THE MINE, THE FACTORY AND THE STORE

Global dynamics in the "green transition" and their consequences in the "Lithium Triangle"

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THE MINE, THE FACTORY AND THE STORE

Global dynamics in the "green transition" and their consequences in the "Lithium Triangle"

Summary

The goal of this publication is to address the critical analysis of the global dynamics that seek to secure "the mine, the factory and the store in the so-called "green transition". More specifically, it examines the dispute between different international actors for control over global supply chains and the value of technologies deemed "clean" in a context where responses to the pandemic and the energy crisis have accelerated this transition—now including security as an added incentive. Our research focuses on the extraction of critical minerals, industrialization and reindustrialization, and the markets that demand such technologies. It is motivated by the results of fieldwork conducted by the team of the *Debt Observatory in Globalisation* in the "Lithium Triangle": the territory of the high Andean salt flats where one of the key materials for the "green transition", lithium, is extracted. It also includes a chapter on alternatives with four proposals to accelerate a different kind of transition: reducing demand in the Global North, a just transition, fair funding, and global justice.

Table of Contents

1. Introduction and motivation

> *The resilience of future energy systems will be measured notably by a secure access to the technologies that will power those systems—wind turbines, electrolysers, batteries, solar PV, heat pumps and other. In turn, a secure supply of energy will be essential for ensuring sustainable economic growth, and ultimately public order and security.*

Proposal for a Net-Zero Industry Act in the European Union
March 2023

It is unusual for a proposed document for a transition in the European industrial sphere to explicitly link technology, growth, energy security, and public order in its objectives. The pandemic –and, above all, the war in Ukraine– have acted as accelerators for a technology-based "green transition" that now has a new mission. While normally defined as a general framework proposed mainly by institutions in the Global North linking the fight against the climate emergency and environmental degradation with a new economic growth strategy, we must now also add the security dimension.

Therefore, this publication arises from an interest in the critical analysis of this new context. In fact, its motivation comes from the trajectory of the *Debt Observatory in Globalisation* and a series of organizations, collectives, and global research networks that examine the progress of the "green transition" on a global level. Nevertheless, its true motivator has certainly been the fieldwork carried out by the *Observatory* in the so-called "Lithium Triangle", one of the strategic territories for the transition. To address this challenge, we have set out to examine *THE MINE, THE FACTORY, AND THE STORE*, as well as the global dynamics of the "green transition" and its consequences in the "Lithium Triangle", and we have divided the text into three parts with different tones.

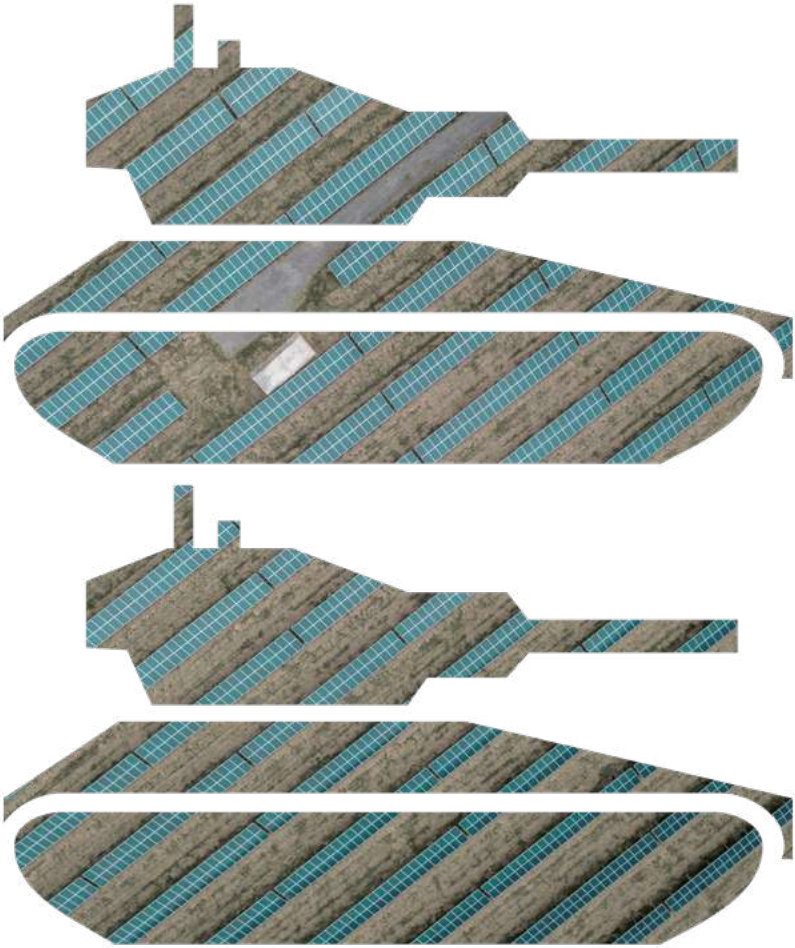
In the first part, we review the global situation of resource extraction, industrialization, and the markets that demand "clean technologies". This chapter, more analytical and descriptive, examines how the centrality of technological investments in the "green transition" and its security function are imperatives for expanding the mining frontier, industrialization, and ensuring sales markets. It is here that the most relevant international actors have deployed numerous instruments (China's 11th to 14th five-year plans, the NGEU recovery funds, the *REPowerEU* initiative, the Inflation Reduction Act, the Critical Raw Materials Act, the Industrial Plan of the Green Deal, the Net Zero Emission Industry Law, and the Global Gateway, among others) to gain hegemony on the international stage with the aim of extracting minerals and producing and selling technology.

In the second part, we focus on a specific territorial situation: the Andean salt flats between Chile, Argentina, and Bolivia, where lithium is extracted—or intended to be extracted. Lithium is a precious mineral necessary for mobile electronic devices and the batteries of electric vehicles. Here, the text incorporates the voices of locals who suffer the impacts of mining. These reactions range from resistance to uneasiness, resignation, division, conflict, or simply waiting for employment or compensation that might help address their unmet basic needs.

Finally, the third part attempts to address the challenges of the climate emergency, biodiversity loss, and resource depletion through the acceleration of other transitions. Our perspective here, which is both proactive and demanding, does not question the urgency of action but instead advocates for alternatives that go beyond *techno-optimism* and its *technological imperative*. With concern, we note that the dimension of global justice is not present in the "green transition" and that the massive demand for technology can have devastating effects on territories in the Global South.

In conclusion, we hope that this text contributes to a better understanding of the global dispute and the situation of the most relevant actors, fosters greater connection with other territorial realities, and continues to encourage debate on how to address a climate, environmental, and social emergency in a truly just manner.

2. The pandemic and the energy crisis: accelerating securitization and a technological transition



Since the Paris Agreement was adopted in 2015, public institutions have proposed numerous tools, plans, and strategies to undertake a "green transition". Among them, the *Green New Deal* stands out for its scope and magnitude as a programmatic and strategic framework to combat the climate emergency through public intervention in the economy.[1]

Both the publication of the Green New Deal for the United States in February 2019 and the approval of the *European Green Deal* in the EU at the end of the same year became the main point of reference for climate and energy transition policies during a time of strong social mobilizations for climate action. The creation of international activist networks such as Fridays for Future, Extinction Rebellion, or By2020 We Rise Up increased pressure on institutions with both the content of their demands and their practices of civil disobedience. In the same year, protests and popular uprisings erupted in Latin America, starting in Chile and spreading to Bolivia, Ecuador, and Colombia. These were expressions of what is now recognized as a year of social upheaval rooted in the serious problems of systemic violence, social injustice, and the environmental exploitation of common goods, ecosystems, and territories.

A year later, the pandemic arrived. On March 11, 2020, the World Health Organization (WHO), concerned about the alarming spread and severity of COVID-19, declared it a pandemic.[2] Just two months later, institutions such as the World Bank, the International Monetary Fund, the Organization for Economic Cooperation and Development (OECD), and the European Commission began emphasizing the need for a "green recovery"[3] and "Build Back Better" (BBB).[I] In other words, the goal was to recover from the negative impacts of COVID-19 on the economy by reinforcing the "green transition".

This was the first accelerator of the transition: the economic recovery from the pandemic. One of its most prominent actors has been the European Union and its NextGenerationEU funds[4] (hereafter referred to as NGEU) with a potential of 806 billion euros in grants and loans for member states. These funds are intended to go towards the recovery and transformation of the European economy, putting it on the path of the *European Green Deal*. Specifically, 37% of the funds were supposed to be directed towards projects[II] and reforms that contribute to the Union's climate objectives, 20% towards digitalization, and 10% towards biodiversity. All are governed by the principle of "do no significant harm", meaning

I As opposed to the Joe Biden administration's *Build Back Better*, under Donald Trump the Federal Government of the United States did not opt for a green recovery. To find out more, see: https://www.theguardian.com/environment/2020/nov/11/five-post-trump-obstacles-to-a-global-green-recovery

II The list of projects funded through NGEU is led by large European companies and is largely invested in the sectors of electric mobility, green hydrogen and renewable energies.

that approved projects and reforms cannot support or carry out economic activities that cause significant harm to any environmental objective.[5]

Following the chronological timeline, on February 25, 2022, the Russian Federation invaded Ukraine. Amid widespread panic about the price and continuity of the energy supply in Europe, the war acted as the second accelerator of the "green transition" by reshaping its priorities. The REPowerEU plan,[6] designed to end energy dependency on the Russian Federation, acknowledges that "the rapid progressive elimination of fossil fuel imports from Russia will impact the transition trajectory" and could involve specific investments in gas and oil infrastructures as well as the use of coal and nuclear energy beyond what was initially planned.[III]

Along the same lines, the April 2023 meeting of energy, climate, and environment ministers from the G7[IV] in Sapporo, Japan aimed to explore energy security and the transition to "clean energy".[V] The two days of meetings included discussions on critical materials, energy efficiency, renewables, natural gas, hydrogen, coal emissions, roads and the decarbonization of heavy industries. In their final document, they stated: "We reaffirm our commitment to accelerating the transition to clean energy with net-zero emissions [...] and recognize the importance of promoting efficient diversification of supply sources to improve energy security and affordability."[7]

Finally, all major international actors are working to gain legitimacy among the citizens of the Global North through campaigns like "You are the EU", promoted by the European Commission at the beginning of 2023. It aims to unite European values of "Democracy, freedom, equality, tolerance, and solidarity" with energy independence and "clean, renewable energy produced in Europe",[8] reaffirming the link between transition, security, and technologies. It represents a form of energy and technological nationalism that mandatorily, urgently and massively advocates for "clean technologies".

III In addition to the noticeable contradiction of maintaining a discourse on fighting the climate emergency while financing and using fossil fuels, REPowerEU has managed to redirect 225 billion euros from the Recovery and Resilience Fund –the effective part of the NGEU– for projects and reforms. This enables them to bypass the principle of causing no significant harm when it comes to infrastructure and energy facilities that require immediate security of supply needs. For more information: https://ec.europa.eu/commission/presscorner/detail/en/ip_22_7717

IV The countries in the G7 are Canada, France, Germany, Italy, Japan, the United Kingdom and the United States. You can find the Climate, Energy and Environment Ministers' Communiqué here: https://www.meti.go.jp/information/g7hirosima/energy/pdf/G7MinistersCommunique2023.pdf

V According to the International Energy Agency, an OECD organization created after the 1973 oil crisis and a reference for international institutions, clean energy or clean technologies include photovoltaic and thermal solar power, electrolysers and fuel cells, onshore and offshore wind power, sustainable biogas/biomethane, batteries and energy storage, carbon capture and storage, heat pumps and geothermal energy, and grid technologies. Within this group, it also includes sustainable alternative fuel technologies, advanced technologies for energy production from nuclear processes with minimal fuel cycle waste, small modular reactors, and related fuel technologies. In this text we will mainly refer to wind power, solar and electric mobility, and, in some cases, to fuel cells, electrolysers and heat pumps.

Figure 1.
Posters from the "You are the EU" campaign that were displayed on billboards in many European cities. Source: European Union.

3. The mine, the factory and the store

3.1. Global supply and value chains

The situation described in the previous chapter –with a "green transition" linked to energy security driving a massive demand for technology– challenges the most relevant actors in the international scene. However, if we analyse the global situation of supply chains for key "clean technologies", we can identify four distinct positions: *dominant*, *advantaged*, *importing*, and *subordinate*.

On the one hand, China holds a *dominant* position, with a sufficiently hegemonic presence in different stages of the supply chain to exert a high degree of control and influence. In 2019, China was responsible for 69% of global cobalt extraction, 64% of graphite and 60% of rare earth elements. In material processing operations, China reached 35% of nickel, 65% of cobalt, 87% of rare earth elements and 58% of lithium. Additionally, Chinese companies have made significant investments in resource-rich areas such as Australia, Chile, the Democratic Republic of the Congo and Indonesia.[9] In 2021, China led the global supply of "clean technology". 65% of electric vehicle batteries, approximately 60% of photovoltaic panels and wind turbines and 40% of electrolysers were manufactured in China.[10]

On the other hand, the United States is in an *advantaged* position because it has the installed capacity to carry out most activities in the supply chain within its borders. It possesses energy resources, minerals, industry, and domestic demand. In 2020, it was the second-largest extractor of rare earth elements and sixth in terms of reserves.[11] It has a well-developed supply chain for electric mobility (with a positive trade balance of 3% in 2021) but lacks wind power (-38%) and photovoltaic (-65%), where it depends on imports.[12]

In contrast, what most characterizes the European Union is its role as an *importer* due to its high energy, mineral, and industrial dependence on external sources. This is partly the result of the expansive and offshoring policies of European corporations. In 2021, the EU had an energy dependency of 55% and a metallic minerals dependency of 54%.[13] The EU is a net importer of "clean technologies", except for wind turbine components. Around a quarter of electric vehicles and batteries, as well as almost all solar photovoltaic modules and fuel cells, are imported—mostly from China. Nevertheless, electric vehicles are also produced by European and U.S. companies in China.[14]

Lastly, numerous countries in the Global South participate in global supply chains in a *subordinate* manner through the extraction and export of natural resources. Countries such as the Democratic Republic of the Congo, Mozambique, Peru, Ghana, or Indonesia have a primary-export matrix and mostly engage in mineral extraction and sale with basic refinement and processing or, economically, low value-added terms. Other countries like Chile, Bolivia, Argentina, or Brazil have different projects to advance industrialization but have encountered internal barriers ranging from their constitutions (in the case of Chile) to internal crises or progressive governments without a clear willingness to abandon extractive intensification—or simply reactionary, denialist governments. However, most of these countries share a common denominator: they are subjected to external debt or trade and investment treaties, which function as instruments to reinforce their subordination.

To go into greater detail on the *dominant*, *advantaged*, *importing* and *subordinate* positions, in the following subsections we will analyse the position of these actors in the extraction, manufacturing, and commercialization stages—in other words, the mine, the factory, and the store.

Table 1. Clearing up concepts: extraction, reserves and resources. Elements, metals, minerals, raw materials and materials

Extraction refers to the initial, most basic stages of mining. Although this is often referred to as *production*, we believe that this so-called "production" does not exist since this activity involves extracting minerals found in nature.

Reserves are raw materials that can be extracted in a legally, economically and technically viable manner. Reserves vary over time. *Resources*, on the other hand, are the result of exploration processes and are valued using geoscientific models. Resources also vary over time: once their extraction is viable they become reserves.

Elements are a type of matter composed of atoms with the same atomic number, and they are classified in the periodic table. *Metals* are chemical elements that are good conductors of electricity and heat. *Minerals* are inorganic substances of natural origin with a defined chemical composition and a certain crystalline structure. *Raw materials* are materials extracted from nature –whether of mineral, vegetable, or organic origin– which undergo a series of artisanal or industrial transformations to become intermediate or final consumer products. *Materials* refers to the element or chemical compound, substance, or mixture of substances that constitute matter. In this report, this term is used to refer to elements, compounds, or rocks of natural origin extracted by human activity for use.

3.2.
The mine: extracting the ingredients for "clean technology"

The first, fundamental stage in the manufacturing of so-called "clean technologies" is to ensure their material foundation—in other words, the elements necessary for their production. Here, we are referring to minerals such as copper, lithium, nickel, manganese, cobalt, graphite, silicon, rare earths, platinum, chromium and zinc, as well as bulk materials like steel, cement, plastic, and aluminium.[15]

Figure 2.
Critical strategic materials used in different technologies.
Own work, based on Supply chain analysis and material demand forecast in strategic technologies and sectors in the EU.

Supply Risk (%)	Raw material	Li-ion batteries	Fuel cells	Electrolysers	Wind turbines	Traction motors	Solar photovoltaics (PV)	Heat pumps
4.8	Gallium						✕	
4.1	Magnesium			✕				
4.0	REE (magnets)		✕	✕	✕	✕		✕
3.8	Boron		✕	✕	✕	✕	✕	✕
2.7	PGM		✕	✕				
1.9	Lithium	✕						
1.8	Germanium						✕	
1.8	Natural graphite	✕	✕	✕				
1.7	Cobalt	✕	✕	✕				
1.4	Silicon metal		✕	✕	✕	✕	✕	✕
1.2	Tungsten		✕	✕				
1.2	Manganese	✕	✕	✕	✕			✕
0.5	Nickel	✕	✕	✕	✕		✕	✕
0.1	Copper	✕	✕	✕	✕	✕	✕	✕
5.3	HREE (rest)		✕	✕				
4.4	Niobium			✕	✕			
3.5	LREE (rest)		✕	✕				
3.3	Phosphorus	✕					✕	
2.6	Strontium		✕	✕				
2.4	Scandium			✕				
2.3	Vanadium		✕	✕				
1.8	Antimony						✕	
1.6	Arsenic						✕	
1.5	Feldspar		✕					
1.3	Baryte		✕	✕				
1.3	Tantalum			✕				
1.2	Aluminium	✕	✕	✕	✕	✕	✕	✕
1.2	Helium							
1.1	Fluorspar	✕					✕	✕
1.0	Phosphate rock							

Note: Here, materials have been divided into two categories: strategic and critical. For the EU, the criticality of materials is measured by their importance to the economy and the risk that exists in supply chains.[16] Strategic materials, on the other hand, are crucial for key technologies for the European "green and digital transition", defence, and the aerospace sector, and they may also be subject to future risks in supply chains.[17]

In the table, platinum-group metals (ruthenium, palladium, osmium, iridium, rhodium and platinum) are grouped together. Rare-earth elements are divided into three subgroups: those used for permanent magnets (such as neodymium and dysprosium), heavy rare earths and light rare earths.

