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"WE STAND NOW WHERE TWO ROADS DIVERGE. BUT UNLIKE THE ROADS IN ROBERT FROST'S FAMILIAR POEM, THEY ARE NOT EQUALLY FAIR. THE ROAD WE HAVE LONG BEEN TRAVELLING IS DECEPTIVELY EASY, A SMOOTH SUPERHIGHWAY ON WHICH WE PROGRESS WITH GREAT SPEED, BUT AT ITS END LIES DISASTER. THE OTHER FORK OF THE ROAD — THE ONE LESS TRAVELED BY — OFFERS OUR LAST, OUR ONLY CHANCE TO REACH A DESTINATION THAT ASSURES THE PRESERVATION OF THE EARTH."

> - RACHEL CARSON, SILENT SPRING, 1962

METALS -THE FOSSIL FUELS OF THE 21ST CENTURY

The transition to a carbon-neutral society is heavily focused on technology and innovation fixes, such as the large-scale shift to renewable energy, the replacement of 1.4 billion petrol and diesel cars with electric vehicles, and the digitalisation of our societies and economies. However, the underpinning economic model remains largely unchanged: extract, consume, throw away – a model that privileges continued relentless overconsumption in the Global North and pursues eternal economic growth at nature's expense.

These so-called green technologies and infrastructure fixes come with a substantial – and familiar – catch: they all require vast amounts of metals and minerals. This means opening more and more mines, exacerbating the longstanding environmental and social consequences of extractivism. Metals have become the fossil fuel of the 21st century.

Each year mining moves into new frontiers and encroaches further into nature and communities all over the world. On land, exploration goes deeper underground and eats into our remaining wilderness. For example, rather than serve as a warning, the rapid melting of Arctic ice sheets has encouraged mining, with previously unreachable sites now seen as economically viable.

World-renowned marine biologist Sylvia Earle has called deep-sea mining 'the biggest land-grab in the history of humankind' and indeed the deep sea has become the final frontier for mining on Earth. Already, more than 1.3 million square kilometres of ocean have been set aside for mineral exploration. Despite scientists warning of irreversible, large-scale biodiversity loss, some countries and companies intend to start mining in international waters as soon as 2023.

Several existential questions arise from this relentless push towards extraction. Can humanity really afford to lose large swathes of nature, on land and in the deep sea, to fuel a 'green growth' economy that will benefit a few in the Global North? Do extractive economies still have a place in the 21st century? Can we envisage a society that can counter climate and nature collapse, while simultaneously breaking free from resource extraction?

OBJECTIVE OF THIS PAPER: RETHINKING METALS AND MINING

Recent reports by the Intergovernmental Panel on Climate Change (IPCC) and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) have awakened the world to the damning human impacts on nature and climate. The solution is difficult yet clear: transformative change.

This paper sets out some possible pathways to transformative change. It describes a science and fact-based vision of a world in which terrestrial mining has become obsolete and the deep sea is safeguarded from invasive digging. It offers an alternative to the business-as-usual approach applied by most global scenarios for future metals demand (World Bank², International Resource Panel³, International Energy Agency⁴, Organisation for Economic Co-operation and Development (OECD)⁵), which presume continued growth of consumption and production, expressed as Gross Domestic Product (GDP). Typically, these growth scenarios predict at least a doubling or quadrupling in the demand for metals by 2050 or 2060. Breaking away from business-as-usual and envisioning a different future is key to shaping effective policy measures that can prevent the expected mining boom.

