



Australia, Chile and Finland's energy transition minerals policy: trends and implications

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ABSTRACT

Global decarbonisation has increased energy transition mineral (ETM) demand for renewable energy technologies. Governments are devising policies on ETM value chains to increase their mineral reserves, maximise revenues and economic benefits, develop domestic expertise and value adding, and strengthen their international alliances. In parallel, they need to address the environmental, social and governance risks, legacies, and cumulative impacts of industrial expansion. Focusing on Australia, Chile, and Finland, we examine where these OECD countries focus their policies, interrogating whether they balance supply security and value chain opportunities, with social and environmental governance. We find a strong policy emphasis on industrial development and rapid growth. While environmental governance receives some attention, the governance of social impacts and issues is less developed. Historical mining industry emphasis shaped influential mining-focused “policy communities” in Australia and Chile, whereas Finland's policy community adopted a broader industrial ecosystems approach. Critical engagement policy networks contribute to broadening policy focus to encompass social and environmental governance, and Indigenous rights through innovations in policy. Examples include Chile's notion of industrial and environmental *knowledge as a public good*, and Finland's increased municipality powers. If implemented, including via Indigenous Free, Prior and Informed Consent, the policy innovations that critical engagement policy networks advance have the potential to help balance industrial growth and social and environmental priorities.

1. Introduction

The global shift to a less carbon-intensive energy system has increased adoption of renewable energy technologies. These current technologies are resource intensive, and their uptake drives demand for energy transition minerals (ETMs). ETMs include minerals classified as “critical” due to supply constraints, such as lithium, manganese, nickel, cobalt, or rare earth elements (REE), but also other essential minerals with less constrained supply including copper or aluminium (Sturman et al., 2022). Projections see global mineral demand growing two to three and a half times by 2030, with solar photovoltaic (PV) and electric vehicles (EV) as major drivers (IEA, 2023a, 2023b). ETM supply chains

remain highly concentrated, despite concerns that diversification is necessary (IEA, 2023a). Examples of supply chain concentration include the cases of cobalt (mining concentration in the Democratic Republic of Congo (DRC) and processing in China) and rare earth elements (mining and downstream value adding concentration in China) (IEA, 2024).

Global demand increases mineral exploration and extraction in mineral endowed regions – including regions burdened by mining legacies, or with no prior mining activity, increasing socio-environmental pressures and disruptions, often in jurisdictions with limited social and environmental governance (Lebre et al., 2020; Svobodova et al., 2022). As nations and industry seek to secure and diversify mineral supplies, the mining frontier expands into the territories of Indigenous¹

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¹ Other than when referring to specific instances of Australian policy that use the term First Nations, we use the broader term Indigenous People(s).

and land-connected peoples, and in jurisdictions that lack protections for community consultation and human rights (Owen et al., 2023a,b).

A multifaceted ETM policy-making task is balancing geopolitical and industrial development priorities, with social and environmental governance for industrial expansion. Governmental policy and geopolitical debates on ETMs use a security focused language that mobilises ‘national interest’ and ‘access to resources’ as priorities on the back of industrial development opportunities and geopolitical contentions. Aware of the value adding opportunities downstream, ETM endowed nations seek to expand their downstream industrial ecosystems to increase their share in the economic benefits springing from renewable energy and electrification technology demand. Where possible, nations seek to secure mineral supplies from their geopolitical allies (friend-shoring), if not within their borders (re-shoring) (Vivoda, 2023; Riofrancos, 2023). Value chain concentration together with inventory management practices and strategic investment, notably from China (Wischer, 2024), drive concerns about the possible effects of country-based dependencies and dominance, potential conflicts, or major disrupting events (Nygaard, 2022; IEA, 2024). The risks are tangible amid destruction of markets, armed conflicts, polarisation, and the supply chain disruptions that followed the COVID-19 pandemic (IEA, 2022; Mariev and Islam, 2025).

The focus on security emphasises re-shoring, self-sufficiency and fast-tracking and can deviate attention from environmental and social governance and outcomes, instead equating supply chain security with sustainability (Riofrancos, 2023), while largely overlooking social impacts and resistance. The fast-tracking trend visible in current policy discourse has raised concerns (Owen et al., 2023). Adding to this are the unequal distribution of benefits and impacts in ETM and clean technology value chains (Sovacool et al., 2020; Jerez et al., 2021) and the trade-offs between social and environmental impact dimensions. The security focus overlooks domestic resistance to extraction or industrial development and whether re-shoring, which increases security of supply, effectively results in better environmental and social outcomes.

The security emphasis distracts from social and environmental outcomes in producing countries and motivates us to concentrate on the policy coverage of social and environmental dimensions of ETM value chains at the country level. Focusing on Australia, Chile and Finland, this paper identifies differences in the policy focus of three OECD countries with diverse government systems and roles in the ETMs value chain. In the context of this study the term “social and environmental governance” encompasses the regulatory and governance arrangements and actions each country implements to address impacts, transformations and their repercussions on people and the environment.²

We analyse whether the ETM value chain policies of the countries studied balance supply, security, sovereignty and value chain opportunities with social and environmental governance for industrial expansion. We also examine who seeks to influence policy-making, who is included, and what “policy networks” are influential in each country. We understand ETM value chains as incorporating all activities from the extraction of minerals to their processing and conversion into components and devices with practical applications in low emissions energy technologies. ETM value chains include, for example, a lithium brine extraction site, battery chemicals processing facilities, or battery component factories. They are not limited to the battery stream of the value chain and can equally include REE and their incorporation into permanent magnet manufacturing.

The analysis in this paper is organised as follows. After outlining the methodology for the study in section two, section three presents the results of the studies undertaken. Starting with the composition of the ETM value chains, we move into analysing their environmental and

social dimensions, the ETMs value chains policy focus, the policy actors and networks involved in ETMs policy, and a policy critique. In section four, discussion, we integrate the findings and later finalise with concluding remarks.

2. Methodology

We apply a country case study approach to explore whether three ETM-endowed OECD nations balance industrial development and geopolitical priorities, with social and environmental governance, as part of their ETM sector policies. In the country case studies, we apply a case study questionnaire to collect and systematize data, and later analyse the data inductively. Informing the case study questionnaire design was an understanding of policy-making that considers actors’ formal or informal involvement and their agency, as well as the influence of policy-making traditions. Below we outline the criteria for case study selection, the case study questionnaire, and key concepts informing the analysis.

2.1. Case study selection

In selecting the case studies, we sought countries sharing a similar level of governance and institutions, ETM mineral abundance, and facing simultaneously i) the call from international allies and industry to expand their ETM sector to enable value chain diversification away from China, and ii) domestic expectations to ensure acceptable social and environmental standards, benefits and rights protections. This led us to select OECD countries with significant mineral endowments and active stakeholder debate on ETM value chains. To ensure diversity among the case studies we selected countries with different roles in the ETMs value chains, and diverse government and governance systems. OECD membership indicates that countries are recognized as having a baseline level of governance and institutions. The cases include Australia and Chile, both major minerals producers and exporters; and Finland, whose mineral endowment is significant in the context of the European Union (EU). Australia accounts for close to half of the global lithium production. Chile is the second largest lithium producer and the world's top copper exporter. Finland is important to the EU's re-shoring plans as it is the only EU member with reserves covering most battery minerals and is seen as a serious contender for foreign direct investment (FDI) in the ETM sector. Finland has grown its downstream value adding ecosystem in the battery sector, while Chile and Australia have recently signalled aspirations in that direction.

The case study countries include different government systems and ETM governance arrangements. Chile is a unitary state with both private sector and government participation in the ETMs value chain, a commodity-by-commodity policy approach to key ETMs, notably lithium and copper, and an array of announced policy measures aimed at increasing state participation and localising benefits. Copper industry growth drove what is now termed the “Chilean miracle” of economic development, resulting in relative poverty reduction. Australia is a federation with an ETM sector entirely in private hands. It has a complex array of Federal and State governance arrangements and is developing policy to increase its downstream ETM value chain participation. Finland is a Nordic welfare state and a member of the EU with an established industrial sector. Finland has historically emphasized innovation and technological development, and the state has recently taken an active role in developing the entire value chain for ETMs related to battery production. These cases allow us to analyse and contrast policy-making in diverse contexts.

2.2. Case study questionnaire

We adopted an exploratory approach to the case studies guided through a set of agreed questions, henceforth the ‘case study questionnaire’. Questions in the case study questionnaire served to characterise

² We refrain from using the ‘ESG’ banner when referring to social and environmental impacts or governance because of the multiple definitions of the term which can lead to confusion.

the ETM value chains and their social and environmental dimensions, collect information on the ETM policy focus, actors and networks, and then contrast these results to formulate a critique of ETM policy for each country. Fig. 1 outlines the components of the case study questionnaire.

The case study questionnaire standardised data collection across the case studies and covered questions on ETM value chain composition, and its social and environmental dimensions; ETM value chain policy content, tools, evolution, policy actors and networks; and a critique of the ETM value chain policy balance. The latter refers to the main question of the paper: whether amid the global push to expand ETM value chains outside China, policies are giving adequate coverage to questions of social and environmental governance for industrial expansion. Fig. 2 outlines the contents of the Case Study Questionnaire.

To address these questions, we collected data through document review, media review, and archival research spanning both the academic and practitioner literature. For consistent analysis, we developed a guide outlining the context for each section of the questionnaire, possible information sources, and examples. Researchers are based in the case study countries where expert community membership and participation in a range of research projects offered participant observation opportunities in each jurisdiction. The team has members with command of the official language in each of the countries studied.

2.3. Policy networks

While our primary analysis centres on formal government policies, our understanding of "policy" is broader. It considers the "policy networks" and actors influencing government policy directions, and the policy styles or patterns that set the context. Our country policy comparisons focus on the links and interdependence between government and other societal actors with the aim of understanding policy-making processes and outcomes.

A policy network comprises formal and informal links between government and other actors interested in policy-making and implementation, where policy results from interactions between these interdependent actors (Rhodes, 2006). Policy actors can form coalitions to influence policy directions regardless of whether they are part of government institutions or have formal policy-making roles (Haelg et al., 2020; Jenkins-Smith et al., 2014). Aside from policy-makers, policy actors include civil society organisations, industry associations, Indigenous and land-connected peoples, and research and development organisations, among others. Policy actors can influence policy through, for example, voluntary standards, media campaigns, protests, studies, supporting technological and industrial developments, lobby efforts, citizens' participation and oversight, or informal interactions as part of the expert and interest communities they represent. While acknowledging the agency of policy actors, we recognise that jurisdictions and national industrial structures can develop policy-making traditions, or policy styles, following historical patterns that influence the form of deliberation and politics, and the actors and ideas included (Howlett and Tosun, 2018). These concepts serve as reference points to maintain awareness of the breadth of what policy entails, they are not applied deductively.

We distinguish two main categories of policy network: policy communities and issue networks (Smith, 1993; Sairinen, 2000). A *policy community* limits the number of participants, restricts access via membership of key institutions, and has a high degree of consensus on policy aims, on what passes as accepted knowledge, and on the values underpinning the community (Laffin, 1986, p. 12; cf. Smith, 1993, p. 62). In an *issue network*, participants share an interest in a policy area, yet network membership is open, large and evolving. Consensus is unlikely and conflicts emerge over responsibility, participation and possible actions. Issue networks develop easily in new policy areas where no groups have established dominance or where there are no established institutions to enable exclusion, with members often resorting to overt lobbying strategies given their lack of formal roles or influence.

3. Results

This section outlines the results of the case study questionnaire. Each sub-section addresses a component of the questionnaire for the three countries in sequence, before moving onto the next questionnaire component. The Results section structure is as follows: 3.1 Composition of the ETM value chain, 3.2 Environmental and social dimensions of the ETM value chain, 3.3 Policy focus for ETM value chains, 3.4 Policy actors and networks, 3.5 Policy critique. Each section builds on previous ones, so that 3.5. Policy critique can examine whether, amid pressures to accelerate industrial growth, policies are giving adequate coverage to questions of social and environmental governance for industrial expansion.

3.1. Composition of the ETM value chain

The three countries exhibit different value chain step and commodity focus. Finland participates comprehensively along value chains and minerals. Australia and Chile remain specialised upstream, are world leaders in key commodity extraction and intend to expand their processing capacity. Below we outline the composition of each country ETM value chain. We distinguish the following value chain components i) upstream (exploration, mining/extraction), ii) mid-stream (intermediate processing and manufacturing), iii) downstream (final product manufacturing, assembly) and iv) recycling and circularity.³ Figs. 3–5 outline the ETMs value chains of each country, while sections 3.1.1 to 3.1.3 provide more detail.

3.1.1. Australia

With a well-established mining track-record, albeit primarily in bulk commodities (coal, iron ore and bauxite) and gold, Australia is rapidly developing its ETM sector. Upstream, mineral exports (AUD 360 billion) account for more than half of Australian exports. ETM commodities include lithium (5.2% of export value and a major growth category in 2024–25), copper (3.4%), zinc (1.3%), and newly emerging areas of graphite and cobalt. To date, Australia has limited participation in the downstream ETM value chain, although government policy under the Critical Minerals Strategy 2023–2030 (Australian Government, Ministry for Resources, 2023) seeks to grow midstream and downstream opportunities including the refining and processing of raw minerals, and the manufacture of goods requiring critical minerals, including EV batteries and solar technologies.

Capitalising on this mineral endowment, several mineral processing projects are underway. Australia has seven operating lithium mines, making it the top global lithium producer. Expanding into midstream and downstream value-chain sectors, it is expected that the first lithium hydroxide for battery cathode precursors will be produced in mid-2025, with more refineries in the pipeline. Several new mines for other critical minerals have been awarded federal government major project status and are in development. Of note is the Wingellina Nickel-Cobalt (NiCo) project under construction and set to develop one of the world's largest NiCo deposits. The Siviour Battery Anode Materials Project in South Australia will combine mining one of the world's largest graphite deposits and refining the raw material into graphite to export for battery and electric vehicle manufacturing (Invest South Australia, n.d.). Fig. 6 displays selected ETM value chains components in Australia.

There are strong R&D capabilities in Australia, including a strong Mining Equipment, Technology and Services (METS) sector and world-class mining and engineering schools at highly ranked universities and scientific research organisations (Guo and You, 2023). Access to quality infrastructure such as ports and railroads benefits the mining industry.

³ There is no globally standardised typology of energy transition minerals value chains. There are variations across commodities, countries and technologies.

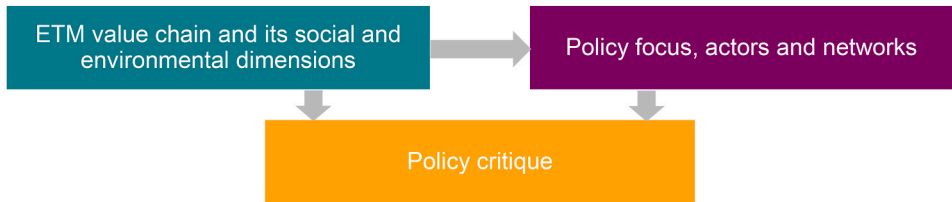


Fig. 1. Components of the case study questionnaire.

