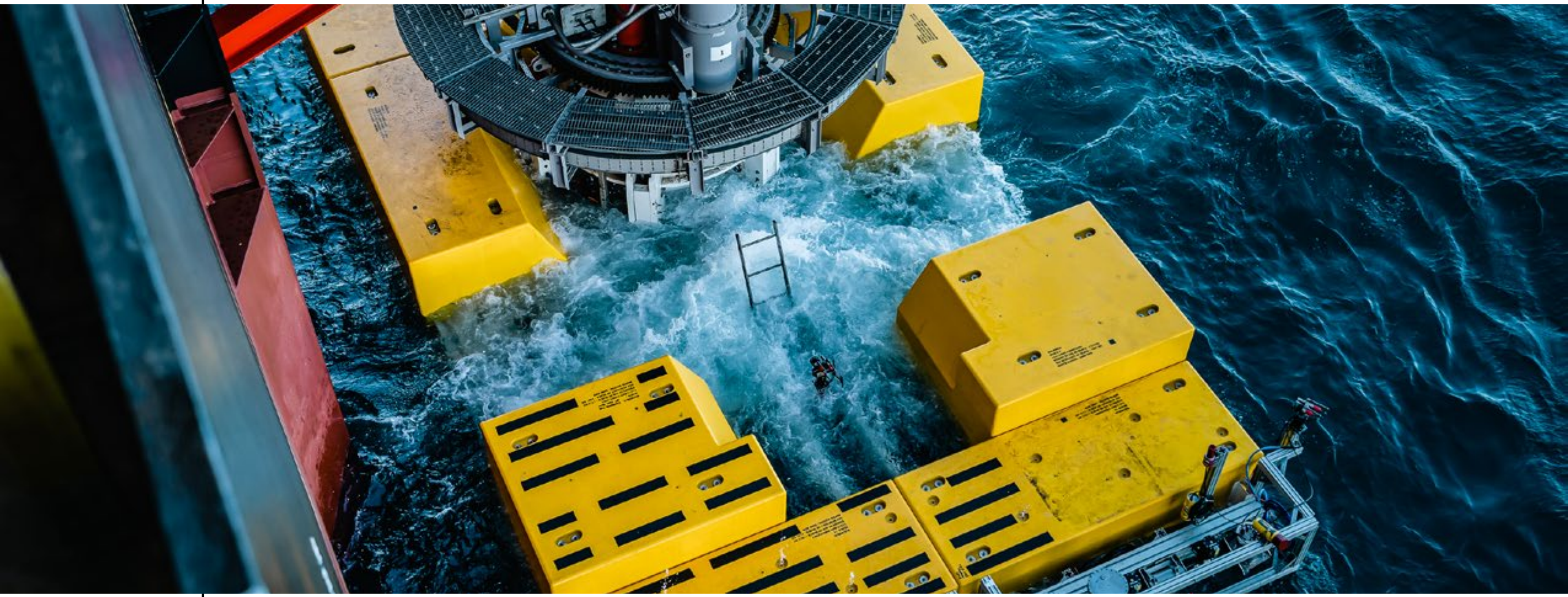
Goal 12: Responsible Production and Consumption

Creating a carefully managed metals commons that will be used, recovered and reused again and again directly aligns with Goal 12 by achieving the sustainable management and efficient use of natural resources. That is why we have invested in developing onshore processing flowsheets that will generate near-zero solid waste and will work with partners to create a circular model for our metals.

Goal 13: Climate Action

How we build our metal commons also matters. It makes us keep a close eye on our operations as we look to achieve near-zero waste and net zero emissions, which directly aligns to Goal 13. From process optimization, renewable energy, fuel alternatives and new technologies, we are building our decarbonization path. Given that the metals we are looking to supply are the ones needed for EV batteries and renewable energy storage, we are enabling the clean energy transition. Considering power generation and transport together account for more than two-thirds of total global GHG emissions and have been responsible for almost all global growth since 2010,[22] the clean energy transition is crucial to address climate change. For additional context, fuel combustion for transportation is responsible for 27% of all direct CO_2 emissions, which could be mitigated by the adoption of EVs powered with renewables.

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



Goal 14: Life Below Water

At first glance, it might seem counterintuitive that a company looking to develop seafloor minerals can directly and positively contribute to life below water, but this is an area where we will add value. Currently, the ISA has allocated 43% of the CCZ as protected area. In addition, a percentage of the areas under contract also will be set aside. This directly aligns with Goal 14, which seeks to sustainably manage and protect marine and coastal ecosystems. We look to help increase the economic benefit to Small Island Developing States (SIDS) from the sustainable use of marine resources while implementing international law as reflected in UNCLOS.

Goal 17: Partnership for Goals

As a company with a small workforce, partnerships are important to leverage expertise and amplify impact. That is why Goal 17 is particularly relevant to us. Working with the scientific community is an example of how we collaborate. For the last 10 years, we have done a lot of research with several academic institutions contributing to TMC's ESIA program. The ESIA program consists of more than 100 discrete studies throughout the water column, from seafloor to surface. This research increases the world's scientific knowledge of the deep sea, and it will help us develop technology to manage and mitigate negative impacts to the marine environment, which is also part of Goal 14.

The international nature of this emerging industry requires us 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 support the achievement of the SDGs. All these actions align with Goal 17, and its effectiveness, transparency, and accountability involve data, monitoring and reporting.

What We Do

Our operations

From the collection of nodules to the production of battery metals, there are two main operation segments we are developing: Offshore and Onshore.

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. Work is currently focused on completing:

1) Environmental baseline surveys
2) Collector test, planned for Q3 2022
3) Environmental and social impact assessment
4) Development of adaptive management systems

Onshore operations: Involves the development and testing of a near-zero waste flowsheet for nodule processing, and the testing and eventual construction of processing plants, which will consist of primary processing and refining.

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 the processing of nodules.

We have built strong partnerships that allow us to move fast

OFFSHORE: RESOURCE → COLLECT → SHIP

ONSHORE: PROCESS & REFINE → PRODUCT

RESOURCE ESTIMATION

MAERSK

Invested $25M in 2017. Provided project management services, including vessel operations and supplier management on all resource definition and environmental offshore campaigns.

AMC consultants – mine smarter

Provides Canadian 43-101 & U.S. SEC S-K 1300 compliant technical reports.

NODULE COLLECTION TECHNOLOGY DEVELOPMENT

Allseas

Invested $100M in 2019-2021. Developing a pilot and first commercial nodule collection system.

ENVIRONMENTAL IMPACT ASSESSMENT

University of Gothenburg, Natural History Museum, National Oceanography Centre, Heriot Watt University

Several of the world's leading deep-sea research institutions contributing to the offshore Environmental & Social Impact Assessment (ESIA) program consisting of over 100 discrete studies. These organizations are independent and expect to openly publish their research in peer-reviewed journals.

FLOWSHEET DEVELOPMENT

HATCH

Engaged for concept engineering of near-zero solid waste flowsheet and pilot plant technical support executed at FLSmidth, XPS and SGS facilities.

PILOT PLANT PROGRAM

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

OFFTAKES

GLENCORE

Invested in 2012. Holds offtake on NORI area:

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

Resource Definition and Environmental Offshore Research Campaigns

Maersk Supply Services (MSS) provided project management services, including vessel operations and supplier management, on all resource definition and environmental offshore campaigns from 2018 until December 2021. MSS invested $25 million in 2017. Their long track record of health and safety excellence has translated to zero fatalities and zero lost-time injuries during the offshore campaigns they conducted on behalf of TMC's subsidiaries.

AMC, a world-leading resource consultancy, has independently estimated resources for all of the NORI and TOML contract areas and has undertaken an independent economic analysis of the NORI-D project. The company has provided reporting under two mineral projects reporting standards, the Canadian NI 43-101 and the newly outlined SEC S-K 1300 in the United States.

Environmental Impact Assessment

To better understand the CCZ ecosystem, we work with numerous world-leading **ocean research institutions**. These organizations are independent, and researchers contractually retain their academic freedom to reach conclusions on findings and publish results. We expect numerous academic papers to be published in peer-reviewed journals in the coming years. Institutions include Sweden's University of Gothenburg, the U.K. Natural History Museum & National Oceanography Centre, University of Leeds, Heriot Watt University, University of Hawaii – Manoa, Texas A&M University, Florida State University, and the Japan Agency for Marine-Earth Science & Technology (JAMSTEC). This work is also part of TMC's Environmental & Social Impact Assessment (ESIA) program consisting of more than 100 discrete studies throughout the water column, from seafloor to surface.

Nodule Collection Technology Development

We are planning a phased development for polymetallic nodules in the NORI area where they would be collected using offshore collection systems composed of collector robots on the seafloor, a riser and lifting system (RALS) in the water column, and a production support vessel on the surface. The nodules are expected to be transferred to transport vessels and shipped to onshore processing facilities.

Through our strategic partnership with Allseas, a Swiss offshore contractor specializing in subsea engineering and construction, a former drillship vessel (*the Hidden Gem*) was acquired in February 2020 and has been converted and modified to undertake a pre-production collector test in which a collector robot, RALS and other systems will be tested. Knowledge from environmental research is being used to define best design and operational parameters to mitigate and avoid negative environmental impacts.

If we obtain an exploitation contract, the first phase of commercial production (Project Zero) would then be expected to commence after the *Hidden Gem* has been upgraded to become a production support vessel that can produce up to 1.3 million tonnes per annum of wet nodules. The nodules collected in Project Zero are expected to be processed through either existing third-party facilities on a tolling basis or through partnerships to construct new rotary kiln-electric arc furnace (RKEF) facilities. In the next phase of development (Project One), as outlined in the NORI-D Initial Assessment Technical Report Summary, production is expected to be expanded with an additional converted drillship (*Drill Ship 2*), a subsequent upgrade to the *Hidden Gem*, and the construction of a bespoke production support vessel (*Collector Ship 1*).

In March 2022, NORI signed a non-binding term sheet with Allseas to develop and operate a commercial nodule collection system with a targeted production capacity of 1.3 Mtpa of wet nodules and expected production readiness by Q4 2024. Allseas and NORI also intend to investigate acquiring a second production vessel similar to the *Hidden Gem*, a Samsung 10,000 drillship, that is expected to be engineered to a higher production rate of 3 Mtpa of wet nodules. A higher-production-rate system is expected to reduce the per tonne nodule collection cost significantly compared to the first production system that TMC and Allseas intend to develop and operate.

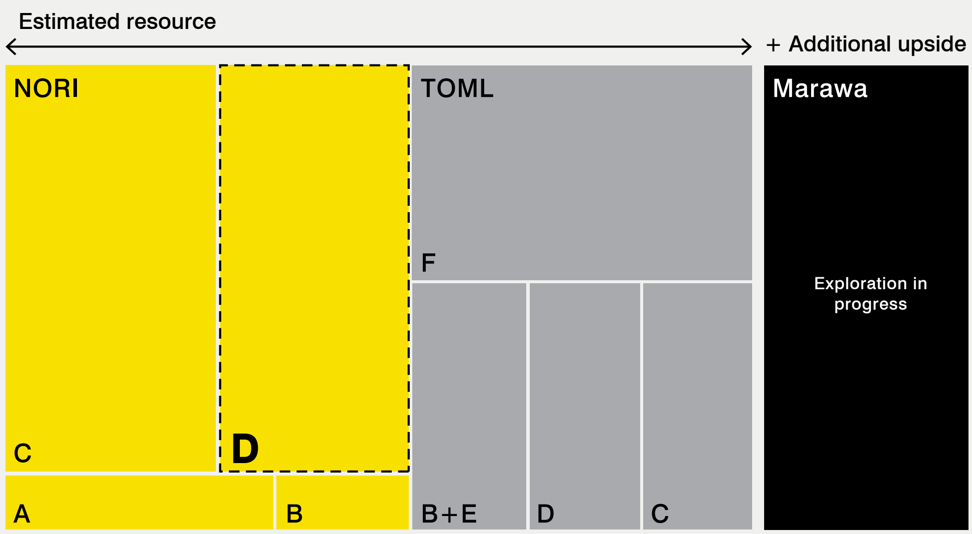
Onshore Processing of Nodules and Product

Once nodules are collected, a cargo vessel is expected to transport them to an onshore processing plant. Using existing metallurgical technology, we developed a near-zero solid-waste flowsheet that meets all of our project objectives and takes advantage of the nodules' unique properties, including four metals in a single ore; very low traces of hazardous elements like arsenic (As), cadmium (Cd) and mercury (Hg); and low composition variability. A pilot plant program demonstrating the major process steps was developed and executed at FLSmidth and Glencore-subsidiary XPS Expert Process Solutions (XPS) and is in progress at SGS. Hatch, a Canadian engineering consultancy, was engaged for concept engineering and pilot plant technical support.

In March 2022, TMC signed a non-binding memorandum of understanding (MoU) with Epsilon Carbon to complete a pre-feasibility study for a commercial-scale deep-sea nodule processing plant in India that could process 1.3 Mtpa of wet nodules and produce more than 30,000 tonnes per annum (tpa) of NiCuCo (nickel-copper-cobalt) matte and 750,000 tpa of manganese silicate product.

Glencore, an Anglo-Swiss multinational commodity trading and mining company, invested in TMC in 2012 and has secured an offtake for 50% of TMC's production of nickel (Ni) and copper (Cu) coming from a TMC nodule-processing facility from the NORI area.