In Figure 2 we see that copper and aluminium are required for all technologies. Other materials are present in 6 out of 7 technologies: nickel is used in all except traction motors, and boron and silicon are not present in lithium-ion batteries. Rare earths used in batteries and manganese are found in 5 out of 7 technologies.[18]

Below are other studies that also evaluate the frequency with which different materials are used for each type of technology.

Figure 3.
Materials for the manufacture of the principal technologies for the "green transition". Own work, based on data from the International Energy Agency.

	Copper (Cu)	Cobalt (Co)	Nickel (Ni)	Lithium (Li)	Rare earths*	Chromium (Cr)	Zinc (Zn)	PGM (Platinum-Group Metals)	Aluminium (Li)
Photovoltaic solar energy	●	○	○	○	○	○	○	○	●
Wind energy	●	○	◐	○	●	◐	●	○	●
Electric vehicles and batteries	●	●	●	●	●	○	○	○	●
Hydrogen energy	○	○	●	○	◐	○	◐	●	○
Electricity grids	●	○	○	○	○	○	○	○	●

* They are a group of 17 chemical elements, including dysprosium and neodimium.

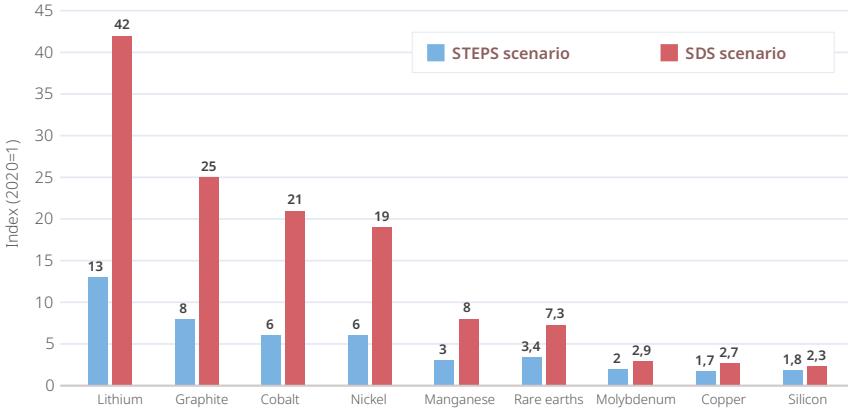
Note: the different colours represent the relative importance of each material: red=high, pink=moderate, white=low. PGM stands for Platinum-Group Metals.

It is important to emphasize that each technology includes sub-technologies[VI] that, depending on their development, end up determining the higher or lower intensity of one material or another. Nevertheless, Figure 3, emphasizes once again the high importance of copper and aluminium for practically all technologies, as well as rare earths and zinc for wind energy, nickel for hydrogen, and cobalt, nickel, lithium, and rare earths for electric vehicles and batteries.

VI The most commonly used batteries in electric vehicles are lithium-ion batteries. This category includes lithium-cobalt-oxide (LCO), nickel-cobalt-aluminium-oxide (NCA), and nickel-manganese-cobalt-oxide (NMC) batteries. NMC batteries also have subdivisions based on the proportions of manganese, cobalt, and nickel in the cathode chemistry. There are also other lithium battery compositions that do not contain cobalt, such as lithium-manganese-oxide (LMO) and lithium-iron-phosphate (LIP) batteries. For more information, see: Lallana, Martín; Torrubia, Jorge and Valero, Alicia (2023). *Minerales para la transición energética y digital en España: Estado del arte, revisión de políticas públicas y alternativas*. CIRCE - University of Zaragoza, commissioned by Friends of the Earth Spain. Available at: https://www.tierra.org/.

Continuing with the evaluation of the mineral intensity of technologies and their projected future demand, we will now focus on the report *The Role of Critical Minerals in Clean Energy Transitions* by the International Energy Agency (IEA). For the most ambitious environmental and climate scenarios, the total demand for materials for "clean technologies" should quadruple between 2020 and 2040. In the same period, sectors such as electric vehicles and batteries would see their demand multiply by thirty.[19]

Figure 4.
Global demand for minerals for batteries, renewable energies and networks in 2040 as compared to 2020. Own work, using data from the International Energy Agency.

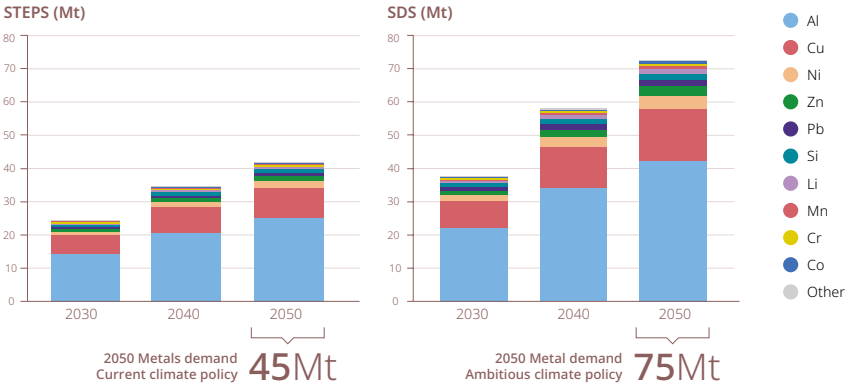


Note: according to the IEA, the Stated Policies Scenario (STEPS) is the most conservative reference point for the future, as it does not assume that governments will achieve all declared goals. On the other hand, according to the IEA, the Sustainable Development Scenario (SDS) offers an integrated approach to achieving internationally agreed-upon goals on climate change, air quality and universal access to renewable energy.

The detail in Figure 4 shows how the SDS scenario requires more materials than the STEPS scenario. In the context of the IEA's "green transition", which promotes technological development without questioning the economic model, greater ambitions regarding the climate require increased mineral exploitation. The SDS scenario implies a 42-fold increase in lithium demand for the mentioned technologies, a 25-fold increase in graphite, a 21-fold increase in cobalt, a 19-fold increase in nickel, an 8-fold increase in manganese, and a more than 7-fold increase in rare earth elements—all within just two decades.[20]

Using these two scenarios (SDS and STEPS) as a reference, the publication *Metals for Clean Energy: Pathways to Solving Europe's Raw Metals Challenge* (written by KU Leuven University and commissioned by Eurometaux[21]) also quantifies the difference between these scenarios.

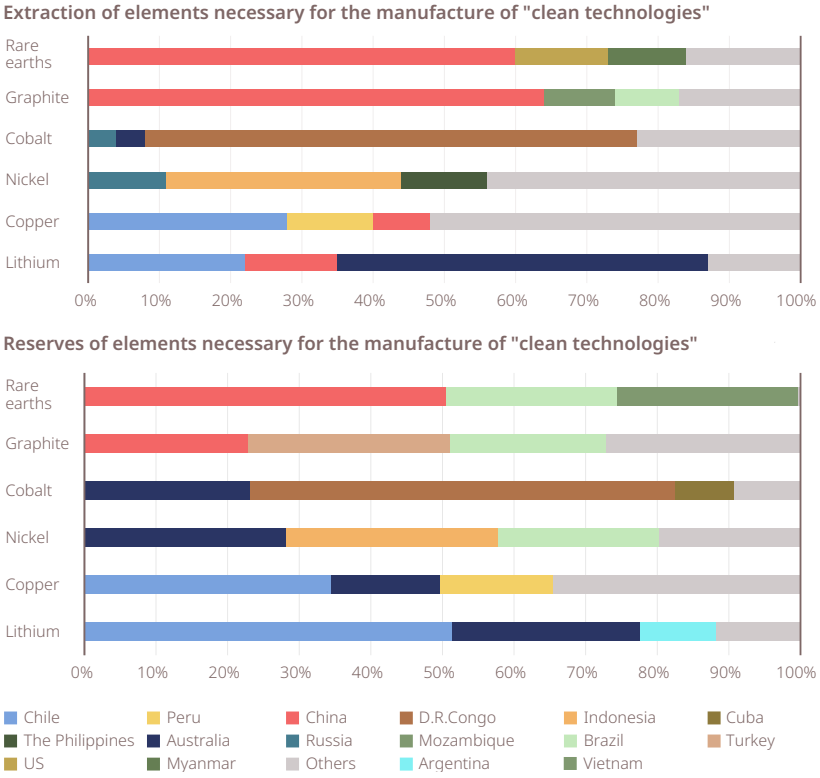
Figure 5.
Global metal demand by commodity for "clean energy" technologies in a STEPS and SDS scenario respectively. Source: KU Leuven.



The SDS, which represents a greater climate ambition according to the IEA, would result in an extraction of 30 megatons more materials annually compared to the STEPS scenario. More than 50% of the total demand would be for aluminium, followed by copper, nickel, and zinc. The absolute quantities do not reflect the importance of minerals such as cobalt or rare earth elements for magnets, which, despite being extracted in smaller quantities, have a greater climate impact per ton during their extraction and refining processes.[VII]

VII The production of one ton of cobalt sulphate or neodymium oxide emits the equivalent of 16.73 tons and 65.80 tons of CO_2 respectively. For more information, see: https://www.iea.org/data-and-statistics/charts/average-ghg-emissions-intensity-for-production-of-selected-commodities

Figure 6.
Participation of the three main countries in extraction and reserves of selected minerals, 2019. Own work, based on data from the International Energy Agency and the United States Geological Survey.



In the part of Figure 6 displaying the extraction of elements needed for the manufacture of "clean technology", China, Chile and the Democratic Republic of the Congo stand out. The latter is home to a large percentage of global cobalt extraction (69%), concentrated primarily in the Katanga region in the southeast of the country. This region is also a source of copper, tin, radium, uranium and diamonds. Chile, on the other hand, is tied with Australia for global leadership of lithium mining; it is also the country with the greatest copper extraction. China is third in terms of lithium and copper, but it is the clear leader in graphite extraction (64%). The same is true for rare earths (60%), which are primarily extracted from the "rare earth capital", the Bayan Obo mining district of the Inner Mongolia region. The distribution of nickel is somewhat different and is split between Indonesia (33%), the Philippines (12%) and Russia (11%).

Regarding reserves, there are strong coincidences with current extraction areas. For example, Chile currently has the largest recognized reserves of lithium and copper, China has rare earths and graphite, the Democratic Republic of the Congo has cobalt and Indonesia has nickel.

The strategic importance of controlling minerals for the production of "clean technologies" has caused significant movements among international actors. In March 2023, the European Commission published a comprehensive set of measures to "ensure the EU's access to a secure, diversified, affordable, and sustainable supply of critical raw materials." Among these, the *Framework for ensuring a secure and sustainable supply of critical raw materials* stands out.[22] This act which is open to amendments and scheduled for a final vote in September 2023, provides clear priorities for action, establishes a list of raw materials[VIII] and sets specific quantitative targets for 2030: at least 10% of the annual consumption of these materials must come from within the EU, at least 40% of transformation must occur within the EU, and at least 15% must be obtained through recycling, while no more than 65% of each strategic raw material, at any stage of transformation, can come from a single supplier.[23]

Another relevant point of the act is its aim to reduce administrative burdens and permit granting procedures in the EU for initiatives that, if considered selected strategic projects,[24] will have access to funding and benefit from shorter permit granting timelines: twenty-four months for extraction permits and twelve months for transformation and recycling permits—surprisingly short compared to the analysis by the IEA, which calculates an average of 12.5 years from discovery to feasibility exploration, 1.8 years for infrastructure construction, and an additional 2.6 years to start production. In other words, about 17 years from discovery to mining production.

A few years earlier, the United States passed a legislative framework to modernize its energy policy –*The Energy Act of 2020*[25]– along the same lines as the European law. This law requires that the executive branch designate a list of critical minerals[IX] to be updated every three years. The latest list, from 2022[26], contained 50 minerals considered critical, mostly imported and prone to supply chain disruptions.[X] The law also includes a section titled "Monitoring mineral investments under Belt and Road Ini-

VIII At the same time, the fifth list of critical raw materials for the EU was also published. It includes 34 raw materials that are of great importance to the EU economy and whose supply is associated with high risk. Among these materials are some necessary for "clean technologies" such as cobalt, gallium, germanium, rare earths, lithium, manganese, graphite, niobium, platinum, copper, silicon, and nickel. For more information, see: https://single-market-economy.ec.europa.eu/sectors/raw-materials/areas-specific-interest/critical-raw-materials_en

IX For the US, the criticality of minerals is associated with national security or economic development.

X The minerals listed here are very similar to the European list; however, both the platinum group metals and rare earths are broken down into individual elements.

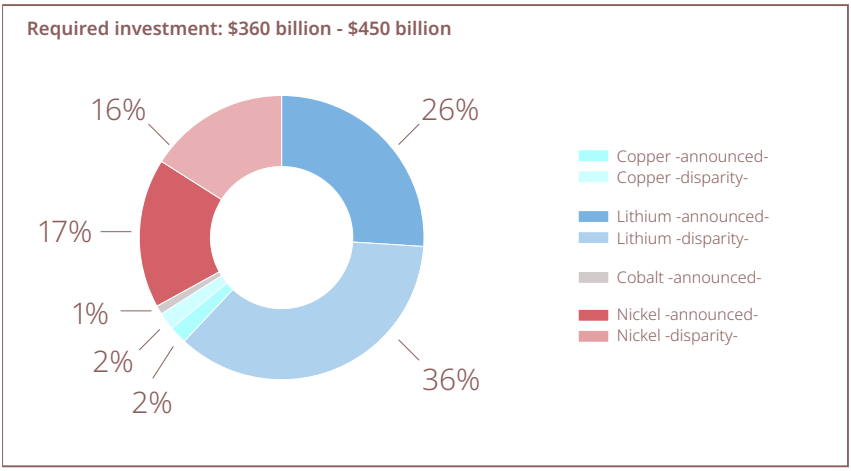
tiative of People's Republic of China." Implicitly or explicitly, the laws of the US and the EU aim to control and reduce Chinese hegemony. Undoubtedly, China has had over a decade of advantage over the Global North regarding the deployment of minerals necessary for the transition. Since 2001, all of China's five-year plans (10th, 11th, 12th, 13th and 14th) have promoted advancement in the global supply chain and value of "clean technologies". In its National Plan for Mineral Resources (2016-2020), China sought to encourage the exploration of scarce minerals, curtail production where there was excess capacity, and ensure supply for emerging strategic industries. The plan specifically mentioned rare earths, proposing that their exploitation stabilize at 140,000 tons per year by 2020.[27] Simultaneously, the development section of China's 14th five-year plan, published in late 2021, promotes the expansion and strengthening of rare earth companies and encourages them to merge, reorganize and extend their industrial chains.

On another note, the IEA estimates that the investment required in this decade for critical mineral mining in the net-zero emissions scenario by 2050[XI] ranges from $360 billion to $450 billion. However, the announced investment is between $180 billion and $220 billion[XII], approximately half of what is needed.

XI For a critical analysis of policies on climate neutrality or net-zero emissions, see: Pajares, Miguel (2023) *Bla, bla, Bla. El mito del capitalismo ecológico*. Raig Verd. More information at: https://www.rayoverde.es/catalogo/bla-bla-bla-el-mite-del-capitalisme-ecologic/

XII The IEA divides the announced investment by region: 4% China, 5% North America, 10% Africa, 13% Europe, 21% Latin America and the Caribbean, 36% other Asia-Pacific countries and 10% the rest of the world.

Figure 7.
Investment required to meet mineral demand in the Net Zero Scenario, 2022-2030. Own work, based on data from the International Energy Agency.



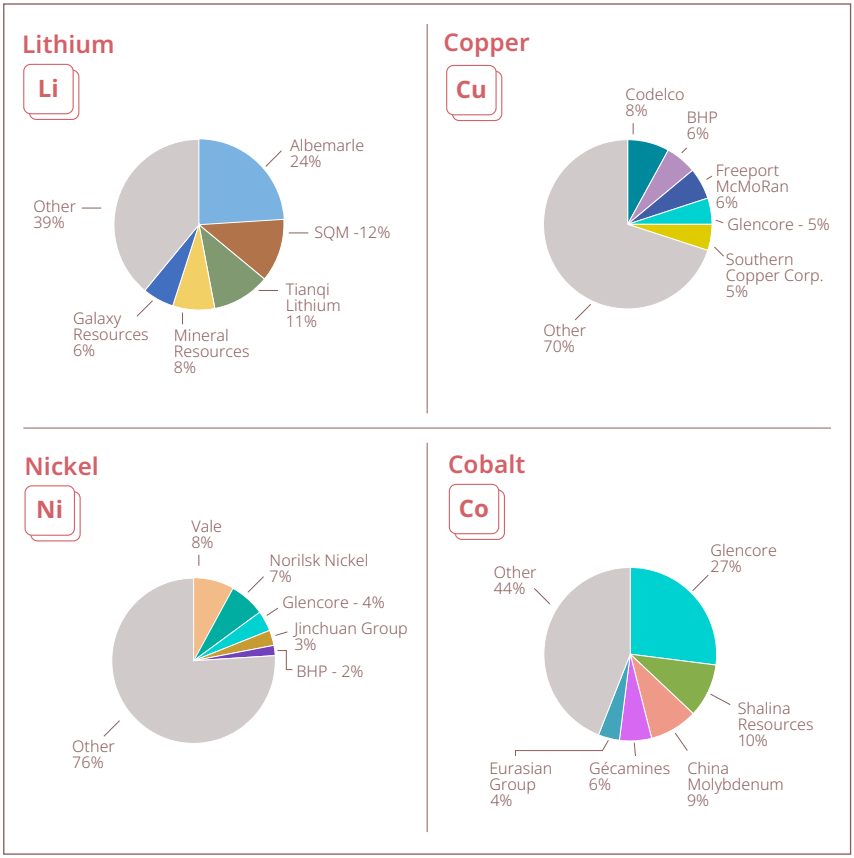
Note: The International Energy Agency created the Net Zero Scenario based on the principles of adopting all available technologies and a reduction in emissions dictated by costs, technological maturity, market conditions, and international cooperation to ensure a just transition and supply security.

The IEA itself has stated that, for the type of investments required in mining and its long-term character, to encourage investment there must be confidence that there will be persistent demand and high prices. It notes that there are two possibilities for expanding extractive capacity: opening new mines or expanding existing ones. Expansions can be faster, but their ability to supply global markets is limited. Therefore, according to the IEA, most investment should go towards new mines. For lithium and nickel, it estimates that 70 new medium-sized mines will be needed, along with 30 for cobalt and 80 for copper.[28] Investment should accelerate in the next three years, with two-thirds for copper with the remaining portion almost entirely for nickel. Despite its relevance and short-term increase, the IEA states that investment in lithium will be small compared to investments in copper and nickel (4%, between €14,400 and €18,000 million), and half of it has already been announced. As for cobalt, it is mainly considered a byproduct of copper and nickel, and the investment would be covered with the aforementioned figures.

