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Insights on Public Acceptance of Major European Lithium Mine Projects

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Abstract
Lithium is a very important element for the green energy transition. However, most of it is imported to Europe mainly from Chile, China, and the USA. The European Union (EU) has promising hard-rock lithium projects, while the public acceptance (PA) is a prerequisite for their viability. In this paper, the PA of four European lithium projects is assessed using data from several sources. The data is analyzed by applying protest event analysis, i.e., assessment of media reports, social media, and data from the Environmental Justice Atlas; an extensive literature review was also carried out to search for all available scientific data. The examined projects are the Beauvoir (France), the Mina do Barroso (Portugal), the Keliber (Finland), and the Greenbarrow (UK). The present analysis aims to contributes to the green energy transition debate by presenting and clarifying several aspects pertinent to PA for these lithium projects. All projects practice stakeholder engagement and online communication on community-related issues, mainly in local languages. For the Keliber project, there seems to be no major opposition, while the picture given in the public and social media looks positive. On the other hand, there are some environmental concerns and criticism for the Greenbarrow project. The Beauvoir and Mina do Barroso projects are different cases. Land use and potential water contamination are major issues of concern. Both regions have long mining history with quite negative reputation, while Beauvoir is located close to a protected area. Mina do Barroso is the only project for which academic papers highlighting disputes have been published in scientific journals. Both Mina do Barroso and Beauvoir projects are situated in agricultural areas and are included as dispute cases within the Environmental Justice Atlas. PA of lithium projects is crucial for the energy transition at EU level. Their monitoring should be carried out in line with active stakeholder engagement, whereas any misconduct can spark additional organized opposition which can be challenging and difficult to be restrained.

Keywords Lithium · Kaustinen · Mina do Barroso · St. Austell · Beauvoir · Energy transition · Public acceptance

1 Introduction

Lithium (Li) is a strategic metal with excellent physical and chemical properties. Its demand is expected to sharply increase in the following years for the manufacture of Li-ion batteries and other energy-storage devices, which are required to meet the goals of the green energy transition.

The projections made by the International Energy Agency [1] estimate that the global electric vehicle (EV) fleet will be almost 140 million by the end of this decade. The annual demand for EV battery materials in 2030 is estimated at 185 kt for Li, 180 kt for Co, 177 kt for Mn, and 925 kt for class I Ni. Another factor that needs to be seriously considered is the significant anticipated reduction of cost for the production of lithium from brines [2, 3]. However, there are signs that prevent the pace of the green energy transition, namely the insufficient proven reserves of battery minerals (lithium, cobalt, nickel, and graphite) to meet the demand and the limited production of these elements from new sources and recycling [4–6].

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The main Li resources are brines with about 0.1% Li_2O grade and hard-rock deposits with 0.6 to 1.0% Li_2O grade [7]. The biggest hard rock lithium deposit is located at Greenbushes in Western Australia, whereas almost 60% of Li is produced from brines in South America, China and the USA. On the other hand, in Europe, except its extraction from groundwater in sedimentary basins, only Li hard rock deposits are considered for exploitation. The Li-bearing minerals of the highest economic importance are Li-pyroxene spodumene, the phyllosilicates petalite, lepidolite and zinnwaldite as well as the phosphate amblygonite [8].

Many of the critical raw materials (CRMs), also those needed for the green energy transition, are located within or close to protected areas or areas with other/sensitive land uses, including peasant and indigenous lands [9–13]. In this sense, intensive exploration and exploitation activities for the production of green energy transition metals may be challenging from the perspective of PA [14]. In fact, green energy transition has already caused various mining and mineral exploration disputes (MMEDs) in Europe [15, 16] and elsewhere [17, 18].

Lithium exploration and the respective mining projects are issues that have only recently emerged in Europe. In the effort of exploring and mining new deposits, PA, also called social license to operate (SLO), plays a significant role and determines the successful development of the projects [19]. As the lithium projects are a new issue in Europe, there is a need for their scrutiny also from the PA perspective. So far, such studies have been mainly focused on projects facing opposition [16, 20], while issues pertinent to PA received less attention. Therefore, there is a need for a balanced perspective on PA related to lithium projects.