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



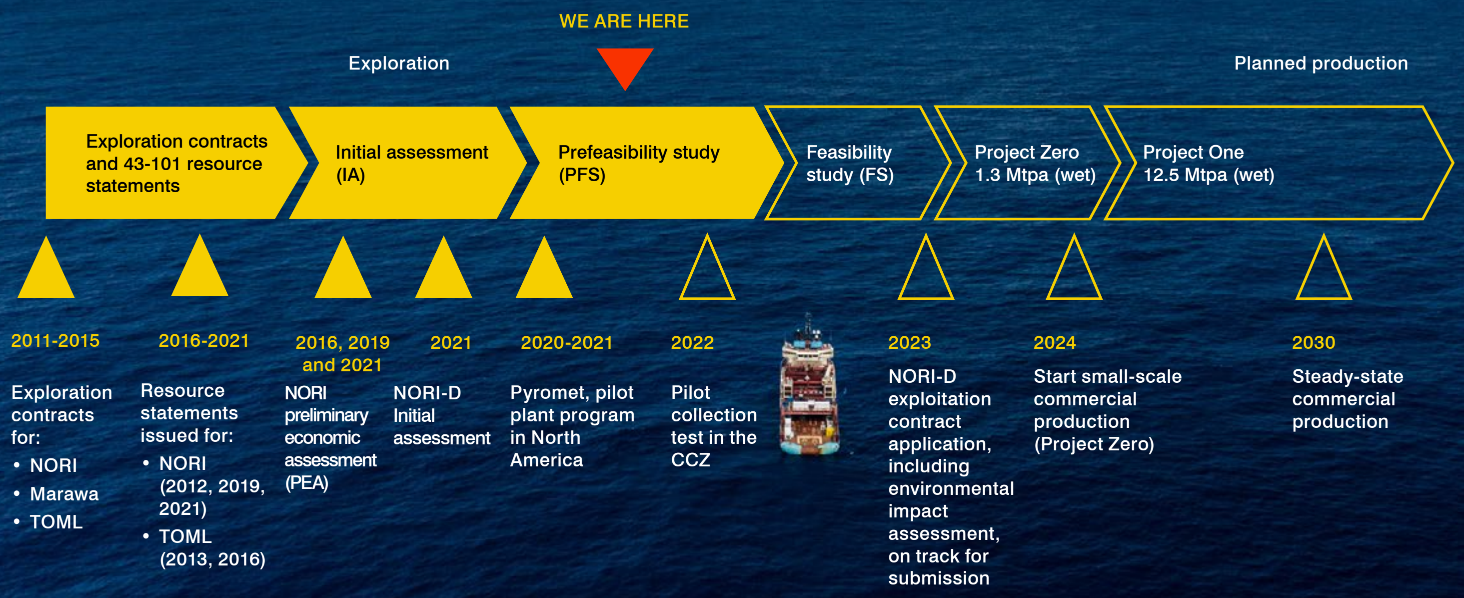
Visual representation of sub-areas with TMC's CCZ permitted areas

While TMC holds exploration rights to a number of areas within the Clarion-Clipperton Zone (CCZ), initial development is focused on NORI Area-D, which is 25,160 square kilometers or 11% of our contracted areas. Located on the southeast margin of the CCZ, it represents the optimal combination of proximity to shore (1,500 kilometers from the coast of Mexico); water depth (4.3 kilometers); and high and consistent nodule abundance (15-20 kg/m²).

The NORI Area-D project has significant optionality not available to terrestrial deposits. Once the nodules are brought to surface, they're on tidewater and can be shipped to a location with an existing port and industrial sites with natural gas, renewable power and an existing workforce of skilled and specialized labor. The NORI Area-D development program is focused on commencing in Q4 2024, with what we call **Project Zero**. This will involve collection of 1.3 Mtpa of wet nodules to produce about 30,000 TPA of NiCuCo matte and 750,000 TPA of manganese silicate. Once in production, the focus will be on scaling and increasing production in a manner that manages development and environmental risks as we build operating knowledge and experience. This is what we call **Project One**. Our strategy is to focus on using existing technologies and to partner with capable groups to realize the opportunity that this huge resource of critical minerals represents.

Project development:

NORI-D on schedule for expected commercial production in 2024



Note: Timeline represents estimates and may be subject to change

From offshore collection to onshore processing, we work with our partners on a series of parallel workstreams. Let's take a closer look.

Offshore		Onshore
RESOURCE DEFINITION	COLLECTION SYSTEM	PROCESSING SYSTEM
ENVIRONMENTAL PROGRAM	REGULATIONS & CONTRACTS	PLANT SITE SELECTION

Offshore

Offshore activities include all activities related to making sure nodule collection can be achieved in an efficient and environmentally sound manner in the CCZ. From technology development to deep-sea baseline and impact assessments, 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. This information is used to define the modifying factors required to convert resources to reserves and to demonstrate project economic viability.
- **Collection system:** Designing and developing a collection system that includes subsea collector robots on the seafloor, an airlift riser system to transport nodules from seafloor collectors to the surface, production support vessel on the surface to dewater nodules and offload nodules to bulk cargo vessels to transport nodules to shore
- **Environmental program:** Gaining knowledge on the ecosystem, potential operational impacts, mitigation strategies, and development of an adaptive management system to monitor and ensure that established acceptable parameters are continuously met
- **Regulation and contracts:** International Seabed Authority (ISA) permitting requirements include broad engagement with stakeholders and experts as we are developing a resource deemed common heritage of humankind via the sponsorship of developing states

RESOURCE DEFINITION

- Exploration campaigns
- Indicated and measured resources

COLLECTION SYSTEM

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

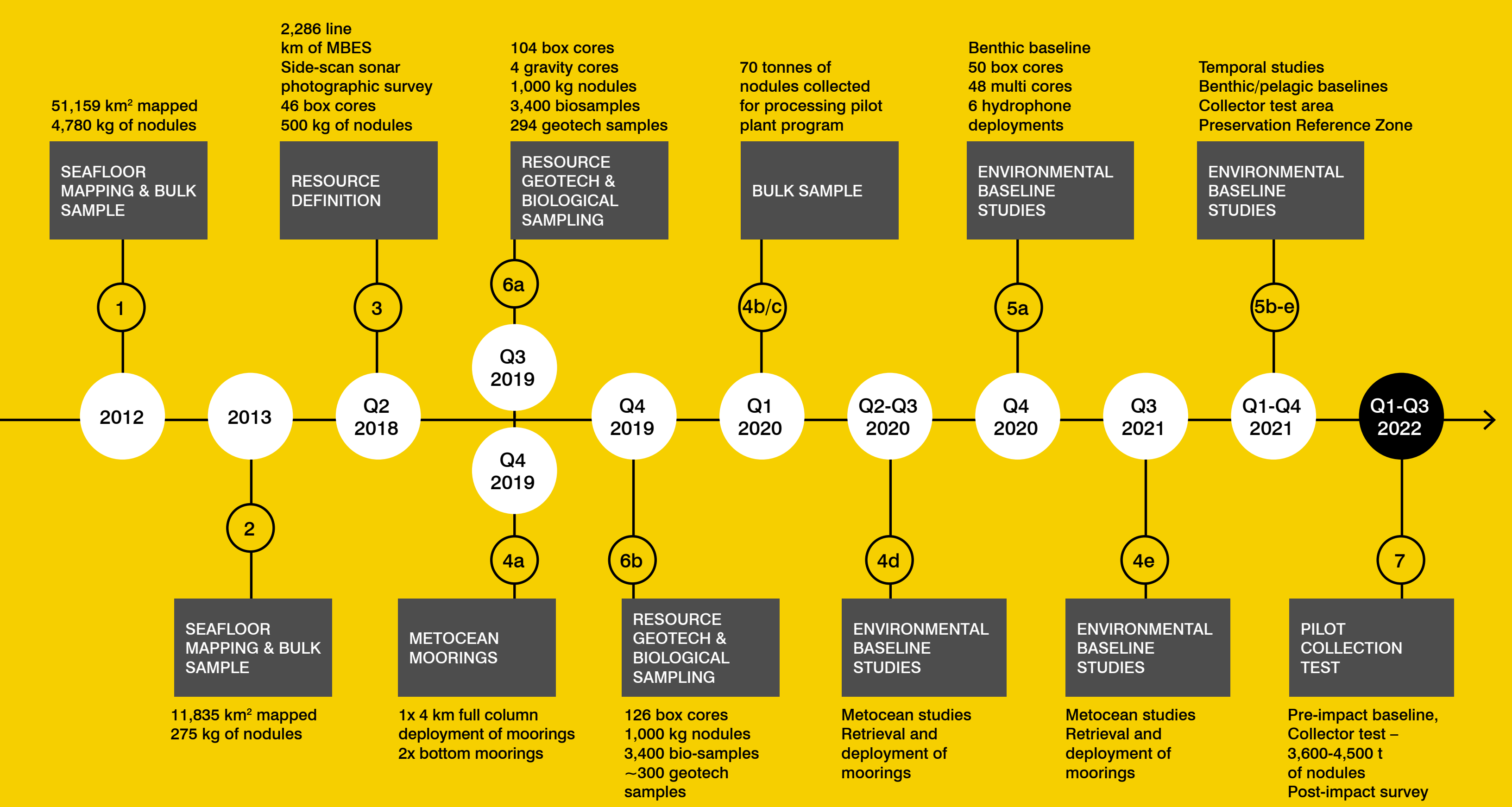
ENVIRONMENTAL PROGRAM

- Science advisory board
- Environmental baseline sampling
- LCA white paper, climate change
- EIS for collector test and production
- Adaptive management system

COMPLIANCE & REPORTING

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

To support all these workstreams, NORI has been collecting samples and analyzing the CCZ area since 2012. Below is the timeline of the campaigns carried out to date by NORI and the focus of each of them.



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

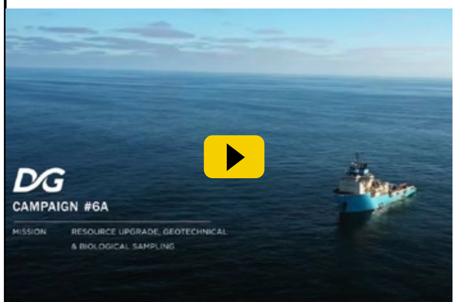
In addition to these NORI campaigns, before TMC's acquisition of TOML in 2020, two bathymetric mapping, geological and environmental sampling campaigns were done in the Area in 2013 and 2015. TOML's offshore exploration campaigns have included sampling to support environmental studies, collection of high-resolution imagery and environmental baseline studies. A number of future campaigns are planned to collect data on ocean currents and water quality to assist plume modeling, environmental baseline studies, 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 of the TOML Technical Report Summary.

To date, only limited offshore marine 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 such area.

RESOURCE DEFINITION

- 5 campaigns
- Indicated & measured methodology
- NI 43-101 and SEC S-K 1300 resource statement



Nodule Collection Technology Development

Resource Definition

One of the attributes that makes nodules attractive is there is no overburden to be removed, as nodules sit unattached on the seafloor and are unobstructed from above. This same attribute makes resource assessment very effective. We carried out five campaigns to define the resource in NORI Area-D. By collecting samples and scanning the seafloor using an autonomous underwater vehicle (AUV) with geophysical instruments and cameras, we were able to define the composition and quantity of this resource in the surveyed areas with a high level of confidence.

AMC was commissioned to provide resource estimation in the NORI and TOML areas and complete a techno-economic evaluation of the NORI-D project. This evaluation brought together contractors for the offshore shipping and processing work scopes as follows:

- Evaluation independently compiled by AMC in compliance with SEC S-K 1300 standards
- Offshore collection system design and costing by DRT with inputs from Cellula Robotics and Herbert Marine Engineering
- Onshore metallurgical plant design and costing by Canadian Engineering Associates
- Metal product price projections from CRU Group
- Shipping rate projections from Pareto JGO Shipbrokers

Technical report summaries for NORI-D and for TOML were issued in March 2021.

Resource definition: 2D nature of the resource allows effective definition

BOX CORE SAMPLING[1]

250
box cores collected[2]

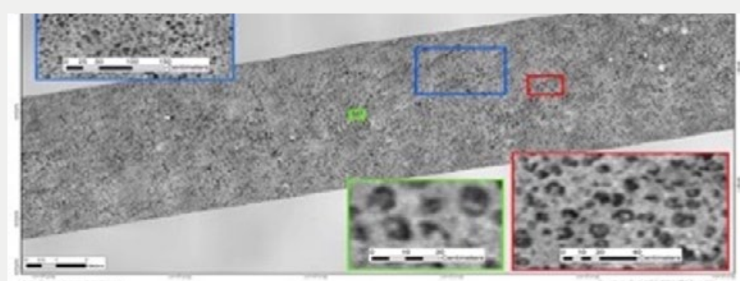
82,000
kg (wet) nodules collected[2]

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

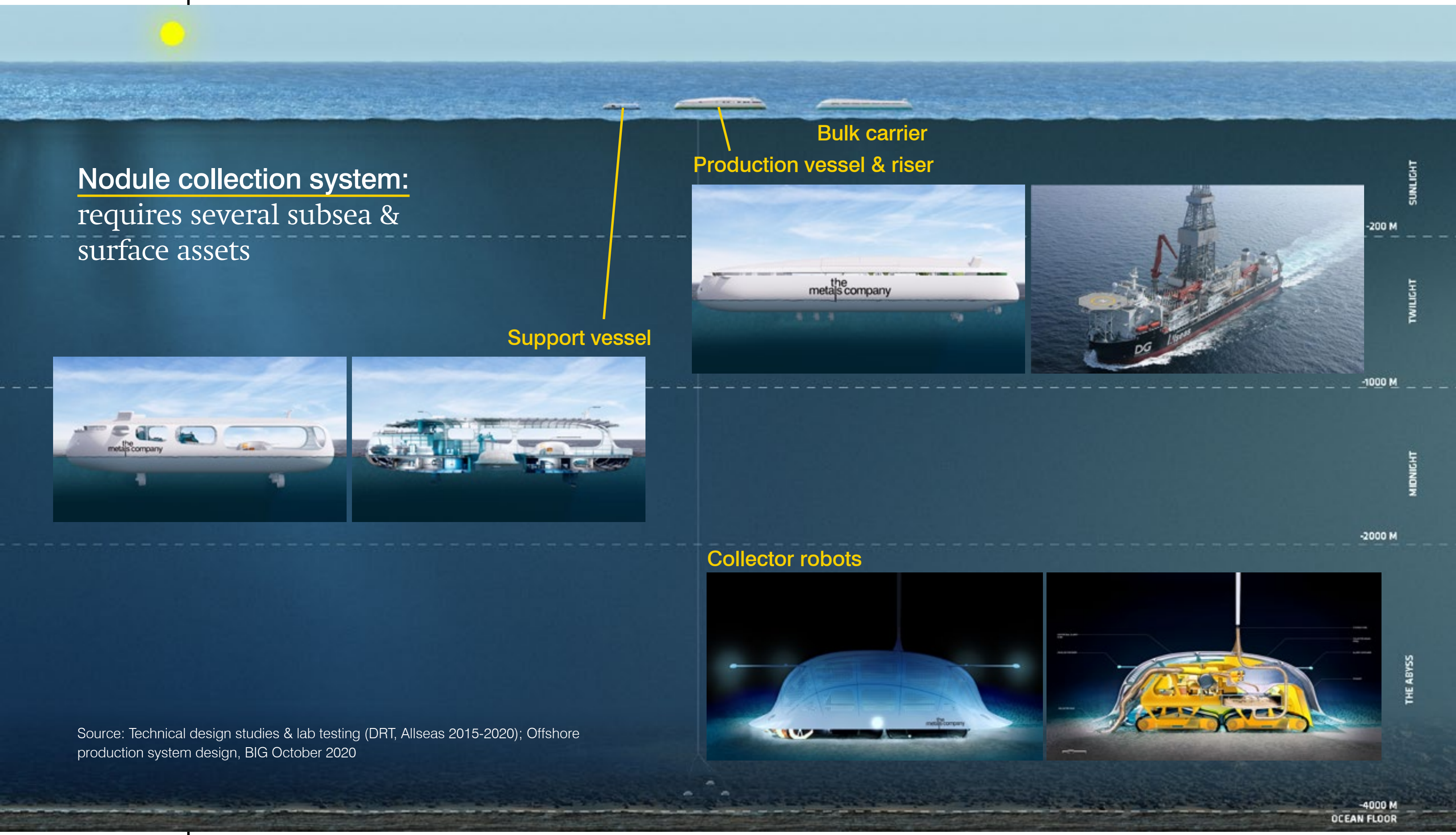
[2] Boxcores, nodules collected, high-res bathymetry, detailed bathymetry – compiled by DeepGreen from Canadian NI 43-101 and SEC Regulation S-K (Subpart 1300) Compliant NORI Area-D Clarion-Clipperton Zone Mineral Resource Estimate and associated financial model, AMC, March 2021. Canadian NI 43-101 Compliant 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

- System design
- Allseas partnership
- Pilot system design
- Pilot system procured
- Pilot system fabrication nearly completed
- Production vessel

Nodule Collection Technology Development

In collaboration with some of the world's leading offshore engineers and designers, we are developing a nodule collection system that includes subsea collector robots, an airlift riser and lift system, and a main production vessel. After nodules are collected and brought up to the production vessel, they then would be offloaded to a bulk carrier that can ship the nodules to any major port.