It should be noted that the projections of the IEA ultimately influence investment. Its strong voice and the scope of its analysis, within a framework that does not question fundamental issues, ultimately serve as a "warning to investors". Furthermore, stimuli in the form of projected increasing mineral demand and the urgency of the approach, position in-

ternational mining corporations as key players and beneficiaries of the "green transition".

Figure 8.
Leading mining corporations in the extraction of four selected minerals.
Source: International Energy Agency.



Among the most important mining corporations, Swiss multinational Glencore stands out. It is considered the largest private company dedicated to the trading and extraction of raw materials and food worldwide. Glencore has a significant presence in the nickel, copper, and especially cobalt markets, where it controls over a quarter of global extraction. We also find Chinese companies such as China Molybdenum, Tianqi Lithium, or the Jinchuan Group, which participate in the cobalt, lithium, and nickel markets, respectively. Additionally, the private Australian company BHP

extracts copper and nickel, while the private company Galaxy Resources and the public company Mineral Resources share a significant portion of global lithium extraction. Specifically, when it comes to this vital material for electric mobility batteries, the American company Albemarle holds 24% of global extraction, and the Chilean company SQM holds 12%. Lastly, the Chilean state-owned company Codelco dominates 8% of the market for copper—a metal that serves as the foundation for virtually any technology and is essential for electrification plans.

Table 2.

Essential minerals do not substitute fossil fuels

> *Lithium and rare earths will soon be more important than petroleum and gas.*
>
> Ursula von der Leyen, president of the European Commission, in her 2022 State of the European Union address. September 2022.[29]

These types of statements commit a fundamental error: mineral extraction requires large amounts of fossil fuels, especially diesel. Therefore, the "new mineral map" adds another layer of complexity to global geopolitics, as its geographical distribution differs greatly from that of gas and oil reservoirs, but in no way replaces the "fossil fuel map".

3.3.
The factory:
Made in China/the USA/Europe and industrialization in the Global South

China, the United States and the European Union have all launched their industrialization or reindustrialization plans for the "green transition". In 2015, Chinese Premier Li Keqiang presented the *Made in China 2025* initiative, which includes 10 areas of government support for industrial modernization in sectors such as information technology, robotics, aerospace, aviation, ocean engineering, maritime and rail transport, energy saving and electric vehicles, new materials, pharmaceuticals and medical devices, and agricultural machinery.[30] Years later, in September 2022, the President of the European Commission, Ursula von der Leyen, announced in her State of the European Union address, "We will ensure that the future of industry is made in Europe."[31] The *Made in Europe* initiative has been realized, for example, through the creation of a photovoltaic solar industry alliance in the EU to regain production lost to China.[32]

Nevertheless, in the industrial field, the milestone that has most impacted the global scene has been the launch of the Inflation Reduction Act (IRA) in the United States, a plan that provides significant incentives for the "Made in the USA" industry. The IRA was passed into law on August 16, 2022, and it is an industrial policy that includes goals such as expanding renewable energies, rebuilding energy infrastructure, and producing "clean technologies".[33] Its $369 billion budget is allocated to consumer and business tax incentives, grants, loans, and operations on a federal level.[34]

To a certain degree, the IRA could be compared to the NGEU recovery funds, but the private sector argues that the latter suffer from excessive bureaucracy, laborious processes, and time-consuming procedures compared to the simplicity of the IRA. For example, the IRA offers up to $7,500 for taxpayers who want to purchase an electric or hydrogen car and who earn less than $150,000 per year. The buyer can deduct $3,750 from the final price of the vehicle if a percentage of the critical mineral value of the battery that powers the motor has been 1) extracted or processed in the US, 2) extracted or processed in a country with an effective free trade agreement with the US, or 3) recycled in North America.[XIII]

XIII This link between domestic manufacturing and domestic minerals is specified in an annual progression: by 2023, 40% of minerals must meet one of the requirements, in 2024 it will increase to 50%, and by 2027 it will reach 80%.

Furthermore, they can deduct an additional $3,750 if a percentage of the battery components' value is manufactured or assembled in North America.[XIV] The same applies to the $2,000 domestic bonus for purchasing heat pumps, electric water heaters, stoves and biomass boilers. For the industrial sector, incentives are specified at $3 per kg of clean hydrogen[XV] produced, $1.75 per gallon of sustainable aviation fuel production, $15 per MWh of nuclear energy for existing facilities, and $30 per MWh for zero-emission generation commissioned after 2024.[35, 36]

The EU has interpreted the IRA as detrimental to European companies, especially in the automotive sector. It believes that it violates international trade rules and argues that over $200 billion is tied to provisions on locally produced content that infringe on World Trade Organization (WTO) regulations.[37]

Table 3. The appeal of the IRA and offshoring

An example of what can happen is found in a recent announcement by Ford: it is considering cutting over 3,000 jobs in Europe to move a portion of production to the US.[38] It has also announced the construction of an electric vehicle and battery complex worth $5.6 billion in Tennessee.[39] BMW has communicated an investment of nearly $2 billion in South Carolina for a battery plant. Freyr Battery Norway has also announced a $1.7 billion investment in Georgia, and Enel will build a manufacturing plant for photovoltaic solar panels and cells in the US.[40] However, according to the EU, offshoring is not the only problem. Subsidies to companies operating in the US and benefiting from the IRA such as Tesla, Toyota, ABB, Panasonic, Hyundai or Kia offer them comparative advantages in international markets.

This "green subsidies" war to attract the industry was staged in early 2023 at the World Economic Forum in Davos. At the meeting, the European Union presented its proposal, a mixture of an alliance and a counteroffensive that consisted of three actions: first, announcing that the EU's strategy for dealing with China was to "reduce the risk instead of decoupling", understanding that a direct confrontation with the Asian giant made no sense for Europe and that the path was to use EU tools to prevent unfair competition from Chinese products. The second action was the creation of a "Raw Materials Club", a coalition driven by the US and the EU that aimed, once again, to combat a Chinese monopoly. The third action resulted in the presentation of the Green Deal Industrial Plan, which

XIV Specifically, 50% in 2023, 60% during 2024 and 2025, and up to 100% in 2029.

XV Carbon intensity from 0 to 0,45 Kg CO_2e/kg H_2.

set objectives for the decarbonization of the industry.[XVI] This plan focuses particularly on renewable energies, the transformation of energy and transportation infrastructure, and a massive shift to fossil-free hydrogen as a means of storage, a fuel and a raw material, taking into account "the need to massively increase the technological development, manufacturing production and installation of net-zero industry technologies", considering "the risk of replacing our reliance on Russian fossil fuels with other strategic dependencies that could impede our access to key technologies and inputs for the green transition."[41] In other words, the risk of replacing Russia with China.

The Industrial Plan has three initiatives that are considered pillars: the Critical Raw Materials Act, which we saw in the previous section; the reform of the design of the electricity market, and the Net-Zero Industry Act. The first two pillars can be summarized as ensuring critical materials and cheap (in reality, less expensive) energy for European industry.[42] The third pillar, the Net-Zero Industry Act, is the most genuine proposal of the Made in Europe concept and aims to scale up the production of "clean technologies" in the European Union to reach or approach 40% of annual needs by 2030.[43] The law also links competition, transition, and security, asserting that partners and competitors have implemented measures to gain market share and ensure supply security, as "the resilience of future energy systems will be measured notably by a secure access to the technologies that will power those systems— wind turbines, electrolysers, batteries, solar PV, heat pumps and other."[44]

As noted, this strong link between security and technology enables sources of funding to be included in plans such as REPowerEU, which includes proposals from the Industrial Plan.[45] Other funding sources that will contribute to it are InvestEU, cohesion funds and the Innovation Fund. All of this momentum would be directed towards closing the investment gap between what is considered necessary for the objectives of the Green Deal Industrial Plan and what is actually being mobilized. Great importance is also placed on the creation of the European Sovereignty Fund. This fund aims to boost the resources available for preliminary research, innovation, and strategic industrial projects.[46]

Last but not least, the Green Deal Industrial Plan also has an external dimension. This international trade agenda calls for closing agreements with Mexico, Chile, New Zealand, and Australia; making progress with India and Indonesia; and resuming talks on Mercosur. Additionally, Sustainable Investment Facilitation Agreements (SIFA) will be established, particularly with partners in Africa. Here, the goal is "to attract and ex-

XVI "Decarbonization" refers to the progressive process of reducing CO_2 emissions.

pand investments while integrating environment and labour right commitments." These agreements fall under the Global Gateway, where the European Union aims to deploy "a new European strategy to boost smart, clean and secure links in digital, energy and transport sectors and to strengthen health, education and research systems across the world."[47]

Table 4. Treaties, agreements and gateways

Despite describing the links between the Global North and the Global South as "smart, clean, and secure", they exemplify an unequal relationship between imperious demands and an offer showcasing its "comparative advantages" to attract investment. A clear example of this is found in the chapters on "trade and sustainable development" of free trade agreements.[48] Although they have been announced as the modernization of treaties to incorporate human, social, labour, and environmental rights[49] into the structures of international economic law institutions, they ultimately dilute those rights to align with commercial interests and continue reinforcing colonial relationships.[50] Furthermore, these chapters are non-binding, so they do not guarantee respect for these rights while being used to legitimize the signing of new agreements.

While awaiting the outcome of the NGEU, IRA, and Green Deal Industrial Plan funds, China continues to exert significant industrial hegemony. As we mentioned in the previous section, since 2001 all of its five-year plans (10th, 11th, 12th, 13th, and 14th) have promoted industrial advancement in "clean technologies". In 2021, it had 34% of global copper processing capacity, 50% of lithium, 56% of nickel, and 69% of cobalt. It also controlled 48% of global aluminium production, 55% of iron, and 53% of steel. China is the largest supplier of "clean technologies" on the planet, and in 2021 it could manufacture 75% of global battery production, 58% of wind turbines, 75% of solar panels, 39% of heat pumps, and 41% of electrolysers.[51] China has offered numerous state aids to these strategic sectors in the form of subsidies and consumer refunds, tax exemptions, and support for research and development through so-called "government-guidance funds" that combine public and private investments and loans from public banks.[52] With all these incentives, China has managed to mobilize an average of around 80% of global investment in "clean technologies" from 2018 to 2021.[53] It is estimated that production costs in the European Union related to the manufacturing of Chinese solar panels are 25-30% higher, while Chinese electrolysers are sold 25% cheaper than those made in the US or EU.

Regarding companies, we summarized the announced projects for the manufacturing of photovoltaic panels and the production of batteries and electric vehicles below.

Figure 9.
Investment in the manufacture of solar panels by company.
Own work, based on data from the International Energy Agency.

Company	Headquarters	Announced region for expansion	Year of completion	Inversion
Canadian Solar	Canadá	Qinghai, China	2027	**$ 9.800.000.000**
LONGi	China	Inner Mongolia, China	2024	**$ 2.400.000.000**
Shangji	China	Jiangsu, China	2024-25	**$ 2.000.000.000**
Tongwei	China	Sichuan, China	1st phase 2023	**$ 1.900.000.000**
Q Cells	South Korea	South Carolina, USA	2024	**$ 1.800.000.000**
Jiangxi Jinko	China	Jiangxi, China	2023-25	**$ 1.500.000.000**
Jiangxi Jinko	China	Qinghai, China	2023-24	**$ 1.400.000.000**
Solar Space	China	Anhui, China	2023	**$ 1.400.000.000**
Eging PV	China	Anhui, China	N/A	**$ 1.400.000.000**
First Solar	USA	Alabama, USA	2025	**$ 1.200.000.000**
JA Solar	China	Jiangsu, China	2023	**$ 1.000.000.000**

Figure 10.
Production of batteries and manufacture of electric vehicles in 2021 and 2030.
Own work, based on data from the International Energy Agency.

Battery production (GWh/año)

Company	Headquarters	2021	2030
CATL	China	148	890
BYD	China	84	510
LGES	South Korea	108	600
Tesla	USA	10	370
Other		500	3130

Manufacture (millions of electric vehicles /year)

Company	Headquarters	2021	2030
Volkswagen	Germany	0,4	1,4
Tesla	USA	1	20
Toyota	Japan	0,1	3,5
Other		5,1	sd

The vast majority of the world's major solar panel manufacturers operate in China. According to the IEA, LONGi and Zhounghuan Solar produce around 50% of the world's solar wafers; Tongwei, Aiko, LONGi, and Trina account for 40% of global cell manufacturing; and LONGi, Trina, Jinko Solar, and JA Solar contribute to 40% of module production. Future investments do not indicate a change in the high concentration of manufacturing, and by 2027 it is expected that 78% of modules, 85% of cells, and 94% of wafers will be manufactured in China.[54]

On the other hand, the battery and electric vehicle industry is experiencing rapid changes with new players entering the market and older players seeking expansion. The portfolio of new projects is dominated by Chinese companies such as CATL and BYD, the US-based Tesla company, and the South Korean LG Energy Solutions (LGES), which together account for 40% of total projects. Although this is not reflected in the tables, it is expected that North America and Europe will increase their electric vehicle assembly capacity from 14% to approximately 24% by 2025. Japan and South Korea will decrease from 8% to 3%, while China will maintain a 70% share. However, for components such as cathode and anode manufacturing for batteries, China's share will exceed 90%.

Now that we have seen the situation in the US, EU, and China, we should also mention plans such as Japan's Green Transformation program and incentive schemes linked to the manufacturing of solar photovoltaics and batteries in India. At the same time, countries in the Global South are attempting to advance their industrialization processes. In the next chapter we will delve into the situation in South America, which, unlike Asia, has had limited integration in productive activities due to neoliberal policies associated with the Washington Consensus, leading to a premature deindustrialization process and the internationalization of domestic markets.[55]

Figure 11.
Production and fabrication capacity for solar panel components and fabrication capacity for maritime and terrestrial wind turbines.
Own work, based on data from the International Energy Agency (2021).

	Solar panel components						Wind power components					
	Wafer		Cells		Modules		Towers		Nacelles		Blades	
	Production (GW)	Capacity (GW)	Production (GW)	Capacity (GW)	Production (GW)	Capacity (GW)	Terrestrial (GW)	Maritime (GW)	Terrestrial (GW)	Maritime (GW)	Terrestrial (GW)	Maritime (GW)
World	**190**	**370**	**190**	**410**	**190**	**460**	**88**	**18**	**100**	**26**	**98**	**25**
China	96%	96%	78%	85%	73%	75%	55%	53%	62%	73%	61%	83%
Europe	0%	1%	1%	1%	2%	3%	16%	41%	13%	26%	18%	12%
North America	0%	0%	1%	1%	5%	2%	11%	0%	10%	0%	10%	0%
Otros Asia-Pacific countries	3%	3%	18%	13%	19%	18%	12%	6%	8%	2%	6%	4%
South and Central America	0%	0%	0%	0%	0%	0%	5%	0%	6%	0%	4%	0%
Africa	0%	0%	0%	0%	0%	1%	1%	0%	0%	0%	0%	0%
Eurasia	0%	0%	0%	0%	1%	1%	0%	0%	0%	0%	0%	0%
Middle East	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Returning to the global perspective, Figure 10 provides an overview of the subordinate status of the Global South in the "green transition" tech industry. If we look at the production of components for solar panels

and wind turbines across different parts of the world[XVII] we can see that regions such as South America, Central America and Africa contribute only small percentages to wind technology, despite being regions that concentrate the necessary minerals for their manufacture. The same applies to electric vehicle production. The involvement of regions like South America, Central America, and Africa is virtually non-existent, even though they have the minerals required for battery manufacturing.

Figure 12.
Production of electric vehicles and battery components.
Own work, based on data from the International Energy Agency (2021).

	Electric vehicles and battery components						
	Cathodes		Anodes		Batteries		Production of electric cars (millions)
	Production (kt)	Capacity (kt)	Production (kt)	Capacity (kt)	Production (GWh)	Capacity (GWh)	
World	**440**	**1400**	**250**	**810**	**340**	**910**	**6,8**
China	77%	68%	92%	87%	66%	75%	54%
Europe	1%	1%	0%	0%	21%	8%	27%
North America	16%	1%	2%	1%	11%	6%	10%
Otros Asia-Pacific countries	5%	26%	7%	13%	2%	10%	7%
South and Central America	0%	0%	0%	0%	0%	0%	0%
Africa	0%	0%	0%	0%	0%	0%	0%
Eurasia	0%	0%	0%	0%	0%	0%	0%
Middle East	0%	0%	0%	0%	0%	0%	0%

To complete this section, we will analyse a reality that often goes unnoticed: proposals for industrialization in Africa. The African continent holds reserves of some of the elements necessary for the "green transition" in significant extraction volumes. More than 50% of the world's cobalt is extracted in Africa, specifically in the Democratic Republic of the Congo; almost 40% of manganese is from Morocco, South Africa, and Ghana; over 30% of graphite is from Mozambique, Gabon, Madagascar,

XVII For more detailed information on the countries making up the regions defined by the International Energy Agency, see: https://www.iea.org/countries

and Ivory Coast; nearly 80% of platinum is from South Africa and Zimbabwe, and 40% of chromium is from South Africa. Despite being a territory with abundant natural resource extraction and mineral reserves for the "green transition", industrialization processes are limited and highly localized. The Africa Mining Vision policy framework created by the African Union[XVIII] in 2009 highlights "the need to improve resource development and governance capacity to incentivise investment in new mines and facilities further down the value chain."[56] In other words, the plan sought to go beyond the purely extractive phase. The reality is that, in terms of industry, three distinct and unequal regions coexist in Africa: North Africa, which contributes 40% of industrial added value, and South Africa, which accounts for 10%, despite representing 15% and 5% of the African population, respectively. In Sub-Saharan Africa, where three-quarters of the continent's population resides, 50% of industrial added value is generated. Most of the 189 industrial parks in Africa are concentrated in East Africa, Egypt, Morocco, Nigeria, and South Africa.[57]

The forecasts from the IEA predict an increase in fertilizer, steel, and cement production, as well as the manufacturing of household appliances, vehicles, and "clean technologies" in the African continent. In this, the Democratic Republic of the Congo and Zambia stand out, as they established a common governance structure in 2022 –the DRC-Zambia Battery Council– to develop the battery value chain. In the early 2010s, companies in Kenya and South Africa were pioneers in solar panel production, but now they have shifted their focus to the distribution of technologies manufactured in China.[58] According to the IEA, the industrialization of Africa depends on greater energy availability. This, according to the IEA, involves expanding the use of fossil gas from recent discoveries—in Mozambique, for example.[59] However, this proposal, in addition to obvious climate impacts, faces an unequal reality on the continent. In countries like the Democratic Republic of the Congo, Uganda, Niger, Burkina Faso, Madagascar, Malawi, Chad, or Liberia, the percentage of the population with access to electricity is less than 30%.[60]

XVIII The African Union was created in 2001 as a political union made up of 55 African states. Its goals are the promotion of unity and solidarity among its members, the elimination of remnants of the colonial period, the coordination of cooperation for development, the protection of sovereignty and the promotion of international cooperation with the framework of the United Nations.