The present study assesses the state of PA in four European Li mining projects, namely EMILI (Beauvoir mine) in France, Keliber in Finland, Mina do Barroso in Portugal, and Greenbarrow in St Austell, UK (Fig. 1), since these projects

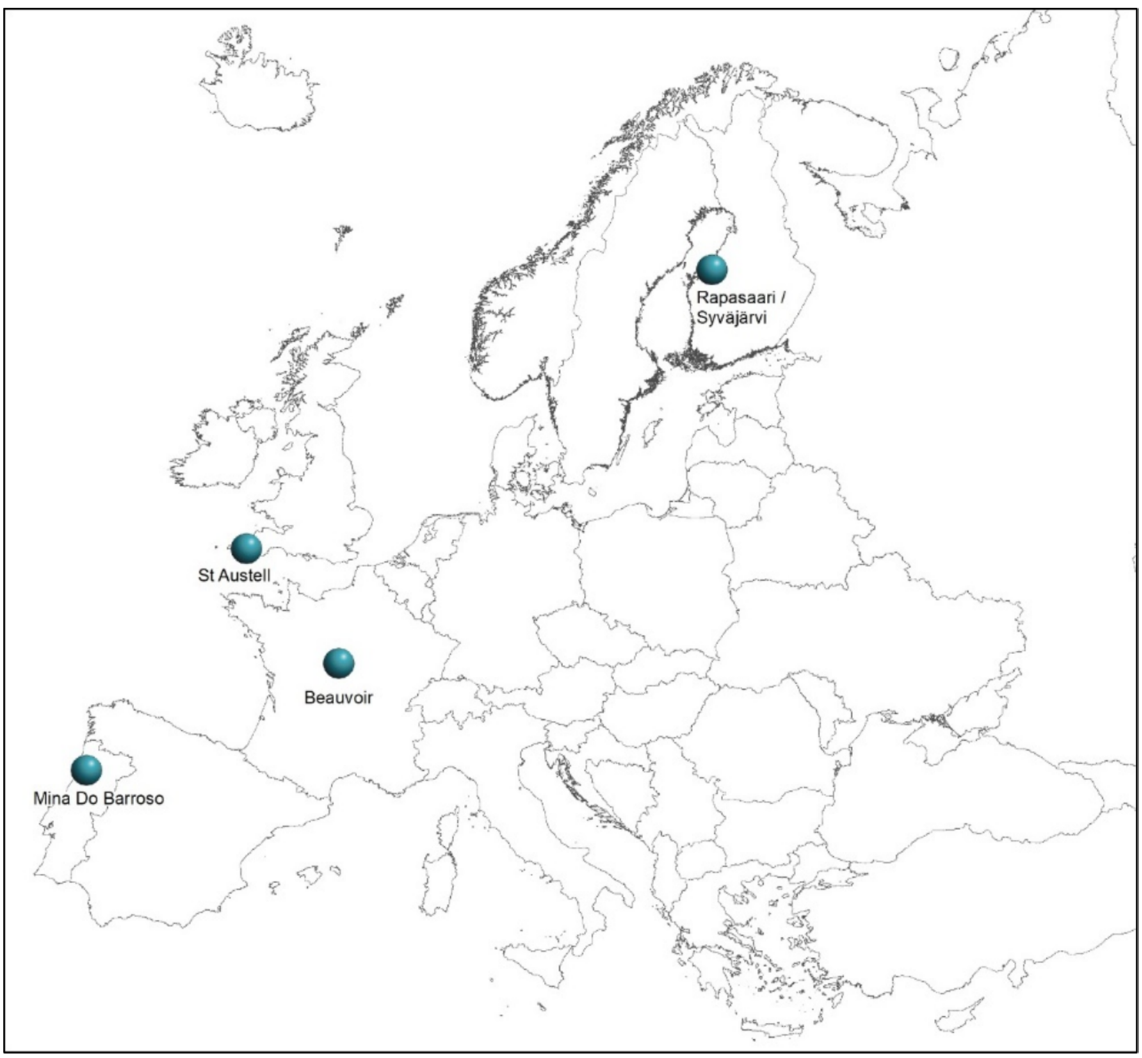


Fig. 1 Location of the case studies. Syväjärvi and Rapasaari mines in Finland belong to the Keliber project