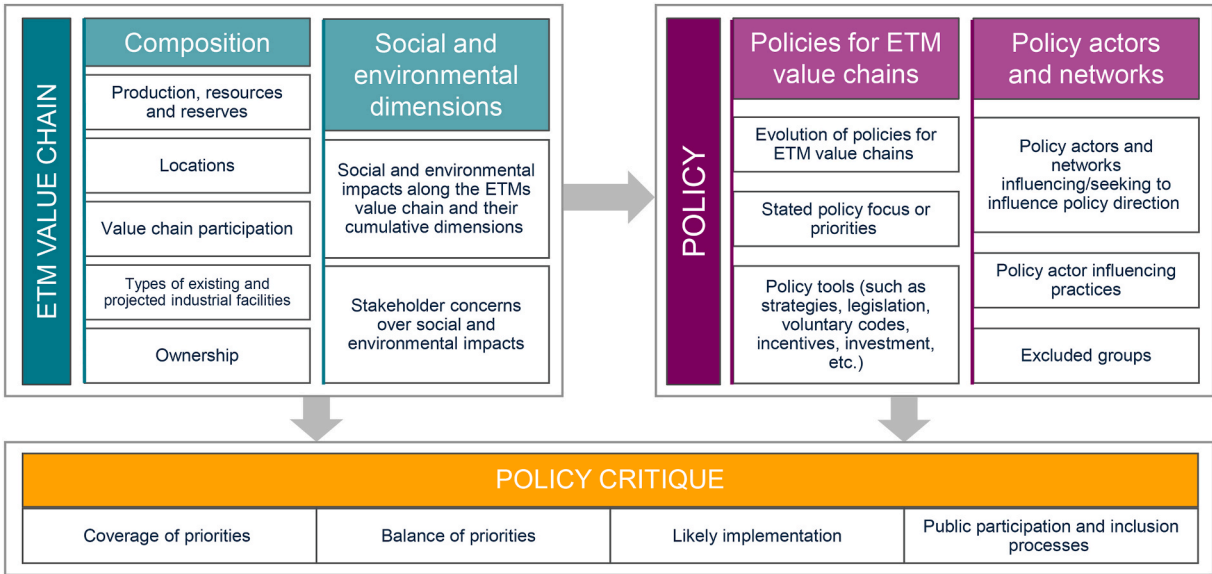


Fig. 2. Contents of the case study questionnaire.

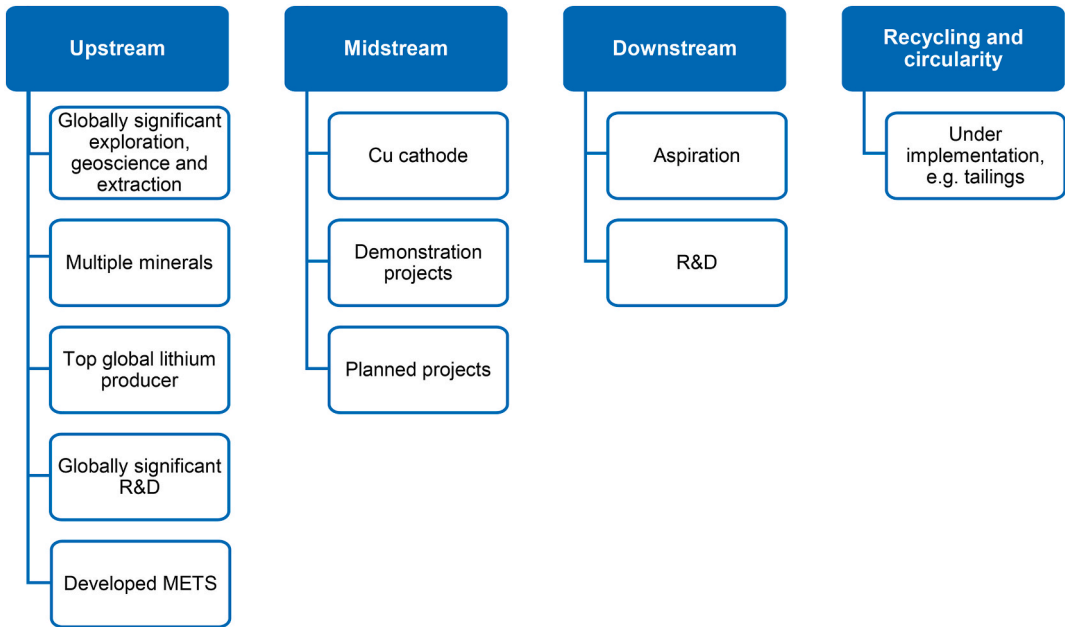


Fig. 3. Composition of the ETMs value chain in Australia.

Building on these advantages, Australia has increased its mineral processing capabilities with pilot plants. However, structural barriers, such as access to investment for scaling, technology innovation, specialist skills, intellectual property, and market entry remain (MCA, 2023).

3.1.2. Chile

Chile is a key global supplier in the upstream ETMs sector, as the largest producer of copper and the second-largest producer of lithium, and holder of significant reserves of both. In the last decade, the state has sought to increase Chile's downstream participation. The copper

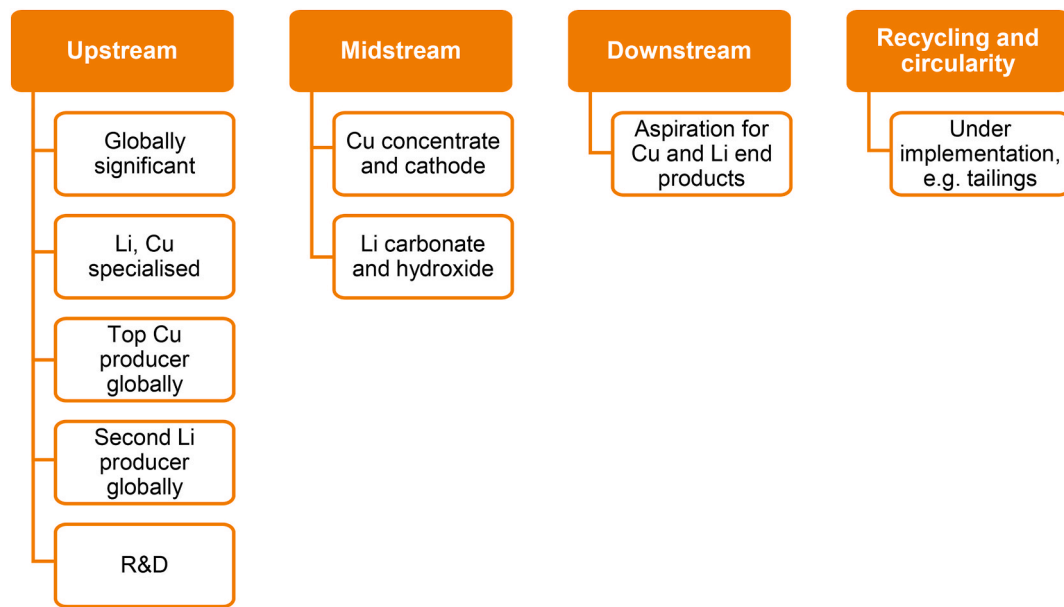


Fig. 4. Composition of the ETM value chain in Chile.

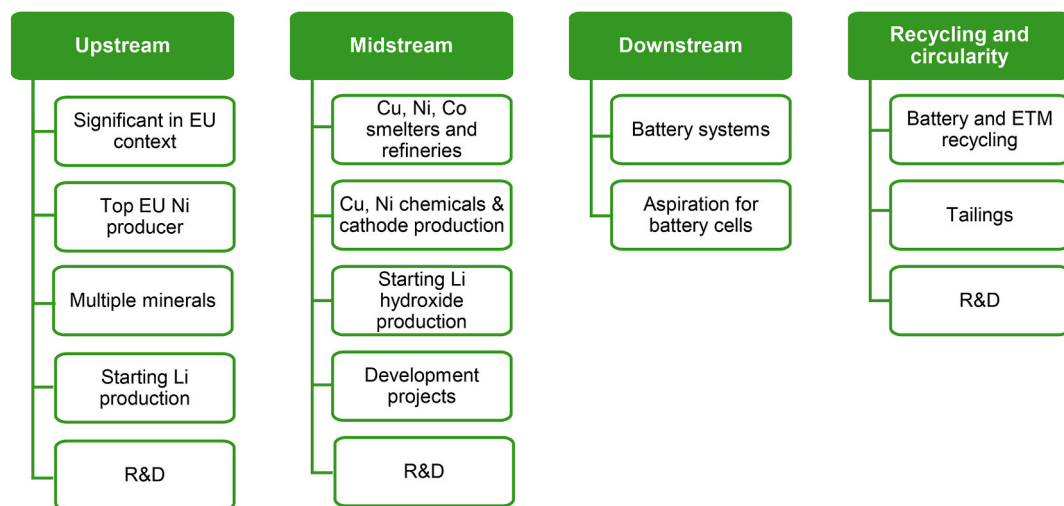


Fig. 5. Composition of the ETM value chain in Finland.

industry has been important to Chile's economy. In 2023, Chile was responsible for more than 24 percent of global copper production (USGS, 2024; U.S. International Trade Administration, n.d.). Codelco, the state-owned copper miner, and the world's largest copper producer, operates several major mines including El Teniente, Chuquibambilla and Radomiro Tomic. Most of Chile's copper is exported as copper concentrate, a semi-processed material, produced during the processing of copper ore, which is then further processed to become refined copper. In 2020, copper concentrate represented 74.4% of the total national copper production, of which 71.7% was exported (Cochilco, 2021). For refined copper, both Codelco and Alcoa American operate copper smelters in Chile.

In recent years, lithium extraction has increasingly contributed to Chile's industrial development. In 2023, lithium production ascended to 26% of global production (excluding the US) (USGS, 2024). Lithium comes from the salt plains, or "salares", of the Salar de Atacama, in the Antofagasta Region, where private companies Albemarle, and SQM in partnership with Tianqi operate. Regulators have approved further lithium extraction in the Salar de Maricunga, in the Atacama Region.

Much like copper, Chilean lithium producers export lithium primarily in a partially processed state, mainly in the form of lithium carbonate and, to a lesser extent, as lithium hydroxide. In 2020, through the Clean Technologies Institute, the Chilean state established a policy position to add value to the lithium extracted nationally. Fig. 7 displays selected ETM value chain components in Chile.

3.1.3. Finland

Finland is active in all steps of the ETM value chain, with a long history of mining and material industries. While the Finnish mining sector pales in comparison to global mining giants, it has a significant role in the European context (MEAE, 2023). Although mining is not a major industry in Finland's national economy, the country is the largest or sole domestic producer of certain minerals such as nickel within the EU. Other ETMs produced in Finland include chromium, copper, zinc and small amounts of cobalt, and platinum group elements (PGEs). A new lithium mine with integrated battery-grade lithium hydroxide production (first in Europe) is scheduled to start in 2025-26. Finland has multiple ETM deposits, including cobalt, graphite and REEs and an

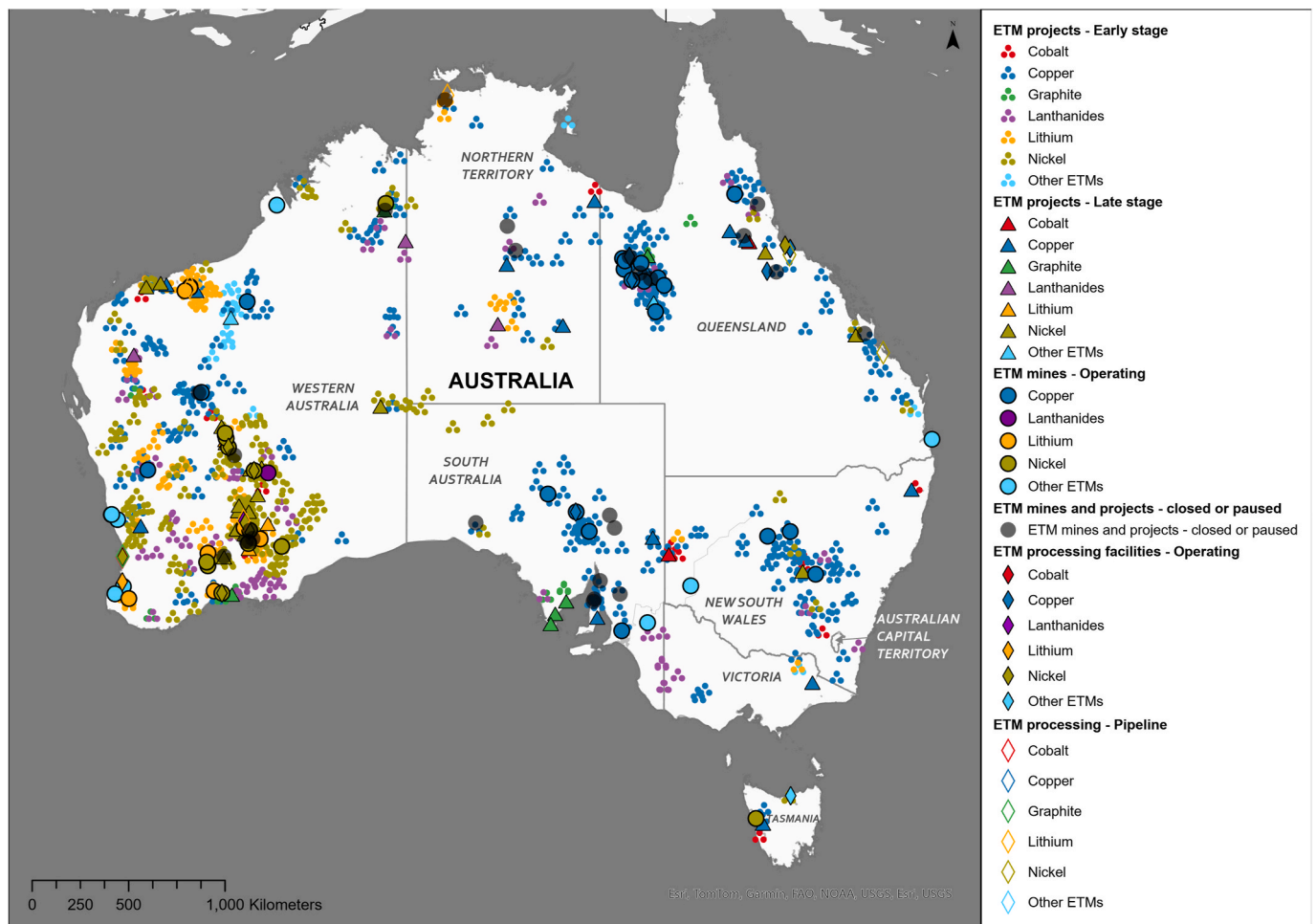


Fig. 6. Selected ETMs value chain components in Australia. Figure shows approximate location of ETM projects in early stages of development (exploration and reserves development); late stages (feasibility and construction); operating (currently producing) mines; mines which are closed (in rehabilitation or abandoned) or paused (temporarily in care and maintenance); and ETM processing facilities (refineries and smelters) which are operating or in pipeline (announced or being developed). Note that some of these projects, including in early stages, might be inactive or cancelled. Data sources: [S&P Capital Pro](#), (2025).

active exploration scene ([Jonsson et al., 2023](#)).