Table 5. Security, industry and the external dimension

> *Europe is a garden. We have built a garden. Everything works. It's the best combination of political freedom, economic prosperity, and social cohesion that the human kind [sic.] has been able to build, these three things together. The rest of the world [...] is not exactly a garden. The rest of the world... Most of the rest of the world is a jungle, and the jungle could invade the garden.*

Josep Borrell, High Representative of the Union for Foreign Affairs and Security Policy. Inaugural speech at the European Diplomatic Academy. October 2022.

Despite Borrell's attempts to justify his statements amid criticism for their colonial and racist undertones,[61] security-focused and bellicose rhetoric are increasingly present and explicit in European institutions after the pandemic, and especially in the wake of the invasion of Ukraine. The EU's fourth list of critical raw materials from September 2020 states that renewable energies and digitization are strategic sectors—but for the first time, it also includes defence and aerospace.[62] The European Raw Materials Alliance, in turn, aims to increase the resilience of the value chain of rare earths for motors and magnets, considering the automotive sector, renewables, defence and aerospace as key industrial ecosystems for the EU.[63] Both cases reveal the reality that raw materials are not only for manufacturing "clean technologies".

Finally, the reference we used to open the introduction of the Net-Zero Industry Act linking technologies, supply, security, and public order marks a clear trend in the new attributions of the "green transition".

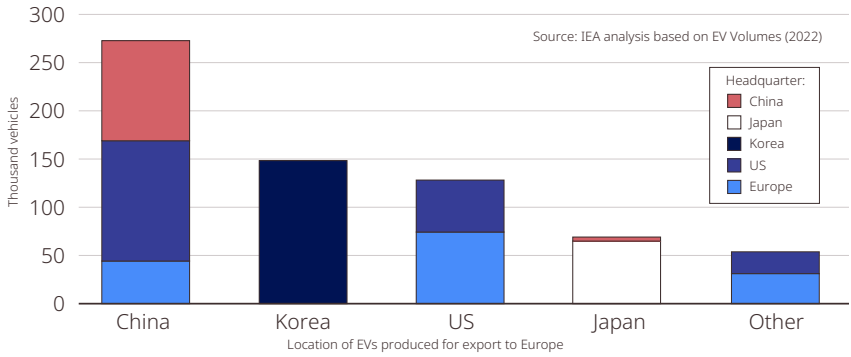
3.4.
The store: the final destination of "clean technology"

In this chapter, we will address the final destination of technology for the "green transition", the countries and groups of countries that generate the highest demand flows, and who is capable of producing this technology at the projected pace.

Just like in mining and manufacturing, China holds a *dominant position*. It accounts for 25% of inter-regional exports of electric vehicles and 80% of lithium-ion batteries, with the majority destined for Europe and other Asian countries. However, China also has strong domestic demand. From 15,000 electric vehicles in 2013, China's electric vehicle fleet grew to 220,000 in 2015 thanks to the introduction of strong tax incentives. The dynamism of its domestic market, cheap labour and looser environmental regulations have attracted many manufacturing brands. In 2021, 20% of electric vehicles sold in China were manufactured by foreign companies. In 2022, total sales reached 6.4 million vehicles.[64]

On the international front, China is Europe's largest trading partner. Almost 25% of batteries used in the production of European electric vehicles come from China, and 40% of European imports of electric cars come from China even though 60% of these are manufactured by international brands such as Tesla.

Figure 13.
European imports of electric vehicles by production company and manufacturer headquarters, 2021. Source: International Energy Agency.



When it comes to solar panels, Chinese hegemony is even more notable. China's 14th five-year plan, published in June 2022, aimed to achieve 33% renewable electricity generation by 2025, mainly through 18% from solar and wind energy. These policies to stimulate demand in the short-term primarily support the domestic industry, which has demonstrated a high capacity for responsiveness. As we mentioned in the previous section, as a result, the announcements of the world's largest-scale photovoltaic manufacturing projects are found in China, led by companies like Canadian Solar, LONGi, Shangji, Tongwei, Q Cells or Jiangxi Jinko.

Figure 14.
Commercial balance of the supply chain of selected regions/countries in 2021.
Source: International Energy Agency

	Lithium-Ion batteries	Electric cars	Fuel cell mobility	Solar panels	Wind turbines	Heat pumps
China	13%	8%	5%	52%	14%	14%
EU	-30%	-27%	-92%	-100%	6%	-25%
USA	-7%	3%	-4%	-65%	-38%	2%
Japan	27%	76%	61%	-92%	-46%	17%
South Korea	-14%	58%	8%	45%	80%	8%

If we expand the analysis to the six technologies reflected in Figure 14, we can better understand the situation of different key countries and regions. For example, the European Union has the highest dependency on imports of heat pumps, solar panels, electric cars, lithium-ion batteries and fuel cell mobility. The only technology in which it is a net exporter is wind power. The United States and Japan are also net importers of technology but have a very different reality in the automotive sector, where they are exporters. The US imports batteries and exports a small portion of its electric vehicle production. In contrast, South Korea and, above all, China are export powers for all technologies, except for batteries in the case of South Korea.

Just as with the analysis of the industry, we must consider the results of "green subsidy" policies, which are represented by the IRA and NGEU

funds. In the case of the NGEU, although there may not be such a clear connection between mines and factories, it does stimulate the European market. The green and digital projects and reforms of the NGEU serve to invigorate the European domestic market, mainly for electric vehicles, renewables, and green hydrogen, to achieve the decarbonization goals of the Union.[65] REPowerEU, the Green Deal Industrial Plan and the Critical Raw Materials Act aim to bridge the gap between mines and factories by ensuring critical materials for reindustrialization and linking this to European energy security. In contrast, the intention of the IRA is clearly to stimulate mines, factories and the market. It offers American end consumers up to $7,000 if they purchase an electric vehicle with materials from the US and manufactured in the US. In the end, this is an unequivocal commitment to domestic mining, domestic manufacturing and the domestic market.

Returning to the territories that receive "clean technologies", it is interesting to examine Bloomberg's annual publication, *Climatescope*, on investment in the energy transition. As with the IEA, this type of analysis by one of the world's most prestigious financial media outlets shapes investor sentiment and, no matter the accuracy of its predictions, can influence the direction of investment flows.

That being said, in 2022 *Climatescope* identified Chile, India, mainland China[XIX], Colombia, and Croatia as the most attractive countries for investment within emerging markets.[66] In the case of Chile, its target of 40% clean electricity generation by 2030 makes it an attractive location for investors. Over the past seven years, Chile has attracted $20.8 billion in renewable energy investments thanks to the standardization of Power Purchase Agreements (PPAs)[XX] and the ability of developers to reach bilateral agreements with large consumers outside the regulated market. According to Bloomberg, India has the largest and most competitive clean energy market globally. Its government set one of the world's most ambitious targets for renewable energy: 500 GW by 2030. By 2021, India had installed 115 GW. Mainland China, on the other hand, had 334 GW of solar and 331 GW of wind power by the end of 2021, by far the largest renewable energy fleet in the world, accounting for 37% of the global total. In 2021, China captured 45% of global renewable energy investment.

On a different scale, Colombia and Croatia are also considered attractive markets by Bloomberg. Although *Climatescope* tries to maintain a certain distance from the analysis of the political context, it praises the policies of

XIX Excludes Hong Kong, Macao and Taiwan.

XX A PPA (Power Purchase Agreement) is a long-term agreement or contract for the purchase and sale of energy between a renewable energy developer and a consumer.

former Colombian President Iván Duque, which attracted $952 million in wind ($678 million) and solar ($274 million) energy investments in 2021, 18 times more than in 2017. Bloomberg also attempts to reassure investors regarding the presidency of Gustavo Petro, stating that he "became Colombia's first centre-left president. While it is early, it seems likely that he will continue to support the development of renewable energy in the country." As for Croatia, the country aims to install 3.5 GW of solar capacity and 1 GW of wind power by 2030.

Regarding the electrified transportation sector, the financial media defines the five most attractive emerging markets for investment as mainland China, India, Romania, Chile, and Taiwan. In China, electric transportation grew by 54% in 2021 and attracted $109 billion in investment. India reached $769 million, significantly lower than China, but it has deployed the Faster Adoption and Manufacturing of Electric Vehicles (FAME) federal plan and has included exceptions, tax deductions and VAT reductions. Romania has the National Energy and Climate Plan (NECP), which estimates a need for 700,000 electric vehicles to achieve its objectives and aims to install 600,000 charging stations by 2030. Through its National Electromobility Strategy, Chile aims to make buses and taxis 100% electric by 2035 and freight transportation electric by 2040. Electric vehicle imports to Chile also benefit from bilateral agreements that exempt or reduce import taxes to less than 1%. Lastly, Taiwan focuses particularly on two and three-wheeled vehicles, with policies that incentivize their electrification.

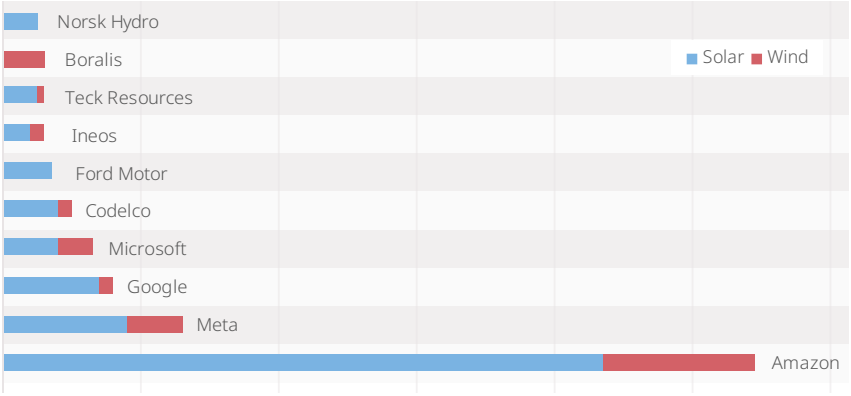
Closing the analysis by Bloomberg, if we look at some national proposals from other countries in the Global South we can see that plans that also involve technological implementation have proliferated since the Paris Agreement. This is the case with Morocco's 2021-2023 Industrial Recovery Plan, which has three pillars: strengthening the Moroccan industrial sector, ensuring energy security, and decarbonizing the industry through the implementation of renewables.[67] In 2019, Rwanda published its National Environmental and Climate Change Policy, which explicitly promotes "green technologies and mobility".[68] Nigeria has its 2020 Economic Sustainability Plan for pandemic recovery, which includes a stimulus of $5.9 billion allocated to ten strategic projects, including $619 million for the installation of solar panels for those not connected to the grid.[69] In Latin America and the Caribbean we find the regional RELAC initiative, created in 2019 with a voluntary agreement among 15 countries in the region to promote renewable energies.[70] In that same year, Cuba considered installing 2,144 MW of renewables, Brazil aimed to increase renewable energy (solar, wind, biomass, and hydroelectric) to 45% by 2030, and Ecuador, Costa Rica, Guatemala, Nicaragua, and El Salvador also had

ambitious goals, but with a focus on hydroelectric power, which causes significant social and environmental conflicts.[71]

Finally, it is worth noting that the private sector has also made significant demands for clean technology—especially major tech companies. These corporations have a dual strategy: they seek to position themselves as actors committed to the "green transition" to gain an advantage over their competitors and, additionally, they want to reduce their energy costs because they are major consumers.

In 2022, Amazon signed PPAs for 10.9 GW of clean energy, followed by Meta with 2.6 GW, Google with 1.6 GW, and Microsoft with 1.3 GW.[72]

Figure 15.
Leading companies in the purchase of clean energy, 2022. Source: BNEF.



In 2022, 56 new companies joined the RE100, a group of large businesses committed to obtaining 100% of their electricity from renewable sources. In total, the 397 RE100 companies have purchased approximately 249 terawatt-hours (TWh) of clean electricity to date but, according to BNEF projections, they will need an additional 290 TWh by 2030 to meet their goals.[73]

Table 6. Forced labour for the global store

The high demand for "clean technologies" also entails accelerating production processes. A study conducted by Sheffield Hallam University in the United Kingdom determined that China subjected Uighurs, a Turkic ethnic group originating from Central and East Asia, to forced labour programs for the manufacturing of solar panels. The Chinese government responded by stating that the workers participated voluntarily as part of a concerted effort to alleviate poverty.[74]

However, this extreme situation is not unique to China. In April 2023, a landmark trial in Lecce, in the Apulia region of Italy, sentenced seven individuals associated with Tecnova SRL to prison terms of up to 18 years for slave labour and extortion involving over 1,000 workers, many of whom were migrants. Tecnova was tasked with constructing the infrastructure for 14 solar parks within a very short time, which led to intensified production. Workers were receiving wages of €2 per hour.[75]

On June 1, 2023, the European Parliament voted in favour of a new due diligence directive aimed at establishing standards for the obligations of large companies regarding both actual and potential adverse impacts on human rights and the environment resulting from their own operations, those of their subsidiaries, and those carried out by their business partners.[76] Although due diligence is intended to be the regulatory instrument used to address such situations, various organizations point out that its limited scope and ambition are insufficient to counterbalance the power of large companies.[77]

4. The situation in the "Lithium Triangle"

While the previous chapter provided an analytical overview of the situation regarding "the mine, the factory, and the store" that determined the role of major international actors, in this section we will delve into a specific territorial reality that is directly affected by the broader global context. We present conversations, meetings, and dialogues from the fieldwork conducted by the ODG team in Chile and Argentina in December 2022, which were our main motivation for undertaking this research.

For thirty days, the ODG team visited lithium mining areas in the Atacama Salt Flat in Antofagasta, Chile, as well as exploration sites for lithium mining in the Maricunga Salt Flat in Chile's Atacama region. They also visited new green hydrogen projects on the coast of the Antofagasta region in Chile, copper extraction and processing in Tierra Amarilla and Copiapó, located in Chile's Atacama region, and lithium exploitation and processing in Argentina's Catamarca Province. The quotes collected in the following pages are the result of these encounters.

4.1.
Different approaches to a single resource

The Andes Mountains are a geological formation that stretches across Latin America from western Venezuela to the island of Tierra del Fuego and is part of the geology of the Pacific's "Ring of Fire".[78] The central and southern Andes traverse the territories of Bolivia, Chile and Argentina, combining volcanoes, glaciers, peaks of over 6,000 meters, wetlands and high-altitude salt flats.

The region where the borders of Bolivia, Chile and Argentina come together features salt flats and high-altitude lagoons such as the Uyuni Salt Flat (Bolivia), the Atacama and Maricunga Salt Flats (Chile), the Hombre Muerto Salt Flat (Argentina), and high-altitude and Puneña lagoons in Catamarca (Argentina). These areas are important sources of minerals, particularly lithium, potassium, and boron. However, these salt flats are also unique ecosystems and natural environments of great complexity and fragility[79] with a high presence of endemic species[80] that are being affected by the extraction of brines that are later used to concentrate lithium and other elements.[81] This zone is known to investors and project financiers as the "Lithium Triangle", a colonialist name that exemplifies the devaluation of the territory, its denaturalization, and its desacralization, reducing everything to a resource from which profit can be extracted, with the added fact that lithium is now presented as a strategic resource for the "green transition".[82]

Lithium, also known as "white gold" by some sectors, [XXI] is the lightest metal on the periodic table and is mainly marketed as lithium carbonate, lithium chloride, and lithium hydroxide. Lithium can conduct heat and has a high electrochemical potential, which is necessary for the operation of electric batteries. As a result, it has become a highly useful metal for producing cathodes for the batteries of electric vehicles, for the storage of renewable energy (especially solar energy), and for batteries in consumer electronic products such as mobile phones or laptops.[83] As a result, its demand has significantly increased recently in the context of the "green transition".

As for its origin, there are various sources of lithium worldwide: oil and geothermal fields, pegmatite rocks, sedimentary rocks, seawater, and

XXI As noted by Slipak and Argento (2021), the term "white gold", as well as "Lithium Triangle" or "the Saudi Arabia of lithium" are examples of naming processes that are part of the territorialization of capital and extractivism in Latin America. For more information, see: http://cec.sociedadeconomiacritica.org/index.php/cec/article/view/277/678

brines[XXII] in salt flats. Of all these sources, the most common forms of lithium extraction are from pegmatite rocks (like in Australia) and brines in salt flats (like in Bolivia, Chile, and Argentina), from which not only lithium is extracted but also other minerals like potassium, boron, sodium, and magnesium.

Before delving into each country's management of lithium as a resource, we will take a detailed look at the extraction volume, reserves, and resources to map and account for the existence of lithium and its possibilities for exploitation.

Figure 16.
Global lithium extraction, reserves and resources in 2021.
Own work, based on data from the US Geological Survey.

Note: The US does not make public the data on lithium extraction.

According to data from the U.S. Geological Survey, in 2021 Australia was the largest lithium producer worldwide (at 47%), followed by Chile (30%), China (15%), and Argentina (5%). If we look at lithium reserves globally, Chile (36%) has the highest reserves, followed by Australia (24%) and Argentina (10%). Considering the current context, it is likely that with the announcement of the National Lithium Strategy by President Boric in April 2023 –as we will later explain– there may be changes in the percentage of reserves held by each country given the legislative flexibility for exploitation in Argentina. If we look at the worldwide lithium resources

XXII Evaporitic rocks are sedimentary rocks that form through the chemical precipitation of salts dissolved in concentrated solutions (brines). The process of the concentration of solutions is typically the result of evaporation in restricted seas or saline lakes. This is a definition from the consolidated teaching innovation group on Geochemistry, Igneous, Metamorphic, and Sedimentary Rocks (GRIMS) at the University of Barcelona. For more information, see: http://www.ub.edu/clasfroc/ca/content/qu%C3%ADmiques

in 2021, Bolivia, Argentina, and Chile collectively held 61%, followed by Australia (9%) and China (8%).