are case studies of the EU Horizon EXCEED Innovation Action. Moreover, these cases are very interesting because the European Commission has launched the Green Deal initiative, that aims to make Europe the first carbon–neutral continent by 2050 [21]. In order to intensify mineral exploration and improve its supply security for mineral raw materials, the EU also established the Critical Raw Materials Act (CRMA), that intends to accelerate permit processes for selected strategic mining projects [22].

The assessment can be useful as the project holders are in the process of applying for permits or planning mine development, beneficiation and processing activities. It is important to detect any latent or visible issues and controversies at an early stage where most mining-related disputes occur [23, 24]. Even though it is challenging to detect if a project has acquired a PA/SLO, its loss is clearly visible from a number of events including protests, appeals, petitions, and disputes and this may happen without any prior notice [19, 25]. Therefore, potential controversies or other related aspects need to be identified and mitigated so that trust and dialogue between the diverse local stakeholders are initiated and maintained. This approach is essential for the development of a sincere and honest company-community relationship. The local community involves several stakeholder groups such as residents, landowners, entrepreneurs, municipalities, associations, non-governmental organizations (NGO), media, and in some cases indigenous people. An important trans-local stakeholder group can also include second homeowners. However, external stakeholders, such as various relevant authorities, provincial and central governments, industrial and labor associations are also important.

The present study complements the first preliminary PA/SLO assessment carried out for these projects in 2023 [26]. Now, an in-depth analysis that involves a systematic approach using online media records, literature, and company reports is implemented; also, analysis of data collected by the involved companies for associated land uses, as well as environmental and social impact assessments, is carried out. In addition, social media hits are also recorded to detect what is posted and discussed about these projects. The present paper deals also with aspects of *social geology*, a concept that explores social issues related to geology and mining [27–30]. So, the study aims to answer the following two questions: (i) which is the state of PA in the examined case studies and (ii) which are the main implications and associated risks.

The novelty of this study is highlighted by the application of protest event analysis as well as the use of social media data with the help of Meltwater media analysis software's artificial intelligence (AI). It is also underlined that the study reviews critically activist discourses and journal papers written by social scientists, something that is rarely noticed in literature.

2 Public Acceptance

The SLO/PA is an informal social contract that was developed in the end of 1990 s to bridge the gap between the expectations of the mining industry and the society. PA became an important issue as opposition to mining escalated all over the world at that time [31, 32]. PA indicates the approval of mining activities by the local community or more widely, by the society [19]. It incorporates the principles of Global Mining Initiative (GMI) and aims to enhance the role of the mining industry to reach the objectives of sustainable development [33, 34].

PA is a major challenge in the entire mining life cycle of energy transition metals that involves the use of traditional or emerging technologies [20]. It depends on a number of aspects, including project location and associated land uses, corporate conduct, commodity type (e.g., lithium, uranium, coal), mining history in the country/region, reputation of past mining activities, the general trust of the involved stakeholders in the industry, and the state as well as local and regional authorities [15, 31, 35]. Also, factors including the standards of quality of life in the affected areas, the knowledge of terms such as energy transition, green deal, decarbonization, electric vehicle (EV) batteries, as well as the level of education are decisive and influence the views of the interested stakeholders [36, 37].