Finland's west coast has cobalt, copper, nickel and zinc smelters and refineries that have expanded their production capacity following rising demand from the battery sector ([MEAE, 2023](#)). Notably, Finland produces 10.8% of total refined cobalt globally ([Idoine et al., 2022](#)), although these refineries depend on imports. Further downstream, there is an array of recently established battery material production plants and new projects on the pipeline. The Finnish state has taken coordinated action to support ETM value chain expansion, specifically in battery production ([MEAE, 2021](#)). [Fig. 8](#) displays selected ETM value chain components in Finland.

3.2. Environmental and social aspects of ETM value chains

There are documented concerns, contention and negative social and environmental impacts, as well as promises of economic and social benefits springing from the ETMs industry in the three case study countries. In Australia, concerns about Indigenous rights, territories and cultural heritage, and benefit distribution take centre stage. In Chile, the cumulative impacts of copper, lithium and other industries have defined clear sacrifice zones and impacts on Indigenous Peoples. In Finland, some ETM exploration projects have faced resistance based on local vulnerabilities and apprehension due to previous environmental incidents in the mining sector. Below we highlight key social and environmental aspects of the ETMs sector in each case country. [Fig. 9](#)

provides a summary of the social and environmental dynamics in the ETM value chains of the countries studied.

3.2.1. Australia

In Australia, mining has generated positive and negative impacts. Through booms and busts, mining has substantially increased standards of living, contributing significantly to GDP, exports, employment and wages ([Downes et al., 2014](#)). However, previous research highlights concern over fair distribution of socioeconomic benefits across Australian cities and remote regions that host mines ([Arias-Loyola et al., 2022](#)). ETMs mines and projects in development occur in remote locations, predominantly in remote Western Australia, but also in the Northern Territory, north-west Queensland, and remote South Australia. These areas incorporate high socio-economic disadvantage, with inadequate housing, infrastructure and services ([Burton et al., 2024a,b](#)). The fly-in-fly-out labour regime favoured by the mining industry adds pressures on remote locations benefiting urban and coastal areas.

ETM mines and reserves are located largely on the traditional lands of Aboriginal and Torres Strait Islander people. There is a complex system of land rights with many Indigenous communities lacking secure land titles to their traditional lands, except for some titles in the Northern Territory awarded under the [Aboriginal Land Act 1978 \(Cth\)](#). A recent study by [Burton et al. \(2024a, b\)](#) found that 57.8% of critical mineral projects in Australia are located where native title exists. Therefore, under the federal [Native Title Act 1993 \(Cth\)](#) Indigenous

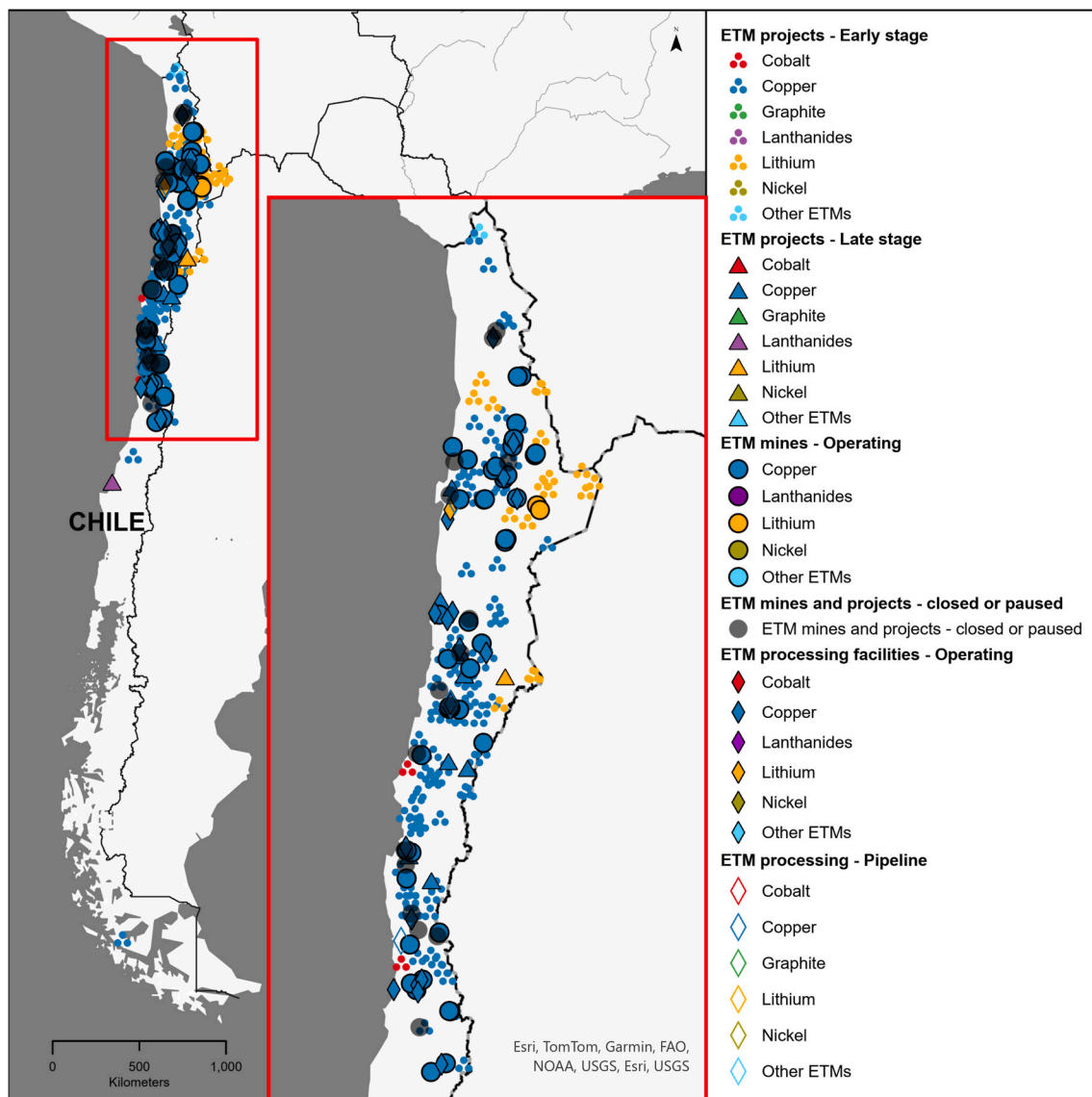


Fig. 7. Selected ETM value chain components in Chile. Figure shows approximate location of ETM projects in early stages of development (exploration and reserves development); late stages (feasibility and construction); operating (currently producing) mines; mines which are closed (in rehabilitation or abandoned) or paused (temporarily in care and maintenance); and ETM processing facilities (refineries and smelters) which are operating or in pipeline (announced or being developed). Note that some of these projects, including in early stages, might be inactive or cancelled. Data sources: S&P Capital Pro (2025).

Peoples have a right to negotiate Indigenous land use agreements (ILUAs) with project proponents prior to the commencement of mining. This increases to 79.2% when incorporating procedural rights linked to Indigenous native title claims.

Australia has expressed its support for the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) (United Nations (General Assembly), 2007), however is yet to integrate UNDRIP principles in its legislative, judicial, and administrative processes. Free, Prior and Informed Consent (FPIC)-like procedures are only included in The Northern Territory (Southalan and Fardin, 2019; Burton et al., 2024a,b) with other mining states, particularly Western Australia and Queensland, failing to do so to date. Furthermore, the destruction of cultural heritage has been a systemic issue, with the Juukan Gorge case (Nagar, 2021) in the Pilbara region of north-western Australia being only one of many incidents resulting in irreversible losses of Indigenous cultural heritage. To date there is no comprehensive legislation in place to protect Indigenous heritage, especially since it is regulated by individual states and territories rather than Commonwealth legislation. In absence of comprehensive federal policy protection of Indigenous heritage

(Huntley and Wallis, 2024), there are concerns that ETM projects can exacerbate cultural heritage losses.

Previous mining operations have left negative environmental legacies in Australia, including large disturbances to the landscape, water pollution, or rendering land unusable after the mining activities have ceased. Of particular concern are the environmental and safety legacies of abandoned mines, of which there are 80,000 across the country (Werner et al., 2020). For example, the remediation and legacy issues of Queensland's Mt Morgan gold mine were left to the Queensland government when Mount Morgan Limited ceased production. There is a lack of comprehensive policy and funding to address mine legacy sites, again attributable to state and territory regulation of mining. Research is exploring opportunities for extracting some ETMs from mine waste and tailings.

Another challenge is cumulative impacts (Everingham et al., 2022) in mine-affected regions, stemming from multiple historic and current mine operations or emerging from multiple land uses of different nature, such as mining, gas, agriculture and renewable energy development. Development of new ETM projects can produce additional cumulative

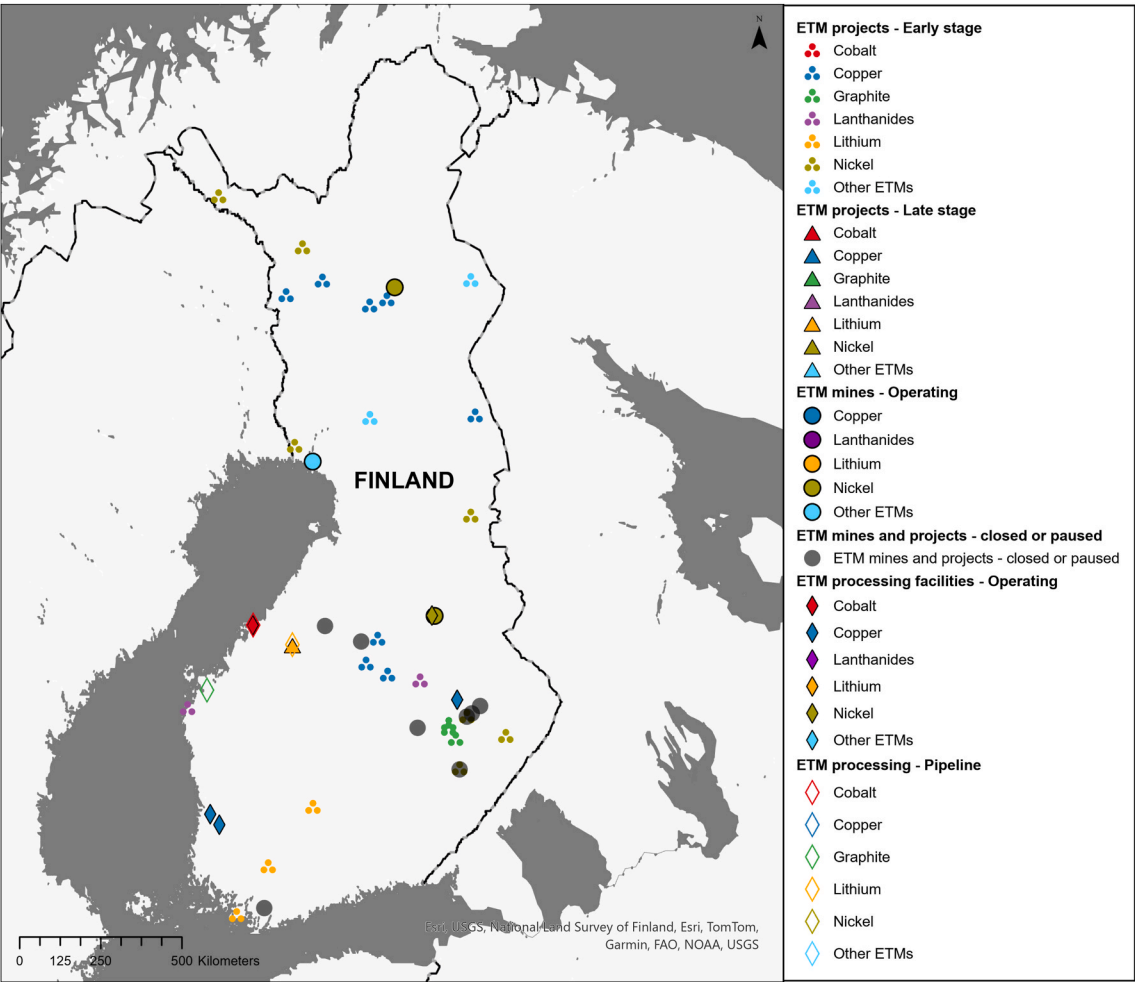


Fig. 8. Selected ETM value chain components in Finland. Figure shows approximate location of ETM projects in early stages of development (exploration and reserves development); late stages (feasibility and construction); operating (currently producing) mines; mines which are closed (in rehabilitation or abandoned) or paused (temporarily in care and maintenance); and ETM processing facilities (refineries and smelters) which are operating or in pipeline (announced or being developed). Note that some of these projects, including in early stages, might be inactive or cancelled. Data sources: [S&P Capital Pro \(2025\)](#).

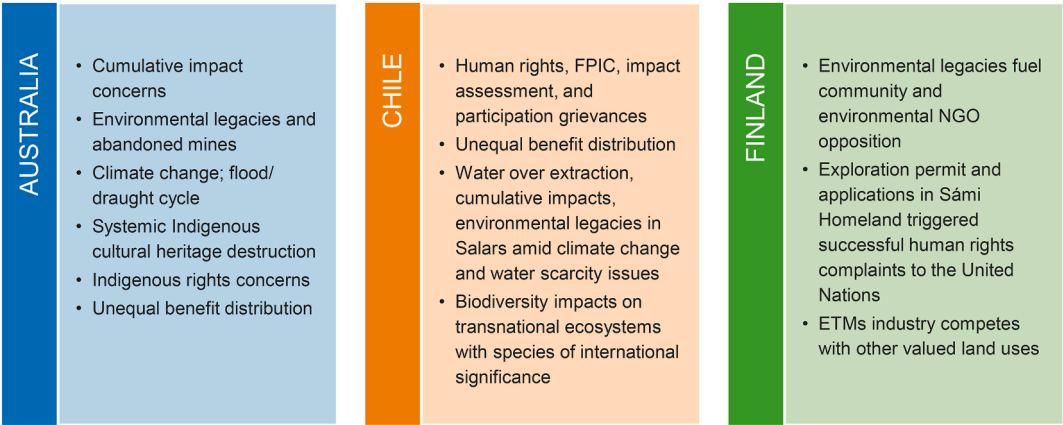


Fig. 9. Synthesis of the social and environmental dynamics in ETM value chains in Australia, Chile and Finland.

impacts, and not all environmental acts in Australian states and territories require that cumulative impacts be considered in project assessment ([Minerals Council of Australia, 2015](#); [Swayne, 2012](#)). In addition, long-term intergenerational impacts are not considered in policies, mine management plans, or environmental impact assessments ([Leyton-Flor and Sangha, 2024](#)).