Precisely where lithium resources are concentrated, the so-called progressive governments of Luis Arce in Bolivia, Alberto Fernández in Argentina and Gabriel Boric in Chile coexist, each with distinct strategies and policies regarding the management, extraction, and industrialization of this natural resource.

Although Bolivia is no exception in Latin America in the excessive expansion of primary-extractive projects, the arrival of Evo Morales to the presidency in January 2006 marked a turning point in the conception of primary resources. Lithium was one of the nine strategic projects of the new plurinational state, and since 2008 Bolivia's strategy for industrializing evaporitic resources[XXIII] has involved controlling extraction rates, making choices about the participation levels of certain sectors in decision-making processes, and even exerting state influence over scientific policies.[84] Another notable legislative advancement was Law No. 928, enacted on April 27, 2017, which created the National Strategic Public Company of Bolivian Lithium Deposits (YLB) to replace the National Management of Evaporitic Resources. YLB was tasked with carrying out all exploitation of the salt flats.

Bolivia implemented policies aimed at developing a public project for the comprehensive exploitation of the value chain, and the salt flats were declared state reserves. This means they cannot be exploited by private companies—unlike in Chile and Argentina. A pilot project was launched, and plants for potassium chloride extraction and lithium carbonate processing are being constructed. Specifically, in addition to the industrial plant that is currently under construction in the Uyuni Salt Flat, there is a second industrial plant project in the Coipasa Salt Flat and a proposed exploration project in the Pastos Grandes Salt Flat.[85] Bolivia has not relinquished state control over extraction and technology in this phase, nor has it relinquished ownership of the resource, financing and commercialization, all of which are associated with the exploration and extraction phases.

Nevertheless, the state-owned YLB has the option to seek private partners for lithium transformation or battery production and commercialization.

In January 2023, the Bolivian government signed an agreement with the Chinese consortium CATL Brunp and CMOC (CBC) to promote the technology of direct lithium extraction. This agreement has raised some concerns due to a lack of transparency. The announced shift in lithium

XXIII "Evaporitic resources" refers to materials obtained by evaporating the water present in their composition, such as salt, lithium, magnesium, boric acid or borax, which are dissolved in saline water (brine).

production towards Direct Lithium Extraction (DLE) technology has raised concerns among some researchers and analysts such as Campanini and Córdova[86] due to the absence of industrial plants for DLE that can extract the projected volume, the chemical waste generated by this extraction system, the lack of storage facilities for such waste, and the amount of energy and water required for the process. Furthermore, Fernando Patzy, the Andean Region Manager of the Natural Resource Governance Institute (NRGI), has also expressed concerns about Bolivia continuing to be a provider of raw materials[87] without the technological transfers and innovations needed to participate in the global value chain, meaning it remains subordinate to foreign companies.[88]

Unlike in Argentina and Chile, where the main profits are accumulated by large transnational companies responsible for production, the surplus generated in Bolivia, although primarily associated with exploration and exploitation, remains within the country. Therefore, its nationalist industrial model contrasts with the transnational commercial model of Chile and Argentina. Nevertheless, both models link development to large-scale land exploitation and indiscriminate use of water to engage in global capital flows without necessarily guaranteeing respect for the will and rights of communities.[89]

In Argentina, at the government level, lithium is referred to as a "strategic resource" and special funds have been allocated for research on aspects related to the resource. In addition, the province of Jujuy officially declared lithium strategic in 2011. However, there is currently no national policy in place regarding the scale of extraction. Argentina does not have a specific regulatory framework for lithium or a uniform legislative body for its exploitation due to the federal nature of the country and the overlap of regulations issued by both the state and the provinces.[90] Through Article 124 of the National Constitution, amended in 1994, it is established that "The provinces have the original dominion over the natural resources existing in their territory."[91] This article makes it difficult to establish a unified policy on any resource.[92]

At a secondary level, we find the Mining Code (Law 24,585), which grants the State "original ownership" of mines, establishing its "sovereign and jurisdictional rights", but without allowing it to either explore or dispose of them. The Code, in addition to authorizing private individuals to search for mines, distinguishes between surface ownership and subsurface ownership, with the latter belonging to the discoverers so that public institutions can later grant concessions. This prevents the State from having an impact on the planning of resource exploitation, and even less so the communities that inhabit the territories.[93]

The Argentine provinces grant the exploitation rights of salt flats to private companies (all of which are currently foreign), charging royalties without imposing requirements in terms of production. Meanwhile, companies enjoy a concessional tax regime at the national level.[94] As a result of this, fiscal and environmental legislative competition arises among the provinces of Catamarca, Salta, and Jujuy to present themselves as the "most attractive" to companies so they can collect royalties, which are capped at 3% of the value of minerals at the mine mouth.[XXIV, 95] The only exception is the province of Jujuy, where the resource has been declared strategic.[96]

In recent times, there have also been government initiatives to advance the industrialization of lithium. One example is the call for an energy transition and the approval in 2022 of initiatives such as the strategic project of the National Centre for Lithium Batteries for Renewable Energy Storage and Mobility Solutions (CENBLIT).[97] Additionally, in April 2023, Undersecretary for Development Strategy Verónica Robert also expressed the need to make a series of policy decisions that promote the industrialization of lithium in Argentina, particularly in the country's northern provinces.[98]

In the Republic of Chile, the relationship between the state and lithium dates back much further. In 1976, during the military dictatorship led by General Augusto Pinochet, lithium was declared a substance of nuclear interest in the Organic Law of the Chilean Nuclear Energy Commission (CCHEN), and three years later it acquired strategic status. In 1979, lithium became exclusively state-owned and two categories were established: those with mining rights before 1979 –mostly owned by the state– and those acquired after that date. As a result, CORFO[XXV] owns 55% of the surface area of the Atacama Salt Flat, CODELCO[XXVI] owns 100% of the Pedernales Salt Flat and 18% of the Maricunga Salt Flat, the National Mining Company (ENAMI) owns 4% of the Aguilar Salt Flat, and, finally, three private groups own 25% of the Maricunga Salt Flat.[99] The Mining Code of 1983 was the legal framework that established the subsidiary role of the state and its strong link with private investment, as it declared state ownership over land and deposits but provided conditions and mechanisms

XXIV The "value at the mine mouth" is the price of the freshly extracted and transported mineral prior to any transformation process and after deducting certain costs incurred by the companies in the extraction phase: from crushing and grinding or smelting to some administrative, commercial, and logistical costs (Slipack and Urrutia, 2019).

XXV CORFO is the Corporación de Fomento de la Producción (Corporation for the Promotion of Production) and is presented as an agency of the Chilean government within the Ministry of Economy, Promotion and Tourism. It is responsible for "promoting entrepreneurship, innovation and competitivity and strengthening human capital and technological capacity to contribute to national economic development." For more information, see: https://www.corfo.cl/sites/cpp/homecorfo

XXVI CODELCO is the Corporación Nacional del Cobre (National Copper Corporation) of Chile. It is a state agency dedicated to copper extraction.

for concession and private exploitation.[100] As a result, today these state institutions directly grant special lithium operation contracts (CEOL) or administrative leasing contracts for the extraction of specific quantities to private companies for a certain period.

The Chilean state ensured a certain degree of control over the salt flats by regulating the pace of exploitation. Extraction is private, although legally the door was left open for it to be public. Nevertheless, power concentrated in the central authorities and a particular contract negotiation scheme between the state and capital allow the state to proportionally obtain a greater share of economic benefits than in the Argentine model. However, this does not imply that these benefits are evenly distributed among the population or that there is greater respect for the communities inhabiting the lands.[101] Additionally, since the profits from the mere primary extraction of lithium have limitations, the Chilean state has reacted by attempting to create secure and attractive terms so that large amounts of private capital settle in Chile and produce part of the batteries.

It is worth mentioning that in recent years there has been interest in establishing an industry in the lithium value chain. However, according to Lara and Meripal (2023), Chile has a limited domestic market, an uncertain and uncoordinated regional market, and a limited range of manufacturers specialized in the links of lithium-ion batteries, mostly located either in Asian clusters or close to large markets with high consumption (China, the United States, and Europe).[102]

Nevertheless, on April 20, 2023, President Boric presented the National Lithium Strategy and announced the creation of the 100% state-owned National Lithium Company, which will be responsible for the joint public-private exploitation of the salt flats while respecting the terms of existing contracts.[103] The Lithium and New Technologies Public Institute was also created for innovation and investment in science, technology, and knowledge.[104]

Boric's announcement has generated different reactions, including more than eighty networks, communities, and civil society organizations that signed a Declaration for the National Lithium Strategy (ENL).[105] Although they celebrate the announcement as an opportunity for a greater state presence in production processes and a fairer distribution of revenues obtained from mineral exports, they believe that the ENL was developed without the participation of civil society, academia, territorial organizations and, above all, the people and communities. They also denounce the fact that this situation contrasts with the more than one hundred lobbying meetings the government has held with representatives from lithium mining companies and the electric mobility market. Regarding

this point, it is worth mentioning that lithium extraction in Chile and other countries in the Southern Cone is intended for electric vehicles that are primarily consumed in the European Union, the United States, and China, which also lobby to ensure their access to critical minerals. The signatories of the declaration also call for the establishment of guarantees to prevent the perpetuation of socio-environmental injustices experienced by the people and communities in the Loa River Basin, and they demand compliance with regulations regarding the protection and conservation of ecosystems. Some have warned that the fact that the ENL is based on public-private collaboration leaves the door open to the exploitation of lithium by new companies and the continuation of the degradation of unique ecosystems such as the Andean salt flats.[106]

4.2.
Territorial dynamics in Atacama, Antofagasta and Catamarca

Historical processes of mineral extraction and extractive economic organization have created sacrifice zones where numerous social, environmental, economic, and gender impacts converge. These are geographical regions that have consistently been subjected to environmental damage or a lack of economic investment. Maristella Svampa defines them as "territories that experience the radicalization of a situation of environmental injustice, where the space's production and the logic of dominant territorial control do not consider the satisfaction of the social and economic needs of the population and the environmental sustainability of the territory. It involves a devaluation of other forms of production and ways of life that differ from those of the dominant economy."[107] While past and current extractive activities have already had strong negative effects, it should be noted that these will significantly worsen with the increase in demand generated in the context of the "green transition".

This section focuses on analysing the impacts and effects of lithium extraction in the territories adjacent to the Atacama Salt Flat (Antofagasta region, Chile), Maricunga Salt Flat (Atacama region, Chile), and Tres Quebradas Salt Flat (Catamarca province, Argentina). It also includes some of the impacts related to the extraction of other minerals necessary for the "green transition" in the mining area around Tierra Amarilla (Atacama region, Chile).

Chile's north is characterized by a succession of mountain ranges that border basins occupied by saline lakes called "salt flats". As we mentioned at the beginning of the chapter, the evaporitic rocks accumulated in these salt flats are rich in elements such as sodium, magnesium, potassium, boron, and lithium. The extraction of lithium in the Atacama Salt Flat, which holds the largest lithium reserves in the country, began in 1984, although its presence in brines had already been noted in 1969.[108] Recently, exploitation projects have been approved in the Maricunga Salt Flat, the country's southernmost salt flat, where lithium reserves have also been found—albeit in smaller quantities and concentrations.

Figure 17.
Geographical area of the Andean salt flats of the Southern Cone on the border between Bolivia, Chile and Argentina.

Figure 18.
Atacama Salt Flat (Antofagasta) and Maricunga Salt Flat (Atacama) and Tres Quebradas Salt Flat (Catamarca).

Figure 19.
Surface area of salt flats and lithium reserves and concentration. Own work, based on data from Codelco[109], José Cabello[110] and World Energy Trade.[111]

Salar flat	Surface area (km^2)	Lithium reserves (tons)	Lithium concentration (mg/l)
Atacama	986	10.400.000	1500
Maricunga	145	389.000	1073
Tres Quebradas	289	1.300.000	794

In Argentina, exploitation came later –in the 1990s– but in recent years, exploration of the high-altitude salt flats and lagoons has been encouraged. In this country, lithium is concentrated in the salt flats of the Puna region, the high plateau between Jujuy and San Juan. Extractive activity began in the Hombre Muerto Salt Flat and in recent years has expanded to the provinces of Jujuy, Salta, and Catamarca, whose administrations

formed the Regional Lithium Committee in 2022[112] to promote the sector. The Tres Quebradas project in Catamarca, led by the Chinese company ZiJin, aims to produce 20,000 tons of lithium annually in the coming years.

> *One of many mountain wetlands where water blossoms in the desert.*
>
> Carlos Pizarro, sustainable tourism guide in Copiapó

Unlike other extractive mining systems used for metals like copper or gold, lithium mining through brine extraction does not require drilling into the rock and creating kilometres of underground tunnels. It has a smaller visual impact, and the extraction process itself is not highly polluting in terms of greenhouse gas emissions, since it is based on the evaporation of water. That's why many projects and companies define it as "sustainable mining". However, the impacts, although less identifiable, are still present.

As mentioned before, in the Chilean and Argentinean highlands of the Andes, there are scattered lakes and lagoons resulting from the melting of ice and glaciers during the Pleistocene.[113] These are complex hydrographic basins with endorheic systems. In other words, they are topographically lower than their surroundings and accumulate water –either from nearby rivers or from groundwater– that has no outlet to the sea. If these are combined with an arid climate, high altitude, radiation, and significant evaporation, the dissolved elements and ions in the water become concentrated, giving rise to evaporitic rocks (brines) and salt flats.

However, not all brines contain lithium. Lithium is found when the waters circulate at high temperatures instead of at ambient temperature. The ongoing volcanic activity in the Andes, associated with the formation of the mountain range itself, has allowed for hydrothermalism[XXVII] and, as a result, the presence of rocks containing lithium or other elements such as aluminium.

These salt flats form complex and fragile ecosystems as they host unique microbial communities that are key to the existence of other living beings and are highly sensitive to hydrological changes.[114] These ecosystems harbour a great diversity of algae and small aquatic crustaceans. They are habitats for camelid mammals such as vicuñas and guanacos, small rodents like chinchillas, and numerous bird species including flamingos. In the Maricunga Salt Flat, located in the middle of Nevado Tres Cruces

XXVII Hydrothermalism is the circulation of groundwater at elevated temperatures. It occurs in contexts of volcanic or tectonic activity. Its presence can facilitate the alteration of rocks or sediments, affecting their chemical composition.

National Park, 160 kilometres northeast of the city of Copiapó, 53 species of fauna and flora have been recognized in the areas between the salt flat and Laguna Santa Rosa. Furthermore, this area is home to 17 species of fauna facing conservation issues and is part of a Priority 1 site on the list of Priority Sites for Biological Conservation in Chile.[115]

Figure 20.
Surroundings of the Maricunga Salt Flats. Photograph: ODG team

However, as is the case in similar situations around the globe, this categorization does not prevent it from being home to some of the country's lithium exploration and exploitation projects. Preliminary numbers position this salt flat as the second-best in the world for lithium extraction, following the Atacama Salt Flat.[116] There are already three projects established in the area: the Blanco Project by the Salar Blanco company, the Salar de Maricunga project by the state-owned Codelco company, and the Sales de Maricunga extraction project by Simco Spa (a Taiwanese company) and the Errázuriz Group, a conglomerate of companies owned by Chilean entrepreneur and politician Francisco Javier Errázuriz Talavera. The latter of these initiatives has not received environmental evaluation approval due to a complaint filed by an indigenous Colla community, alleging a lack of compliance with prior, free, and informed consent for indigenous peoples.[XXVIII]

XXVIII Consultation with indigenous peoples is a participation mechanism based on dialogue between the Chilean state and indigenous peoples, as stipulated in International Labour Organization (ILO) Convention 169 concerning Indigenous and Tribal Peoples in Independent Countries. To be approved, extractive projects located in territories inhabited by indigenous peoples must comply with the requirement of informed consultation.

Table 7. The Maricunga Salt Flat and the Colla people

When walking through the Andes, one may soon realise the immeasurable value of the landscape and the scenic and natural richness of that environment. It includes peaks over six thousand meters tall that were once volcanoes, as well as the highest active volcano in the world, Ojos del Salado Volcano, at 6,893 meters. Among the peaks lie high-altitude lagoons such as Laguna Rosa and Laguna Verde. These kilometres and kilometres of horizon are also home to wildlife and unique plant species.

Maricunga is located at an altitude of 3,650 meters; in addition to being home to great natural wealth, within a radius of hundreds of kilometres are dozens of communities of the indigenous Colla people. These communities occupied the provinces of north-western Argentina in the 15th and 16th centuries to travel back and forth between the mountain slopes of Chile and Argentina. With the passing of time and the arrival of capitalism, these nomadic communities lived in the mountains while maintaining their worldview and traditional activities such as agriculture, herding and small-scale mining. Due to their geographical location, they have not been able to remain untouched or distant from the impacts of large-scale mining, which has a major presence in the region. Nonetheless, Colla communities work to preserve the region, resisting and acting as guardians of the mountains.

One of the emerging activities in this region is "sustainable" tourism; in other words, locally controlled tourism that is committed to the territory, the environment, and local communities. This is not only a business, but also a way of raising awareness of the value of the landscape as a means of promoting its conservation and defending it as a shared resource. Large-scale mining represents a threat to this sector as explained by Carlos Pizarro, an activist and sustainable tourism guide from Copiapó: "These projects don't have a long history. There hasn't been much research done on hydrology, and we don't know how they'll behave or react. They can't assure us that they won't cause damage to water basins, wildlife –especially chinchillas and vicuñas– or have an impact on the landscape."

However, those in the tourism sector aren't the only ones defending the region. Activists and environmental advocates work to confront the mining offensive and raise awareness of the dangers it may pose to the natural environment. Eduardo Herrera, a professor and member of the Environmental Defence Collective of Atacama (CODEMAA), fears that, due to their intensive use, the projects could affect the water levels of Laguna Santa Rosa and, consequently, the species that rely on it for food. "The other concern is the impact on the landscape caused by the installation of a large industry in an area with high landscape value, such as the salt flats and their surroundings", he adds.

Figure 21.

Evaporitic pools for lithium extraction in the Maricunga Salt Flat.
Photograph: Carlos Pizarro

Lithium extraction from brine is highly water-intensive. The process involves pumping the brine through boreholes with depths ranging from 30 to 200 meters. This brine is then sent to freshwater pools where the liquid evaporates and salts are concentrated. Once the water has evaporated, lithium is separated through precipitation from other compounds dissolved in the brine such as magnesium, calcium, potassium, and sodium.