Source: Technical design studies & lab testing (DRT, Allseas 2015-2020); Offshore production system design, BIG October 2020

Next-Generation Collector Ship Design

We worked with the BIG-Bjarke Ingels Group on an innovative offshore collection 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.

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.

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

Hidden Gem Arrives In Rotterdam

As the ultimate collector system design, we are looking at producing near-zero solid waste and zero release of carbon sinks from the ocean. Our partner Allseas is developing a pilot collector system and, with the acquisition of the *Hidden Gem*, we are on track for Project Zero. *The Hidden Gem* and the subsea collector robot will be part of the collector test that will take place in 2022 at NORI Area-D.

Laboratory testing has been delivering some great results and confirming our technical assumptions of the system's efficiency and productivity. For example, by building a simulated analog of the seabed and the world's largest floating test tank, Allseas was able to test the nozzle pickup to achieve a high nodule pickup efficiency while mitigating sediment entrainment.

Offshore development milestones: progress on track

Production vessel & riser: Drillship acquired & conversion in progress

Collector robot: Fabrication of long-lead items in progress

- **2015-2019** — In-depth technical scoping and design studies by DeepGreen
- **2019** — Technology downselects for all systems and subsystems for pilot/early production system
- **2020** — Lab testing and final design of pilot/early production system
- **March 2022** — Pilot system test in the Atlantic Ocean
- **2022** — **3,600-4,500 t (wet)** to be collected in the CCZ using pilot/early production system
- **2024** — **1.3 Mtpa (wet)** early production system operational
- **2025-2030** — **12.5 Mt (wet)** 2x drillships 1x purpose-built vessels

[1] Woods Hole Oceanographic Institution, "Deep-Sea Mining"
[2] European Dredging Association, "Reasons for Dredging"

The nodules are expected to be collected from the seafloor by self-propelled, tracked collector robots using seawater jets aimed at nodules in parallel with the seafloor at a speed of approximately 0.5 meters per second. No rock cutting, digging, drill-and-blast or other breakage are expected to be required at the point of collection. The collectors would be remotely controlled and supplied with electric power via umbilical cables from the production support vessel. Instead of manipulating the nodules from above, the waterjet is applied horizontally to lift the nodules from the seabed to be collected. This horizontal waterjet approach helps keep the disturbance of seabed sediments to a minimum.

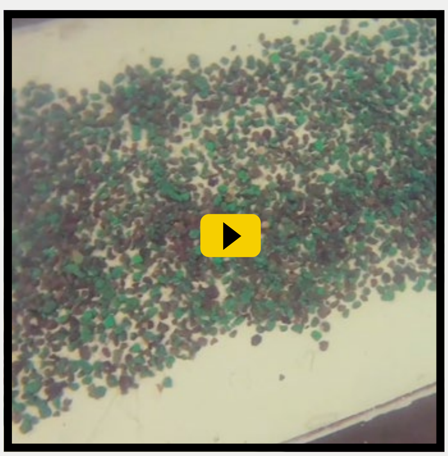
When it comes to mitigating impacts to deep-sea ecosystems, there are many choices that we can make as we design our collection systems. This includes optimization of return water depth, efficient collector head design, and efficient subsea sediment separation that minimizes the sediment lifted to the surface and then discharged in the midwater. We continue to explore ways to reduce our impact on the CCZ and to reduce the system's footprint. For example, because the airlift system and the vessel's dynamic positioning used to match the position of the vessel to the collector robots on the seabed are the most energy-intensive activity offshore, we are looking for ways to optimize energy efficiency and researching new technologies that can help us move away from fossil fuels.

To learn more about the offshore technologies being developed, please view our short video clips below of our laboratory testing program.

Environmental Program

The environmental program is the foundation of our offshore development activities, as the program's goal is to acquire enough understanding of the deep-sea ecosystem to have the least negative environmental footprint during nodule collection. With the help of many experts, including an

Allseas progress: visualization of nodule collection at lab scale



ENVIRONMENTAL PROGRAM

- Science advisory board
- Environmental baseline sampling
- LCA: white paper, climate change and waste
- EIS for collector test and production
- Adaptive management system

ENVIRONMENTAL PROGRAM VIDEOS

Environmental Baseline Expeditions:

5A ▶ 5B ▶ 5C ▶ 5D ▶ 5E ▶

Resource Definition:

6A ▶ 6A JOURNEY OF A BOXCORE ▶

external science advisory board, we have been able to get many answers to our questions and acquire a clearer understanding of our contract areas in the CCZ. This knowledge is being used for our environmental impact assessment as well as the design of our collector and adaptive management systems.

We know the abyssal plain where nodules are found is the most common habitat type on Earth, covering 70% of the ocean floor.[3] We also know less than 10% of all marine organisms live below 4,000 meters.[4] Through the work being done in our environmental program, we are developing a baseline of the marine organisms that live in the water column and on the seabed and analyzing how they might be impacted by our activities.

We have designed the most comprehensive seabed-to-surface research program that has been 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 of all the zones of the water column and seabed.

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

28% of ocean life

65% of ocean life

7% of ocean life

Most impacts from nodule collection are expected to occur on the Abyssal Zone seafloor

[3] NOAA "Ocean Floor Features"
[4] Yinon M. Bar-On et al., "The Biomass Distribution on Earth," May 21, 2018

Research: Environmental Impact Assessment

There are three main impacts that are of concern from our operations:

1 Nodule removal

Nodules serve as a hard-surface habitat to which some sessile invertebrates are attached. Nodule collection will permanently remove most nodules and the organisms attached to them. We are investigating throughout other parts of the CCZ to understand the wider distribution of benthic organisms.

Mitigation action: Currently, we are researching the distribution of organisms that live in the seabed sediment and on the nodules to understand in more detail the overall impact that nodule removal will have in this area. Some organisms need hard nodule surfaces for critical life function, but many others live in the sediment itself. To protect and enable repopulation:

- At least 43% of the CCZ has been set aside by the ISA into Areas of Particular Environmental Interest (APEI), never to be mined.[5]
- Additional "no take zones" or preservation reference zones (PRZs) will be set aside and are expected to account for 10% of TMC's contracted area.
- We anticipate that 15% of nodules would be left behind in TMC's operational areas.

For comparison, only 7.7% of global oceans are protected today and the global targets currently being discussed by the global community aim to protect 30% of the oceans by 2030.[6]

2 Benthic plume

As the collector robot moves across the seafloor, it will entrain and mobilize the top 5 centimeters of the seafloor sediment. Ninety percent of the sediment entrained by the collector robot would be separated from nodules inside the collector and discharged at the seafloor within meters of its origin, generating a plume. This plume may spread to other areas and the fine sediment may clog the feeding and respiratory structures of filter feeding organisms. Sedimentation may also bury nodules, making them unavailable for attachment by animal larvae. Several studies are underway to model the behavior of the benthic plume, and, to date, the findings indicate that the impacts of the plume may not be as widespread as previously thought.

Mitigation action: Our collector robot is expected to entrain and mobilize the top 5 centimeters of sediment under the nodules, which will be ejected from the rear of the robot as a benthic plume. Plume models predict that close to 95% of suspended particles in the plume will rise 5-6 meters above the seafloor and resettle within days in a 100- to 1,000-meter radius. We have field studies planned to verify the predictions of the plume modeling as part of the collector vehicle testing scheduled for Q3 2022. We are also exploring reduction solutions via discharge parameters and mining patterns, and are finding ways to accelerate particle flocculation, which will speed up sediment resettlement on the seabed.[7] The science of plume dynamics has been well-developed by the dredging industry, and the insights provided will allow us to design and establish the best parameters to mitigate the benthic plume generated by the collector robot.

3 Return water plume

From the collector, nodules, seawater and any residual sediment that elude separation inside the collector (<10% of total entrained sediment) enter the riser pipe and get lifted to the surface vessel. Once aboard the vessel, nodules get dewatered and seawater used for nodule transport, along with any residual sediment and nodule fines (from nodule breakage in transport), is returned into the water column at depths below the measured oxygen minimum zones where it will form a highly dilute plume (midwater plume). One of the risks that needs to be managed when it comes to the midwater plume is ensuring that it does not significantly impact the behavior or feeding and respiratory efficiency of key pelagic filter-feeding animals.

Mitigation action: We are researching optimal reinjection points that will cause minimal disruption to marine wildlife. A recent study by MIT on the midwater plume found that modeling can reliably predict the properties of a mid-water plume in the vicinity of the discharge.[8] The research also found that modeling can reliably predict the properties of a mid-water plume in the vicinity of the discharge.[9]

[5] 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

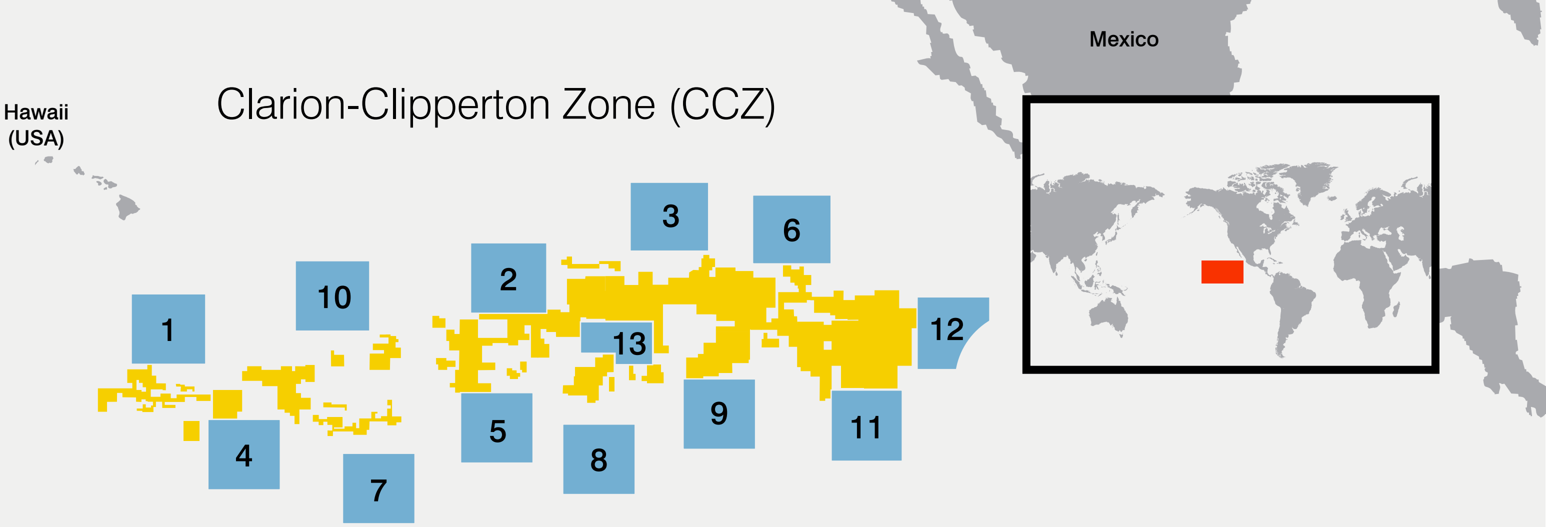
[6] Campaign for Nature, "Why 30%?"