The procedures and the level of transparency of the mining permitting process affect the trust of most involved stakeholders and therefore the outcome of the overall process for obtaining PA. In this sense, a perception of environmental injustice might be significant in triggering opposition [38]. The views of the stakeholders differ a lot among countries with poor or well-developed mining industry as well as different historical and legal backgrounds and traditions. Also, the views of all involved stakeholders as well as of the general public may change in the near future after considering the pace of the changes required towards the green transition [16, 20]. These changes may require, at least at European level, faster revision of the existing legislation, increase of the permitting process transparency and more efficient communication policies [39]. In any case, the consultation process needs to be fair and truly participatory, especially in cases when indigenous people and stakeholder groups living in remote areas are affected. Also, sufficient time needs to be devoted for the communication of all project data to the people, who in some cases may have limited access to available information and modern communication means as well as different priorities and habits in their daily life [40]. Language and the way such communication is made play also an important role in the establishment of a sincere company-community relationship [26, 41, 42].

Corporate social responsibility (CSR) as well as environmental, social, and governance (ESG) are crucial aspects for investors in mining projects as well as for the affected population. CSR and ESG target mainly environmental (e.g., reduction of the carbon footprint of a process, waste valorization), social (e.g., benefit sharing for the wider community, the employers and obviously the consumers), and economic/governance (e.g., regulatory compliance, transparency in accounting practices and energy market, cost paid by the average citizen for the green transition, mainly driven by the politicians and the industry) aspects [43, 44].

A technology acceptance framework (TAF) may be used for obtaining PA in projects involving emerging technologies [45]. However, local and general acceptance may differ in the same country even from one region to another and may depend on several social and cultural factors. Also, the views of several stakeholders including policy makers, lawmakers, and practitioners need to be clearly communicated to the public and local communities.

Another issue that needs to be considered is that mining and metallurgical operations are not typical examples of circular economy. Thus, other aspects such as by-product recovery from certain ore types and waste minimization need to be seriously considered. Surface or underground mining may also be a critical factor for obtaining PA, because in underground mining operations wastes may be used for backfilling, the visual impacts are less intense, and the overall environmental deterioration is in most cases minor [46, 47]. In these cases, apart from material flow analysis (MFA), other tools including life cycle assessment (LCA), strategic environmental and social assessment (SESA), EIA and cost–benefit analysis (CBA), and analytical hierarchical process (AHP) with integration of PA [48] can be used, and their results need to be widely communicated to all interested stakeholders [49].

Economic and political instability, inequality, high-energy prices, and inflation are among the issues that may drive environmental and social activism and modify the views of indigenous people and local communities in MMEDs and in acquiring a PA [50]. Some countries, like Bolivia, consider nationalization of Li and other CRM sectors [50]. Resource nationalism has also been one of the factors to oppose investments and operations from foreign mining and exploration companies [15, 50–52].

Also, it is underlined that in areas where indigenous populations live, social issues stem from historical and current policies and cannot be easily discussed or solved with the approach followed by multi-national mining enterprises. Many times, such controversies become evident in natural resource conflicts and may even exacerbate them. Because of profound inequality, lack of participation, lack of trust in government, and other socio-political issues, conflicts are generally more intense in Global South and may frequently involve violence [53], whereas they are less intense in Global North [24, 54, 55].

In Environmental Justice Atlas (EJAtlas), Temper et al. [56] proposed a four-level conflict classification by intensity: inexistent/latent, low, medium and high (Table 1). Eerola [15] applied this approach to classify Finnish MMEDs and named the low and medium categories as disputes, while the high one as conflict (Table 1). It is known that cases of high intensity are rare in Europe. In the current dispute over the Jadar Valley lithium project in Serbia, both the government and the protestors have been involved in violent actions.

In order to obtain PA, the companies apart from providing economic incentives, creating jobs and minimizing social and environmental risk may also work in improving the quality of life in the affected areas, targeting mainly improvements in education and health care system [50]. As a result, the overall social-geological potential of a region needs to be reliably assessed by projecting the anticipated risks and opportunities prior to understanding the way local people envisage their future in an area in which mining projects are planned [47, 49].