According to the International Energy Agency, it is estimated that an average of 330,000 litres of water are needed to produce 1 ton of lithium from brine, whereas for copper or cobalt the water usage is reduced to 30,000 and 60,000 litres per ton, respectively.[117] Other studies estimate that the water requirement for producing one ton of lithium carbonate is as high as 2 million litres.[118] However, beyond the conflicting figures (which, according to water advocacy activists, result from a lack of transparency in corporate management), the impact worsens because the concentration of this mineral occurs in arid areas with high water stress, such as the Atacama Salt Flat.

The Atacama Desert is the area on the planet with the lowest levels of precipitation, with averages that do not exceed 10 litres per m2/year.[119] That is why it is popularly known as “the driest desert in the world”. Despite this reality, data from 2020[120] showed that together, the companies SQM and Albemarle produced a total of 18,000 tons of lithium metal in the Atacama Salt Flat with intensive water consumption.

Figure 22.
The walls in San Pedro de Atacama reflect the struggle against extractivism and the defence of water supplies. Photograph: ODG team

> *It isn't lithium mining, it's water mining.*
>
> Francisco Mondaca, Atacameño Association of Irrigators and Agriculturalists of Toconao and Council of Atacameño Peoples

Francisco Mondaca, of Lickan-Antay or Atacameño origin (an indigenous people who inhabit the Atacama Desert), is a member of the Council of Atacameño Peoples, an organization that brings together some of the Atacameño communities in the area. Mondaca tells us that it is ironic that in a town like Peine –a community located in the southern part of the Atacama Salt Flat which has been completely transformed by mining– its 300 inhabitants can have no more than 4 litres per second, while nearby over 2,000 litres of water per second are being extracted for the mines.

This issue also affects agriculture. In the desert, mainly alfalfa, wheat, and corn are grown, but so are other crops such as carrots, potatoes, beans, and fruits. Due to the climate, traditional irrigation practices are based on flood irrigation. Karen Luza, a Lickan-Antay, a resident of San Pedro de Atacama and a water conservation activist, explains that "while the mines are using litres and litres of water each day, I have to wait a month to be able to irrigate my field using the established irrigation system, which is one of the few community-managed systems."

However, the indigenous population's relationship to water is not only based on its consumption. "We are the water-people, and the relevance and importance of water for subsistence, not only as humans but as a world system, is very unknown to the West. Water has its own world, and in the desert it's easy to see how it works and the brutal intervention it's suffering from due to mining" says Sonia Ramos, a water activist in San Pedro de Atacama. For her and all the water activists who oppose extractive mining, the struggle to defend this common good is not easy due to the great power held by the mining sector and companies.

Table 8. Water management in Chile

Chile is the only country in the world where water ownership is private. Currently, 96.2% of the Chilean population obtains water and sanitation services from private transnational companies, specifically from three major economic groups: the association of the French Suez Group and the Spanish corporation Aigües de Barcelona-AGBAR (43.8%), the Ontario Teachers' Pension Plan from Canada (36.1%), and the Japanese company Marubeni (10.5%).[121]

There is also a portion of community water management, but it is dispersed and there is no data available to quantify it. In San Pedro de Atacama, for example, cultural practices of water use and management have been maintained communally to ensure flood irrigation and sustain agriculture based on traditional crops. Nevertheless, a decrease in water flow in recent times[122] is hindering agriculture.

In Chile, the promulgation of the Political Constitution of 1980, the enactment of the Water Code (1981), and the repeal of the Agrarian Reform Law and the right to water use led to a new relationship involving the "individual ownership" of water. This new relationship sees water as a resource, something separate from the land, and eliminates the idea of water as a shared good. It also allows the holders of water rights to trade in those rights (sell, mortgage, lease, etc.). Chile is one of the most water-stressed countries in the world.[123] This situation, combined with the individual possession of water rights, leads to the purchase and accumulation of rights by large speculators.[124] It is worth mentioning that 1% of consumptive holders of water rights –those that use that water for commercial irrigation or mining– hold about 79% of available water.[125]

Furthermore, the holders of mining concessions have the right to use the water found in their mining operations. This is known as "miner's water", which is defined as the water rights granted solely by law to the owner of a mining concession over the water found in their mining operations, and it is subject to certain requirements and modalities established by law.[126]

> *The state has abandoned us, and social improvements rely on private investment.*
>
> Carlos Ulloa Fuentes, singer of the group Luditas, San Pedro de Atacama

The pattern is similar in extractive areas: towns are dedicated to agriculture, livestock farming, handicrafts and, ultimately, traditional activities. Areas far from major cities have a sense (and visible evidence) of being neglected by the central administration, paving the way for the arrival of large corporations with their promises of social investment in the form of economic compensation and the provision of basic services that guarantee fundamental human rights.

Table 9. Corporate progress and social division

The meaning of the phrase that begins this section can be observed throughout the extractive territory, from the perforated and mined town of Tierra Amarilla (Atacama, Chile) –surrounded by copper, gold, silver, and molybdenum mines– to the Andes Mountains, where indigenous peoples resist in small communities far from urban centres with solar panels, running water and internet installed by companies. In some areas, they even have access to free hospital services provided by mining companies. These corporate practices and strategies are successful to the extent that they occur in marginalized communities without public access to or guarantees of basic services and rights. In the case of Chile, they are facilitated by a deeply neoliberal constitutional framework.

However, although there is a kind of social consensus on the need to cover basic rights, not all communities accept these –in their words– "rewards" or "crumbs" from companies. Some communities remain firm and opposed to mining. These differences generate social division and conflict among individuals, communities, and territories.

In San Pedro de Atacama, the Council of Atacameño Peoples reached an agreement with the Albemarle company whereby the company must offer 3% of its profits to the Council, which in turn distributes them among the constituent communities. However, not all communities accepted this agreement, and that has generated social division among the population.

Figure 23.
Guanacos at the San Francisco Pass in the Andes. Photograph: Carlos Pizarro

Figure 24.
The Canadian mining company Kinross provided Tomasa and Juan of the Pastos Verdes region with satellite internet and solar power. Photograph: ODG team

"The arrival of extractivism and this greenwashing forced certain people who didn't have a position to take a stance, and that generated a kind of social division" explains Carlos Ulloa, a local resident and musician. "In a certain way they modernize and improve people's lives, and that generates a very powerful dependency. Extractivism pours funds everywhere to wash its image or to comply with international agreements", he adds. Ulloa is one of the members of Luditas, a hip-hop group from San Pedro de Atacama that has strong lyrics against mining extractivism and savage capitalism. Their concerts in the area bring together young activists and residents of San Pedro, a town with a wide cultural and tourist offer that receives visitors from all over the world.

These social impacts are not only reflected in social fragmentation, but also in the disappearance of productive networks and traditional activities specific to these territories. Before large-scale mining arrived, Tierra Amarilla, a city of over 12,000 inhabitants in Chile's Atacama region, was a valley of farmers. "There was agriculture here, the river had water, we had trees... Every morning, my grandmother and I would come to the fields of Tierra Amarilla to buy milk. There was a slaughterhouse with fresh meat... All of that disappeared", explains Claudio Alfaro, a teacher and resident of the area. The promise of development that came with mining has not been fulfilled, or at least it seems that way to inhabitants. The salaries of people working directly for the mining company are high compared to other professions like teaching, but "A person who works for the mining company and has a good salary ends up leaving to live elsewhere because the town lacks services, there's no recreation for their children, there are no supermarkets, there are no banks... there's only pollution", he explains.

In the town of Fiambalá, in Argentina's Catamarca province, a similar process is beginning to unfold. The installation of a lithium processing plant by the Chinese company ZiJin has prompted the arrival of hundreds of workers. These individuals come from other parts of the country, but there is also a significant number of Chinese personnel. "There's been a major change to the social fabric, with plenty of new people arriving. But not only that", says Lis Sablé, a resident and member of the Fiambalá Despierta Assembly; "the peace and tranquillity of the place has also changed. Suddenly we have all these trucks and vehicles tearing through town at high speeds."

The case of Fiambalá is notable due to the involvement of the Chinese giant and its lack of transparency. A few weeks before the visit of the ODG team in November 2022, the pilot lithium processing plant located in the centre of town was temporarily closed without any explanation.

The closure coincided with a spate of poisonings among inhabitants of Fiambalá, with symptoms such as fever, vomiting and muscle pain caused by contaminated water, as reported by members of the Agua Pucara Assembly.[127] The information published in the media referred to a series of irregularities related to the handling of chemical waste, but neither the company nor the provincial authorities provided any information about the reasons for the closure.

Figure 25.
Workers' entrance to the ZiJin company facilities on the outskirts of Fiambalá.
Photograph: ODG team

> *There's a direct relationship between extractivism and the patriarchy.*
>
> Natalia Lueje, territorial coordinator of NGO Sustentarse

When discussing social impacts, gender impacts deserve specific mention. Mining is a highly male-dominated sector, and its impacts on women are numerous and diverse. On one hand, the organization of work –which includes geographical mobility, long working hours, living in worker camps, and shift systems– leads to experiences of dislocation and disruption of everyday life.[128] This further deepens the sexual division of labour, relegating women to reproductive and caregiving tasks within the family and reinforcing the figure of the absent father. These conditions

make it very difficult for women to be present in the mining sector as workers. In fact, women currently only represent 8.9% of personnel in mining-related tasks.[129] Their presence increases when we include jobs derived from mining activities, such as the provision of goods (food and beverages, artisanal utensils) or services (debris transportation, cleaning, laundry, entertainment in night venues, and commerce), as well as sex work, all of which have significantly lower wages.[130]

In mining enclaves, towns, and cities that depend on mining activity, androcentric dynamics are generated, expressed in a range of recreational activities related to alcohol consumption, drugs, and sex.[131] These dynamics, in turn, have the potential to accelerate situations of intrafamily male violence and violence against sex workers. In our conversation, Natalia Lueje told us that women's bodies are always more impacted by the effects of dispossession, pollution, and violence. "A very specific case is that when large numbers of workers arrive from work, it leads to problems of street harassment, sex trafficking, and even child prostitution", she asserts.

In the town of Fiambalá, the arrival of hundreds of men to work at the lithium processing plant is already having an impact on the lives of the people there, particularly women. "This used to be a peaceful town. Nowadays, it's full of men who suddenly have high salaries, 4x4s... they roam the streets as if they were the kings of the town", says Julieta Carrizo, a resident and member of the Fiambalá Despierta Assembly. She spoke of the abuse of power against female workers as well as the dangers and difficulties they face in working in the salt flat, an isolated territory in the mountains –kilometres away from any urban centre– with a majority of men. But abuses don't only occur in the mountains: "in town, on Saturdays the nightclub[XXIX] is full of miners who harass, pursue and exert their economic power over women—many of whom are underage", she adds.

Fortunately, in Fiambalá women are also most of the ones taking part in assemblies to raise awareness of the impacts and abuses of mining, denouncing extractivist and colonialist practices, and defending the region, its water and mountains. Fiambalá Despierta is made up of a group of neighbours who have been meeting since 2016 when rumours of the mining company's installation began to circulate. In addition to direct resistance against mining, the defence of traditional activities and the strengthening of community ties are other tools that can curb the advance of the industry. In the province of Catamarca, ACAMPA (Asociación de Campesinos del Abaucán), with the support of nonprofit association

XXIX Called "Boliche" in Argentina

BePe (Bienaventurados los Pobres), promotes agroecological agriculture and the management of shared and communal resources such as collective agricultural infrastructure, community radio and networks for the exchange of seeds, crafts, and local products.

Figura 26.
Neighbours from the Fiambalá Despierta Assembly after an event on lithium extraction. Photograph: ODG team.

4.3.
Green hydrogen and the “green transition” in Chile

> *The impact might not be that visible, but if you work or live at sea you see it on a daily basis.*
>
> Ester Fernández, from the Union of Divers and Seafood Gatherers of La Caleta de los Patos, Tocopilla, Antofagasta, Chile

Figure 27.
The Antofagasta coast will be a focus of green hydrogen projects.
Author: ODG team

As we have already mentioned, the economy of the Antofagasta region –among others– is shaped by mining, which has also been Chile’s main economic activity for decades. This region has access to the sea, which has turned its coastal cities into an energy hub for mining activity, with desalinated seawater being used for the cooling process in the generation of electricity at thermoelectric plants. This energy is transported through several high-voltage power lines that cross the entire region

until reaching large open-pit mines such as Chuquicamata, one of the world's largest copper extraction mines, located near the city of Calama.

On the coast, thermoelectric plants generate electricity by burning coal, although they have been gradually converted to operate as combined-cycle plants using gas as well. This has led to the emission of gases with high sulphur, nitrogen, and particulate content, contributing to acid rain and air pollution.

In the coastal city of Tocopilla, which receives visitors with a "Welcome to Tocopilla, the capital of energy" sign, the complex of thermoelectric plants built decades ago in the port area has polluted the air, land, and water while also increasing serious health problems among its residents—including cancer.[132] Paradoxically, power outages are frequent in the city, and there is a lack of infrastructure and electrical supplies in nearby communities.

Table 10. What is green hydrogen?

Hydrogen is an energy carrier, not a resource. This means that it requires a primary energy source to produce it, and that it enables energy storage—just like a battery. Hydrogen can be produced using both fossil fuels (such as petroleum derivatives, gas, or coal) and renewable sources. When renewable energy is used for its production, it is considered "green hydrogen".

The process used to generate green hydrogen is electrolysis, which involves separating the hydrogen from oxygen in water molecules using an electrical current. The water for this process must be free of impurities, so freshwater or desalinated water is typically used and transported to green hydrogen plants. However, this can generate or exacerbate water stress in the region where green hydrogen projects are implemented since 9,000 litres of water are required to produce just one ton of this energy carrier.[133]

In June 2019, the Chilean government presented the Decarbonization Plan for the Energy Matrix,[134] which aims to close all thermal power plants by 2040—although those in Tocopilla must begin closing in 2024.[xxx] However, the Chilean government also perceives the Decarbonization Plan for the energy matrix as an opportunity to position itself as a protagonist in the "green transition" through the promotion of green hydrogen. In this sense, in November 2020 Chile approved the National Green Hydrogen Strategy[135], which states that the country has an installation potential for renewables of over 1,800 GW, 70 times the current domestic demand. This capacity would be mainly from photovoltaic solar energy.

xxx This plan is included in the Nationally Determined Contribution as part of its commitment to the Paris Agreement to address climate change.

This Green Hydrogen Strategy is meant to be applied in three stages. The first stage focuses on activating the domestic industry and developing the export of this energy vector, while the second and third stages focus on increasing the amount of green hydrogen produced and transporting it to different regions of the planet such as China, Japan, South Korea, the United States, Europe or the rest of Latin America.

Within the first goal mentioned, the activation of domestic industry focuses on decarbonizing mining activity, which is highly dependent on fossil fuels. This is where the National Green Hydrogen Strategy is linked to the Decarbonization Plan for the Energy Matrix. Although the closure of thermal power plants is planned, desalination plants are expected to continue operating to meet the large amount of desalinated water required by the green hydrogen projects in the Antofagasta region in the north of the country. This is one of the regions where most of the green hydrogen projects are concentrated, along with the Magallanes region in the far south of the country.[136]

Figure 28.
Goals for stages 1 and 2 of Chile's National Green Hydrogen Strategy.
Source: Estrategia Nacional del Hidrógeno Verde

Natalia Lueje, territorial coordinator of the Chilean NGO Sustentarse, states that in the case of the Antofagasta region, "the economic model that exists has a rentier perspective of the land; it's mining, extractivist... and within that extractivism there's an extractivist network, which is the production of energy on the coast for large-scale mining. In this context, with all the infrastructure that's been created here in the industrial neighbourhood of Mejillones and also in Tocopilla, new business opportunities are emerging, which in this case is green hydrogen."

Table 11. Mining decarbonization

The decarbonization of mining is one of the priorities of the Chilean government, as mining is the country's main economic activity and is highly dependent on fossil fuels.

With the National Green Hydrogen Strategy, the government aims to create a feedback loop: lithium and copper are extracted to build photovoltaic panels and wind turbines, which generate the electricity needed to produce green hydrogen used as a raw material or a byproduct for mining activities. This strengthens both the mining and energy industries without questioning the extractive model in the Antofagasta region or its local effects such as biodiversity loss, social and environmental impacts, and risks to the livelihoods of indigenous and local communities.

Continuing to use desalination plants in thermoelectric power plants and the possibility of building new ones will deepen the negative impacts generated in recent decades. The salt separated from the water (brine) is discharged back into the sea, leading to an increase in its concentration and causing impacts on the marine environment and its ecosystems such as increased water acidity.[137] In an interview, Raúl Riquelme, a diver and fisherman from the Punta Cuartel peninsula, provided an example from his experience: "I dive –I'm a shellfish diver– and we have our own bio-sensors in the marine environment—especially bivalves: razor clams, mussels... By their texture, size, and appearance, you could tell that something was happening in the bay. That's when you realize something is very wrong."

The most serious violations will occur in the territories and communities of the Chango People, an indigenous people who were recognized by the Chilean authorities in October 2020.[138] Their economy is based on fishing and the collection of algae and molluscs at shallow depths.[139]

"Industry is already coming to our area to stay. Unfortunately, it will impact resources, our way of life, our health... Because it's all polluted, all the shellfish is polluted with that bad water, full of brine, which unfortunately contaminates the entire environment" explains Patricia Paez, president of fishermen in Tocopilla and leader of the Chango Women's Association.

In the smaller coves inhabited by Chango communities with more direct access to the sea, industrial fishing and trawling also pose a threat. Besides the fact that fishing vessels do not comply with the minimum distance from the coast, this type of fishing devastates the biodiversity found in the seabed, which adds to the impact of desalination plants on the coastline. "We see that marine resources like molluscs or fish are no longer abundant or found at the same depths as before. Now we have to go deeper and farther out to find them, and all that comes with risks that we aren't used to", asserts Marcelo Silva, regional councillor of the Chango people, fisherman, and president of the Caleta Hornito Fishermen's Association.

Figure 29.
Organic waste from the desalinization process in the industrial port of the city of Mejillones. Photograph: ODG team

Indigenous communities feel abandoned by local administrations: “Our cove is 17 kilometres from the first of the seven thermoelectric power plants in Mejillones, but ironically we depend on an oil generator with limited operating hours”, says Silva. This has made it more difficult to maintain the cold chain for marketing the products collected the same day or the day before. Silva also points out the poor practices of the large energy companies operating the thermoelectric plants: “They boast about how friendly they are to communities [...] but in practice, it isn’t true.”