TRANSFORMATIVE CHANGE MEANS DOING THINGS DIFFERENTLY-NOT JUST A LITTLE MORE OR LESS OF SOMETHING WE'RE ALREADY DOING.¹

- 1 Chan, K. (2019), "What Is Transformative Change, and How Do We Achieve It?: Think Globally Act Locally," IPBES blog. https://ipbes.net/news/what-transformative-change-how-do-we-achieve-it
- 2 World Bank (2020), Minerals for Climate Action: The Mineral Intensity of the Clean Energy Transition. https://www.worldbank.org/en/topic/extractiveindustries/brief/climate-smart-mining-minerals-for-climate-action
- 3 International Resource Panel, United Nations Environment Programme (2019), Global Resources Outlook 2019: Natural resources for the future we want. <u>https://www.resourcepanel.org/reports/global-resources-outlook.</u>
- 4 International Energy Agency (2021), Role of Critical Minerals in Clean Energy Transitions. https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions
- 5 Organisation for Economic Co-operation and Development (2019), Global Material Resources Outlook to 2060. https://www.oecd.org/environment/global-material-resources-outlook-to-2060-9789264307452-en.htm

The paper takes 2050 as its viewpoint. This temporal displacement enables reader-participants to grasp the enormous transition to a far less resource-intensive society, a society equipped to deal with the impacts of climate change, reverse the biodiversity loss of the preceding century, and break free from resource extraction.

The paper is structured as follows:

- 2050: a post-mining world brings us into an alternative vision of the future;
- 2020: the tipping point for mining explains some of the ongoing trends in 2020, helping readers understand the shift to come;
- Seeds of change highlights the many changes and new ways of doing that were already present in 2020 and that allowed the transformation to take place;
- A compass for the future provides insights on on the paradigm shift away from mining in the 2020s;
- Imagining a world without mining workshop presents a workshop concept to co-envisage the paths to post-mining futures, encouraging readers to adopt their own paths of action.

Let's start by projecting ourselves to 2050, a world in which mining has become a thing of the past, and look at how we got here, by visiting the seeds of change already sprouting in 2020.





WE ARE IN 2050, NOVEMBER 23RD CHUQUICAMATA, CHILE.

A crowd gathers for the opening of the Global Extractivism Museum (GEM). It is a sober memorial to an era of relentless extractivism and mining that came to an end this year, when Chuquicamata, Chile's biggest copper mine and the last mine on Earth, closed. The massive scar of the mining pit forms a dramatic backdrop to the museum.

Visitors – and the millions of people across the globe who experience the GEM virtually – marvel at the mining machines on display. It is sobering to see how over time the greed for metals created irreparable injustices across the planet. The lives it destroyed, the ecological disasters it led to, the wars it ignited. The most terrifying machines are those designed for deep-sea mining – massive, automated machines designed to dig up the deep seabed, working as far as six kilometres under water. They were used only in a few tests in the 2020s and then, when by deep-sea mining's certain devastation of the place where life originated could no longer be ignored or accepted, put on hold forever.

By then it was already clear that mining was a hopelessly outdated concept: new ventures such as deep-sea mining or moon and asteroid mining were not only untenable – they weren't even needed. In the 2040s mining could no longer compete with the supply of secondary metals and substitute materials that were progressively taking over the market, supported by a circular-economy approach pioneered in the 2020s. The 2030s and 2040s were hard times for the few companies that survived the burst of the mining "bubble" and continued extracting copper, nickel, lithium or cobalt. More successful companies shifted towards urban and landfill mining, recovering metals from e-waste, landfills and other secondary sources.

It wasn't just changes in materials use that drove mine closures. Growing concern led citizens across the world to challenge extractive economies that threatened life by driving climate change. Accountability to future generations became the compass for strict circular-economy policies that included caps on global resource use and a general shift in consumer behaviour: the Great Transition. The Transition was also about deeper change, with more and more countries letting go of the tired GDP-growth paradigm and replacing it with economies focusing on wellbeing for both planet and people. NEW VENTURES SUCH AS DEEP-SEA MINING OR MOON AND ASTEROID MINING WERE NOT ONLY UNTENABLE – THEY WEREN'T EVEN NEEDED.