It is known that many MMEDs can persist for years or even decades [15]; some disputes can be long-standing, some others may end in a way or another while often new ones emerge. Most of these disputes occur as a result of conflicting land uses or due to the advanced risk for contaminating the environment and affecting communities, livelihoods, and ecosystems in the vicinity of mining sites [54, 57]. Disputes may also emerge as a result of the bad reputation and poor corporate conduct of the mining industry [15, 50], or because SLO/PA was not considered as an evaluation parameter in the preliminary stages of project assessment [47]. In some cases, projects can also be associated with corruption, poor health and safety standards, risks in artisanal and small-scale mining, mine accidents, and tailings dam failure [58–63]. Recently, many companies have attempted to improve their image and present in sufficient detail issues related to social license to explore (SLE) in their corporate websites [64]. These aspects are mainly related to stakeholder engagement, company–community relationship and PA. In an attempt to obtain SLE, especially in sensitive contexts prone to disputes, the companies may

Table 1 Conflict intensity levels of the Environmental Justice Atlas [56] and their classification as disputes and conflicts [15]

Intensity level	Characteristics
High	Violence, mass mobilizations, mass arrests (conflict)
Medium	Visible opposition: demonstrations, direct action by non-violent resistance (*dispute*)
Low	Some organized opposition (*dispute*)
Latent/inexistent	No visible nor organized opposition

also advertise the use of new low-impact mineral exploration technologies (LIMET) which address health, safety and environmental issues and have competitive advantages that may positively influence public perception [64]; LIMET may involve, among others, closed circuit drilling, deep-penetrating electro-magnetic survey, myography, surface soil, plant and snow sampling, and use of drones.

Disagreements with a local community may result in delays, extra costs or even termination of a project [23]. A recent well-known dispute regarding the promising Jadar Valley Li project in Serbia caused several delays and eventually its halt by the government [65]. However, the decision was recently revoked [66] and new discussions about the overall importance of the project may be soon initiated depending on the political developments in the country. A recently launched documentary describes very well the diverse aspects and protests related to the Jadar project [67].

3 Methodology

The present assessment of PA in four selected European case studies involves an online media record and literature survey by applying the protest event analysis (PEA) [68]. PEA, that is based on analysis of online media reports, is used to identify and map natural resource conflicts in diverse scales [69, 70]. Protest movements need publicity for their campaign and demands while disputes appear in the media, in which online reports are available [71]. Thus, they can be detected and studied using available online surveys and analysis. In the present study, online media reports for the projects and involved companies were searched to identify related disputes. However, instead of using simple Google queries that favor commercial contents [72], the Meltwater media analysis software was systematically used to detect relevant critical news and social media posts. The keywords used in this search for each project under study are indicated in Table 2.

Meltwater has a series of survey options, including sources, languages, countries, and periods that can be set up for a specific purpose. The available selected sources in Melwater for our survey were news, blogs, comments, Facebook, forums, Instagram, LinkedIn, X (ex-Twitter), and YouTube. The chosen languages were those of the projects' host countries into which the searches were geographically restricted. Meltwater produces also an analysis report on social media content using AI. Social media posts (e.g., X) were also identified by Meltwater from their negative sentiments. Sentiment analysis is a technique that uses machine learning, natural language processing and computational linguistics to understand people's feelings and opinions expressed in social media [73]. Negative sentiments are mainly related to potentially critical attitudes towards an issue (e.g., company, project).

Table 2 Keywords used for each project under study in Meltwater media analysis software

Project name	Keywords
EMILI	Beauvoir, Lithium
Greenbarrow	British Lithium
Keliber	Keliber
Mina do Barroso	Mina do Barroso

The number of media hits and their reaches was also observed. A media hit is "any feature broadcast to a larger audience: TV appearance, blog post, book review, online article, or podcast interview are all considered media hits" [74]. Social media reach is a metric of media analytics that refers to the number of users who have come across a particular content on a particular social media platform [75]. Therefore, media hits and social media reach can be used to determine how many times an issue is reported by the media and which is its exposure among the public. They indicate the importance and attention that the projects have achieved in the media and social media. Media attention might involve correspondence with negative attitudes towards an issue; usually, a conflict is reported in the news, whereas a neutral or positive event does not attract any attention in most cases [76].