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

[8] Jennifer Chu, "What will happen to sediment plumes associated with deep-sea mining?" July 27, 2021

[9] Muñoz-Royo, C., Peacock, T., Alford, M.H. et al., "Extent of impact of deep-sea nodule mining midwater plumes is influenced by sediment loading, turbulence and thresholds," July 27, 2021

As a precaution, 43% of the CCZ in now under protection



PROTECTED AREAS
Area of Particular Environmental Interest (APEI)

1.97 m km²
under **protection**

EXPLORATION AREAS
Exploration contract areas granted by the International Seabed Authority (ISA)

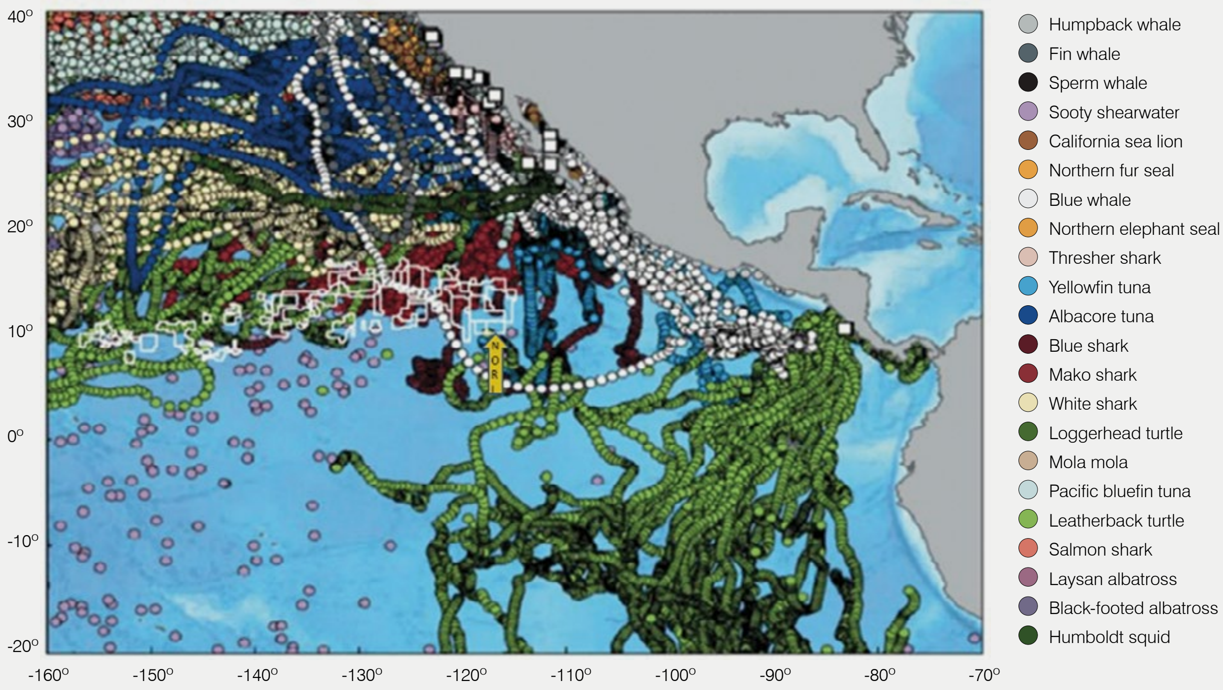
1.24 m km²
under **exploration**

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

Many of the impacts to the marine environment can be minimized or even eliminated by clever design of the collector system. For example:

- Increasing the depth of the return water outlet can minimize the impacts on the more productive mesopelagic layer. Since most marine life is in the upper layers, placing the discharge in the bathypelagic zone has a significant effect on minimizing impacts. Also, an adjustable collector head can adapt the waterjet used to pick up nodules to minimize sediment disturbance and, with it, the size of the benthic plume.
- We are also looking at designing a system that minimizes acoustic disturbance to the water column, as this is particularly important for the cetaceans such as whales and dolphins that occasionally traverse the CCZ. Fortunately, tracking data for key migratory species in the eastern Pacific is available. It shows that NORI-D is located outside the known migratory routes for many species of sharks, whales, turtles, birds and commercially important fish 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, operations in the CCZ are going to be a one-time disturbance. After the disturbance of nodule collection, the area will be left alone to recover untouched. The CCZ is so remote that there are very few, if any, additional impacts, such as trawling, fishing and polluted runoff from land. Research on recovery rates is currently incomplete but is expected to be species-specific. Mobile species such as fish are expected to return soon after mining. Microbes and larger organisms that live in the sediments are expected to potentially take longer to recover, in the time scale of tens to hundreds of years. The organisms that relied on the nodules for habitat might not recolonize areas where the nodules have been removed. However, they will be represented in protected areas such as the APEIs and might recolonize nodules left behind in the collection areas.

Beyond smart design, we will also be able to fine-tune our operations in real time through the use of an adaptive management system that will allow us to monitor the precise conditions in the deep sea.

Adaptive Management System (AMS)

An adaptive management system (AMS) is a structured, iterative process of robust decision-making in the face of uncertainty, with an aim to reduce uncertainty over time via system monitoring. Information will be provided via data-driven machine learning supported by expert opinion and by an array of sensors. This data will continually be updating a digital twin of our system, enabling us to make real-time and informed environmental management decisions.[10] For example:

- An interactive digital map of the seabed that will allow us to avoid ecologically sensitive areas.
- Sensors monitoring the plume will detect if the size of the plume is larger than expected; in which case, we can undertake mitigation measures (e.g., slow down or pause collection operations).
- Sensors to track bottom currents in real time would send an alarm to us if a plume is drifting toward an ecologically sensitive area, so we could redirect the collector or pause operations until the direction of the current changes.
- Assess areas to leave untouched to act as seed areas for animals to recolonize disturbed areas.

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

During production: we can adapt our operations in real time

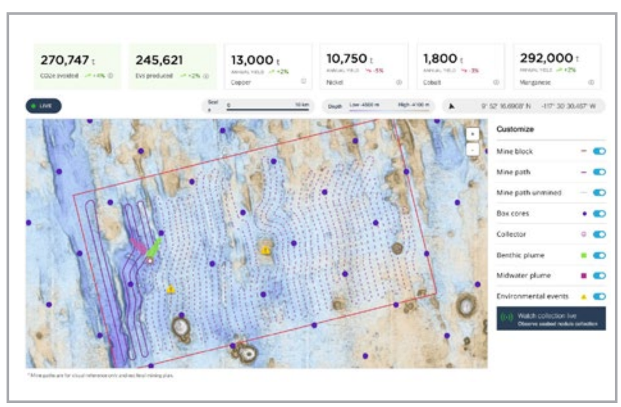
There are other data points, such as noise levels, that our sensors and video stream could collect, and the potential impacts of those variables will be assessed during our upcoming collector test. These then will be analyzed against the baseline data already collected.

We entered into an agreement with Kongsberg Digital to develop a digital twin of the deep-sea operating environment and enable 3D visualization of deep-sea operations. Once completed, it will be part of our AMS. This will enable TMC to keep its deep-sea activities within safe operational limits as well as provide regulators and other stakeholders with visibility of the ongoing operations.

As part of TMC's commitment to transparency and accountability in this burgeoning new industry, we are developing a public dashboard where certain data can be viewed, analyzed and downloaded for additional examination. The public dashboard will be available to all stakeholders.

Information such as the collection system's whereabouts and activity in the CCZ will be available, 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 be key components of an integrated environmental management system (EMS). The digital twin will optimize the environmental performance of operations by applying environmental constraints and limits to the mine planning process. The iterative nature of an adaptive management approach also means that the predictive and protective capabilities of the EMS will gradually improve over time as more information enters the system.

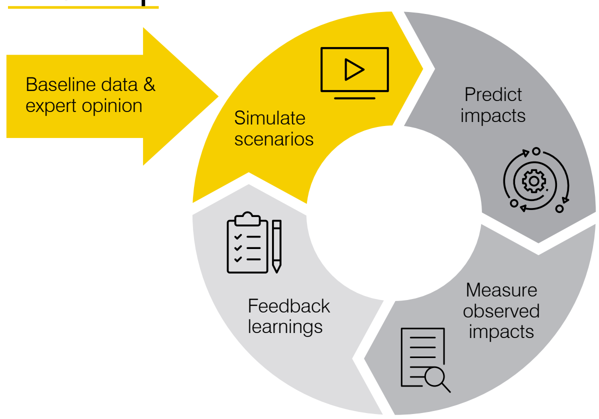


Initially driven by expert opinion and active adaptive management using hypothesis and "experimental design," the data-driven machine learning models will become more intelligent over time, which will reduce the uncertainty of environmental impact by correlating operational data to observations made by sensors in the deep sea with operational precedent. AMS integration with collection operations management will help support our adherence to environmental regulations. Over time, the system would improve production efficiency and environmental management as more operational data is collected and analyzed. For each kilometer traversed, our knowledge of the deep-sea ecosystem, its bidirectional interaction with human civilization and key environmental metrics would improve.

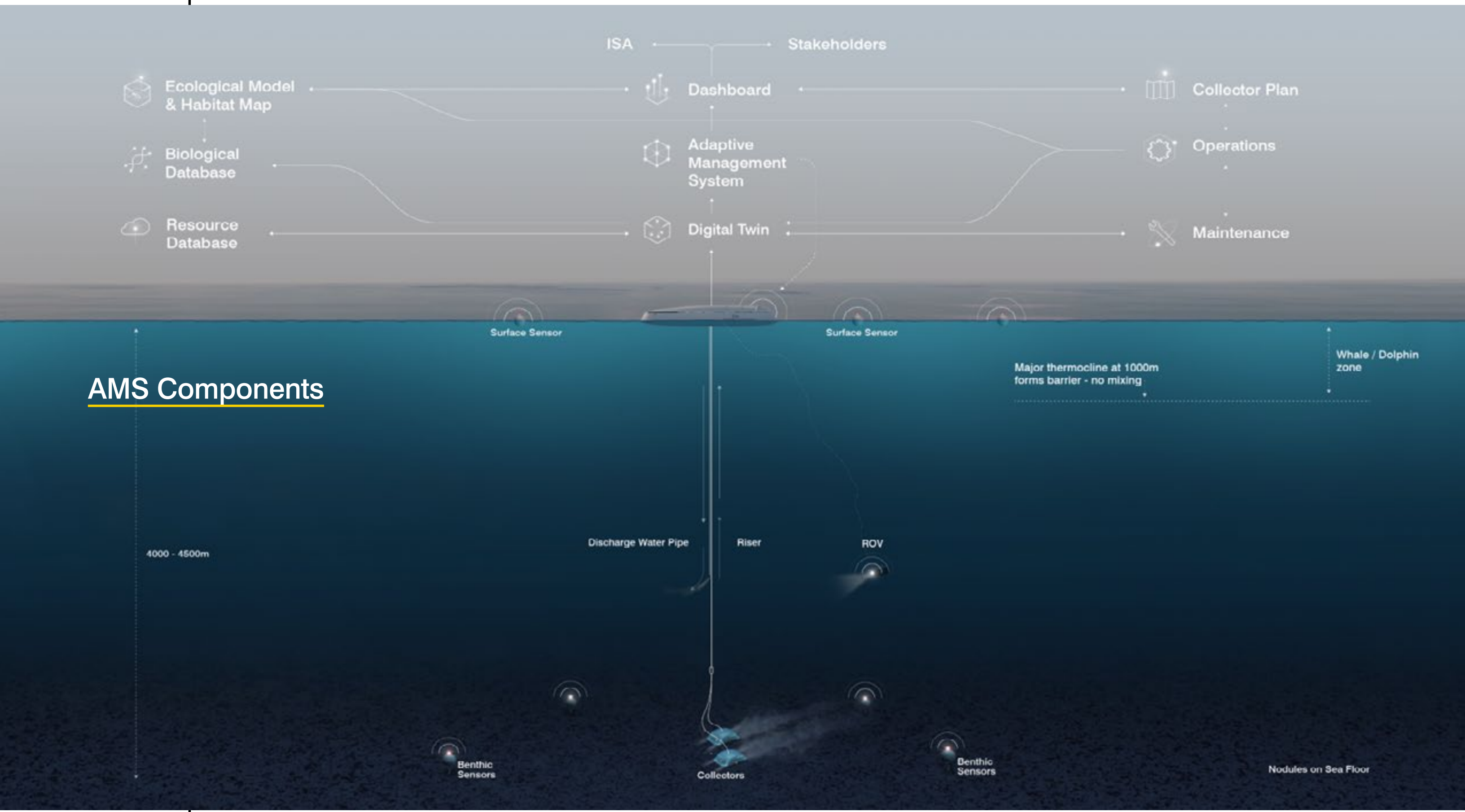
At the core of the AMS technology stack lies a digital twin that virtually represents all the deep sea and collection equipment. This component allows underwater robots and vehicles to be tracked in near real time, with data coming in from an array of deep-sea sensors. As data is ingested by the digital twin, models developed using state-of-the-art methods by environmental and data scientists would be used to simulate the future and generate plans or make contingencies.

Afterward, the data would be deposited into our ever-growing database and the difference between incoming data and the AMS's predictions would be used to continuously improve our models and simulations through a feedback loop. Importantly, the data would be shared with researchers and academic institutions to improve humanity's understanding of the world's oceans and aid conservation of deep-sea and connected ecosystems.

AMS Loop



AMS Components



Contributions to Research

Ocean Research: Partnering to Increase Human Knowledge

We are proud to contribute to society's knowledge of the deep ocean through our comprehensive environmental program, which analyses the CCZ from the surface down through the water column to the abyssal plain.

We hope our research can make crucially important contributions to wider fields of science, policy design and technology. 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.[11]

In addition to understanding the deep-sea ecosystem of the CCZ to help understand the potential impacts on nodule collection, we see the untapped potential that ocean science can bring us to positively impact humanity. This understanding motivates us to continue funding such an extensive scientific program. We are actively developing partnerships with leading researchers, sharing our vast catalog of deep-sea biological and sediment samples with labs, and exploring the immense potential of these common heritage resources to increase humanity's knowledge of the deep sea.

We strive to conduct this research program in a transparent and collaborative way. 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. In addition, the ISA has developed the DeepData Database, an open-source database to house all the scientific and environmental data collected by companies for the benefit of the scientific community. Scientists deriving work from these samples are free to publish their findings.

Our teams are currently collecting data about the chemical, physical and biological characteristics of the water column and seabed in our exploration area, down to 4.5 kilometers deep. We are building a more complete picture of habitat connectivity, and how it relates to the distribution and function of deep-sea organisms and the overall structure of their communities.

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

With the help of academic and research institutions around the world, we will support over 100 original studies that are divided into the following main work packages:

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

With further ongoing support studies including:

- 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 we are preserving them to be available for the day when the regulatory framework for this type of resource is established. Deep-seafloor organisms represent a wealth of genetic material that could be a source of new drug and treatment ideas for humans. Six deep sea-derived drugs have been approved by the U.S. Food and Drug Administration to date, generating $2.3 billion per year in global pharmaceutical services.[12] While most marine genetic research has focused on creatures that dwell in shallow and tropical ocean water, attention is increasingly being focused on the deep sea, where organisms have adapted over thousands of years to survive in cold, dark and highly pressurized environments. A great success is ziconotide, a synthetic form of peptide extracted from the venom of the predatory tropical cone snail *Conus magus*, living under 2,000 meters in the sea. Under the brand name Prialt™, ziconotide was licensed by the European Medicines Agency as a non-narcotic anti-pain drug.[13]

[12] D. Ottaviani, "Economic value of ecosystem services from the deep seas and the areas beyond national jurisdiction," 2020
[13] 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

Exploration contracts are granted for a 15-year period with the option to apply for five-year extensions. But a private contractor can only apply with the sponsorship of a state. In our case, the Republic of Nauru sponsors NORI and the Kingdom of Tonga sponsors TOML. All contractors need to provide information enabling the ISA Council to determine their financial and technical capabilities to carry out proposed activities. Contractors are required to submit a five-year program of work and report annually to the ISA. Every five years, the contractor provides a five-year periodic review of its plan of work to the ISA and proposes a subsequent five-year program of work.

The regulations on prospecting and exploration set out the duties and obligations of the ISA and the contractors regarding the seabed activities under contract and follow a standard formula that requires signatories to abide by the provisions of the 1982 UNCLOS and the 1994 Agreement relating to the Implementation of Part XI of the Convention, as well as the regulations. The regulations are supplemented by a series of recommendations for the guidance of contracts and sponsoring states issued by the Legal and Technical Commission (LTC) and periodically updated.