2020 – The Tipping Point For Mining

The destructive lifestyles and economies of much of the 20th century and first two decades of the 21st were deeply shaken in the Global North by the 2020 COVID pandemic. Called the "lost year" because of the deep crisis sparked by the pandemic, 2020 was later acknowledged as a positive year of change. Years of climate campaigning together with COVID-related measures such as lockdowns, travel restrictions and a return to public spaces brought on by less car use made society think about its relationship to nature. The evidence that extractivism and other assaults on nature triggered the emergence of new diseases through zoonosis contributed to a growing sense that something was fundamentally wrong with the "old normal".

In the Global North, and particularly in Europe, plans to securitise supply chains of raw materials through insourcing of mining production encouraged communities and civil society to mobilise in opposition to resource exploitation, empowered by similar social movements from the Global South, already well versed in the dangers and effects of the mining industry. Resistance came in the form of declarations, protests, petitions and rising awareness. The environmental crimes and corruption associated with mining were pursued through the courts and in the streets. New narratives such as Ubuntu, Buen Vivir and degrowth challenged traditional modes of development, and were discussed and debated amongst those who viewed "business-as-usual" as a direct threat to societal wellbeing. As people noticed how their lifestyles had been affected by COVID, new narratives of a post-gowth, post-development, post-extractive and post-mining future began to take shape. The expansion of mining to new frontiers, such as the deep sea, stood in stark contrast to global commitment to reversing biodiversity loss. Under increasing pressure from citizens, civil society organisations and thousands of scientists, decision-makers were forced to turn their backs on extractive lobbies and listen carefully to calls for the transformational change needed to preserve life on the planet – including human life.

While many had already known that several planetary boundaries (the planet's "safe operating space for humanity") had been transgressed, this fact and its consequences were generally ignored – by individuals as much as by governments – despite the growing social and political movements promoting alternatives, despite the overwhelming scientific knowledge about the potential impacts of deep-sea mining and ongoing extraction on land. The increasing gap between the 1% extremely rich and the remaining 99%, between the over-developed and under- or de-developed areas of the world, the social exclusion and growing economic inequality which converted some countries into "sacrifice zones" for mining and other forms of extractivism to benefit others: these were ignored, too.

Looking back, it's hard to imagine how so many people put up with it. Polluted cities caused nine million deaths each year and created generations of asthmatics.⁶ Toxic stress caused by working and living conditions led to a massive increase in depression and other mental health illnesses all over the world. Heavy metals at sea forced restrictions in fish consumption. Acid drainage from mining reached the seas and polluted coastal areas. The long-term health impacts of the endocrine disruptors in synthetic chemicals were just beginning to be understood. Ever-increasing extraction and processing of natural resources (metals, minerals, biomass, fossil fuels, water and land) was destroying biodiversity and driving gross human-rights violations.



Le Page, M. (2019). "Does air pollution really kill nearly 9 million people each year?", New Scientist, March 12. At: <u>https://www.newscientist.com/article/2196238-does-air-pollution-really-kill-nearly-9-million-people-each-year/</u> Promises to end child labour and deadly conditions in and around mines were not kept. The exploitation of people and human rights violations by the mining industry grew with each new mine. Mining and processing kept destroying biodiversity, led to increasing water stress impacts, and about 10% of global greenhouse gas emissions.⁷ Even the most unenlightened began to see: this could not go on.

Options were very limited anyway. By 2020, even the most fervent proponents of the electric vehicle (EV) transition within a GDP-growth scenario knew global reserves of metals such as copper, lithium or manganese would be depleted before 2050, even with an exponential increase in recycling rates. Predicted lithium consumption for EVs alone would have completely depleted world reserves in just two decades, while increased mining and continuous growth would have actually increased greenhouse emissions in absolute terms, making decarbonisation policies utterly useless.⁸

Deep-sea mining - still promoted by some - threatened to worsen biodiversity loss and climate conditions by reducing the ocean's carbon dioxide absorption capacity and disrupting open-ocean ecosystems on a global scale. The fact that genetic material from threatened deepsea vents made it possible to develop tests and vaccines for COVID and other diseases⁹ lead to strict protection measures under a newly mandated International Seabed Protection Agency following a global ban on deep sea mining.