3.2.2. Chile

In Chile, the social and environmental impacts in the areas of influence of copper and lithium operations overlap significantly around the southern edge of the Salar de Atacama, in the Antofagasta Region. SQM and Albemarle's lithium operations are located on the salar and extract lithium from underground brines. Two large-scale copper mines,

BHP's Escondida and Antofagasta Minerals' Zaldivar are located to the south. The Antofagasta Region, as well as the other regions of the arid north of Chile, such as Tarapacá and Atacama, are where most of Chile's mining activity occurs. These regions are particularly sensitive to the socio-environmental impacts of large-scale mining. These include social exclusion, unequal local access to mining benefits, human rights risks and cultural tensions, together with negative environmental legacies, and pressures on water, other natural resources and biodiversity, in the context of climate change dynamics and with repercussions on Indigenous livelihoods (León and Sánchez, 2020; Jerez et al., 2021).

In the Salar de Atacama, Indigenous Peoples seek to protect their autonomies and territories amid mining industry expansion, notwithstanding direct engagement with the industry via both employment and agreements (Akchurin, 2023; Babidge, 2013). Water grievances emerge in response to socio-environmental risks and groundwater extraction (Petavratzi et al., 2022). Analysts have noted that the understanding of brines as a mineral under the control of the Mining Ministry, based on the Chilean Mining Code of 1983 (Law No. 18,248, 1983), rather than water bodies connected to broader ecosystems enabled water depletion, incomplete water consumption data, water injustice and cultural tensions (Jerez et al., 2021). Indigenous Peoples have resorted to legal action through environmental tribunals to address water overextraction from copper and lithium operations and its effects on the environment and Indigenous life systems, sometimes activating state enforcement (Akchurin, 2023), including state legal action (see *Segundo Tribunal Ambiental*, 2019; *Consejo de Defensa del Estado*, 2020; *Cambrero*, 2022; *Consejo de Defensa del Estado*, 2022; *Primer Tribunal Ambiental*, 2024, for example). Indigenous Peoples likewise engage in litigation to protect their right to FPIC, and due procedure as part of environmental impact assessments. Thus, failure to include Indigenous Peoples with adequate procedures can result in the reversal of permits (see for example *Primer Tribunal Ambiental*, 2020).

Following the 2019 social uprising, water became established as a socially and environmentally contentious matter nationally, with citizens, grassroots movements and assemblies increasingly scrutinising how social dynamics can exacerbate droughts including the role of the private sector (Akchurin, 2025). In the Atacama salar, lithium mining water use affects other economic sectors negatively, and the lithium sector benefits predominantly migrant workers, diminishing local economic contributions (Liu and Agusdinata, 2020). Copper contributes significantly to water consumption and impacts. For example, in 2023, Minera Escondida received a significant fine for causing irreparable damage to the Monturaqui-Negrillar-Tilopozo aquifer and to the life systems of Atacameño Indigenous people due to water overextraction (*Primer Tribunal Ambiental*, 2024).

Historically, the copper industry in Chile has been held responsible for a suit of environmental legacies affecting local populations in areas that have come to be known as sacrifice zones. Sacrifice zones connected to the copper sector include Puchuncavi, in the Region of Valparaíso, and Baquedano, in Antofagasta. More recently, inhabitants of the Salar de Atacama have organised to seek redress for long-term negative cumulative impacts from copper mining and exacerbated by lithium extraction.

3.2.3. Finland

Mining activities in Finland have faced growing public concern over environmental and social risks since the steep increase in mining activities in the early 2010s. A focusing event for this was a major leakage in the Talvivaara nickel mine's gypsum pond in 2012, which negatively affected the reputation of the whole sector (Sairinen et al., 2017). The more recent concerns can partly be attributed to the demand for ETMs, as exploration has been expanding to new areas with no previous history of mining, where attitudes towards the activity are more cautious (Jartti et al., 2017). According to Eerola (2022), 18 mining companies working in the ETMs sector faced public opposition during 2020–21. Meanwhile, the overall investments in exploration were the largest in Finland's

history in 2023 (Tukes, 2024). Mining opposition has been strongest in areas with high environmental values, sensitive waterways, recreation activities, summer housing, and impacted livelihoods, such as tourism and reindeer herding in the north (Eerola, 2022; Similä and Jokinen, 2018). In contrast, traditional mining and industrial areas of Western Finland and North Karelia have generally welcomed new projects and been attracted by their potential socio-economic benefits (Mononen and Sairinen, 2020; Leino et al., 2023).

At the turn of the 2020s, the criticism towards mining became visible in various local opposition movements and in two popular citizen petitions⁴ demanding more stringent regulation for the sector and more power for municipalities. For example, in Heinävesi, exploration for graphite and concern over local environmental impacts of a potential mine caused a major opposition movement, which developed into a national-level campaign targeting the entire industry (Leino et al., 2023). Another ongoing debate centres on how mining projects should benefit the local economy and communities. The idea that “Finland must not remain just a reserve of raw materials” remains a prominent topic in the public debate about ETMs (e.g. Maaseudun tulevaisuus, 2025; Ilta-Sanomat, 2023). In recent years, two measures aimed to address these local level issues. First, the 2023 renewal of the Mining Act granted municipalities power through land use planning to decide whether it is possible to establish a mine in their administrative area (Pölonen and Leino, 2023). Second, a mining mineral tax was introduced, allocating 60% of its proceeds to the municipality hosting the mine (Kaivosmineraaliverolaki, 2023).

In the midstream ETM value chain, two precursory battery material projects have also recently caused public concern because of their plans to release sulphate rich process waters to the nearby waterways. In Harjavalta, BASF's material plant received an environmental permit, however it is yet to start operations after local environmental NGOs (Puhtaan meren puolesta & Vesien puolesta ry) appealed the decision and the court ordered the company to modify their plans (Kuntalehti, 2024a). In Hamina, CNGR's plans to release sulphate to the Baltic Sea spawned a social movement and a popular citizen petition, steering the developers to reconsider their implementation plans (Kuntalehti, 2024b).

The Sámi people have taken a general position against mining in the formal Sámi homeland area (e.g. Yle, 2020). In the past decades, the Finnish mining authority has granted occasional reservations (which give the privilege to apply for an exploration permit) and one exploration permit within the area, but they have not led to activities on the ground. The Mining Act (505/2023) requires that mining activities must not endanger the rights of the Sámi to maintain and develop their culture and traditional livelihoods. This includes an obligation for authorities to assess the potential impacts of mining projects on Sámi communities and to engage in consultations. However, these rights recognized by the law have been a subject of ongoing debate and legal scrutiny (e.g. Amnesty, 2025). Recently, the Sámi challenged an exploration permit granted to the Geological Survey of Finland in 2016 in the Finnish courts and, along a separate reservation case from 2020, brought the matter before two UN Committees (*Committee on the Rights of the Child*, 2024, September 13; *Committee on Economic, Social and Cultural Rights*, 2024, September 27). The Finnish courts dismissed the case, however the UN Committees later ruled that Finland had violated Sámi rights in both cases, stating that no impact assessment was conducted nor was FPIC obtained when granting the permits (*Committee on Economic, Social and Cultural Rights*, 2024, September 27; *Committee on the Rights of the Child*, 2024, September 13). Although most mining professionals in Finland do not consider projects in the formal Sámi homeland area feasible, the contradictory interpretations of the law (e.g. “the obligation to negotiate” or “significant impact”) and the uncertainty it creates for the Sámi remain problematic.

⁴ If a citizen petition gathers over 50,000 signatures, the parliament must address it. Although citizen petitions are rarely accepted in their original form, they can influence future legislation indirectly.

The recently published new mineral strategy includes an action point to “Ensure the realization of Sámi rights in mineral industry projects,” which refers to the above case (Finnish Government, 2024, 42).

3.3. Policy focus for ETM value chains

Policy in the three country cases started targeting ETM value chains following the booming prices of the late 2010s, yet there are differences in approach. Finland and Australia's FDI and project streamlining, together with urgency and fast-tracking narratives apply across minerals, in contrast with Chile's drive to increase government participation, development benefits, environmental governance and, to some extent, governance of social matters with lithium and copper as key commodities. Australia and Finland's streamlining and urgency discourses centre on maximising the economic development opportunity of contributing minerals and technology for decarbonisation. In contrast, Chile's proposes institutions and governance to increase national economic benefit and acquire industrial knowledge while improving environmental standards, including through a strategic perspective to industrial expansion planning in regions. Chilean policy does not set aside the urgency of the climate situation, yet it centres discourse more on strategic planning than on fast-tracking. As a consumer of metals, Finland is also proposing approaches for their sustainable consumption, circular economy and to diversify supply chains (Finnish Government, 2024), where references to circularity can also be found in Australian and Chilean policies (Australian Government, Department of Industry, Science and Resources, 2024; Australian Government, Ministry for Resources, 2023; Gobierno de Chile, 2021; Gobierno de Chile, 2023a). Below is an outline of the policy emphasis for ETM value chains in the three countries.

3.3.1. Australia

The Federal, Western Australian, Queensland and New South Wales governments have established or are far advanced in defining strategies for the Critical Minerals and Battery industries. These recent strategies have largely emphasized not only mining, but domestic value adding, supported through investment de-risking and regulatory “streamlining”, while placing less emphasis and providing less detail on social and environmental governance (Sinclair and Coe, 2024). Fig. 10 provides a timeline of the key policy developments discussed in this paper. A more detailed timeline is available in Appendix 1.

At the Federal level, Australia has made a strategic choice to deliver on multiple complex fronts. Australia's Critical Minerals Strategy (Australian Government, Ministry for Resources, 2023) centres on stable domestic supplies and economic benefits, demonstrating high “ESG credentials”, de-risking investment and delivering fast regulatory approvals to support sector growth. The 2023 strategy to 2030 maintained the industrial growth and supply chain security focus of its 2022 predecessor (see Australian Government, Department of Industry, Science, Energy and Resources, 2022), yet it referenced First Nations FPIC (see Australian Government, Ministry for Resources, 2023) and devoted more statements to First Nations engagement than the 2019 and 2022 Strategies.⁵ The 2023 strategy combines de-risked growth aspirations with regulatory reform and streamlined approval promises to ensure that project development is fast-tracked. Its reform targets include reviewing the Environment Protection and Biodiversity Conservation Act 1999

⁵ The 2022 strategy did not mention FPIC. Australia's 2019 Critical Minerals Strategy, issued by the previous Coalition (Liberal and National Parties) government and before the Juukan Gorge disaster, had similar elements to the Labor Party strategies, yet reflected an overall lack of attention to First Nations matters, and limited sustainability inclusions. It did not refer to First Nations engagement or participation, nor to improving mining's social performance. References to environmental and social aspects were circumscribed to the safety and “cleanliness” of Australia's mining sector and the potential to better utilise waste streams from existing mining operations.

(Cth) (EPBCA) and establishing a National Environmental Standard for First Nations Engagement and Participation in Decision-making. However, lacking political impetus, to date these have stalled. The review of the EPBCA commenced in 2019, with Professor Samuel's 2020 report recommending widespread and sweeping changes, particularly the incorporation of nature-positive aspects of environmental protection (Samuel, 2020). As of May 2025, the federal government has yet to implement legislative change, although reform is likely to soon commence given that the government has returned to office with a greatly increased majority. Similarly, First Nations' engagement under the EPBCA has also stalled, although the *Interim engaging with first nations people and communities on assessments and approvals under the EPBCA* provides an outline of statutory obligations. Such guidelines for engagement are crucial, especially given the cultural heritage disasters like Juukan Gorge in May 2020 by mining titan Rio Tinto.

Resource and implementation capacity gaps, together with political divisions could hinder simultaneous delivery on regulatory reform, First Nations engagement, rapid approvals, and sector growth. This is a risk in states or territories such as Western Australia and the Northern Territory experiencing skills shortages and capacity constraints. In those facing opposition to reform such as Western Australia, whose poor track-record of First Nations cultural heritage protection attracted international attention, and where farming community backlash led to the reversal of tighter regulations designed after extensive consultation (Garlett et al., 2023; Bourke, 2023). Similarly, political division and industry resistance have hindered the proposed Federal Government Nature Positive Plan to reform the EPBC Act. The Nature Positive Plan proposes a new Environmental Protection Agency tasked with enforcement and national environmental standards. Calls to include a “climate trigger” in the reforms have attracted industry resistance (Commonwealth, Department of Prime Minister and Cabinet, 2024; Black, 2024). First proposed in 2000, the climate trigger would see high greenhouse gas-emitting projects referred to the Federal Environment Minister for Assessment (Monaghan, 2024). However, the Bill for such a trigger, to be included in an amended EPBCA, was dropped a few months later for lack of support under the conservative Howard government. Addressing greenhouse gas emissions and fossil fuel impacts remained a political football in Australia for 20 years.

A major step in emissions reduction was the introduction of a carbon pricing mechanism in 2011 by the governing Labor Party. Like the Mineral Resource Rent Tax contemplated at the same time on the back of the 2010 tax review (the Henry Review), the carbon pricing mechanism was reviled by the conservative liberal opposition and industry alike. Lasting less than three short years, the Carbon tax was abolished in 2014 when the conservatives came to power (Teeter and Sandberg, 2016). Australia continues to reject carbon pricing mechanisms in its energy transition, instead primarily relying on the development and implementation of innovation and technology to accomplish the developments needed to reduce greenhouse gas emissions. However, the implementation of the Australian Carbon Credit Unit (ACCU) Scheme under the Clean Energy Regulator has established methods (a set of requirements) that outline the capture of carbon dioxide. Methods tailored to ETM mining are yet to be specified.

The 2023 Federal Critical Minerals Strategy emphasises attracting FDI and building international partnerships within the bounds of the overall security emphasis in ETMs policy globally (see Riofrancos, 2023; Nem Singh, 2021). State level strategies concentrate on attracting investment. With dedicated ETM investor support functions, Queensland's, and Western Australia's strategies, for example, seek to attract international investors to support domestic capability, employment and value adding. In parallel, Federal policy encompasses tighter FDI review to prevent investment “in conflict with [...] national interest or national security” (Australian Government, Ministry for Resources, 2023, p. 29). Australia is part of bilateral and multilateral initiatives on ETMs with key partners including the United States, the United Kingdom and India. Bilateral engagement covers multiple collaborations with the United States as well as initiatives with Korea, Japan, France, India, the United

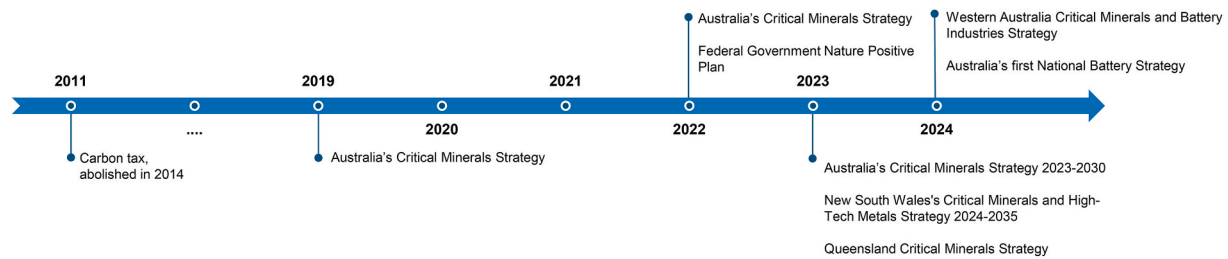


Fig. 10. A timeline of the key policy developments in Australia.