Upon signature of the contracts, the contractors commit to several requirements:

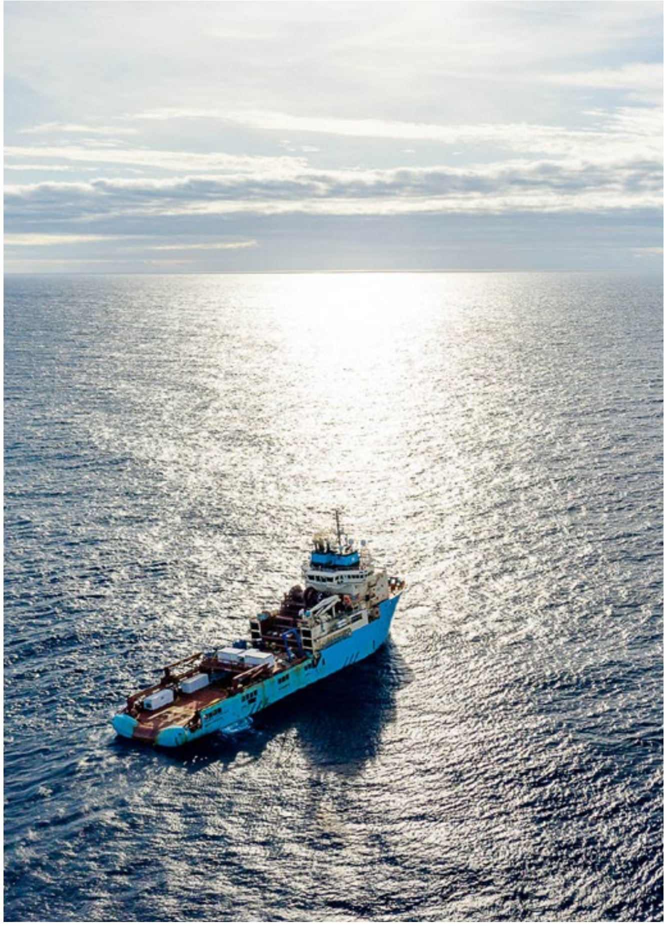
- Provide an annual report to the ISA on the activities in the Area. These reports are monitored by the ISA through the LTC and evaluations cover exploration work, environmental studies, the development of mining technology, and legal and financial issues.
- Prevent, reduce and control pollution and other hazards to the marine environment arising from exploration activities. This not only requires monitoring of activities but also collection of baseline data establishing the natural conditions of the local environment before any human intervention takes place.
- Propose a program for the training of nationals of developing states. The training program, as agreed with the ISA, is incorporated into the contract.
- Submit to the Secretary-General, prior to the commencement of activities under the contract, a contingency plan to respond effectively to incidents arising from activities in the exploration area.

As introduced in the Mining Code section of this report, the regulations on exploration and prospecting are in place, and the regulation on exploitation has been under development since 2014. The process is open to stakeholder consultation and progress has been achieved to date. The completion of these regulations has been delayed due to COVID, but work continues and a new project workplan has been adopted. More certainty on the timely completion of this work has been brought forward by the submission of a two-year notice by the Republic of Nauru in accordance with the 1994 implementation agreement.

We are currently focused on applying for our first exploitation contract from the ISA on the NORI Area-D, with the goal of potentially starting commercial production in 2024. To that end, we have a particular focus on the completion of our ESIA.

REGULATIONS AND CONTRACTS

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



Onshore

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:

- **Processing System:**
  - Concept Development and Engineering: Metallurgical concept development, mass and energy balances, equipment selection and sizing, developing capital and operating cost estimates
  - Test Work and Piloting: Metallurgical test work and equipment pilot demonstration of the flowsheet processing steps
- **Plant Site Selection and Construction:** Assessing potential locations and partners for construction and/or reuse of existing plants for Project Zero

TMC intends to supply high-value products: nickel and cobalt sulfate and/or NiCuCo matte to the rapidly growing electric vehicle battery market, along with copper cathode for which demand continues to grow. Manganese silicate will be sold to produce alloys for use in the steel industry

PROCESSING SYSTEM

- Flowsheet design with Hatch
- Zero waste, renewable energy
- Lab tests with KPM
- Pilot plant program with FLS, XPS/Glencore and SGS

PLANT SITE SELECTION

- Global location study
- Short list of 6 jurisdictions and ~20 sites
- Market proximity, port, renewables
- Partner selection
- Site selection
- Construction

Onshore metallurgical plant rendering

We worked with BIG-Bjarke Ingels Group to envision what a full-scale nodule processing facility could look like. Our objective was to rethink the typical industrialized design of today's metallurgical facilities and to build something that belongs in the surrounding environment and provides value to the community. 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 STEM education. We see our facilities as part of a community, and we look forward to foster synergies with other processes, just like organisms in an ecosystem do.

Processing System: Flowsheet Development

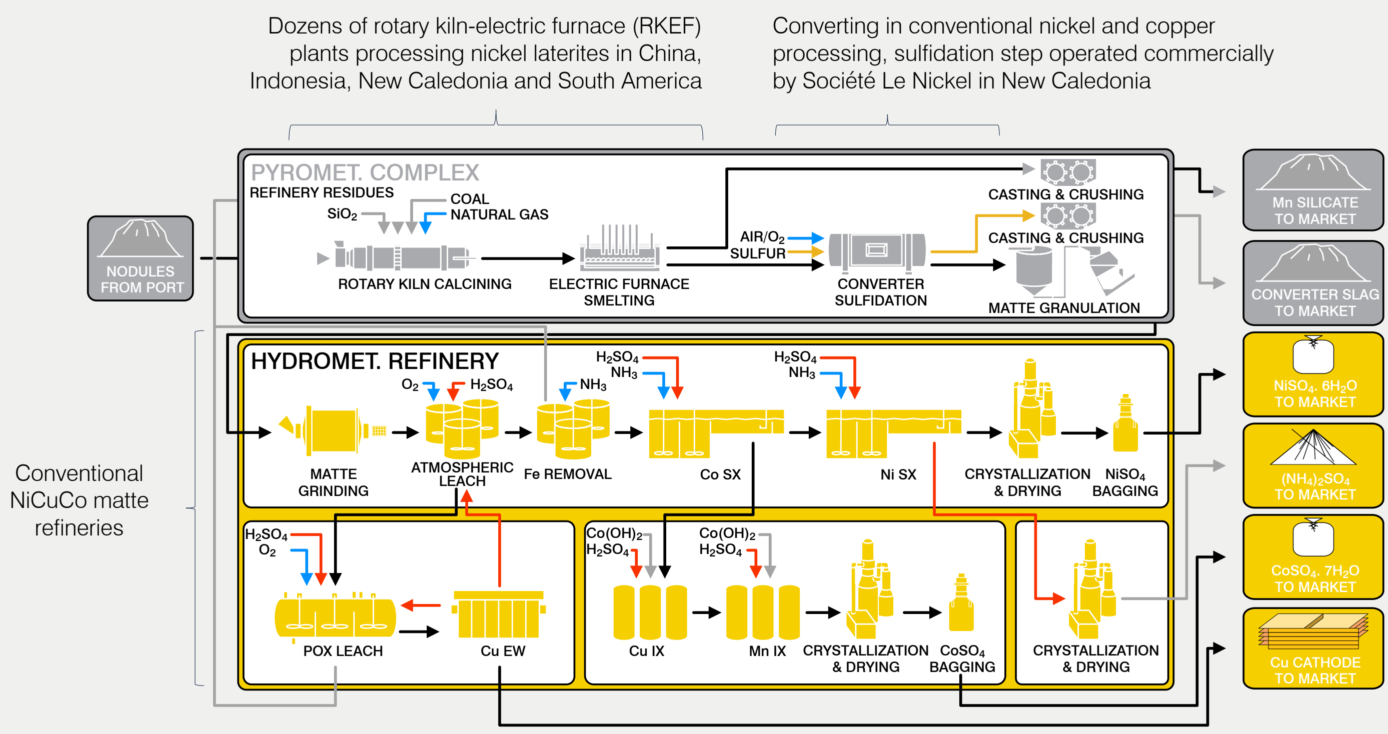
To process and refine collected nodules into critical metals, we have developed a near-zero solid-waste flowsheet together with Hatch, a metallurgical process design firm, and Kingston Process Metallurgy (KPM). Our flowsheet was selected on the basis of meeting the project objectives, which include near-zero solid waste, high metal recoveries, production of high-value products, and low cost compared to alternative technologies. This flowsheet uses conventional equipment, modified for the unique nature of the polymetallic nodule resource, and this is one of the biggest advantages as it gives us the ability to leverage existing RKEF operations. Those are the first two steps of our pyrometallurgical process, with dozens of lines existing today globally.

The key products generated by this process flowsheet are nickel sulfate, cobalt sulfate, copper cathode, manganese silicate and fertilizer-grade ammonium sulfate. The processing flowsheet also provides the potential to generate an intermediate product, a nickel-copper-cobalt matte. Nickel is expected to account for almost half of future production revenues.

PROCESSING SYSTEM

- Flowsheet design with Hatch
- Zero waste, renewables
- Lab tests with KPM
- Pilot plant program with FLS, XPS/Glencore and SGS
- Product definition and marketing strategy

Low-risk flowsheet: using conventional equipment and generating zero solid waste



By using a conventional flowsheet, we can streamline the development costs and timeline. As each technology component has substantial commercial precedence, we can be reasonably confident in our capital estimates as they are based on analogous facilities that have been constructed with known costs. This starter approach to get into rapid commercial production is expected to generate cash flow with a very low capital requirement. This is a key differentiator of TMC's.

We designed what we believe is the lowest possible onshore solid waste metals project. How did we achieve this? Nodules contain useful high-grade metals with remarkably low undesirable elements toxic to human health and/or the environment. As a result, we can produce useful byproducts as opposed to the waste that is normally generated by terrestrial mining processing operations. Our flowsheet design allows for relatively small streams of refinery residue to be recycled to the smelter, which also helps increase our recoveries. Lastly, we have made decisions that result in production of saleable byproducts instead of waste and we are committed to ESG principles. We believe that the benefits outweigh these costs.

Key Process Inputs

Pyrometallurgical Plant
- Nodules
- Electricity
- Natural gas
- Coal

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

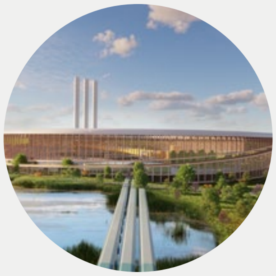
Key Process Outputs

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

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

Zero solid waste: how we achieve it

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



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

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

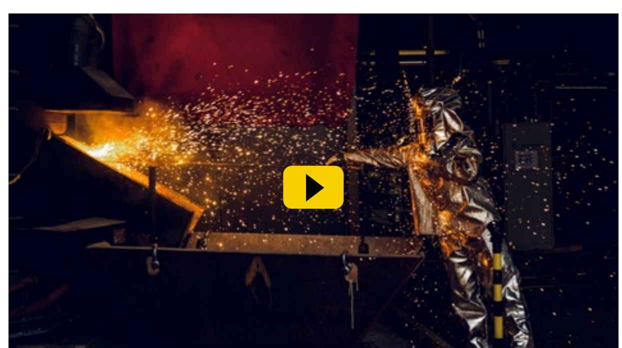
We select reagents that produce products instead of waste

We have completed lab-scale test work and pilot-scale metallurgical testing. For testing we have engaged world-class partners in Kingston Process Metallurgy, FLSmidth, SGS and XPS Expert Process Solutions, a Glencore subsidiary. The advancement of the onshore program continues to validate that the custom-designed flowsheet design can be scaled relatively easily in terms of both volume and level of refining of the nickel, copper and cobalt products.

The key accomplishments in 2021 were:

- Completion of pyrometallurgical pilot testing of polymetallic nodules at FLSmidth & Co. and XPS. The smelting, sulfidation and converting pilot-scale campaigns were successful in creating two separate products: a matte product containing greater than 80% combined nickel, copper and cobalt that is a suitable feedstock to produce critical metals essential for EV batteries and wiring, and a manganese silicate product that can be sold direct to market and further processed to a manganese alloy, a critical input to steel production.
- The matte generated at XPS was transported to SGS Canada Inc. in Lakefield, Ontario, Canada, to test the hydrometallurgical refining stages. The matte is being used as feed to a refinery bench-scale test-work program.

For Project Zero, our strategy focuses on producing high-value intermediate products and to enable a fast track to production while we develop and build our larger-scale operation.



TMC processing pilot campaign

Flowsheet development: working with best-in-class service providers

FLSMIDTH

Calcining

Pilot Kiln & Ancillary Systems
Whitehall, PA, USA

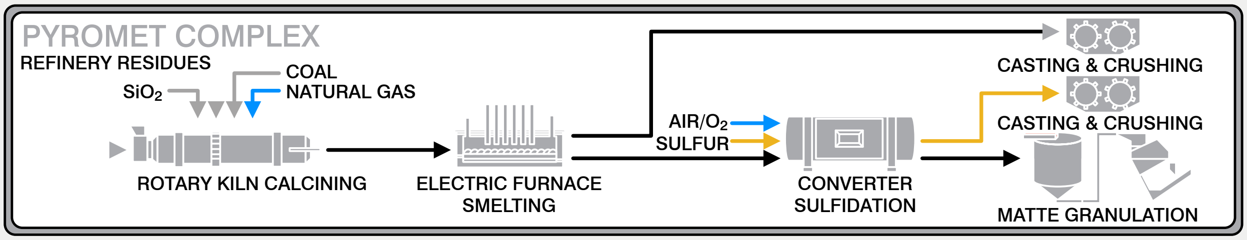
XPS EXPERT PROCESS SOLUTIONS

Smelting, converting & sulfidation

300 kW DC Furnace & Ancillary Systems
Sudbury, ON, Canada

HATCH

Participation to ensure data for engineering deliverables is attained.