5. Alternatives: why and for whom? Accelerating other transitions

After exploring the overall situation and the reality of lithium extraction in the Andean salt flats, we would like to propose some alternatives. This is a difficult task, especially with such complex, structural problems. Therefore, our proposal will focus on four approaches:

- We need to move beyond the technological debate as the centre of the transition: it reduces our scope of thought and generates the global impacts we have seen in previous chapters.
- We need to question the sense of urgency that causes large corporations to be seen as the ones most capable of facing such challenges. Of course, there is a need for acceleration; however, from our point of view, we need a different kind of transition.
- The climate emergency, as well as the biodiversity crisis and resource depletion, are not sudden phenomena; they have political and business actors who have delayed effective action under the belief that structural changes to the economic system would be undesirable and devastating.
- We recognize that, despite the effort and sensitivity required to prepare these alternatives, they are not universal due to the diversity of affected realities and the limitations of who is proposing them: an organization that works from the privileged part of the world.

Therefore, the alternatives we propose –which are by no means an exhaustive list– seek to counter the high hierarchy of technological solutions, the speed of quick fixes, and the lack of global justice in the "green transition".

5.1.
Accelerating demand reduction in the Global North

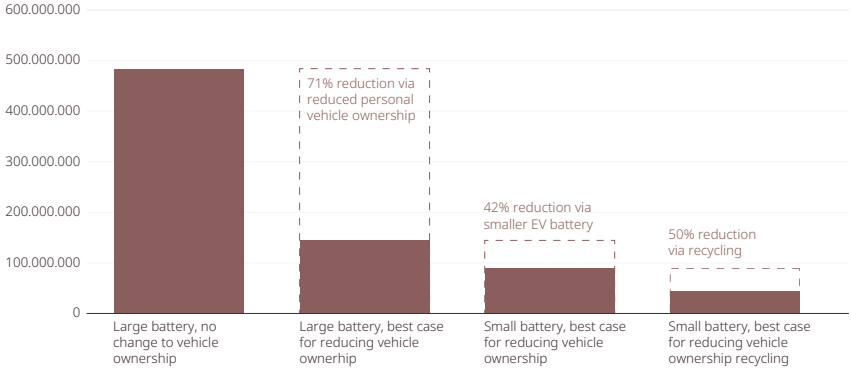
Given the limited questioning of demand, there are numerous academic papers debating the issue of biophysical limits—in other words, whether there are enough materials to undertake a global transition with "clean technologies". In 2019, the Institute for Sustainable Futures at the University of Technology Sydney (Australia) warned in their work "Responsible Minerals Sourcing for Renewable Energy"[140] that "the cumulative demand for renewable energy and storage technologies could exceed current reserves for cobalt, lithium and nickel [...] and demand could reach over 50% of reserves of indium, silver and tellurium" for a 100% renewable transition scenario by 2050.[XXXI]

Also, the Energy, Economy and Dynamic Systems Group (GEEDS) at the University of Valladolid (Spain) published the 2021 article "Análisis de los requerimientos de materiales de la movilidad eléctrica mundial" (Analysis of Material Requirements for Global Electric Mobility) estimating the materials involved in the mobility transition. The study states that "it can be observed that aluminium, copper, cobalt, lithium, manganese and nickel have such a high demand that it would practically deplete their reserves in several scenarios." The authors point out that changes in mobility are needed that go beyond a focus on technology and require a change in habits and socio-economic practices. Therefore, they include a degrowth scenario that entails a significant reduction in transportation usage –60% for land and water transportation and 85% for air transportation– transitioning from heavy vehicles to electric railways with 100% coverage by 2050, and a steady economy that does not pursue continuous economic growth.[141]

Also focused on electric mobility, the recent work "Achieving Zero Emissions with More Mobility and Less Mining" by the think tank Climate and Community Project proposes three policies to contain lithium demand in the United States by 2050: reducing the number of private vehicles, reducing the size of electric vehicle batteries and increasing recycling.

XXXI This study is commissioned by the US NGO Earthworks. It projects a 100% renewable transition to stay below a 1.5 ºC increase in the global average temperature compared to pre-industrial levels. To achieve this, it models future demand considering five scenarios based on the efficiency and recycling of 14 elements: aluminium, cadmium, cobalt, copper, dysprosium, gallium, indium, lithium, manganese, neodymium, nickel, silver, selenium, and tellurium.

Figure 30.
Reducing lithium demand for passenger transport.
Source: Climate and Community Project.

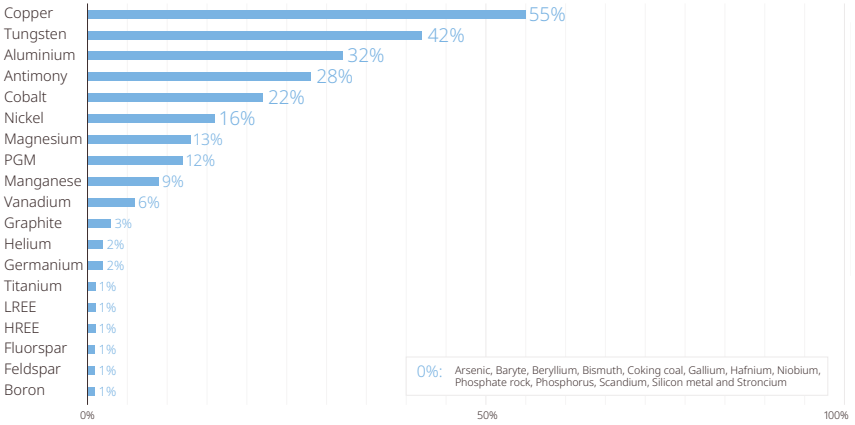


The analysis concludes that the United States can achieve a zero-emission mobility model while limiting the need for primary lithium extraction by more than 85%. The most substantial reduction would come from a shift in mobility ownership, reorganizing the U.S. transportation system through policies and public spending that prioritize public and active transportation and reduce dependence on private cars. According to the study, this should "ensure transit equity, protect ecosystems, respect indigenous rights, and meet the demands of global justice."

Another element aimed at reducing the demand for primary mining is urban or secondary mining, which refers to the recycling of materials that are already part of the technologies we use or have discarded for the manufacturing of new technologies. The European Commission's report on critical raw materials for the European Union in 2023[142] states that the circular economy has increased the use of secondary raw materials, achieving a recovery rate of over 50% for metals such as copper, steel, zinc and platinum. If we look at the percentage of total demand that can be met with secondary materials,[XXXII] only copper has significant numbers at 55%, followed by cobalt at 22% and nickel at 16%. In contrast, for rare earth elements it is only 1%, and for lithium –despite being a critical and strategic material– the percentage is virtually imperceptible.

XXXII The End-of-Life Recycling Input Rate (EoL-RIR) is the percentage of total demand that can be satisfied with primary secondary raw materials.

Figure 31.
Recycling rate of materials with respect to their demand.
Source: European Commission.



In addition to the significant potential for recovery, urban mining also offers considerable reductions in energy consumption ranging from 60% to 95%. Mining copper requires between 5 and 7 times more energy than recycling it. In terms of emissions, while melting recovered copper results in emitting 0.1 tons of CO_2 per ton, the metallurgical processing of copper ore involves emissions of 3 tons of CO_2 per ton, without considering the emissions associated with mining extraction itself and the transportation of concentrates.[143]

Finally, it is important to introduce a limiting element that explicitly incorporates the dimension of global justice. Eduardo Gudynas, a biologist specialising in alternatives to development in Latin America, defines "indispensable extraction" as the extraction of resources necessary to ensure human well-being within ecological limits and resource sufficiency. Therefore, according to Gudynas, extractive activities must be resized, only retaining those that are truly necessary to meet social and environmental conditions with ties to national and regional economic chains.

In summary, accelerating the reduction in demand in the Global North requires:

- Genuine public industrial planning that goes beyond financial stimuli and guarantees for large companies such as the EU Recovery and Resilience Facility, the Green Deal Industrial Plan or the IRA. This planning should be linked to carbon budgets[xxxiii] that determine, taking into account the climate emergency as well as the biodiversity crisis and resource depletion, which industrial sectors need to shrink and be resized, and which should lead the transition. Public industrial planning with carbon budgets should be one of the elements for debate and deliberation in citizen climate assemblies or similar tools for democratizing the transition.

- Specifically addressing the transformation of the private automobile manufacturing sector, as it is a major recipient of public subsidies and a significant consumer of energy and materials.

- Establishing a framework for "indispensable extraction" that sets material limits for an environmentally, socially, and globally just transition. At the same time, it is important to promote an urban or secondary mining industry that recovers minerals for the production of technologies and contributes to a drastic reduction in primary demand.

xxxiii The carbon budget or permissible emissions is the upper limit of CO2eq emissions permissible to stay below a specific global average temperature.

5.2.
Accelerating a just transition to distribute jobs

Closely related to the previous point, accelerating a reduction in demand and embracing the concept of "essential extraction" requires a rethinking of energy- and resource-intensive sectors that also employ a large number of workers.

Before addressing the alternative, it is worth briefly considering two aspects inherent to the "green transition" in terms of employment. First, the proposals put forth by major economic actors position restructuring as an indispensable tool to meet transition goals. This "planning", driven by business leaders[XXXIV] is reflected in the World Economic Forum report "The Future of Jobs 2020". The publication states that 43% of companies are preparing to downsize their workforce through technological integration, 41% plan to outsource specialized work, and, conversely, only 34% expect to increase hiring.[144]

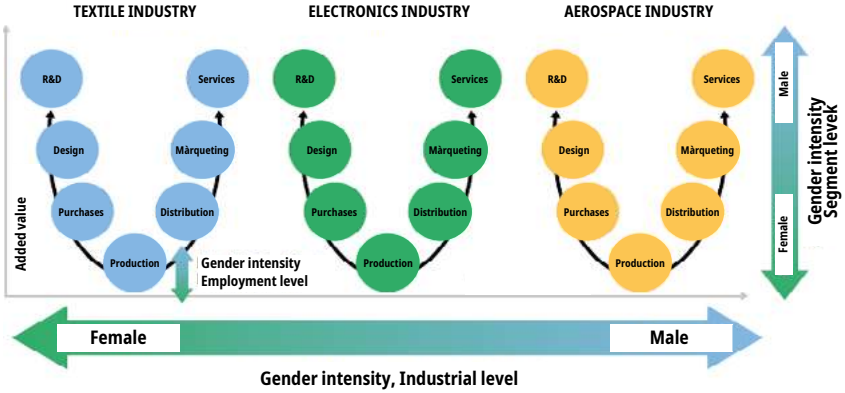
The second relevant aspect is that the sectors and subsectors involved in the "green and digital transition" are highly male-dominated. Large-scale mining, renewable industry, computing, artificial intelligence, software development and others primarily employ men, and their promotion exacerbates the gender division of labour.

In the current configuration of global value chains, three dimensions of the gender participation gap can be distinguished. Firstly, women are concentrated in industries with low sophistication and lower technological intensity (such as the textile industry), while men are concentrated in high-value sectors (such as aerospace). Secondly, women are concentrated in low-value segments within each sector. Lastly, as they are concentrated in less skilled and non-technical sector activities, they face greater difficulties in accessing opportunities for promotion.[145] This triple gap is further accentuated in the Global South due to the geographical distribution of global value chain activities, which are carried out by workers with different skills. Factors such as social class, race, gender identity, and ability should also be taken into account. Furthermore, an element that remains invisible in Figure 32 is the fact that this productive workforce relies on caregiving and household work, which is often unpaid or poorly

XXXIV Martin Sander, director of Ford's electric vehicle division in Europe, noted that the reduction in labour between electric and combustion vehicles during the production phase ranges from 30% to 50%, which will involve restructuring in the sector. Granda, M. (January 24, 2023). "Ford planea recortar 3.200 empleos en Europa y llevarse parte del trabajo a EEUU". *Cinco Días*. https://cincodias.elpais.com/cincodias/2023/01/23/companias/1674491464_305108.html

paid and is mainly performed by women –particularly migrant and racialized women– in household settings. [xxxv]

Figure 32.
Gender participation gaps in global value chains.
Source: Konrad Adenauer Stiftung.



Considering the inherent risks of the "green transition" in terms of labour, gender division, and the international division of labour, it should be noted that the alternative of reconverting and resizing industrial sectors is not without controversy. For example, the European Commission considers that "The automotive industry is crucial for Europe's prosperity. The automotive sector provides direct and indirect jobs to 13.8 million Europeans, representing 6.1% of total EU employment."[146] The same applies in countries where large-scale mining operates. In Argentina, the Ministry of Economy states that mining has been creating jobs for over two years and employs 38,000 workers in the country, with lithium production employing 2,500 employees. However, only 11% of these workers are women.[147]

xxxv In the report by Ecologistas en Acción, *Escenarios de trabajo en la transición ecosocial 2020-2030*, it is estimated that more than half (53%) of the hours worked in Spain in 2017 were carried out outside the scope of the labour market in caregiving activities. For more information, see: https://www.ecologistasenaccion.org/132893/informe-escenarios-de-trabajo-en-la-transicion-ecosocial-2020-2030/

In summary, the acceleration of a just transition to the distribution of work requires:

- Emphasizing the need to resize the industrial apparatus through public industrial planning. This also requires job sharing through a reduction in working hours.[148] This demand is based on the need to reduce polluting production –particularly the production of unnecessary goods and services– and redistribute reproductive tasks primarily performed by women and, especially, migrants.

- Advocating for the construction of a public care system as a cornerstone of productive reorganization and the redefinition of the economy itself. Uruguay has "local care initiatives", and similar projects exist in Chile, Costa Rica, and Colombia. On an institutional level, Uruguay has promoted a National Integrated Care System (SNIC),[149] while Chile proposed it in the rejected constitutional text,[150] and the city of Bogotá has established a District Care System. In any case, institutional initiatives should recognize, support, promote, and respect the autonomy of the community understructure that articulates care to effectively provide substantial improvements to the population.

5.3. Accelerating sources of fair funding

When proposing actions for the transition, sources of funding must also be questioned. When reviewing the rapid policies that have been approved to mitigate and contain the effects of the pandemic and the energy crisis, we see that they have resulted in an increase in public spending combined with modest revenue. The direct effect has been a significant increase in public debt that may have medium-term consequences. Alternative sources of fair funding must therefore be sought, which could be condensed into taxing wealth and cancelling debt (this will be addressed in the following section).[XXXVI]

The work of the Tax Justice Network warns that the world is losing over $483 billion per year because multinational corporations and the super-rich are using tax havens to avoid paying their share. "[Tax evasion] was enough in 2021 to fully vaccinate the global population against Covid-19 three times over[151] [...] 1 in 4 dollars lost to corporate abuse could have been prevented by tax transparency."[XXXVII]

In the European context, in October 2022, the "Council Regulation on an emergency intervention to address high energy prices" was approved.[152] This regulation includes two fiscal policies that aim to limit windfall profits[XXXVIII] and provide financial support to businesses and households to mitigate the effects of electricity prices. The first action proposed a cap on the electricity market price at €180/MWh for specific generators, which would "preserve the profitability of the operators and avoid hindering investments in renewable energies" from December 2022 to June 2023, according to the Council of Europe. The second policy involved a "solidarity tax" that would tax the fossil fuel sector by defining windfall profits based on the method of average income in the 2022 or 2023 fiscal year.[XXXIX] Although each member state designed slightly different measures, a recent study indicated that, if applied to previous years,

XXXVI ODG has produced a series of audiovisual documents and webinars on the "green transition" and fair funding. Available at: https://www.youtube.com/@ODGvideo/videos

XXXVII The Tax Justice Network calculates that corporations evade a total of €312 billion and that these could be recovered with "country by country" reporting, an accountability measure that clearly shows the profits that end up in tax havens.

XXXVIII Windfall profits are benefits that do not arise from direct and planned actions of a company but from unforeseen external changes in market conditions.

XXXIX If average income exceeded 120% of the reference period, defined as the average profit from 2018 to 2021, it would be subject to a tax rate of at least 33%.

they could have generated revenues of over €110 billion.[XL]

These fiscal policies have been implemented in the EU temporarily, but they indicate how windows of opportunity open during times of emergency to address more structural issues. For example, the "solidarity tax" charges at least 33% on windfall profits, which means accepting that 67% of the total goes to corporations. Another significant issue is questioning whether what should be taxed is exceptional profits in exceptional circumstances or simply profits in exceptional circumstances, especially because a climate emergency has been declared by virtually all international institutions.[153] These measures could be considered permanent and necessary to finance the transition more fairly.

Lastly, we want to refer to the principle of common but differentiated responsibilities: greater revenue in the Global North should also mean a greater commitment to the Global South—for example, by fulfilling the obligations established in climate negotiations, such as the transfer of $100 billion from the North to the South.[154]

Responsibilities are not only among countries but also among social classes. The negative impact of French President Emmanuel Macron's direct tax on diesel is well known, as it disproportionately affected vulnerable groups and social collectives.[155] In contrast, it is worth recalling that the strategic and programmatic framework of the Green New Deal –and its European version, the European Green Deal– take historical reference from Franklin Delano Roosevelt's New Deal.[156] Under his administration, The Revenue Act of 1935 was passed, which increased taxes to 75% for incomes over $500,000 per year and reached a peak of 91% between 1954 and 1963.[157]

XL The study is based on the available consolidated data at the time of its completion. Therefore, it calculates that for 2021 the solidarity tax would have resulted in a collection of 4.4 billion euros. Meanwhile, the price cap on electricity is estimated for 2022 and would generate a revenue of 106 billion euros. The same study warns that the final figures may vary due to fluctuation in energy prices during the implementation period. More information can be found at: European Parliament Think Tank (March 29, 2023). *The effectiveness and distributional consequences of excess profit taxes or windfall taxes in light of the Commission's recommendation to Member States*. Available at: https://www.europarl.europa.eu/thinktank/en/document/IPOL_STU(2023)740076

In summary, the acceleration of sources of fair funding requires:

- Permanently taxing corporate profits and higher incomes during extraordinary moments such as the current situation of climate emergency. This revenue should be directed towards mitigating the effects of the transition on vulnerable populations. In the case of the EU, this could mean expanding the scope of the "Just Transition Fund" to include regions and sectors dependent on fossil fuels[XLI] and also encompass sectors affected by public industrial planning based on carbon budgets. The increased revenue should help fulfil international commitments of non-conditional resource transfers to countries in the Global South, free of debts or loans.