Kingdom, and the EU (Australian Government, Ministry for Resources, 2023, p. 29).

Australia's recent strategy seeks to build on its mineral endowment to derive more benefits from participating in the battery value chain, and to ensure value chain security and resilience given the current Chinese concentration. "If we mine it here, we should make it here" reads Australia's first National Battery Strategy, issued in 2024 (Australian Government, Department of Industry, Science and Resources, 2024). The strategy seeks to foster a domestic battery industry with a focus on stationary batteries, high value battery products, and new battery chemistries. It includes production incentives; financial support for traceability initiatives, innovation, skills training and workforce development; tax incentives for critical mineral production; and investments in renewable energy. International trade and FDI feature highly in the strategy, with the US as a key partner. Western Australia had, since 2019, developed a Future Battery Industry Strategy and research centre, and issued research papers that have been influential in identifying Australia's strengths. Western Australia's most recent strategy integrates both Critical Minerals and Battery industries into one strategy (2024).

3.3.2. Chile

With copper and lithium as the key minerals and adopting distinct approaches for each, Chilean policy on ETMs has combined nationalization and market liberalisation,⁶ seen evolving environmental governance (Poveda-Bonilla, 2019, 2020), and witnessed increasing stakeholder engagement in policy-making, particularly by Indigenous groups. Appendix 2 - Selected policy pieces for the copper and lithium sectors in Chile, outlines a sequence of key policy/law pieces relevant to copper and/or lithium starting in the 2010s. Fig. 11 provides a timeline of the key policy developments in Chile discussed in this paper. A more detailed timeline is available in Appendix 2.

Chile sees a role and opportunity in enabling the energy transition,

⁶ Between the 1960s and 1990s Chile issued laws affecting on the operation, ownership and institutions for the copper and lithium sectors. In 1964, Law No. 16.425 set out the "Chileanization" of copper while allowing association with foreign investments. In 1971, Law No. 17.450 saw the full nationalization of deposits for large-scale Chilean copper mining. In 1974, Decree-Law No. 600 (Statute of foreign investment) aimed to increase foreign investment. In 1976, Decree-Laws No. 1.349 and No. 1.350 created Codelco and Cochilco as state organisms for copper production. In 1979, Law No. 2.886 revised the mining code to alter the provisions regarding reserves of different minerals to the State, with Article 5 reserving lithium resources for the State. In 1982, Law No. 18.097 (Constitutional Law over Mining Concessions) sought to provide stronger legal certainty. Lithium was excluded from concessionability. In 1983, Law No. 18.248 (Mining Code) provided the legal basis to administer and manage mineral resources in Chile and the rights and obligations of mining companies and concession holders. This excluded lithium, which remained non-concessionable. Between 1987 and 1995, the Chilean state, via CORFO, divested from SQM and Foote (now Albemarle), returning responsibility for exploring and exploiting lithium to the private sector. Between 1990 and 1993, Laws 18.985, 19.207 and 19.270 modified tax structures to incentivise foreign direct investment in mining, while Law 19.137 allows the transfer to transnational mining companies of Codelco deposits not under exploitation.

having consolidated as the world's top copper producer (Ministerio de Minería, 2022; Natural Resource Governance Institute, n.d.). Historically, successive governments sought to secure a stable environment for industrial growth, enabling booming investment and production in the copper sector.⁷ Based on financial incentives for foreign mining companies (Clark and Clark, 2016), Chile received some of the most significant private investments in the copper sector globally (Bridge, 2004), and foreign company production greatly outpaced Codelco's, and combined global production outside of Chile⁸ (Lavadero Illanes, 1999).

Following its copper boom, Chile turned to improving environmental governance, government take and corporate governance. It created the Environment Ministry, environmental impact assessment system, and environmental tribunals. Driving these reforms were environmental legacies, a lack of environmental governance institutions, socio-environmental conflict, social mobilisation and pressure from the OECD⁹ which Chile aspired to join (Poveda-Bonilla, 2019, 2020; Maillet and Carrasco, 2019). The centralised management of government takes remains a point of contention for host municipalities and regions. The resulting environment is one of low trust in institutions and high levels of citizen contestation through courts, where some actors have understood socio-environmental conflicts in the copper sector as obstacles to growth (Poveda-Bonilla, 2021).

In contrast to its treatment of copper, for decades Chilean policy addressed lithium in terms of its in nuclear energy and military applications, with key producers, Albemarle and SQM, working under contract for state companies with little incentive for innovation or improvements on social and environmental performance (Poveda-Bonilla, 2020)¹⁰ and with no competition from other private companies (Weinstein, 2024). After the 2010s, revenues from lithium production became important to the economy, reaching 8.2% of total

⁷ Legal reforms by the left-wing Montalva and Frei governments nationalised the copper industry. This did not change despite the subsequent violent lurch back to the right, and the neoliberal economic policies of the Pinochet regime.

⁸ The output of these companies was 6.6 times greater than global copper production outside Chile and 23 times more than the copper production of CODELCO over the same period (Lavadero Illanes, 1999).

⁹ The foundational principles and regulations for environmental protection and management, as well as a system for environmental impact assessment (SEIA) were set out in 1994 via Law No. 19.300 General Bases of the Environment. In 2005, the OECD/ECLAC (2005) conducted Environmental Performance Reviews for Chile. This comprised a review of Chile's performance and policy on air, water, nature conservation, and biodiversity, as well as sectoral integration (mining, forestry, and aquaculture).

¹⁰ Specific regulatory provisions differentiate lithium exploitation from that of other mineral resources. In 1979, the government established legislation regulating the extraction of lithium only via authorization by the Chilean Commission of Nuclear Energy (CChen). This law did not apply to three mining properties owned by two public institutions: Salar de Atacama of the Chilean Economic Development Agency (CORFO), and Salar de Pedernales and Salar de Maricunga of the National Copper Corporation (CODELCO). The Mining Code of 1983 established certain classified substances, including lithium, as not subject to an exploration or mining concession, unless activities are performed directly by the State, or through administrative concessions or special operating contracts granted to private parties.

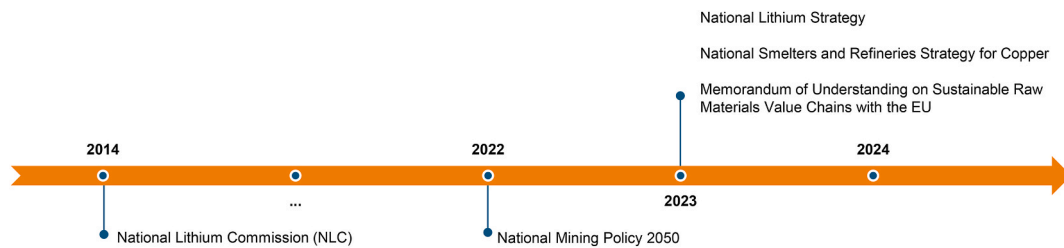


Fig. 11. A timeline of the key policy developments in Chile.

exports by 2022. These high prices led to the “rediscovery of lithium” in policy (Poveda-Bonilla, 2020) with ongoing debate on ways to increase benefits from the mineral such as more state (Gobierno de Chile, Ministerio de Minería, 2015) or private participation (Weinstein, 2024). In 2014, the Bachelet government established the National Lithium Commission to provide advice on a national lithium policy for the sustainable development of the industry. Throughout these shifts, the Chilean Economic Development Corporation (CORFO) has played a central, changing role in the lithium industry (Poveda-Bonilla, 2020; Orihuela and Serrano, 2024).

Chile is due to release a strategy for “diversifying critical minerals for the energy transition” (Ministerio de Minería, 2022, p. 61), has a National Mining Policy 2050 (Ministerio de Minería, 2022), and distinct sectorial strategies: the National Smelters and Refineries Strategy for copper (Gobierno de Chile, 2023b), and the National Lithium Strategy (Gobierno de Chile, 2023a). The National Mining Policy 2050 highlights Chile’s role in supplying minerals for the energy transition and seeks to address productivity concerns (copper sector), a social acceptability crisis, as well as climate change and water vulnerability issues in mineral endowed regions. It states the aim to develop capacity to resolve social conflicts and collaborate to deliver benefits to stakeholders. The Policy promises a lithium governance model to protect the salt plains with territorial planning and improved environmental monitoring and enforcement capacities, simultaneously aiming to reducing environmental licencing timelines by twenty-five percent. Underpinning the strategy are a range of publicly documented stakeholder engagement vehicles and the promise of an “indigenous chapter” to be aligned with the ILO 169 Covenant (International Labour Organization, 1989).

Based on recommendations from the National Lithium Commission, the 2023 National Lithium Strategy (NLS) (Gobierno de Chile, 2023a) outlines measures to increase state participation as the direct owner of the mineral and to incorporate capital, technology, and social and environmental sustainability to the sector, based on developing technical and scientific knowledge as a public good. The NLS identifies social dialogue, participation and a public research institution specialised on lithium as avenues to lift social and environmental standards and address environmental uncertainty and data gaps. Emphasis on industrial development and economic opportunity are more prevalent than on sustainability and social inclusion, simply by the number of strategic objectives devoted to each,¹¹ yet social and environmental objectives appear integrated into the industrial and economic benefit agenda.¹² Likewise, the strategy identifies mechanisms for increased private sector participation in selected salt plains with or without state ownership participation (Weinstein, 2024).

¹¹ Social and environmental sustainability are included in two of seven strategic objectives, while the remaining five deal with development, technological and economic opportunity.

¹² The strategic objectives cover: developing sustainable industrial production capacity, social and environmental sustainability and baseline information, technological and value chain development, fiscal sustainability, diversifying industry participants, and supporting Chile’s productive diversification and economic growth.

Chile’s National (Copper) Smelters and Refineries Strategy (Gobierno de Chile, 2023b) (FURE strategy) includes industrial strengthening and capacity and output growth, updating environmental standards and performance, and improving information provision for citizens. This reflects an industry facing significant environmental legacies at home, and strong international competition. The FURE presents carbon neutrality, circularity and traceability as key environmental attributes Chilean copper must exhibit to access overseas markets. The strategy provides limited detail on social parameters such as community engagement and Indigenous Free, Prior, and Informed Consent (FPIC), focusing primarily on information provision as the main form of citizen or community interaction.

Chile has a free trade agreement with the US and a Memorandum of Understanding on Sustainable Raw Materials Value Chains with the EU. The US’s Inflation Reduction Act (2022) provided potential economic opportunities for Chile’s ETM sector, which as of May 2025 are uncertain, in the wake of the second Trump administration. The non-binding MoU with the EU centres on cooperation and integration on sustainable transition mineral value chains, industrial development and growth, de-risking and value adding, and research and development on mining, environment and climate footprint. The MoU refers to ESG standards yet does not define them, nor does it mention Indigenous Peoples and their rights (EU and Chile, 2023).

3.3.3. Finland

In the recent decade, there has been a clear reframing of the Finnish mining policy narrative from mere national economic benefits (Finnish Mineral Strategy, 2010) towards “the enabler of green transition” (Finnish Government, 2024). This is visible both in the governmental and industrial rhetoric (e.g. MEAE, 2021; Kaivosteollisuus ry, 2022). ETM projects have become an important part of the Finnish mining sector and are critical for the ambitions to develop battery industry value chains in the EU. Finland has also reframed its understanding of the ETM sector by moving away from the notion of mining clusters and adopting the industrial ecosystems concept. This supports a more dynamic and international perspective on the system, which includes mining, refining, technologies, batteries and recycling.

As an EU member state, Finland has a full competence to establish its mineral policies. However, as the EU seeks to establish new domestic value chains around strategically important ETMs, it has introduced several influential policies. The Critical Raw Materials Act (CRMA) (EU, 2024) aims to secure the EU’s access to and supply of critical raw materials while reducing its dependence on China, by facilitating and setting goals to increase domestic production, streamlining permits and activating circular economy approaches. The new Battery Regulation (EU, 2023) lays down mandatory requirements for all batteries placed on the EU market covering sustainability and safety, labelling, due diligence, waste management, and battery passport. The EU has also leveraged various funding instruments to support the development of ETM projects, including IPCEI (Important Projects of Common European Interest) and green loans from the European Investment Bank. These have been also utilized in Finnish ETM projects. Fig. 12 provides a timeline of the key Finnish policy developments discussed in this paper.

A more detailed timeline is available in [Appendix 3](#).

In Finnish mineral policy, there has been a shift towards ETMs and from upstream to the entire value chain. This is illustrated by the establishment of Finnish Mineral Group (FMG) in 2018, when the state concentrated its mining holdings under one company. FMG's presented mission is to "responsibly maximise the value of Finnish minerals and provide materials for climate neutrality" (FMG, n.d.). Furthermore, the National Battery Strategy from 2021 aims to set Finland as a leading country in responsible battery production and sustainable electrification (MEAE, 2021). The Government updated its mineral strategy in 2024 (Finnish Government, 2024): Its key objective is to promote the growth of the Finnish mineral cluster to facilitate the green transition, increase the value added of mining raw materials, and strengthen the strategic autonomy of Europe.

Today, a sense of urgency frames the Finnish ETM policy development by emphasising a closing window of economic opportunity, new geopolitical risks and the need to reduce carbon emissions. This fuels the EU's and the Finnish government's plans to streamline the permit procedures for green industry projects that can include ETMs (Programme of Prime Minister Orpo's Government, 2023). Finnish governments have accelerated the processing of environmental and water permits for projects related to the battery industry by giving them priority in the permit process (Prop. 128/2022; Prop. 196/2024). Furthermore, water legislation has been amended to allow, for example, exceptions to environmental objectives for battery and mining projects (Prop. 175/2024). Streamlining permit processes is also connected to the policy goals of trying to attract foreign investments to the value chains, as the domestic capital to fund these megaprojects is limited.

Over the past decade, sustainability and responsibility have been increasingly emphasized in Finnish policy agendas. While the earlier 2013 national action plan, "Making Finland a Leader in the Sustainable Extractive Industry" (MEAE, 2013), and the 2014 established Sustainable Mining Network (Lesser, 2020) already discuss these concepts, the recently published national battery and mineral strategies both note the importance of "responsibility" extensively. Responsibility in these policies reflects Finland's commitment to global climate efforts but is also used as an argument to justify domestic ETM projects that sometimes face opposition. Responsibility has served as a broadly accepted policy goal at a general level, as both the industry and its critics can support it. Today, a big part of the public industry policy discourse concerns Finland's role in providing the minerals for green technologies more sustainably than many other countries outside the EU. Finland's National Mineral Strategy (2024) preface goes as far as asking "Is it right that the environment is destroyed in African or Asian mines and people are suffering, so that we here in Europe can switch to electric cars and renewable energy" (Finnish Government, 2024). [Appendix 3](#) outlines key policy pieces for ETMs in Finland.