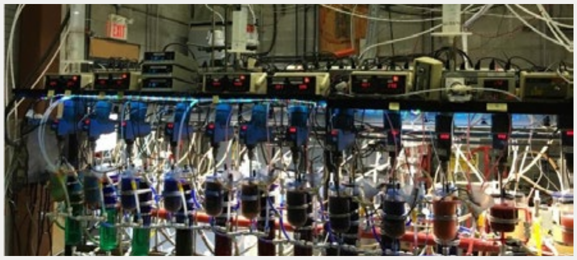


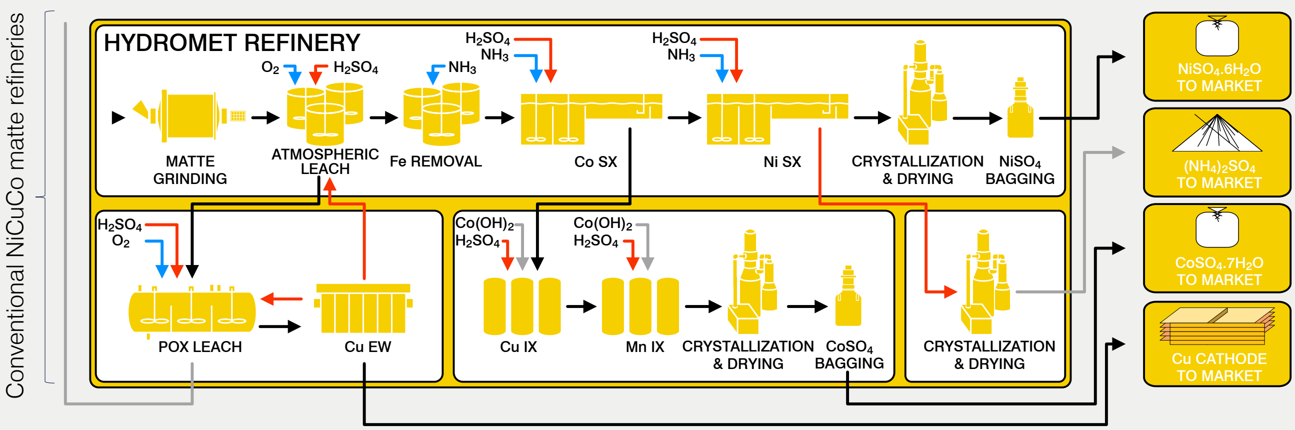
SGS

Processing: hydromet phase underway

Hydromet refinery pilot

Ontario, Canada





Achieving timeline: focus on high-value intermediates and fast track to production

Processing plant rendering

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

2024

1.3 Mtpa (wet)

Project Zero – small-scale commercial production using existing or partner facilities

2025-2030

11.3-54.5 Mt (wet)[1]

Tolling through existing facilities and 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

Plant Site Selection: Choosing the Right Site

Finding the right site for our plant is key to helping us further mitigate ESG impacts and support supply chain diversification of battery metals. Land metal ores are extracted from remote regions, processed on site, and the derived product is transported to a port and shipped, mainly to Asia for processing and battery manufacturing. Then a portion of the end product is shipped across the world to battery end markets. TMC is looking to support the reshoring of global metal supply chains. Several major automakers have already committed to build gigafactories to manufacture batteries and EVs closer to their markets, and TMC will be able to bring the nodules to a major port close to them, providing a supply alternative while also significantly reducing the carbon footprint of today's lengthy supply chains.

TMC has the unique ability to locate processing facilities anywhere, which is both a strategic advantage and one with inherent ESG benefits. Proximity to the end market; access to renewable power, natural gas and a suitably sized port; and the availability of a local skilled workforce are some of the requirements that we set in our global location study. The study provided a list of 13 jurisdictions, of which six jurisdictions were shortlisted for deeper review. In 2021, a logistics study of six shortlisted ports and process plant locations was completed and a scoping study, including a capital and operational cost estimate, was completed for a potential Project Zero scenario. And in March 2022, TMC and Epsilon Carbon have both agreed not to enter into any binding agreements with third parties for the construction and operation of a processing plant for polymetallic nodules through the earlier of TMC and Epsilon Carbon entering into binding Heads of Terms contemplated in the MoU or March 31, 2023. It is anticipated that TMC and Epsilon Carbon will enter a binding Heads of Terms for construction and operations of Project Zero Plant by September 30, 2022.

Our flowsheet design is expected to eliminate waste and be energy efficient. But ultimately, it is the availability of renewable energy and alternative metallurgical reductants that will enable TMC to get as close to net zero emissions as possible. Since our onshore metallurgical plant will be the highest energy consuming part of our entire operations, the siting of our plant is a key decision to address our future carbon footprint. One of the alternatives to metallurgical coal that we tested at lab scale is a torrefied spruce chip reductant. This test ran smoothly, with no difference compared to other smelting tests. We will continue to test reductant alternatives that can help us decarbonize, and once a site location is confirmed, we will be able to better assess viability.

PLANT SITE SELECTION

- Global location study
- Short list of 6 jurisdictions and ~20 sites
- Market proximity, port, renewables
- Partner selection
- Constructability

In March 2022, TMC signed a non-binding MoU with Epsilon Carbon to complete a pre-feasibility study for a commercial-scale deep-sea nodule processing plant in India that could process 1.3 million tonnes per annum (Mtpa) of wet nodules annually and produce more than 30,000 tonnes of NiCuCo matte per annum (TPA) and 750,000 TPA of manganese silicate product.

TMC and Epsilon Carbon envision a long-term partnership: TMC, through its subsidiaries, intends to supply polymetallic nodules and onshore processing expertise. Epsilon Carbon intends to finance, engineer, permit, build and operate the Project Zero Plant. TMC has shared with Epsilon Carbon the near-zero solid-waste processing flowsheet developed between 2018 and 2021 with Canadian technology and engineering firms and technical results from a pilot plant program completed in 2021. Epsilon Carbon intends to deliver a pre-feasibility report (PFR) for a plant in India powered by renewables and with a targeted production start around Q4 2024, which would be in time to receive nodules collected from NORI-D area, provided that TMC's subsidiary NORI secures an exploitation contract from the ISA.

ESG Footprint – Pre-Commercial

Since 2012, our subsidiaries have carried out 18 offshore campaigns, which have been the company's major activities. In addition, a pilot-scale demonstration has been completed on the first three process steps: calcination, smelting and sulfidation/converting. The demonstration has resulted in a very small footprint. While all these activities were carried out by third parties, they are key to the development of our business, and we are reporting their environmental footprint here.

We are including the exploration campaigns done by TOML prior to being acquired by TMC, and the one campaign done by Marawa. Campaigns are listed below.

Area	Campaign	Year	Scope
NORI	Campaign 1	2012	Bathymetric mapping, geological and environmental sampling
NORI	Campaign 2[1]	2013	Bathymetric mapping, geological and environmental sampling
NORI	Campaign 3	2018	Bathymetric mapping, geological, geotechnical and environmental sampling
NORI	Campaign 4a	2019	Environmental baseline – metocean studies #1
NORI	Campaign 4b	2020	Nodule bulk sampling, seafloor geotechnical evaluation
NORI	Campaign 4c	2020	Nodule bulk sampling, seafloor geotechnical evaluation
NORI	Campaign 4d	2020	Environmental baseline – metocean studies #2
NORI	Campaign 4e	2021	Environmental baseline – metocean studies #3
NORI	Campaign 5a	2020	Environmental baseline – benthic #1
NORI	Campaign 5b	2021	Environmental baseline – pelagic #1
NORI	Campaign 5c	2021	Environmental baseline – pelagic #2
NORI	Campaign 5d	2021	Environmental baseline – benthic #2
NORI	Campaign 5e	2021	Environmental baseline – benthic and pelagic – ROV + benthic landers
NORI	Campaign 6a	2019	Geological, geotechnical and environmental sampling
NORI	Campaign 6b[2]	2019	Geological, geotechnical and environmental sampling
NORI	Ocean Infinity[3]	2020	Environmental baseline – ROV/ AUV survey
TOML	CCZ13[1]	2013	Bathymetric mapping, geological and environmental sampling
TOML	CCZ15	2015	Bathymetric mapping, geological and environmental sampling
TOML	CCZ17[3]	2017	Mooring deployment
Marawa	Marawa[2]	2019	Bathymetric mapping, geological and environmental sampling

[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

Environmental

One of the key drivers for the exploration of polymetallic nodules is the significant potential to supply nickel, copper, cobalt and manganese with a lower environmental and social footprint as compared to terrestrial mining. To that end, our commitment is to make science-based decisions and choose paths that will result in a lower environmental and social impact. This includes decarbonization of our operations and development of a process flowsheet that results in waste as near to zero as possible.

GHG and Energy

Currently, we are in the exploration phase and no commercial activities are taking place. We rely on third parties to carry the bulk of our exploration activities, which results in our carbon footprint falling largely under Scope 3 emissions. Most of our Scope 3 emissions come from marine gasoil used to run the contracted vessels. Today our Scope 1 and 2 emissions are negligible because of having a small global virtual workforce of 31 employees and contractors.

In this report, we are sharing the emissions from all the offshore campaigns we have done since starting them in 2012. We decided to go through this exercise of collecting and reporting our historical carbon footprint data, as we plan to offset these emissions. Standard and blue carbon credits supporting projects in Pacific Island nations will be preferred. While this type of carbon offset might take longer to get than buying them from the market, we want to use our resources to create positive impact in our sponsoring states, Pacific region and the ocean in general.

Our emissions to date are relatively small, and we are working on decarbonization paths to keep us as close to zero as possible. Emissions factors from the U.K.'s Department for Environment, Food & Rural Affairs (DEFRA) were used for these calculations as they provided the most conservative footprint for marine gasoil. Below is a summary table with a breakdown between our estimated onshore and offshore emissions.

	Historical Total (2012-2021) Tonnes of CO_2e	2020 Tonnes of CO_2e	2021 Tonnes of CO_2e
OFFSHORE	38,449	10,883	12,378
ONSHORE	25	24.5	0.4
TOTAL	**38,474**	**10,907**	**12,379**

Offshore

Marine gas oil is used to power our marine vessel and all supporting offshore operations, which are now the main source of our emissions and fall under our Scope 3. We have decided to account for the full stack of impacts including emissions from the three campaigns done by TOML before it was acquired by TMC in 2020. It is important to note that Campaign 2 and CCZ13 were shared by NORI and TOML in 2013 and Campaign 6b was shared with Marawa in 2019. Also, there have been two instances when TMC has taken advantage of other vessels already traveling through the CCZ and contracted them for a couple of days for a photographic survey in 2020 and a mooring deployment in 2017. Emissions for these two instances and for Campaign 1 are based on fuel usage estimates.

		Vessels		Air Travel		
Campaign Name	Year	Marine Gas Oil (tonnes)	Vessel CO_2e (tonnes)	Air Distance Traveled (km)	Air Travel CO_2e (tonnes)	Total Offshore Emissions CO_2e (tonnes)
Campaign 1[1]	2012	200	650	780,000	110	760
Campaign 2 and CCZ13	2013	281	912	780,000	110	1,022
Campaign 3	2018	1,549	5,034	543,734	76	5,111
Campaign 6a	2019	705	2,291	834,032	117	2,409
Campaign 4a	2019	367	1,193	489,400	69	1,262
Campaign 6b and Marawa	2019	493	1,602	864,070	122	1,724
Campaign 4b	2020	625	2,031	647,140	91	2,122
Campaign 4c	2020	872	2,832	671,904	94	2,927
Campaign 4d	2020	694	2,255	444,102	62	2,318
Campaign 5a	2020	846	2,748	813,308	114	2,862
Ocean Infinity[2]	2020	201	654	NA	NA	654
Campaign 5b	2021	1,040	3,380	642,918	90	3,470
Campaign 5d	2021	616	2,002	813,308	114	2,116
Campaign 4e	2021	385	1,251	407,448	57	1,309
Campaign 5c	2021	788	2,561	587,778	83	2,644
Campaign 5e	2021	840	2,730	776,614	109	2,839
CCZ15	2015	772	2,509	1,514,376	213	2,722
CCZ17[2]	2017	56	180	NA	NA	180
		11,328	**36,817**	**11,610,132**	**1,633**	**38,449**

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

Onshore

Onshore-related emissions are small as the pilot testing used a small-scale kiln and furnace. Onshore pilot test work started in 2020.

Year	Coal (tonnes)	Coal CO_2e (tonnes)	Natural Gas (GJ)	Natural Gas CO_2e (tonnes)	Electricity (kWh)	Electricity CO_2e (tonnes)	Total Onshore Emissions CO_2e (tonnes)
2020	6.5	20.5	70.2	4	0	0	24.5
2021	0	0	0	0	25,000	0.4	0.4
TOTAL	**6.5**	**20.5**	**70.2**	**4**	**25,000**	**0.4**	**24.9**

Water

To date, water use is limited to facilities on the vessels. Most of it is produced onboard via desalination. A small amount of water is loaded when the vessel is at the harbor for longer periods as the freshwater generator is not run at the harbor. Offshore, during the collection of samples a small amount of water comes with them and it is returned to the ocean. For our future operations, the onshore metallurgical process will require larger amounts of water, but a portion could be recirculated. We continue to optimize our process flow to mitigate freshwater use.

Category	2020	2021
Freshwater Use (m³)	1,140	1,172
Fresh Water Produced via Desalination on Vessel (m³)	1,277	1,884
Wastewater Returned to the Ocean (sediments) (m³)	49	492

Offshore

Campaign Name	Year	Freshwater Use (m³)	Fresh Water Produced via Desalination (m³)	Water Returned to the Ocean (sediments) (m³)
Campaign 1	2012	LR	LR	LR
Campaign 2 and CCZ13	2013	LR	LR	LR
Campaign 3	2018	498	336	18
Campaign 6a	2019	533	465	22
Campaign 4a	2019	109	99	0
Campaign 6b and Marawa	2019	312	315	4
Campaign 4b	2020	172	233	13
Campaign 4c	2020	298	336	8
Campaign 4d	2020	110	102	8
Campaign 5a	2020	558	606	18
Ocean Infinity	2020	NA	NA	NA
Campaign 5b	2021	398	449	7
Campaign 5d	2021	475	457	24
Campaign 4e	2021	149	126	14
Campaign 5c	2021	150	370	237
Campaign 5e	2021	0	482	210
CCZ15	2015	LR	LR	LR
CCZ17	2017	NA	NA	NA
		3,762	4,376	582

NA: Not applicable. Vessel was already fully staffed traveling through the CCZ
LR: Limited records

Onshore

Category	2020	2021
Freshwater Use (m³)	2	0
Wastewater (m³)	2	0

Waste

To date, waste generation is mostly limited to waste generated by crew activities on our vessels during exploration campaigns. Some part of this waste can be incinerated in the ship's certified incinerator. The remaining waste, including hazardous waste, is sent onshore for processing by an approved disposal processing company.

We also achieved a critical objective for our future metallurgical processes with the development of a near-zero solid-waste flowsheet, where the whole nodule gets transformed into usable materials. Nodules are high in useful metal grades and remarkably low in elements toxic to human health or the environment, so we can produce a byproduct aggregate instead of tailings. Additionally, the designed pyromet-refinery combination enables relatively small streams of refinery residue to be recycled to the smelter, helping increase our recoveries. Our choice of reagent also was based on our decision to produce byproducts instead of waste. We are committed to advancing ESG principles and believe the environmental benefits outweigh the costs.