> PROMISES TO END CHILD LABOUR AND DEADLY CONDITIONS IN AND AROUND MINES WERE NOT KEPT. THE EXPLOITATION OF PEOPLE AND HUMAN RIGHTS VIOLATIONS BY THE MINING INDUSTRY GREW WITH EACH NEW MINE.

- 7 IPBES (2019). Global Assessment Report on Biodiversity and Ecosystem Services. Bonn: IPBES. At: <u>https://ipbes.net/global-assessment</u>; IRP (2019). Global Resources Outlook 2019. Nairobi: UNEP. At: <u>https://www.resourcepanel.org/reports/global-resources-outlook</u>; Azadi, M., et al. (2020). "Transparency on greenhouse gas emissions from mining to enable climate change mitigation," Nature Geoscience, 13: 100–104. At: <u>https://www.nature.com/articles/s41561-020-0531-3</u>
- 8 Blas, Ignacio de, et al. (2020). "The limits of transport decarbonization under the current growth paradigm," *Energy Strategy Reviews*, 32: 100543. At: <u>https://www.sciencedirect.com/science/article/pii/S2211467X20300961</u>
- 9 UNESCO (2020). "COVID-19: the ocean, an ally against the virus". At: <u>https://en.unesco.org/news/covid-19-ocean-ally-against-virus</u>

THE GREAT TRANSITION: FROM EFFICIENCY TO SUFFICIENCY

Thus 2020 became the beginning of a Great Transition toward the post-mining world of today. Many started to ask themselves what it was that people needed to thrive and have a good life and how these needs could be met within the limits of our planet. Building on early thinkers such as Mahatma Gandhi and J. C. Kumarappa and works such as The Limits to Growth (1972)¹⁰ or Small Is Beautiful (1973), the community of degrowth, post-growth and ecological economics advocates brought the message to the mainstream that the paradigm needed to change, the system needed to change. Groundbreaking works like Tim Jackson's 2017 Prosperity Without Growth¹¹ and Kate Raworth's Doughnut Economy¹² inspired governments, companies and citizens alike. Millions of youth clamored in the streets for system change instead of climate change. While frightening, the 2020 crisis not only made people realise that change was needed, it showed them that it was possible.

At the political level, the notion that societies needed economic growth (i.e., growth in consumption and production, expressed as GDP growth) was starting to crack. The European Environment Agency openly challenged this idea,¹³ outlining ideas for "growth without economic growth", joining the voices of indigenous peoples, local communities, social movements and scientists from across the world. In Europe, the first-ever EU binding targets to reduce over-consumption were established with the goal of reducing resource use by 2030, which would bring EU consumption within planetary boundaries by 2050. The stage was set for further developments towards a more sustainable future.

MILLIONS OF YOUTH CLAMORED IN THE STREETS FOR SYSTEM CHANGE INSTEAD OF CLIMATE CHANGE.

¹⁰ In fact, the business as usual scenario projected in the 1970s compares very well with real developments 40 years later. See: Turner, G.; Alexander, C. (2014). "Limits to Growth was right. New research shows we're nearing collapse," *The Guardian*, Sep. 2. At: <u>https://www.theguardian.com/commentisfree/2014/sep/02/limits-to-growth-was-right-new-research-shows-were-nearing-collapse</u>

¹¹ Jackson, T. (2017). Prosperity Without Growth: Foundations for the Economy of Tomorrow. London: Routledge.

¹² Raworth, K. (2018). Doughnut Economics, Seven Ways to Think Like a 21st-Century Economist. New York: Random House.