XLI The Fund has a global budget of €17.5 billion for the 2021-2027 period, with €7.5 billion from the European budget and €10 billion from NGEU. It provides financial support to states, focusing on regions and sectors dependent on fossil fuels including coal, peat, and oil shale, as well as greenhouse gas-intensive industrial processes.

5.4.
Accelerating global justice: debt and trade investment treaties

The fourth acceleration applies to the situation in the Global South. As the previous three accelerations are intimately connected to this one, we suggest that the dimension of global justice is essential to address global problems and achieve truly just transitions. There is also the challenge of breaking away from the partitioning of the world into the Global North and South, which helps analyse the distinct and devastating issues in the South but may limit our thought when it comes to building alternatives.

To put an end to extractive dependencies generated by massive demand located primarily in the Global North, countries encounter macroeconomic realities that are formidable barriers. On one hand, external debt imposes a burden on national accounts, preventing endogenous and autonomous policies, including post-extractive ones. As an example, Argentina had accumulated a total of $276.694 billion in external debt in the fourth quarter of 2022,[XLII] of which 67% was effectively in dollars and 34% was due for payment in 2023.[158]

The situation that many countries in the Global South find themselves in forces them to generate short-term income, and one of the most common ways to do so is to intensify the extraction of natural resources. At the beginning of 2023, at the World Economic Forum in Davos (Switzerland), Colombian President Gustavo Petro posed the following questions: "Why not exchange, trade, the debt that countries have and the production processes for climate action in such a way that budgetary resources are freed up to undertake adaptation and mitigation? Why not devalue global debt, which also means a change in the power system?"[159]

In the same vein, the Debt x Climate[160] campaign calls for an end to debt oppression. This global initiative by social, environmental, and labour movements from the Global North and South seeks to allow "developing countries to escape the debt maze, questioning the neocolonial agenda of financial oppression from illegitimate debts[XLIII] imposed by the International Monetary Fund, the World Bank, the Paris Club, and the G7." Unlike Petro's proposal, this campaign does not "exchange" debt for actions,

XLII The total is displayed in dollars as the reference currency, but, in reality, the debt is in different currencies.

XLIII An illegitimate debt is a debt that the borrower cannot be required to repay because the loan, security or guarantee, or the terms and conditions attached to that loan, security or guarantee infringed the law (both national and international) or public policy, or because such terms or conditions were grossly unfair, unreasonable, unconscionable or otherwise objectionable. http://www.cadtm.org/Definition-of-il-legitimate-illegal

as it sees a large part of the Global South's debts as illegitimate and calls for them to be cancelled. [XLIV] In fact, the financial external debt of countries in the Global South is infinitely smaller than the ecological debt and climate debt owed by countries in the Global North due to the historical and ongoing exploitation of natural resources, exported negative environmental impacts, and the free use of environmental space to dump their waste.[161] To certify the cancellation of debt, it would be necessary to revive the instrument of citizen debt auditing, an exercise that involves the active participation of citizens and independent associations in verifying that administrative actions, concessions and contracts, loans, and financial operations of the institution have been carried out to benefit the general interest of the population.[162] The key point here is that debt cancellation also uses climate arguments. This contribution allows us to move away from the discourse that limits the climate fight to greenhouse gas accounting, disregarding pre-existing colonial relations and the differential impacts between countries and their extractive dependencies.[163]

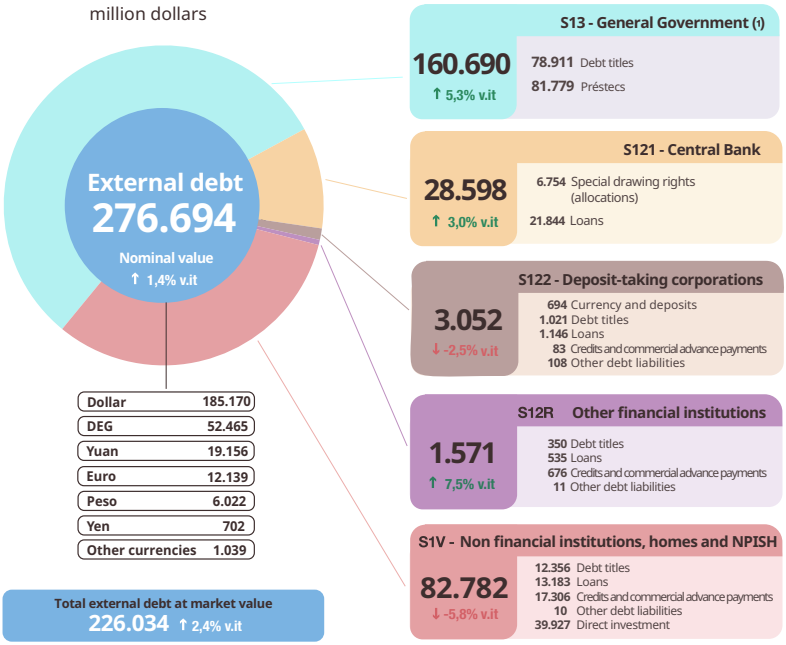
On the other hand, trade and investment agreements (TIAs) also pose a threat to transformative policies. TIAs, in their various forms, offer advantages to large corporations to ensure the accumulation of present and future profits. The systems of protection and the inclusion of ISDS (clauses for the resolution of disputes between investors and states allow investors to bypass national courts and use private arbitration tribunals to file their claims. These tribunals end up deliberating on issues that affect entire communities and countries, endangering the self-determination of indigenous peoples, human rights and ecosystems, and imposing multimillion-dollar sentences on states.[164]

The European Union has 47 trade agreements with 79 partners[XLV] and is in the process of negotiating with Japan, Singapore, Vietnam, Mexico, Chile, Australia, New Zealand, and Mercosur (Argentina, Brazil, Paraguay, and Uruguay).[165] In the case of Chile, on December 9, 2022, negotiations on the EU-Chile Advanced Framework Agreement were concluded, which explicitly states that "The agreement will deepen EU-Chile trade and investment relations", including "greater access to raw materials and clean fuel crucial for the transition to the green economy, such as lithium, copper and hydrogen."[166] The Critical Raw Materials Act also refers to this treaty to ensure material flow.

XLIV The campaign mentions the case of Argentina, which considered the $44 billion granted by the IMF to the government of former President Mauricio Macri as illegitimate debt.

XLV Not including the bilateral agreements that Member States have with third countries.

Figure 33.
Structure of the external debt of the Argentine Republic. Fourth trimester, 2022.
Source: Instituto Nacional de Estadística y Censos de la República Argentina



There is a similar example that shows it is possible to withdraw from treaties. At the end of 2022, France, Spain, Poland, Germany, Luxembourg, Slovenia and the Netherlands announced their plans to withdraw from the Energy Charter Treaty (ECT), stating that the agreement is contrary to their climate goals.[167] While it is true that these countries belong to the Global North, their withdrawal from the ECT sets a precedent that reinforces the need for a comprehensive audit of treaties to suspend claims, withdraw from the International Centre for Settlement of Investment Disputes (ICSID)[XLVI] as Ecuador, Bolivia, and Venezuela have already done, promote national ordinary justice, and refrain from signing new treaties that impede the full exercise of national and popular sovereignty.[168]

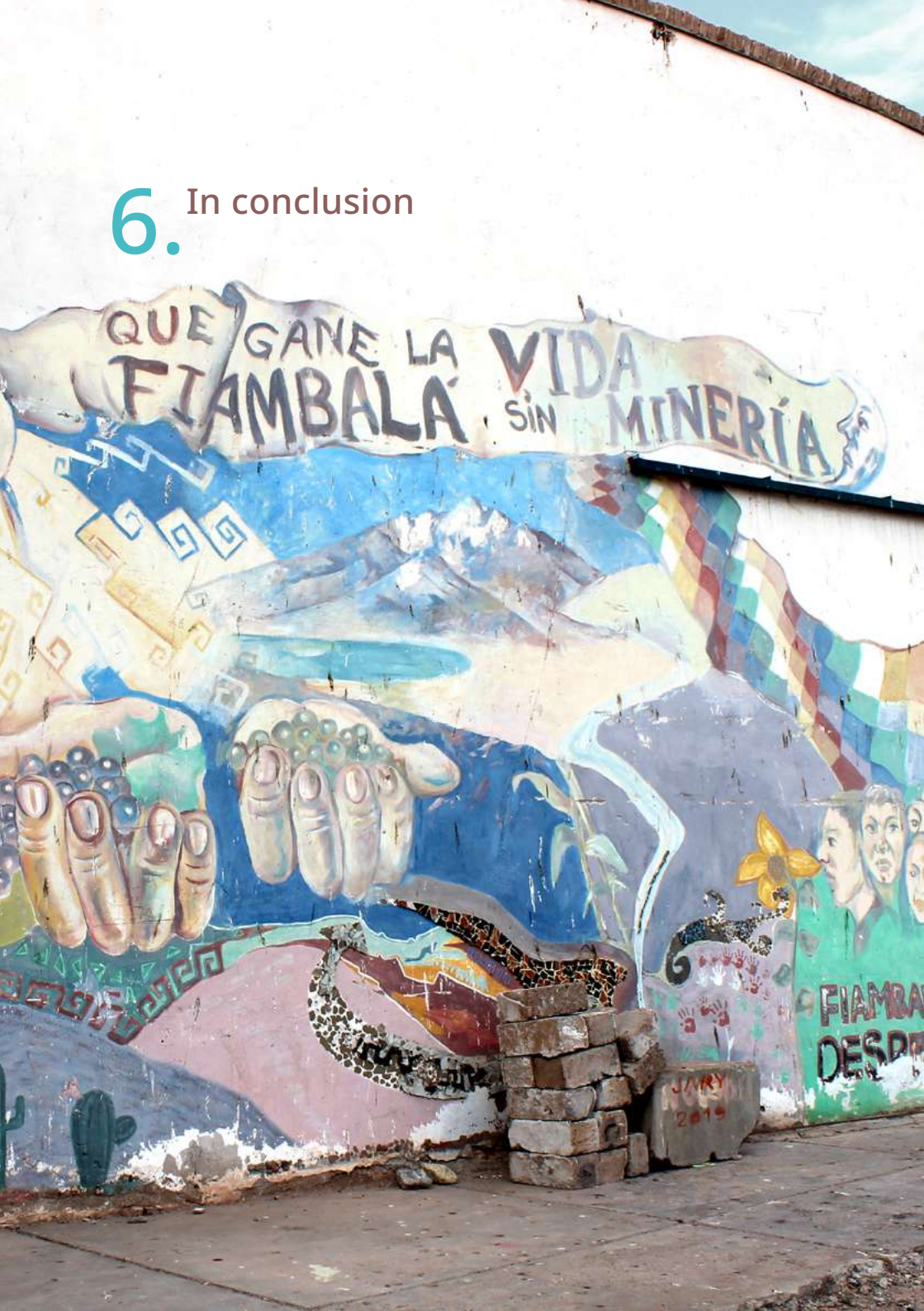
XLVI The International Centre for Settlement of Investment Disputes (ICSID) is an institution of the World Bank based in Washington dedicated to the settlement of disputes related to international investments.

In summary, the acceleration of global justice requires:

- Establishing processes for the cancellation of illegitimate debt in the Global South through citizen debt audits considering ecological, climate, and historical debt. Public over-indebtedness also affects the Global North, and the same audit exercise should apply.

- Conducting a comprehensive audit of trade and investment treaties to suspend their claims, withdraw from them, and refrain from signing new treaties, as they contribute to a global architecture of impunity for economic power.

6. In conclusion



At the beginning of this document, we proposed a critical analysis of the mine, the factory, and the store; in other words, the actors involved in mineral extraction, the manufacturing of "clean technologies", and the markets where there is a demand as a result of the so-called "green transition". We also started with an assertion that has been consolidated and accelerated due to the pandemic and the energy crisis: technology is at the centre of the transition, making it a key element at the commercial, geopolitical, and –due to the war in Ukraine– security levels.

This rushed impulse, justified first by the climate emergency and now by the war, generates an unprecedented demand for the extraction of critical minerals. Moreover, mining requires large amounts of petroleum byproducts. That's why we say that minerals for the "green transition" add a new layer of complexity to the international context but do not replace the map of fossil fuels. As a result, the territories that house these minerals become strategic. It is no coincidence that the so-called "Lithium Triangle" is better known than the Andean salt flats, the Colla and Lickan-Antay communities, or the vicuñas and guanacos. It is also not coincidental that Bayan Obo, Inner Mongolia (China), is named as "rare earth capital". Renaming territories allows us to assign them new functions and responsibilities that will be managed by the corporations leading critical mineral projects: Glencore, BHP, China Molybdenum, Tianqi Lithium, Jinchuan Group, Galaxy Resources, SQM, Zijin, or Albemarle.

However, controlling the mine is not enough. Industrial capacity is required for corporations like Canadian Solar, LONGi, Shangii, Jiangxi Jinko, CATL, BYD or Tesla, and many others to manufacture "clean technologies". In the Global North, the United States and the European Union are competing to control this industry and have invested large amounts of public money through European recovery funds like NGEU or the American Inflation Reduction Act. Both instruments create incentives for the industry to be attracted to national and green initiatives, to relocate and contribute to the transition—in essence, to what is "Made in the USA" or "Made in the EU". This is the extent of industrial planning by these two actors to confront China, which started two decades ago. Since 2001, China's five-year plans have pursued a strategy to lead the "green transition", and they have succeeded: China has abundant reserves of critical minerals, controls a large part of the refining process, and is the largest manufacturer of "clean technologies". Currently, "Made in China" is far ahead of its competitors.

This places different actors in significantly different positions regarding global supply and value chains: *dominant*, *advantaged*, *importing*, or *subordinate*—represented by China, the US, the EU and the Global South, re-

spectively. Chinese technological hegemony in Europe is so pronounced that comparisons with Russian energy dependence and its consequences are ongoing.

We must also highlight how some countries in the Global South are attempting to move away from their subordinate position through industrialization so they can advance in the value chain of technologies. Bolivia is probably the most advanced in the industrialization of lithium, but the results have been fruitless. Chile and Argentina have similar plans, as do the Democratic Republic of the Congo and Zambia, but they face macroeconomic limitations such as external debt or trade and investment treaties, in addition to internal crises, progressive governments without a clear willingness to abandon extractive practices or reactionary governments in denial.

In the retail stage, markets, and the sale of technology, we see the dynamism of the Chinese domestic market, with a demand that covers part of its production and numerous European and US companies operating from Beijing. 60% of the cars imported by Europe from China are manufactured by international brands like Tesla. On a much smaller scale, Chile appears as an emerging market due to its renewable energy commitment, electrification of mobility, and green hydrogen for the decarbonization of mining and export, and is at the head of its class in Latin America and the Global South.

Our fieldwork has only confirmed this role. In Chile, a mining tradition, sacrifice zones like Antofagasta, historical copper extraction, the concentration of lithium in the Andean salt flats and the aforementioned renewable expansion policies and green hydrogen converge. The communities inhabiting the territories of extraction near the Atacama or Maricunga salt flats, as well as the fishing communities of Mejillones and Tocopilla, experience a situation marked by struggle, resistance, resignation, division, conflict, or simply waiting for a job or compensation that can help address their unmet basic needs. In Catamarca (Argentina), lithium fever is disrupting the reality of the town of Fiambalá. The arrival of hundreds of men to work at the Chinese Zijin company's lithium processing plant has had an impact on the life of the town, particularly for women. However, the concern that unites communities on both sides of the Andes is water. "Lithium mining is water mining", commented a concerned Lickan-Antay comrade. Although water is life and sustenance, especially in a territory with high water stress, it is primarily allocated to large-scale mining.

All these negative impacts, which will be exacerbated by a massive demand for minerals, constitute the territorialized reality of the "green transition". Therefore, we have explored alternatives to move away from

technological prioritization and the sense of urgency that skips over the complex and structural questioning of the current situation. We must respond to the situation with other drivers: demand reduction, just transition, fair financing, and global justice. Demand reduction in the Global North implies accepting limits and "essential extraction". It means reconsidering key industrial sectors such as the automotive industry under a change in the regime of private ownership to public, collective, or community ownership. It is through this transformation that we can talk about the promotion of urban mining or secondary extraction, which means recovering and recycling minerals from technologies at the end of their life cycle, not as an "end-of-pipe" solution but as a true post-extractive activity in the Global North.

However, this sectoral reduction proposal must be part of a public industrial plan that goes beyond financial stimuli and guarantees for private companies (such as the NGEU funds, the Green Deal Industrial Plan, or the IRA) and is linked to carbon budgets that determine which sectors should shrink and resize and which should lead the transition. To achieve this, we need to distribute productive and reproductive work by reducing working hours and promoting public care systems that shift the focus of the transition. We also need to expand the scope of just transition funds to ensure that workers are not negatively affected. In this context, fair funding plays a fundamental role, fed by fair taxation that shifts the burden of the transition to higher incomes and the profits of large corporations.

Finally, we would like to conclude this text with the theme that motivated it: the absence of a perspective of global justice in the "green transition". Our proposals underline the challenge of breaking free from a division of the world that helps analyse the problems –which are certainly differentiated and heartbreaking in the South– but may limit our ability to think about alternative constructions in the face of a global problem. In any case, we observe with concern that the perspective of global justice is absent from the "green transition" because it requires taking into account the current phase of exploitation, historical responsibilities, and the imposition of languages of valuation that subordinate Southern epistemologies. Far from presenting a complete proposal, we have focused on the dimension of external debt, which should be cancelled as illegitimate, unsustainable, and trivial compared to ecological debt. We have also warned that trade and investment agreements should be suspended to promote greater autonomy for national and popular sovereignties.

Lastly, even though they may have a lesser presence in this text due to their tone, nature, and scope, we would not like to conclude this publica-

tion without acknowledging that a true transition must have an autonomous path beyond institutional action, one that it is built on the local and community level. Disciplines like ecofeminism, which advocates for recognizing that we are interdependent and eco-dependent beings, are the foundation of a transition that entails an ecological and depatriarchalized economic reorganization. What we need is Degrowth, with a capital "D", to situate ourselves within planetary limits under the principle of common but differentiated responsibilities and to redefine the meaning of our relationships. It is essential that the transition disengages from an extractivism that reproduces a colonial and racist model –a new cycle of oppression for the peoples of the Global South– and that the diversity that inhabits our planet is respected, cared for, and celebrated.

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