3.4. Policy actors and networks

In the three country case studies, government departments with formal industry promotion responsibility and experts from the industrial sector form policy communities shaping ETM value chain policy. In Chile and Australia, the members of this policy community tend to be largely mining specialised. Combined with the historic extractive sector focus, this results in an upstream emphasis in policy, with recent downstream expansion aspirations. In contrast, in Finland, the policy network encompasses a wider array of government and industry actors resulting in an industrial ecosystems approach with less mining specialisation. In developing multiple policy pieces for a large and specialised mining industry, Chile's core technical and mining centred policy community has started to implement formal participation mechanisms to include other stakeholders, providing more details on

mechanisms than its Australian and Finnish counterparts.

We observe that other national, state or local level actors participate in "critical engagement policy networks"¹³ in the three countries. These can be multiple networks raising issues for policy consideration based on broader perspectives or interests than ETM value chain promotion. They utilise mechanisms such as lobbying, campaigning and contestation via courts. The networks can include civil society and Indigenous organisations, think tanks, research and development institutions, individual experts or representatives of competing land uses. For example, Australia's farming community displays formidable lobbying and campaigning capacities, mobilising them at local and national levels within temporary alliances, resembling issue networks, to navigate land related conflicts, including those connected to extractive activity. Finland differentiates itself with the powers available to municipalities. It is at the municipality level where some critical engagement policy networks have advocated stronger environmental requirements for individual projects. Across the Atacama Salar, the recognition of the human right to a clean, healthy and sustainable environment appears to be galvanising a transnational critical engagement policy network. As part of this policy network, human rights, environmental advocacy organisations, Indigenous Peoples and/or individual advocates jointly engage in human rights-based litigation to shape regulatory requirements for lithium extraction. Courts play a key role with their decisions setting policy-relevant legal precedent. This can be observed in the number of cases registered in the Business and Human Rights Resource Centre tracker of environmental and human rights abuse allegations against companies involved in energy transition mineral projects (BHRRC, 2024).

[Fig. 13](#). Overview of Policy Networks outlines the industry promotion policy communities, and the critical engagement policy networks in the three countries. Subsequently, we analyse these policy networks in more detail.

3.4.1. Australia

Federal and State ministries with responsibilities for industry and resources set policy on ETM value chains. Usually, the development of such policies will be accompanied by a review, which includes requests for written submissions from interested parties. Discussion papers by government can provide a reference point for written submissions. Australia's policy actors influencing ETM policy also include industry associations and individual companies, academia, the research and development sector, the electric mobility sector, First Nations rights advocates, and the farming sector. They exert policy influence via: i) membership of a mining industry promotion-centred policy community; ii) policy networks addressing matters of national or regional significance; iii) sector-wide, group or individual lobbying and campaigning.

First, a mining industry promotion policy community, driven by the Minerals Council of Australia, exerts strong influence in ETM policy. Its members are mining industry associations, Government departments with mining sector responsibility, geological surveys and some members of the R&D sector. Their inputs are valorised as technically sound, for example as part of public written submission processes. Membership of these institutions validates policy input as part of the policy community. Based on the written consultation record for Australia's Critical Minerals Strategy (2023) (Australian Government, Ministry for Resources, 2023),

¹³ Industrial promotion policy networks are clearly discernible as policy communities, while critical engagement policy networks that advocate social or environmental governance are more intricate and fluid in their structure and evolution. Classifying critical engagement policy networks as communities or issue networks requires data beyond the scope of this paper that is not necessary to address our research questions. To arrive at a conceptual classification of these networks, further research could rely on interviews and detailed media analysis over time to follow the multiple actors involved in various networks within and across countries, and to ascertain the degree of formality in membership, and shifts in thematic foci and coalitions.

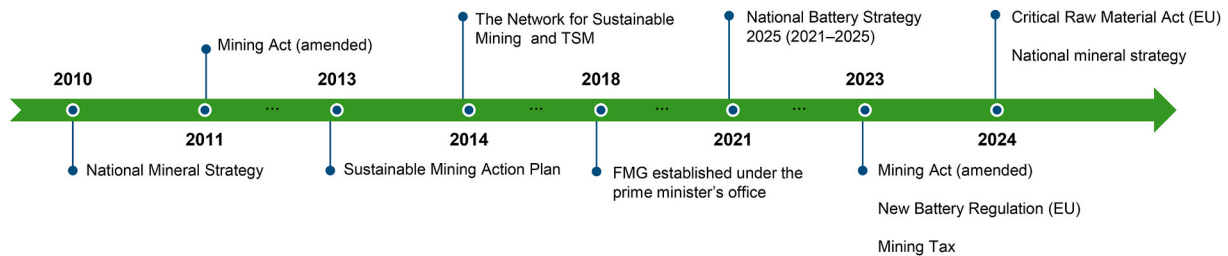


Fig. 12. A timeline of the key policy developments in Finland.



Fig. 13. Overview of policy networks in Australia, Chile and Finland.

industry submissions and some submissions from the R&D sector received attention, demonstrating the influence of the formal mining policy community. This is also evident at the state level. For example, Western Australia's Battery and Critical Minerals Strategy Stakeholder Consultation paper (2023) (Government of Western Australia, Department of Jobs, Tourism, Science and Innovation, 2023) directly recommends papers by (or commissioned by) the Future Battery Industries Cooperative Research Centre, and the Chambers of Minerals and Energy of Western Australia to stakeholders for review. Australia's National Battery Policy likewise utilized a written submissions process. The Australian Government decided to make the stakeholder submissions to this policy confidential,¹⁴ thus offering far less transparency.

Second, critical engagement policy networks respond to matters of regional or national significance. First Nations cultural heritage and inclusion are an example. First Nations organisations, networks and representative bodies advocate stronger regulation particularly in the aftermath of the Juukan Gorge disaster, with support from actors with or without a history of campaigning on First Nations rights. Before 2023, Federal strategy was silent on First Nations FPIC. Yet, in a salient rhetoric shift (Sinclair and Coe, 2024), the 2023 strategy mentioned “engaging early on Free, Prior and Informed Consent” including through the Northern Territory Land Act and Regulations. Written submissions by several First Nation's led bodies and advocates had included calls for FPIC to be the basis for engagement with First Nations people and Communities (for example First Nations Clean Energy Network, 2023; Central Land Council, 2023).

Third, industry sectors and land users engage in lobbying and campaigning. The farming sector is a political force and formal policy actor, whose alignment in policy processes shifts according to the issue. Western Australia's reversal of cultural heritage regulation is an example

of farming sector mobilisation to repel the policy changes the above critical engagement policy network had advocated for. Political polarisation around First Nations rights has hindered policy reform, more so following campaigning by opponents to the Voice to Parliament in the Constitutional Referendum in 2023 (Bruns et al., 2024) whose narrative of social division amplified polarisation (Graham, 2024). Australia's mining industry has a track-record of steering policy and the broader political landscape using mainstream media campaigns, lobby efforts (Maher, 2022a,b) and submissions, in addition to more covert strategies (Lucas, 2021; ACCR, 2024; Environmental Finance, 2024). For example, in 2012, under a Labor Government, Australia established a carbon price scheme and saw greenhouse gas intensity decline, only to remove the price scheme, together with the Prime Minister who advanced it, following campaigning from the mining industry and the Coalition (Woronov, 2019). On the grounds of employment benefits, some State Labor Governments have continued to support new hydrocarbon projects. The remoteness of most mining ventures keeps them out of sight for most voters, largely based in major urban centres.

The mining industry's strong policy influence and hydrocarbon sector advocacy explain why progressive think tanks and the environmental movement concentrate energies on the domestic transition away from hydrocarbons more than on social or environmental standards for the ETMs sector. Therefore, environmental advocacy currently does not concentrate on ETMs sector growth concerns. The influential Green Party, third in the national election in 2019, does not oppose all mining activities, and supports lithium development (Graham et al., 2021). This is not to say that environmental NGOs and think tanks do not engage in ETM related policy matters. On the contrary, several of these groups contributed written submissions to Australia's 2023 Critical Minerals Strategy review. The influence of the Green Party has been somewhat eroded by its disastrous electoral losses at the May 2025 federal election. This demonstrates a shift in interest from the environmental issues tackled by the environmentally conscious Green Party towards increased confidence in the federal labor government to develop ETMs in a manner that benefits Australia.

¹⁴ We wrote to the Australian Government Department of Industry, Science and Resources to seek guidance on the location of submissions and were advised in writing that “to maintain confidentiality, submissions were not made public” (3 March 2025).

3.4.2. Chile

Mining-related policy actors are influential in ETM sector policy given the upstream concentration of the sector in Chile. Government Ministries hold policy formulation responsibility, receive input from technical elites, and seek the support of industry actors such as mining associations or unions. Together, they form an industry promotion policy community. Chile's policy formulation process, in recent decades, has made use of technical advisory panels. The Bachelet and Pineira governments consistently relied on Presidential Advisory Commissions (PAC). These expert panels provided analyses and policy proposals on matters including mining royalties, reforms to national copper miner Codelco, environmental institutions, citizens' participation in environmental governance, and the overall strategy and governance structure for the future of the lithium industry (Poveda-Bonilla, 2019; Poveda-Bonilla, 2020; Poveda-Bonilla, 2021). PAC members have come from specialist, industry, and government backgrounds. Analysts have assessed the PACs as centred on Chile's intellectual elites, rather than on political deliberation or social inclusion (Cisternas Guasch and Vásquez, 2018).

Broad stakeholder engagement beyond technical circles is necessary given the legacies of Chile's copper and lithium sectors, and the country's recent experience of social upheaval. In 2019, dissatisfaction with socio-economic inequalities stemming from four decades of neoliberal economic policies spilled into social unrest in Chile. The unrest did not centre on mining but on a wide array of grievances. Nevertheless, calls for a new constitution to integrate better socio-environmental protections enjoyed the support of more than 78% of voters, or as high as 90% in areas with the worst environmental conditions in Chile (Berasaluce et al., 2021). Within the constitutional convention, representatives sought to include the nationalization of copper, lithium and gold in the proposed new constitution (Convención Constitucional, 2021, 15 December). Representatives of the mining industry viewed proposed constitutional changes to mining concessions and water rights as reflecting an anti-mining sentiment (Minería Chilena, 2022, 3 August). In September 2022, a Constitutional plebiscite saw 61.86% of voters reject the proposed Constitution (Biblioteca del Congreso Nacional de Chile, 2022). A modified draft Constitution was again presented for a second plebiscite in December 2023, when 55.76% of the population voted to reject it (Biblioteca del Congreso Nacional de Chile, 2023).

In the last five years, policy-making exercises have included stakeholder engagement mechanisms, implemented either around already formulated policy or as part of information collection and validation exercises. Indigenous FPIC takes place after policy formulation and some policies have included Indigenous engagement in the information gathering stage or towards implementation (see for example Gobierno de Chile, 2024). The National Lithium Strategy was designed based on input from a PAC,¹⁵ rather than a broader participation process, yet the government is undertaking what it terms a “national dialogue” centred on governance. To implement its National Lithium Strategy, the Government established a Strategic Council of the Lithium and Salt Flats Committee with members from several ministries. With the Ministry of Mining at the helm, the Committee includes, for example, the Foreign Affairs Ministry in line with lithium's “strategic importance to foreign policy” (CORFO, 2023). The Council of Atacameño Peoples (CPA) rejected the National Lithium Strategy, requesting an Indigenous consultation process for the exploitation of the mineral, arguing that the current strategy does not guarantee the protection of the rights of Indigenous Peoples. Subsequently, the Strategic Council of the Lithium

and Salt Flats Committee announced that individual administrative acts will require consultations based on ILO 169 Convention requirements. In 2023, Ariel Leon, who has played a central role in legal action to ensure Indigenous consultation, explained that despite the lack of earlier consultation towards the NLS, Indigenous Peoples expected consultation to take place. Leon outlined four conditions for lithium mining in Indigenous territories: protection of the salt flats, cultural survival, benefit sharing, and Indigenous participation in lithium mining governance through representation in the boards of the various companies and JVs (BNamericas, 2023). More recently, there have been instances of some direct citizen participation in providing policy input. For example, the two-year process to design the National Mining Policy to 2050 reports it involved workshops, technical panels, surveys, and on-line participation mechanisms, with input from 3500 representatives from industry and its associations, NGOs, Indigenous Peoples, academia, and civil society organisations connected to mining activity (Gobierno de Chile, 2021). Likewise, the FURE strategy resulted from a diagnosis by state institutions combined with a stakeholder consultation process (Gobierno de Chile, 2023c).

A critical engagement policy network has galvanised among Indigenous, human rights and environmental organisations, facilitated by the recognition of the fundamental human right to a clean and healthy environment. Policy actors concerned about rights and impacts in the context of ETMs extraction engage in protests, complaint documentation, litigation via courts to set legal precedents, and national and international advocacy. Recent mobilisations include the 2024 community blockading of main roads to Albemarle's and SQM's operations in the Atacama Salar (Protest ends, 2024). National and international advocacy on environment, Indigenous rights and human rights has gathered pace including in connection to lithium extraction in Chile. For example, human rights experts and Indigenous leaders from the CPA collaborated on a human rights impact assessment for SQM's Atacama Salar operations. The results served to advocate for tighter water regulation for lithium extraction as part of the Constitutional Convention (Observatorio Ciudadano, 2022) and featured prominently in a submission by an international coalition of human rights organisations to the United Nations Human Rights Council, as part of China's Periodic Review process (FIDH et al., 2023). Chile's Codelco was recently listed among the top five ETM mining companies attracting most allegations of human rights abuses (BHRRC, 2024). Examples of legal action include the Indigenous Atacameño community of Conchi Viejo securing a court order to preclude El Abra mining company from continuing work in their territory on the grounds of environmental and cultural impacts (Corte de Antofagasta, 2023).

3.4.3. Finland

The Ministry of Economic Affairs and Employment (MEAE) is responsible for the strategic coordination of the mining and battery sectors. The ministry is assisted by Business Finland, which acts as a country promoter regarding international investments and funds research and development projects related to these sectors. The state develops the industry also through Finnish Mineral Group (FMG, under the Prime Minister's Office), which invests in strategic mineral and battery projects, provides anchor investment (seeks minority ownership) and national expertise for international joint ventures (see FMG, 2023). FMG owns the Terrafame nickel mine (which the state saved and bought from bankruptcy in 2016), 20% of Keliber lithium project, 30% of Easpring Finland battery material project and is searching for partners to develop Sokli REE mine and several battery projects.

Other influential organisations in ETM policy development (e.g. strategies) are the Geological Survey of Finland (GTK), which provides research and services in support of decision-making for Government and industry, influential industry associations (e.g. FinnMinn and Finnish Battery Industries), large individual companies (e.g. Keliber), hosting provinces and municipalities. Provinces and municipalities control the zoning of industrial areas and influence development funding towards

¹⁵ For example, the Bachelet Government's National Lithium Commission presided by the Ministry of Mines, included twenty specialists from industry and the private sector and two “permanent guests” one representing the unions and one representing the Council of Atacameño Peoples (Gobierno de Chile, Ministerio de Minería. (2015).