Category	2020	2021
Non-Hazardous Waste Generated (tonnes)	80	103
Hazardous Waste Generated[1] (tonnes)	2	2

Offshore

Campaign Name	Year	Non-Hazardous Waste Generated[2] (tonnes)	Hazardous Waste Generated[1] (tonnes)
Campaign 1	2012	LR	LR
Campaign 2 and CCZ13	2013	LR	LR
Campaign 3	2018	15	0.4
Campaign 6a	2019	19	0.4
Campaign 4a	2019	7	0.4
Campaign 6b and Marawa	2019	13	0.4
Campaign 4b	2020	25	0.4
Campaign 4c	2020	19	0.4
Campaign 4d	2020	13	0.4
Campaign 5a	2020	20	0.4
Ocean Infinity	2020	NA	NA
Campaign 5b	2021	22	0.4
Campaign 5d	2021	25	0.4
Campaign 4e	2021	18	0.4
Campaign 5c	2021	18	0.4
Campaign 5e	2021	20	0.4
CCZ15	2015	LR	LR
CCZ17	2017	NA	NA
		234	5

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, and our vessel contractor provides a conservative estimate of a consistent 0.4 tonnes per campaign

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

Onshore

Category	2020	2021
Non-Hazardous Waste Generated (tonnes)	3	0
Hazardous Waste Generated (tonnes)	0	0

Social

Our Employees

Our team members are purpose-driven individuals and, together, we are creating a hard-working, impact-driven culture with high tolerance for change, uncertainty and adversity.

As of December 31, 2021, we employed 31 employees and contractors. None of our staff are covered by collective bargaining agreements. Geographically, our staff is located in Tonga, Nauru, the United States, Canada, Australia, the United Kingdom and the United Arab Emirates. We are a small team whose impact is amplified by the expertise of the hundreds of people working on the project with us through our partners and contractors. Our leadership team is small and brings a rich mix of relevant backgrounds and perspectives.

Our Team

Experienced leadership team

31 people
Working for The Metals Company

~250 people
Working on the project incl. partners and contractors


Gerard Barron
Chairman & Chief Executive Officer


Craig Shesky
Chief Financial Officer


Tony O'Sullivan
Chief Development Officer


Christelle Gedeon
Chief Legal Officer


Erika Ilves
Chief Strategy Officer


Dr Greg Stone
Chief Ocean Scientist


Erica Ocampo
Chief Sustainability Officer


Corey McLachlan
Head of Sponsoring State and ISA Relations


Jon Machin
Head of Offshore Engineering


Dr Mike Clarke
Environmental Program Manager


Dr Jeff Donald
Head of Onshore Processing

Executive Management by Gender (as of December 31, 2021)	
Male	6
Female	3

Scope: TMC plus wholly owned subsidiaries NORI and TOML
Executive management is defined as the CEO plus officers

Total Employees by Gender and Ethnicity	2016	2017	2018	2019	2020	2021
Total Employees	9	13	16	17	20	31
Gender Breakdown						
Male	6	9	13	16	18	21
Female	3	4	3	1	2	10
Ethnic Background						
Ethnic Diversity[1]	1	1	0	2	5	11

Scope: TMC plus wholly owned subsidiaries NORI and TOML

[1] Ethnic diversity as it relates to 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 are committed to attracting, developing and retaining diverse talent inclusive of every age, gender, gender identity, race, sexual orientation, physical capability, neurological difference, ethnicity, belief and perspective. Our goal is to develop cultural competency by seeking knowledge, increasing awareness, modeling respect and promoting inclusion. Our team is composed of highly skilled individuals, of whom 61% hold post-graduate degrees, including 19% who hold a Ph.D. degree. Moreover, 32% of our staff are women, and 29% of our staff are racially diverse.

We are also looking to have impact through the work we do with our sponsoring states and our partners. For example, we requested from the ISA that at least half of all the trainees they provide as part of our contract requirements are female. The offshore industry today is predominantly male, and we strive to foster not only the inclusion of females but 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 vision of women from developing states playing a central role in marine scientific research and in strengthening the scientific and technological capabilities of their country. We are also seeking to build capacity in our sponsoring states and the 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 of doing things, our success depends on attracting and retaining strong, independent, entrepreneurial and multi-talented team capable of dealing with high levels of uncertainty and adversity. Our team is distributed across several continents and several time zones. Working remotely is the norm for most of our staff. Despite physical and temporal separation, we maintain a strong sense of cohesion by attracting people who are intrinsically motivated by the company's mission. We cultivate a flat organizational structure and a culture built on mutual respect and care for each other. We rely on regular management and company meetings, ongoing communication flows across different technology platforms, frequent ad hoc video communication and creating 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

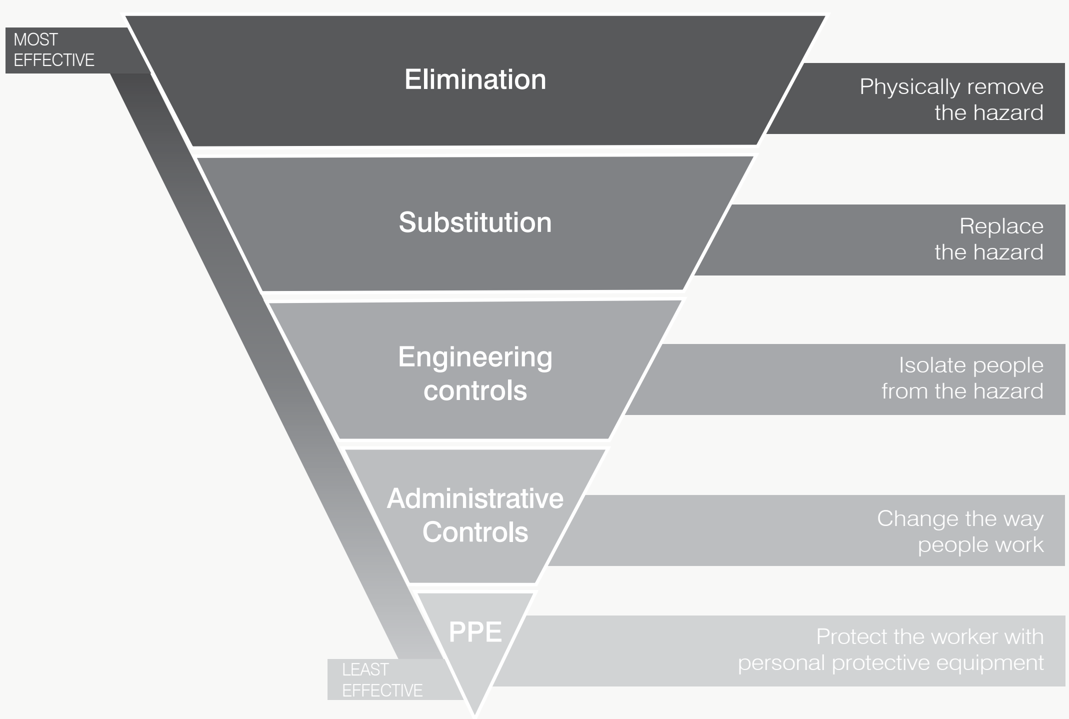
We compensate our staff competitively, striving to be in the 50th to 60th percentile of our peers for total compensation and benefits. In addition to salaries, our compensation and benefits program includes annual discretionary bonuses, equity awards, an employee stock purchase plan, a 401(k) contribution/superannuation or registered retirement savings plan (RRSP) benefit contribution (as applicable jurisdictionally), healthcare and insurance benefits, health savings and flexible spending accounts. Our annual equity compensation is focused on company priorities that we believe create long-term value for our stakeholders.

Environment, Health & 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 partners Allseas and Maersk Supply Services (MSS through December 2021) to deliver safe worksites, as our major EHS exposure has been within these operations. In 2021, all of our offshore exploration campaigns have been completed with no lost-time injuries and no COVID-19 outbreaks. 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. Our safety commitment is simple: Everyone should go back home safely.

Knowing that the mining industry has one of the highest injury and fatality rates of any industry,[14] it is important 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 planning, risk assessment and disciplined implementation of controls. We also have put in place culturally based safety observation systems like safe act observations and obligation to stop work if it is unsafe to proceed.

With our partners we actively use the control hierarchy to manage EHS risk for our people and the environment. The use of technology can support this goal by eliminating employees' exposure to accidents that can be a life-changing event. At TMC, our partners will be using autonomous robots to collect nodules, which will minimize risks to workers. And since there are no tailings with the collection of polymetallic nodules, the risks associated with tailings storage dams, which unfortunately include the potential for fatalities and environmental catastrophes, are fully eliminated.[15]



[14] Theworldcounts.com, 2022
[15] Warren Cornwall, "A Dam Big Problem," Aug. 20, 2020

We have collected safety data from the organizations doing work for us. As the table below shows, there has not been any lost-time injury in the exploration campaigns to date. The limited number of incidents that have occurred have been minor first-aid cases. We investigate incidents and treat them as valuable lessons that are incorporated into future practices. We are providing a breakdown of hours related to work done by TMC and subsidiaries' personnel vs. contractors, and the trailing and behavioral statistics are all related to contractors.

In 2021, the five offshore exploration campaigns have been completed without any health and safety incident and no COVID-19 outbreaks. Since 2012, 18 campaigns have been completed without any lost-time injury. In addition, construction of the collector test system has involved 416,000 person-hours, without any lost-time injury.

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

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

[2] Includes the hours worked by Maersk Supply Services, and, starting in 2020, hours from Allseas, KPM, XPS, SGS and Hatch

[3] Trailing and behavioral statistics are all related to contractors

Sponsoring States

Creating shared value with developing countries through our business and, in particular, with our sponsoring states, is essential to fulfill the intent set out in UNCLOS and our key motivation for partnering with them. This industry has the potential to provide a large positive impact for our sponsoring states.

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

Currently, this work focuses on three areas:

- Training opportunities
- Scholarships
- Community projects

Training Opportunities

TMC is growing and, as we expand, so will our support for training and capacity-building. TMC and its subsidiaries have supported training opportunities since 2011, including sponsoring offshore campaign training and attendance at workshops and conferences. We see a lot of value in this program, as we are fostering a group of highly skilled professionals who will advance our knowledge of the deep sea.

COVID-19 dramatically impacted our ability to provide training and capacity-building opportunities in 2020 and 2021, and we had to adapt to ensure that young scientists could continue to gain valuable practical deep-sea science experience with world-leading scientists through our NORI environmental campaigns.

TMC and subsidiaries	2020	2021	2022
At-Sea training	12	6	2
University of South Pacific Scholarships	0	1	9
Workshops	3	0	TBD
Secondary School Scholarships	0	4	9
Tonga Maritime Polytechnic Institute Scholarships	6	4	TBD

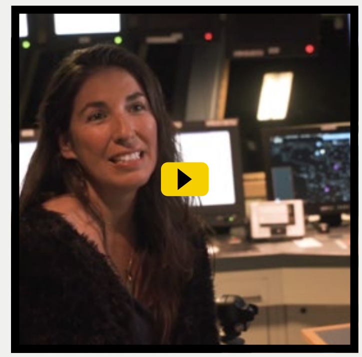
The four ISA trainees selected in 2020 to take part in our environmental baseline study at sea declined participation, citing concerns with COVID-19. Two of these trainees joined us in 2021. However, left without trainees for 2020, we quickly shifted our approach. We decided to create several young science professional roles for the 2020 campaigns and advertise them outside of the standard ISA process. The results were overwhelmingly positive, with more than 120 applications received within a three-week period, far exceeding expectations. The quality of candidates was excellent, and NORI selected 11 early-career ocean scientists, who gained valuable experience in ocean sampling techniques and methods. The scientists came from Chile, Brazil, the United Kingdom, the United States and Italy. Ten of them were women, including a former ISA trainee, Dr. Lucia Villar Muñoz, who had joined NORI on a 2019 campaign. In 2020, NORI also provided an at-sea, on-board placement opportunity for the collection of a bulk sample of polymetallic nodules to a sponsoring state national, Titie Kaufusi from Tonga. Together, this brought the 2020 at-sea, on-board training opportunities to 12 placements.

Along with Dr. Villar Muñoz, four individuals from this cohort have now participated in two NORI campaigns – one in 2020 and one in 2021 – and have become valuable contributors to NORI's environmental baseline program. In 2021, we created a total of six opportunities for at-sea training, and five out of six participants were nationals from developing states. The non-developing state national was from the ISA Secretariat and his training opportunity was designed to assist the ISA in increasing its capacity and knowledge. Their feedback has been positive, and we are proud to be able to support the career development of these young scientists. Learn about their experiences here.

Titie Kaufusi

Mariana Cullell Delgado

Ana Carolina Ronda



Lucía Villar Muñoz

Lucía Villar Muñoz, Trainee with NORI

In 2019, Lucía Villar Muñoz was still a Ph.D. candidate in marine geosciences from Chile when she was selected as a trainee by the ISA and joined one of NORI's offshore campaigns. Lucia was one of the at-sea, on-board placements that NORI provides in accordance with its exploration contract for polymetallic nodules with the ISA.

Lucía performed so well in her first placement in 2019 that she was selected again as one of 11 young scientists to join our 2020 environmental campaign. She joined us again in 2021.

"During this training, the most value knowledge learned was how an environmental survey has to be made," Lucía wrote. *"As an oceanographer, I understood almost all the concepts and how the instruments work, but it was the first time that I realized how all these instruments help us to model (e.g., deep currents), hear (hydrophones) and even visualize (e.g., photography) the entire water column in an area that contains a vast deposit of polymetallic nodules."*

Lucía is a great example of how NORI training led to additional opportunities for both the researcher and her home country.

"In Chile, several potential mining zones for polymetallic nodules have already been identified in the Exclusive Economic Zone," she said. *"Very recently, researchers from Chile and Japan, on board the Japanese research vessel* MIRAI, *found polymetallic nodules between the Salas y Gomez Ridge and Easter Island. The nodules field seems to be large and highly concentrated. This discovery opens many research opportunities related to marine geosciences and oceanography and provides an important opportunity to study the community structure and the ecosystem functioning associated to nodules fields that I intend to promote in my country as soon as possible."*

Scholarships

From secondary school scholarships to technical training to undergraduate and graduate scholarships, we are looking to foster STEM education with a particular emphasis in promoting women's participation in these opportunities. Supporting educational opportunities for students is a priority for TMC, and scholarships play an important role in building capacity within developing nations.

To date, we have had two students graduate with bachelor's degrees from The University of the South Pacific (USP) in Suva, Fiji, through our scholarship program, and we are expanding this program. In 2021, we supported one student from Nauru. In 2022, we will support another nine recipients (eight undergraduates and one master's student) Of these nine recipients, four are from Tonga, two from Nauru, one from Fiji, one from the Solomon Islands, and one from Somalia. The scholarship provides tuition, accommodations, annual return airfare, university fees and books, a new laptop and a living allowance for the three-year degree program.