¹³ Strand, R., et al. (2021). "Growth without economic growth," EEA Briefing no. 28/2020. At: <u>http://doi.org/10.2800/781165</u>

Cities reinvented their mobility plans, banning private cars altogether in many places and revolutionng transport infrastructure, while rational use of work-from-home helped reduce commuting and traffic. In the Global North car sales plummeted and a drastic reduction of privately own cars followed. Reduced work weeks and workdays facilitated a return to the countryside, the return of self- and community-grown foodstuffs, and more available time for social, cultural and political engagement. Social pressure forced governments and international bodies to establish binding commitments and new regulatory frameworks.

This affected everyday patterns of consumption and behaviour: i.e., planned obsolescence of mobile phones, laptops and other electronics was banned and enforced, while strict guidelines for advertisement curbed perceived obsolescence and conspicuous consumption; new regulations ensured long-durability guarantees for all metal-containing devices as well as design and traceability standards that guaranteed reparability, reuse and full recovery of all components. No longer were hundreds of millions of old mobile phones hoarded in drawers, shipped to the Global South or dumped. Most electronic devices became a valuable part of leasing or cooperative schemes where items were fixed during their lifespan and recuperated at end-of-life as part of their producer's expanded responsibility. In the over-developed Global North, the widespread adoption of simple living¹⁴ became a cultural trend, redefining appropriate technologies on the basis of actual needs rather than growth. Reducing overconsumption and superfluous travel was critical for de-carbonising energy and transport systems.

New institutional arrangements were made to ensure that remaining raw materials were used sensibly for the benefit of the whole of humanity while considering the possible needs of future generations. Individual countries started to ban metal mining altogether and deepsea mining was banned globally. The International Resource Panel gave way to a new global mechanism for raw-materials governance. Mining ceased to be ruled by market mechanisms and speculative finance and came under the steering capacity of an international body and publicly owned enterprises which supervised the phasing out of new metals mining. Mining for luxury goods such as gold and diamonds was the first to be banned; rising prices led to more targeted use of minerals, extended value retention, less waste and more reuse and recycling.¹⁵ Social needs and planetary boundaries superseded profit-making as a driver for steering enterprises, securing a "justice transition" away from mining.¹⁶

15 See: Meynen, N. (2019). Frontlines: Stories of Global Environmental Justice. Alresford: Zero Books, p. 142.

16 See: Hitchcock, B. (2019). A just(ice) transition is a post-extractive transition. London: War on Want and London Mining Network. At: <u>https://londonminingnetwork.org/wp-content/uploads/2019/09/Post-Extractivist-Transition-report-2MB.pdf</u>



¹⁴ Or, as the 1987 UN World Commission on Environment and Development ("Brundtland") Commission report had stated, that "those who are more affluent adopt life-styles within the planet's ecological means". See: "Report of the World Commission on Environment and Development: Our Common Future". At: <u>http://www.undocuments.net/wced-ocf.htm</u>

2050, The symbiocene

The geological scars of pollution and exploitation left by the Anthropocene – a term proudly adopted by the scientific community in the 2010s based on the new stratum of radiation, soot and plastics on the planet's surface – as well as the social and environmental scars of the Capitalocene – a historical epoch characterised by the apparently endless accumulation of capital – slowly started to heal, moving away from an apparently irreversible path toward self-annihilation and mass extinction. A new geosocial era emerged: the Symbiocene.¹⁷

How did this transition to a global society that walks lightly upon Earth come about? How did we become equipped to deal with the effects of climate change and reverse the biodiversity loss of the previous century? How did mining become obsolete, restoring life to mountains and rivers and safeguarding the seabed from an invasion of digging machines? How could bold visions for the future have empowered people, communities and countries to act? Read on to find out...

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17 Albrecht, G. (2019). "After the Anthropocene," *Ecologist*, February, 27. At: <u>https://theecologist.org/2019/feb/27/</u> <u>after-anthropocene</u>



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