ETM projects through strategic planning (e.g. regional development roadmaps). Compared to many other countries, a municipality in Finland has extensive autonomy (especially in land-use) and plays an important decision-making role regarding ETM projects (Mononen et al., 2023). The core ETM policy network includes MEAE, BF, FMG, GTK, and industry associations and has features of a policy community such as shared goals and approaches and representation of key institutions. Significantly, the state has organized itself through these actors to operate under the assumption that securing the funding for ETM megaprojects domestically is difficult and thus, international investments are necessary and should be facilitated.

The policy actors negatively impacted by ETM projects (environment, social, livelihoods) form a critical engagement policy network. It comprises NGOs, reindeer herders, the tourism industry, the Sámi indigenous communities, various local movements and actors from certain political parties (such as the Greens). In practice, the environmental NGOs have taken a critical stance towards the mining industry, including many ETM projects, and often collaborate with local protest movements. In the past, there were significant efforts to organize collaborative platforms between the mining sector and affected stakeholders through the Network for Sustainable Mining (Lesser, 2020). However, the Network ceased operations after several stakeholders left the forum due to mutual distrust. A form of policy network closure can be observed in the steering group for the new mineral strategy development process, which included only one representative from the critical stakeholder groups (MEAE, 2023b).

3.5. Policy critique

Australia, Chile and Finland share strengths in their emphasis on industrial development, greenhouse gas emissions reduction contribution, and acknowledging geopolitical dynamics. They clearly articulate the opportunity that decarbonisation presents, and the challenge in addressing social, environmental or geopolitical matters. Of note, recent Chilean policy demonstrates intent to strengthen public knowledge towards better management of environmental and economic development requirements and opportunities. Yet the three countries exhibit some weaknesses in balancing industrial development aspirations with the governance of social or environmental matters, or with Indigenous rights protections, and in articulating a clear approach to local development.

Below, we present a critique of the ETMs policies of each of the three case study countries.

3.5.1. Australia

Some sustainability and responsibility related policy areas appear unclear, including the meaning of “ESG”, and the approach to mine transitions. Australian strategies make extensive use of the ESG acronym yet do not define it. It appears to refer to socio-environmental safeguards. All recent ETM policies/strategies/strategy papers we reviewed refer to ESG standards, credentials or aspirations to raise or demonstrate them. Despite the multiple forms the ESG concept takes, strategies do not offer definitions or indications of scope or standards. On environment, there is surprisingly limited policy focus on the end of life of mines, for a country with so many abandoned mines (Unger et al., 2025), and despite strategic acknowledgement of circular economy priorities (Australian Government, Ministry for Resources, 2023; Australian Government, Department of Industry, Science and Resources, 2024). Australia has undergone a learning process about mine transitions. It is unclear that ETM-connected policy has benefited from the learning. In addition, as renewable energy infrastructure is rolled out, end of life and circular solutions will need more than a brief acknowledgement in strategies.

Likewise, Australia's Critical Minerals Strategy, like various State strategies on ETMs, does not demonstrate the ambitious implementation approach to First Nations engagement necessary to attain the high ESG

standards the strategy aspires to. The reference to First Nations FPIC in the 2023 Federal Strategy represents a significant shift in rhetoric (Sinclair and Coe, 2024) that needs to be matched with action. Yet, Australia has received multiple negative assessments on its performance on First Nations rights including from United Nations Special Rapporteurs on the Rights of Indigenous Peoples (Tauli-Corpuz, 2017). For example, Human Rights lawyer Professor Melissa Castan's testimony to Australia's inquiry into the implementation of UNDRIP described it as ad-hoc and uncoordinated (Commonwealth, 2023, p. 24). Partnership-based approaches with First Nations in developing policies emerged as one avenue Australia relies on to implement elements of UNDRIP (Joint Standing Committee on Aboriginal and Torres Strait Islander Affairs, 2023 p. 24). A participation and partnerships language appears in the Federal 2023 strategy. Nevertheless, the lack of detail on implementation plans, paired with limited evidence of First Nations engagement in the Strategy setting process itself, raise questions. It is telling that the Central Land Council, a key Native Title Representative Body, stated in its written submission to the 2023 strategy that it could not “comment on the extent to which First Nations peoples have been actively engaged by the Australian Government in the development of the strategy” (Central Land Council, 2023, p. 6).

On public participation, generally Australia's submission-based Strategy consultation process can make submissions, and their authors, publicly accessible. However, there are notable exceptions. For example, some parties might submit in confidence. Likewise, the process for the National Battery Strategy gathered submissions without making them public. Australia's Critical Minerals Strategy consultation hub has listed 82 published responses. Western Australia sought input towards its Critical Minerals and Battery Industries Strategy Refresh via a survey, and New South Wales conducted a public consultation process for its 2023 strategy.

3.5.2. Chile

Strengths in the approach to ETMs policy in Chile include i) emphasis on expert advice and debate, ii) institutional reforms to address some socio-environmental concerns, iii) the concept of knowledge as a public good to develop via an increased state role in the lithium sector, and iv) the stated intent to balance participation from various geopolitical and industry actors in the lithium sector (Gobierno de Chile, 2023a). In the last two decades, emphasis on PAC input in the policy-making process has made technical policy input publicly available. Environmental governance reforms emerged in response to civil society and socio-environmental conflicts and unfavourable international expert assessments. The policy-making ecosystem has therefore demonstrated a degree of responsiveness. On lithium, actors from within and without the government raised concerns about limited value adding, government appropriation of rents, community development and benefit sharing, and Indigenous rights. Dissatisfaction across a range of sectors saw them mobilise diverse strategies with a degree of success in triggering policy reform. Of note are statements of intent in the NLS to extend biodiversity protection areas, and the notion of knowledge as a public good including establishing environmental baselines for the salts, which signal an innovative approach to strengthening state technical capacity for regulation and industry promotion.

However, with Chile's Critical Minerals Strategy yet to be released and lithium and copper receiving separate policy treatment, a consolidated approach for ETMs is lacking. This signals possible issues in managing cumulative effects and synergies where a coordinated approach is necessary such as in managing environmental impact and its repercussions on human rights and socio-environmental conflicts. With the industries overlapping in the same territories, separate policies are unlikely to deliver the level of integration socio-environmental realities and communities require.

It is also unclear how the social dimensions of lithium extraction and social baselines shall be addressed during lithium sector growth, with the stated focus of the NLS being majorly on environmental dimensions.

The wording of statements on Indigenous and community participation lacks clarity on whether Chile shall align itself with the requirements of the United Nations Declaration on the Rights of Indigenous Peoples (2007), with the NLS 2023 and the FURE both referring only to the ILO 169 Convention.

3.5.3. Finland

Finland's current ETM policy mix is a continuation of the 2010s mining policy that has effectively widened the scope to batteries, their material production, recycling and to circular economy of raw materials in general. There is also a direct connection to climate policy, green transition and green industrialization.

From an economic perspective, the first steps in establishing ETM value chains based on batteries in Finland have been relatively successful. However, the highest expectations have not been met, partly due to international developments in subsidy policies, which have weakened Finland's position in the global competition to secure large investments (NAOF, 2024). Nevertheless, government policies have clearly facilitated the first steps in building Finland's battery industry and for example, establishing the state-owned FMG has achieved government goals to land international ETM investments through partnerships. Overall, the public-private collaboration has been successfully organized, especially in the battery sector, where governmental institutions like BF are intensively involved.

The Finnish ETM policies address certain sustainability aspects clearly: the national battery (2021) and mineral strategy (2024) include responsibility as an important element of planned actions, the Mining Act reform (2023) strengthened the role of municipalities, the new mining tax (2023) introduced royalties to municipalities, and there is clear policy emphasis on circular economy. Thus, the policies have tried to balance the industrial interests of the core ETM policy community, sustainability and local level concerns.

However, the rapid growth of ETM exploration, mining development and new types of battery projects have intensified criticism against these activities and triggered protest movements in regions where the negative impacts or risks compared to the potential benefits have been deemed too large (Eerola, 2022; Leino et al., 2023). Much of the opposition stems from distrust based on past experiences, different perspectives on risks, and intersecting interests and values on land use. In many cases, the opposition has risen against individual projects and later evolved to target entire industrial sectors. Despite the new ETM policy actions discussed above, the most critical stakeholder groups continue to advocate better mechanisms to prevent mining and exploration in nature conservation areas, the Sámi homeland, and localities with low support for mining. Furthermore, the lengthy permit processes have been a major source of complaints for both the impacted stakeholders and the industry.

While civil society actors have advocated for stronger regulatory frameworks, the mining industry has lobbied for voluntary measures, such as social responsibility reporting, as a sufficient policy measure. The industry and sometimes also municipal officials, have contended that protests are often unjustified, arguing that companies have improved their environmental and social performance over the years and do well in global comparison. While the Sustainable Mining Network was an important collaborative attempt to reconcile different interests in the mid 2010s, it failed to develop and maintain long-term trust between policy actors and a balanced role in policy processes. An overall failure of the Finnish ETM policy has been that it focuses on responsibility at the general level while being weak in addressing local development questions effectively. This can be seen in the National Battery Strategy (2021) and to some degree in the Mineral Strategy (2024), which both lack analysis and proposals on local governance. Instead, these questions are largely left to individual companies and host municipalities to resolve.

4. Discussion

In this section, we synthesise and further connect the results. First, we address policy inclusions and gaps. Later, we illustrate connections between industry promotion policy communities and ETM value chain composition and policy priorities; and between critical engagement policy networks and environmental and social dynamics in ETM value chains. We comment on policy implementation uncertainty and highlight policy innovations that warrant attention in future research.

4.1. Policy coverage

Within a narrative of enabling and deriving economic benefits from the energy transition, value chain security and geopolitics underpin the industrial development emphasis in Australian and Finnish policies for ETM value chains. In contrast, Chilean policy is more decisively centred on maximising national benefits and competitiveness. Finland has historically prioritised industrial linkages and domestic value adding beyond extraction, whereas in Australia and Chile, these have been recent additions to ETMs policies. Social and environmental governance are either i) assumed, e.g. the "theoretically" (Central Land Council, 2023) high 'ESG' standards in Australia; ii) presented in statements of intended reform, e.g. cultural heritage or biodiversity protection reform in Australia, or ambitious social and environmental governance changes in Chile; or iii) remain to be included in policy, e.g. social baselines for Chile's lithium sector, or sufficient local development provisions in Finland. Fig. 14. Outlines key policy inclusions and omissions across the three countries.

4.2. Industry promotion policy communities shaping policy priorities

Mining industry actors and geology and mineral production experts are more influential in Australia and Chile's policy-making processes, given those countries' raw materials export economic focus, than in Finland. In both Australia and Chile, long-standing mining industries are valued as key contributors to economic development, represented by powerful peak bodies, namely the Minerals Council of Australia and Australian State-level industry associations, and Chile's influential Consejo Minero (Poveda-Bonilla, 2019). A focus on extraction as an economic driver has prevailed over the merits of value adding. In both countries, ETM policy communities comprise a similar array of actors including government departments responsible for industrial development, investment promotion or geology, mining industry associations, and technical elites with industry credentials. Technical expert opinion is valorised in both countries to support policymaking choices. While technical experts make up most Chile's policy expert groups (termed PAC in the past), the National Lithium Commission did include a representative of Indigenous Peoples (Gobierno de Chile, Ministerio de Minería, 2015). Finland's influential ETM policy community includes the state-owned Business Finland (BF), Finnish Mineral Group (FMG) and the Finnish Mining Association (FinnMin). However, the mining industry is comparatively less significant in public understandings of the Finnish economy. Competing and valued land uses such as tourism, reindeer herding, recreation, and nature protection drive opposition to new ETM projects. In addition, Finland was a pioneer in adopting industry clusters and innovation ecosystems in its mining and ETM policy (Laasonen et al., 2022). Finland's growing battery ecosystem illustrates effective FDI attraction, combining state investment and incentives with an emphasis on innovation and industrial ecosystems. In Chile and Australia, the policy shifts towards value adding and industrial ecosystems are still too recent to assess their impact.

4.3. Critical engagement policy networks advocating social and environmental governance and Indigenous rights

Advocacy for social and environmental governance and Indigenous

	Policy Inclusions	Policy Omissions
A U S T R A L I A	- Supporting the global energy transition - Collaborating with geopolitical allies - Upstream growth; incentives to create downstream - Statements of intent on sustainability - Regulatory streamlining - Statement of intent on FPIC	- Large overseas upstream ETM investment - Engagement with China - Life of mine approach (abandoned mine legacies) - Cumulative impacts, intergenerational considerations - Solutions on First Nations participation, FPIC, and partnerships
C H I L E	- Supporting the global energy transition - Balancing participation from geopolitical actors in ETM value chain - Knowledge of the lithium sector as a public good - Environmental baselines - Statement of intent to expand biodiversity protection areas - ILO169 Convention obligations on Indigenous rights – covers some FPIC	- Social baselines for the ETM sector - Integrated approach for ETMs extracted in overlapping territories
F I N L A N D	- Supporting global energy transition - Statements of intent on sustainability - Expanding from raw materials to batteries, industrial ecosystems - Urgency and streamlining permits - Supporting European autonomy - Public, private collaboration, FDI attraction - Statement of intent to support Sami rights	- Mechanisms to address local conflicts connected to ETM value chains - Local governance solutions - Indigenous FPIC recognition

Fig. 14. Policy inclusions and omissions in ETMs policies in Australia, Chile and Finland.

rights has some influence in policy, in the context of conflict, negative legacies, or industrial disasters, which create a climate favourable to rhetorical, institutional or governance shifts (see also Birkland, 2006). In the three countries, following significant disasters such as Talvivaara or Juukan Gorge, or documented negative environmental legacies such as in the Chilean copper sector, attention to major issues leads to changes in narrative, or even more stringent regulation. What is concerning about this trend is that slower forms of environmental injustice or violence, which do not take the shape of high-profile disasters, can still have significant impacts on communities, often in “sacrifice zones” (Kramarz, 2022). Unless there are high profile socio-environmental conflicts (e.g. protests or legal action) or publicised major Indigenous rights infringements, Indigenous matters can receive limited attention. This is regardless of mining industry entrenchment.

Chile and Finland display more readily available mechanisms for either citizen or municipality influence on policy, approvals or industrial operations, allowing advocacy for improved social and environmental governance. Chile's Environmental Tribunals allow community actors to make regulatory compliance gaps visible notwithstanding the power differential with mining industry actors (Akchurin, 2023). Finnish municipalities (among other stakeholders) can influence the planning and implementation of mines through permitting processes and block them through land use planning. Citizen movements and the ongoing use of citizens' petitions in Finland have demonstrated, in selected cases, potential to impact national decision-making, resulting in higher environmental standards. Australia's industrial corridor approach could theoretically create opportunities for more regional and community engagement.¹⁶

4.4. Social and environmental governance and FPIC guarantees rely on implementation

Across the three cases, it is uncertain whether the simultaneous intent to expand the ETMs value chain while speeding up approvals,

strengthening environmental and social governance, and implementing FPIC can be delivered. This is particularly the case in Australia, given recent difficulties to roll out the reforms earmarked in policy. Finland is likewise streamlining its regulatory requirements. Chile's National Mining Policy 2050 set an ambitious aim to reduce approvals timelines by 25%, where if delivered, the proposed exclusion of lithium extraction from existing conservation zones and new conservation areas could serve both policy priorities – i.e. streamlining and environmental governance.