After several years of offering scholarships to students attending USP, we have learned how to better support students from developing nations and to improve retention through graduation. As a result, several program improvements have been made, and we feel confident that more of these scholarship recipients are set to succeed at USP as we continue to expand our efforts.

Additionally, in Tonga, we currently support nine secondary school scholarships to cover tuition costs. Four students started in 2021, and five started in 2022. Our commitment is to provide a minimum of five new scholarships each year with a target of supporting 15 scholarships annually by 2023. We also support technical training through the Tonga Maritime Polytechnic Institute (TMPI). Six scholarships were granted in 2020 and four in 2021, meeting our five-year plan of providing 10 scholarships. TMPI students were enrolled in a maritime rating and certificate courses. The TMPI scholarship covers registration, school and textbook fees for the scholarship recipients.

Liliana Iotebatu, Scholarship Recipient from Kiribati

Liliana Iotebatu, 28, was born and raised on Tarawa, the main Island of Kiribati. She recently graduated from the University of the South Pacific in Fiji with a degree in marine science. She received a scholarship from TMC that supported her financially during her three years of study.

"Growing up on the Island of Kiribati, I have come to know and understand that we depend on marine and coastal ecosystems and its resources to support our livelihoods and well-being," she said. "It has been said that the ocean is 'the foundation of our very existence and culture; it is connected with our traditional skills and values.' That is why I chose to study marine science – to help assist and serve my country, Kiribati, in its attempt to manage and sustain our marine resources and to counter the subsequent impacts of climate change and other anthropogenic activities to our marine environment."

Now that she has graduated, Liliana said she wants to use her skills to protect the ocean and advance sustainable practices in her homeland.

"With Kiribati having 33 scattered islands and one of the largest exclusive economic zones in the world, it houses rich and diverse marine resources," she said. "However, people continue to disrespect the ocean by using it as a dumping ground, overharvesting its resources and increasing its level of acidity. Therefore, my goal is to make a difference, and to use my skills, knowledge and experiences that I have gained in my studies to help restore the health of our ocean for today and for future generations."

Anna Rose Ribauw, Scholarship Recipient from Nauru

Anna Rose Ribauw is the NORI scholarship recipient for 2021. She is pursuing a bachelor of science degree in biology and chemistry. She was a star high school student at St. John's College in Levuka, Fiji, where she took top honors in science and English. She wished to pursue a career in the medical field and was inspired by her grandfather, a medical doctor. She is extremely grateful to NORI for their support.

"I would like to acknowledge my scholarship provider, NORI, for they have provided me with an opportunity to further my studies. Moreover, life here on campus is interesting," Anna said.

Community Programs

We have formalized a grant program in Nauru and Tonga for community-led initiatives focused on five themes: (1) ocean health and the environment, (2) women's empowerment, (3) youth initiatives, (4) sanitation and water, and (5) healthy living and food security. Under this program, in 2021 we supported 16 community projects in Nauru and 16 in Tonga, including the planting of mangroves, a powerlifting championship and waste management programs

TONGA: COMMUNITY ASSISTANCE GRANTS

The TOML Community Assistance Program was launched in 2020 to support community-driven initiatives that addressed priority areas of interest. TOML received 649 applications that resulted in the selection of 16 grants based on the level of impact on the community and viability.

It was great to see the positive response to the grant program and to see the many inspiring and creative ideas that the community brought forward. As we expand this program, we look forward to supporting a higher number of projects.

In 2021, TOML supported 16 community grants:

- **Apifoou College Dentistry:** Grant to support the building of a handicap-accessible and suitable restroom.
- **Esi O Salote School Bus:** Grant went toward the acquisition of a dedicated transportation vehicle for Holonga students.
- **Keep Eua Clean:** Grant funded 18 250-liter rubbish collection bins for the Eua villages to improve waste collection.
- **Falaleu Women's Group:** Grant funded the furnishing of the kitchen at the Falaleu Women's Group weaving shelter with cooking appliances, enabling a new income stream through catering .
- **Fanga Women's Group:** Grant went toward the building of a fence around the perimeter of land allotment and planting organic vegetables and root crops to improve food security.
- **Fua'amotu Electric Water Pump:** Grant was used to fund an electric water pump for Fua'amotu/ Mala'evakapuna to improve water distribution to the Mala'evakapuna community.
- **Ha'afeva Toilet Project:** Grant supported the building of 22 toilets for Ha'afeva Island, helping provide a good sanitation system for 22 households on Ha'afeva Island.
- **Houma Rugby Field:** Grant funded a goalpost refurbishment and rugby equipment for the Houma youth.
- **Tuluta Koula Crops Plantation:** Grant funded farming of crops to improve food security and provide employment to 18 youths.
- **Kolovai & Ahau Mangrove Project:** Grant was used on mangrove seedlings to undertake reforestation in the villages of Kolovai and Ahau to improve coastal protection for Tongatapu's eastern side.
- **Lapaha Women's Group:** Grant was used to fund more tables, sets of tapa prints for the design, and pots for the paste to support a tapa-making group to provide employment for members of the women's group.
- **Water Harvesting for Reserve:** Grant funded a 27,000-liter water tank to reserve water for the community of Siesia and improve community water-storage capacity.
- **Popua Village:** Grant went toward the purchase of eight sewing machines and other sewing materials to enhance women's involvement in micro economic development.
- **Tefisi Sewing Project:** Grant was used to fund 10 sewing machines for the Tefisi Women's Group and provide employment for group members.
- **Tu'anekivale Village:** Grant funded 20 rubbish collection bins for the village of Tu'anekivale to improve waste collection.

Esi O Salote School Bus

Kolovai & Ahau Mangrove Project

Tefisi Sewing Project

NAURU: COMMUNITY ASSISTANCE GRANTS

11 GRANTS

5 SPONSORSHIPS

NORI's community assistance program commenced in December 2020 with a critical project that was identified around the need for the disabled community in Nauru. The community initiative was advertised, and the projects were selected through a robust process. The allocation of grants started in March 2021 with seven projects. Four more projects were awarded grants in October 2021.

The feedback regarding the application process has been favorable and recognized for its simplicity and quick distribution of funding. Further, this initiative is seen as addressing areas largely ignored by other donor agencies and proved popular, as it enables many small-size projects to access funds rather than focusing on a single large project. These grants also give agency to the community to create impact.

In 2021, NORI supported 11 community grants and five sponsorships.

Uaboe District Community Kitchen Garden

Aweiy Enongen Man Weekend Reading Classes

Nauru Primary School Pipe Project

- **School Shade Yaren Primary School:** A shelter was built over the playground for the Yaren Primary School to provide protection from the extreme heat and sun during dry seasons and from the rain during the wet season.
- **Nauru Primary School Pipe Project:** NORI supported a water collection and piping project for the Nauru Primary School to collect rainwater, which provided the school with a more secure supply of fresh drinking water.
- **Uaboe District Community Kitchen Garden:** The grant supported the Uaboe Youth Group and their work to improve food security for 13 households in the Uaboe District.
- **Aweiy Enongen Man Weekend Reading Classes:** The Aweiy Enogen Man project aims to instill a love of reading in young children by offering Saturday reading classes. The grant went toward the purchase of reading materials and an assortment of mats and cushions on which children can relax and read.
- **Earn and Learn Agency (ELA):** ELA helps educate young parents on the importance of early childhood education. The grant supports workshops and the purchase of educational materials.
- **Save Our Seas:** The Boe community's "Save Our Seas'" project brought local communities together, focusing on youth as clean-up gangs who would help scour the beach for rubbish and debris, so it could be disposed of properly.
- **SOE Boe:** The grant was used to purchase power tools to build several traditional wooden one-man outrigger canoes. The canoes will be used by low-income local fishers to catch and provide fish for their families.
- **Nauru Rotary Club:** The grant supported the construction of a small building to host Rotary Club programs and activities and which will act as a venue for meetings and the group's future hub.
- **Denig Fitness Training Center:** The grant supported the purchase of equipment for a local community gym in the Denig District, helping local residents to stay fit and healthy, and to train for activities such as powerlifting – one of Nauru's most popular sports.
- **Nauru Plastic Free:** The grant supported a local NGO, Nauru Plastic Free, in its efforts to reduce pollution through organized school seminars and student rubbish collection drives, with a prize for the school that is judged the cleanest. NORI also provided wheelie bins to all participating schools to help keep the schools clean.
- **First Step to Independence:** A grant went to support a young mother in her efforts to help 30 Nauruan women build self-esteem and support their families.

We also supported the community with sponsorships to **Nauru Disabled Association, Tour De Nauru, Nauru Powerlifting Championship/NORI Cup, World Mental Health Day** and **World Diabetes Day**.

Economic

Contributions to Governments

As part of the exploration regulatory regime, we are required to provide annual payments to the ISA and our sponsoring states. We are committed to equity amongst our sponsoring states and our agreements will reflect this. Projects will advance at different speeds, and we expect benefits to increase as a project nears operation and as collection of nodules commence.

Royalties and taxes payable on any future production from the CCZ will be stipulated in the ISA's exploitation regulations. While the rates of payments are yet to be set by the ISA, the 1994 Implementation Agreement [Section 8(1)(b)] prescribes that the rates of 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."

An ISA open-ended working group has met several times, including most recently in March 2022, to discuss a number of potential royalty and taxation regimes supported by modeling conducted by the Massachusetts Institute of Technology. No final recommendations were made. However, a 2% ad valorem royalty increasing to 6% after a period of five years of production was discussed as well as a 1% ad valorem environmental levy. These amounts were used for the economic analysis included in the initial assessment contained in the NORI Technical Report Summary. Additional discussions have considered capping any proposed environmental levy once an agreed total value has been reached and might no longer be collected once sufficient funds are in trust. We can provide no assurances that any such royalties or levies will not be greater than those discussed and could be significantly greater. The open-ended working group plans to meet again in July to continue negotiations on the financial regime.

2021 Fees and Contributions (USD)

ISA Fees	$132,000
Sponsoring State Fees (administrative)	$445,000
Sponsoring State Community Programs	$140,600
Training Programs	$64,300

Under the NORI Sponsorship Agreement between Nauru and NORI and under the TOML Sponsorship Agreement between Tonga and TOML, upon reaching a minimum recovery level within 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 Year 5 of production) on a compounding basis based on the official inflation rate in the United States. In addition, NORI and TOML will continue to pay an administration fee each year to Nauru and Tonga, which is subject to review and increase in the event that NORI or TOML are granted an ISA exploitation contract.

About This Report

About This Report

Scope and Boundary

The information in this inaugural report is presented on behalf of The Metals Company (TMC) and all of its consolidated subsidiaries covering exploration activities from 2012 until December 31, 2021.This document also serves as TMC's U.N. Global Compact Communication of Progress for 2021.

This report has been prepared using the Global Reporting Initiative (GRI) Standards as a guidance – GRI referenced. In addition to GRI, this report references additional frameworks including the Task Force on Climate-related Financial Disclosures (TCFD), and Sustainability Accounting Standards Board (SASB) for the minerals and mining sector.

GRI Content Index

GRI 2 General Disclosures 2021

GRI Disclosure		Page/Location
The organization and its reporting practices		
2-1	Organizational details	Pages 6-9, 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 Page 115
2-3	Reporting period, frequency and contact point	Page 109 This is TMC's first 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	Pages 13-23
2-7	Employees	Page 98
2-8	Workers who are not employees	Page 98
Governance		
2-9	Governance structure and composition	Pages 43-47
2-10	Nomination and selection of the highest governance body	Pages 46-47, Nominating Committee Charter
2-11	Chair of the highest governance body	Page 46
2-12	Role of the highest governance body in overseeing the management impacts	Pages 46-47
2-13	Delegation of responsibility for managing impacts	Pages 43-47
2-14	Role of highest governance body in sustainability reporting	Pages 46-47 Sustainability and Innovation Committee Charter
2-15	Conflicts of interest	10-K Page 174
2-16	Communication of critical concerns	Pages 48-49 10-K Page 152
2-17	Collective knowledge of the highest governance body	Page 45 10-K Page 147-151
2-18	Evaluation of the performance of the highest governance body	10-K Pages 152-153 Compensation Committee Charter
2-19	Remuneration policies	10-K Pages 118, 153-157 Compensation Committee Charter
2-20	Process to determine remuneration	10-K Pages 137-138
2-21	Annual total compensation ratio	Page 99 10-K Page 36. We have not yet assessed compensation ratio

Strategy, policies and practices		
2-22	Statement on sustainable development strategy	Pages 4-5, 62-63
2-23	Policy commitment	Pages 10, 24, 43, 50, 51
2-24	Embedding policy commitments	Page 44. Currently working on materiality assessment and sustainability goal development
2-25	Process to remediate negative impacts	Pages 10, 47
2-26	Mechanisms for seeking advice and raising concerns	Page 47
2-27	Compliance with laws and regulations	None
2-28	Membership and associations	Page 48
Stakeholder engagement		
2-29	Approach to stakeholder engagement	Pages 48-49
2-30	Collective bargaining agreements	Page 98

SASB content index

SASB Metals & Minerals, Industry Standards, Version 2021 - 12

This index references SASB standard indicators where they may align with disclosures in the report, but does not make any claims of reporting in accordance with the SASB Metals & Minerals Industry Standard.

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	Pages 94-95
	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	Pages 50-51
Air Quality			
	Air emissions of the following pollutants: (1) CO, (2) NOx (excluding N_2O), (3) SOx, (4) particulate matter (PM10), (5) mercury (Hg), (6) lead (Pb), and (7) volatile organic compounds (VOCs)	EM-MM-120a.1	We are currently in the exploration stage of our development and there are neither manufacturing nor other activities applicable to this topic
Energy Management			
	(1) Total energy consumed, (2) percentage grid electricity, (3) percentage renewable	EM-MM-130a.1	Pages 50-51, 94-95
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	Page 96
	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	Page 97
	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	Page 97
	Total weight of hazardous waste recycled	EM-MM-150a.8	Page 97
	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	Page 100. Currently in the exploration stage of our development
Biodiversity Impacts			
	Description of environmental management policies and practices for active sites	EM-MM-160a.1	Pages 76-80. 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	Pages 76-80. No current active sites and we do not anticipate ever generating acid rock drainage. 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 Indigeneous Peoples			
	Percentage of (1) proved and (2) probable reserves in or near areas of conflict	EM-MM-210a.1	None. Pages 38, 52
	Percentage of (1) proved and (2) probable reserves in or near Indigenous land	EM-MM-210a.2	None. Pages 38, 52
	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. Page 38, 52
Community Relations			
	Discussion of process to manage risks and opportunities associated with community rights and interests	EM-MM-210b.1	Pages 48-49, 61, 102-106
	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	Page 98
	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	Pages 100-101
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	Page 98

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