There are positive rhetoric shifts at the strategy level on Indigenous matters in Chile and Australia that need to be matched with delivery. The influence of policy actors seeking more benefit sharing or more Indigenous Peoples' participation is clear in Chile's National Lithium Strategy discourse. In Australia, Federal Government policy on ETMs has recently included FPIC in its rhetoric, while gradually opening its language towards First Nations partnerships and participation. In Finland, the recent cases of two exploration reservations and an exploration permit taken to the Finnish courts and UN committees by the Sámi demonstrate discontent and uncertainty about Sámi rights in practice. Whether the declared policy intent results in more inclusion of Indigenous Peoples depends on implementation.

4.5. Chilean policy innovation

Chile has proposed several policy solutions for its lithium sector that are worth noting and monitoring during implementation as examples of innovation. First is the aim to create knowledge of the lithium sector as a public good via stronger state participation and public institutions. Active state participation is not a new approach to mining in Chile, given its copper sector history. What is innovative is the notion of knowledge as a public good and giving the state, as an industrial actor, responsibility for developing public knowledge on the social, environmental, technological and economic dimensions of the sector towards better regulation and contract negotiations. Complementary and notable innovations include earmarking certain salaries for conservation, excluding lithium extraction from existing conservation areas, and recognising the need for environmental baselines in the salaries. In contrast, the policy does not identify social baselines as a gap to address. This is despite research finding that the social impacts of lithium extraction globally (Agusdinata et al., 2018) and in the lithium triangle need to be

¹⁶ To date limited development has occurred, especially with Fortescue Industries' Green Energy Manufacturing Centre in Gladstone, although this is likely to increase given the passing of the *Future Made in Australia Act (2024)* (Cth) which supports manufacturing for local communities.

understood, including in baselines and with ongoing, participatory monitoring (Petavratzi et al., 2022).

5. Concluding remarks

Industrial development is a shared priority in the ETM value chain policies in Australia, Chile and Finland, framed within a broader narrative of enabling and deriving economic benefit from the energy transition. The idea of streamlining and accelerating industrial development, including extraction, is prominent, together with assertions that social and environmental governance will be strengthened or maintained. Australia and Chile acknowledge FPIC in the text of their policies for ETM value chain upstream components. However, it is uncertain whether the simultaneous intent to expand the ETMs value chains while speeding up approvals, strengthening environmental and social governance, and ensuring FPIC can be delivered. These policy areas are developed in unequal levels of detail, and implementation is in its early stages.

Common to the three countries are active industrial promotion policy communities and critical engagement policy networks. Industrial promotion policy communities are influential in mainstream ETM value chain policy-making and valorise input from industrial actors and government departments responsible for industrial promotion. Mining industry actors and geology and mineral production experts hold significant influence in Australia and Chile, given their focus on raw materials export. Finland has emphasized innovation and industrial ecosystems, maintaining a long-standing focus on value adding and considering a broader array of industries and land users. In contrast, value-adding in ETM policies is a more recent emphasis in Australia and Chile.

Critical engagement policy networks advance social and environmental governance and Indigenous rights, and attain higher influence amid conflicts, negative legacies, or industrial disasters. Examples of mechanisms available to these critical engagement policy networks include environmental tribunals in Chile, and Citizens Petitions and municipality powers in Finland. These mechanisms allow actors such as Indigenous Peoples, host communities or environmental NGOs to advocate for checks and balances during industrial expansion. These mechanisms are important because, Indigenous matters and slow forms of environmental injustice or violence (Kramarz, 2022) may receive limited attention if not attached to major incidents.

In addition, some of Chile's policy solutions hold promise in balancing industrial growth and social and environmental priorities. Chile's proposed expansion of environmental conservation areas in the salars, and its innovative notion of 'knowledge as a public good' via state participation in the lithium sector, warrant monitoring and analysis including through the lens of FPIC.

In the three case study countries, influence from actors outside the traditional industry promotion circles, such as municipalities, host communities, Indigenous Peoples' representatives, or voluntary standard-setting bodies, contributes to enhanced checks and balances and debate, and can facilitate improvements in social and environmental governance. Countries along the ETMs value chains need to develop and support inclusive spaces for discussions on socio-environmental governance tools, public engagement, and Indigenous rights, ensuring that policy solutions are scrutinised and refined. This is necessary both for affected actors and for the future of global value chains, given that policy focus and influence are not uncontested in the study countries, and these highly mineral-endowed nations are set to

play important roles in ensuring a just and responsible decarbonisation.

CRedit authorship contribution statement

Diana Carolina Arbeláez-Ruiz: Conceptualization, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. **Rauno Sairinen:** Conceptualization, Formal analysis, Funding acquisition, Investigation, Methodology, Supervision, Validation, Writing – original draft, Writing – review & editing. **Julia Loginova:** Conceptualization, Formal analysis, Investigation, Methodology, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. **Juha Kotilainen:** Formal analysis, Investigation, Validation, Visualization, Writing – original draft, Writing – review & editing. **Nigel Wight:** Formal analysis, Investigation, Validation, Writing – original draft, Writing – review & editing. **Tina Soliman-Hunter:** Formal analysis, Investigation, Validation, Writing – original draft, Writing – review & editing.

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Appendices.

Australia

Appendix 1

Selected Australian Government Policy Developments on ETM Value Chains

Date	Policy	Objectives
2017	National Mineral Exploration Strategy 2017-2022 (Australian Government, Geoscience Australia, 2017)	Seeks to increase investment in exploration and promote discovery via incentives, data, research collaboration and communication. Data use to minimise exploration's environmental footprint. States regulatory requirements and community scrutiny as issues to address with regulatory reform, data and communications. Identifies mining sector as contributor to First Nations and community employment.
January 2019	Future Battery Industry Strategy Western Australia (Government of Western Australia, 2019)	Positioning the state as a leading producer and exporter of battery materials, technology and expertise. Focused on competitiveness, broadening the scope of minerals extracted and processed, and increasing R&D capabilities.
March 2019	Australia's Critical Minerals Strategy (Department of industry, innovation and science and Australian trade and investment Commission, 2019)	Fostering upstream and downstream development via investment attraction, innovation and infrastructure. Outlines information sources, government support and research initiatives. Emphasises lithium, cobalt, REE opportunities.
June 2020	Australia's Global Resources Statement (Australian Government, Department of Industry, Science, Energy and Resources, 2020)	This detailed statement refers to Australia's technical credentials and regulatory regime. On low emissions it emphasises hydrogen and carbon capture, utilisation and storage. Identifies lithium demand for batteries as an opportunity. On coal, it mentions commitment to a technology led approach to emissions reduction. No First Nations references.
2021 2024	Mineral Investment Attraction Plan Summary (Australian Government, Australia Minerals, 2021; Australian Government, Australia Minerals, 2024)	Updated in 2024. The 2021 summary focused on attracting investment and promoting new entrants with legal compliance as a differentiating factor. The updated version mentions Australia's role in facilitating the transition to net zero, global strategic and security needs and alliances, geopolitical and supply chain resilience considerations. It refers to ethical, social and environmental responsibility as differentiating factors and areas of global scrutiny.
2021	New South Wales Critical Minerals and High-tech Metals Strategy (New South Wales Government, 2021)	Increasing downstream participation to replace the existing 'dig and ship' model. Focuses on attracting investment along the supply chain from exploration to expanding participation in processing and recycling. Sets out to establish an industrial hub. No reference to First Nations or Indigenous Peoples.
March 2022	2022 Critical Minerals Strategy (Australia) (Australian Government, Department of Industry, Science, Energy and Resources, 2022)	Strengthening Australia's role in global value chains and meeting demand, expanding the upstream and downstream components. It emphasises investment and commercial offtake agreements, Australian knowledge, skills and IP and jobs. Does not mention First Nations.
November 2022	Strategy Update Western Australia's Future Battery and Critical Minerals Industries November 2020 – November 2022 (Government of Western Australia, Department of Jobs, Tourism, Science and Innovation, 2022)	Promoting the future battery and critical mineral industries. Prioritises participation in supply chains, investment attraction, energy storage applications (based on competitive advantage), developing local capabilities, and mineral certification to high social, environmental and governance standards.
December 2022	Nature Positive Plan – response to the review of the EPBC Act. (Australian Government, Department of Climate Change, Energy, the Environment and Water, 2022)	Outlines proposed new governance institutions: Environmental Protection Australia (EPA), Environmental Information Australia, and new Environmental Standards.
June 2023	Australian Critical Minerals Strategy 2023 – 2030 (Australian Government, Ministry for Resources, 2023)	Diversifying global value chains via international partnerships, building sovereign processing capability, become a "renewable energy superpower" and derive more economic value from mineral resources including for First Nations. Mentions First Nations Free, Prior and Informed Consent.
June 2023, Updated March 2025	Queensland Critical Minerals Strategy (Queensland Government, Ministry for Resources, 2023)	Released in 2023 strategy, with updates in 2025, the strategy sought to speed up development and investment, build value chains and to foster research and "ESG excellence".
August 2023	Review of mine objections processes - Queensland (Queensland Law Reform Commission, 2023)	As part of the Queensland Industry Development Plan, and following a request from the Attorney General, the Queensland Law Reform Commission issues its first paper as part of the review of mine objections processes. Following extensive work and consultation, after a change of government (from Labour to the Liberal-National Party) the mandate of the review is cancelled.
2023 Updated 2024 and 2025	Critical Minerals in the Northern Territory Reports (Australia's Northern Territory, Northern Territory Geological Survey, Department of Mining and Energy, 2025)	The 2023 report (updated in 2024 and 2025) outlines the defined critical mineral resources in the Northern Territory, downstream opportunities and critical minerals for which it has geological potential. Includes two examples of Aboriginal owned ventures.
May 2024	Western Australia's Battery and Critical Minerals Strategy 2024-2030 (Government of Western Australia, Department of Jobs, Tourism, Science and Innovation, 2024)	Promote mining, processing and manufacturing to support the energy transition and create jobs within a robust "ESG framework" and with positive First Nations outcomes. Prioritises streamlining approvals, shared infrastructure and financial support for strategic projects.

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Appendix 1 (continued)

Date	Policy	Objectives
May 2024	National Battery Strategy (Australian Government, Department of Industry, Science and Resources, 2024)	Harness economic advantages in renewable energy and contribute to the net zero transition. Develop a domestic battery industry with emphasis on stationary batteries, high value battery products and new chemistries. Mentions support of and engagement with First Nations. States aspiration to lead on sustainability, standards and circularity.
March 2025	Cancellation -review of mine objections processes - Queensland (Queensland Law Reform Commission, 2025)	Extensive work and consultation by the review interrupted by a change of State government (from Labour to the Liberal-National Party). Review mandate cancelled. Its report and recommendations were due in June 2025.

*Chile***Appendix 2**

Selected policy pieces for the copper and lithium sectors in Chile

Year	Policy	Objectives	Impact on Copper	Impact on Lithium
2010	Law No. 20.417 (Law No. 20.417, 2010)	Creates Ministry of Environment, Environmental Impact Service (SEA) and Environmental Superintendency (SMA).	●	●
2012	Law No. 20.600 (Law No. 20.600, 2012)	Creates Environmental Tribunals	●	●
2014–2015	National Lithium Commission NLC	Proposes reform for the sustainable development of the lithium industry, stronger socio-environmental governance, higher value adding and industrial linkages, stronger state role, and greater investment in R&D.		●
2021	Clean Technologies Institute	Awards of contract to develop knowledge and new technological solutions for more environmentally responsible energy sources, including lithium battery technologies. Decision overturned via legal challenge.		●
2022	National Mining Policy 2050 (Ministerio de Minería, 2022)	Four component strategy including social, environment, economic and institutional/ governance dimensions with specific goals. Profiles energy transition minerals, circular economy, from the outset.	●	●
2023	National Smelters and Refineries Strategy (Copper) (Gobierno de Chile, 2023b)	Sets out to increase production capacity and competitiveness while improving environmental standards and citizens' information.	●	
2023	National Lithium Strategy (Gobierno de Chile, 2023a)	Seeks to generate additional societal value from lithium extraction, through greater state ownership and greater protection of selected <i>salares</i> .		●
2024	Law No. 21.591 for Mining Royalty (Law No. 21.591, 2024)	Establishes a two-part mining royalty tax.	●	
	National Critical/Strategic Minerals Strategy	Announced data collection underway.		●

*Finland***Appendix 3**

Key policies and their objectives relevant for ETMs in Finland

Date	Policy	Objectives
2010	National Mineral Strategy (Finnish Mineral Strategy, 2010)	To provide solutions for global mineral value chain challenges; contributing to domestic growth and wellbeing; reducing environmental impacts. Based on Raw Materials Initiative by the EU (2008).
2011	Mining Act (Finnish Mining Act (621/2011))	Updated old Mining Act from 1965. Objective to promote mining. Municipalities are given a veto right to prevent uranium and thorium mining in their territory.
2013	Sustainable Mining Action Plan (MEAE, 2013)	Contains 35 recommendations on sustainability issues including governance, training, infrastructure, exchange of information and experience, promotion of exports and gaining social approval for the sector.
2014	The Network for Sustainable Mining and TSM (Lesser, 2020)	Served as a cooperation forum for the mining industry, various stakeholders and NGOs. The network activities were closed, after many members left it. Currently the network is managing the responsibility system TSM for mining and exploration companies in Finland.
2018	FMG established under the prime minister's office (FMG, n.d.)	State's mining holdings are concentrated on one company. Aim to develop lithium battery value chain in the country, establish new business opportunities and secure impactful and profitable investments.
2021	National Battery Strategy 2025 (2021-2025) (MEAE, 2021)	Proposes objectives for growth and renewal of the battery and electrification cluster, promotion of investments and competitiveness, responsibility, circular economy and digital solutions.
2023	Mining Mineral Tax Act (Kaivosmineraaliverolaki, 2023)	The tax rate is for most ETMs (metallic) 0.6% of the taxable value of their metal content. Previously, there was no separate mining tax in Finland.

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Appendix 3 (continued)

Date	Policy	Objectives
2024	Critical Raw Material Act (EU) (EU, 2024)	To ensure a sustainable and secure supply of raw materials within the EU while promoting responsible extraction and usage practices.
2023	New Battery Regulation (EU) (EU, 2023)	To establish comprehensive standards for the design, production, and recycling of batteries, promoting sustainability, circularity, and competitiveness in the European battery market.
2023	Mining Act (amended) (Finnish Mining Act (621/2011, as amended 505/2023))	To increase the influence of municipalities through land-use planning.
2024	National mineral strategy (Finnish Government, 2024)	To promote growth of the Finnish mineral cluster and related business ecosystems, to strengthen clean transition and European strategic autonomy.

Data availability

Data could be shared upon request.

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