Different social media platforms provide access to free analytics, including YouTube Analytics, Facebook Page Insights, LinkedIn Analytics, Instagram Insights, and Twitter Analytics, while commercial applications provide both advanced metrics and data visualization [75].

This online media report survey for the records in the period 2023–2024 was carried out by the authors on December 19, 2024. Results for all projects are presented in a comparative framework and are described in the following section. Academic literature relevant to the projects was also searched by using Google Scholar, Science Direct, Mendeley, and Scopus reference databases using the keywords indicated in Table 2.

Public reports produced from the involved companies were also analyzed, while issues related to associated land use and local attitudes were selected for a closer examination. This was carried out by content analysis that is a "technique for making inferences by objectively and systematically identifying specified characteristics of messages" [77]. It is used to identify the existence of certain words and concepts within texts. The content analysis approach applied in this study was conceptual analysis, which involves selection of certain concepts for scrutiny in texts [78]. The issues of interest were related to associated land use, environmental and social impacts, company and community activities as well as perception of local people towards each project. To define project locations and present/analyze associated land uses, maps were elaborated by using ArcGISPro and the European Corine land cover data [79].

Finally, it was also explored whether these projects are included in the EJAtlas as dispute cases. This was made possible through search of the respective map and/or through queries using as terms the project name and the commodity of interest (lithium). It is also important to underline that site visits were made, except for Greenbarrow, in order to obtain updated and more reliable information. Based on Table 1 data, the cases are also classified according to their dispute intensity. Data acquisition and the analytical process are also illustrated in Fig. 2. The projects are presented in the next section in alphabetical order.

4 Results

The characteristics of the four premier European pegmatite and rare metal granite (RMG) case studies that are investigated in this study regarding their PA-related issues are summarized in Table 3, while their media hits, reaches, and negative social media posts for the period 2023–2024 are presented in Table 4.

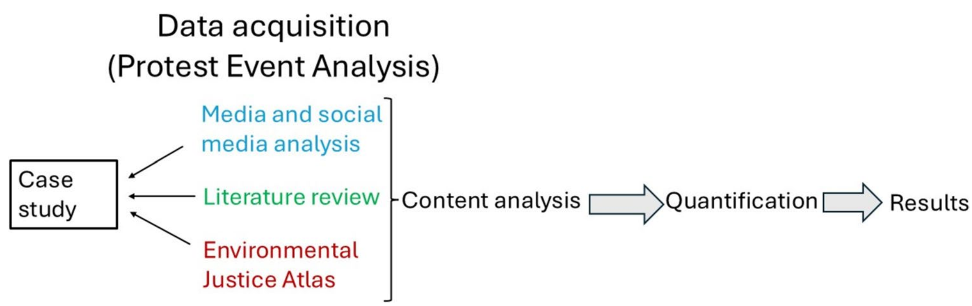


Fig. 2 Flowchart of data acquisition and the analytical process applied in this study

Table 3 Characteristics of the four European lithium projects

Project (country)	Project owner	Deposit type	Project stage	Type of mine	LiO_2 grade (%)	Reserves (kt)	References
EMILI (France)	Imerys	Granite	Exploration, applying for mine permit	Under-ground	0.9	Not yet estimated (goal: annual production 34,000 t of $LiOH.H_2O$)	[7, 80]
Greenbarrow (UK)	Imerys-British Lithium	Granite	Exploration	Open Pit	0.536 (inferred)	160 (inferred)	[7, 81]
Keliber (Finland)	Sibanye-Stillwater (79.82%) Finnish Minerals Group (20%)	Pegmatite	Mine and environmental permits, mine, concentrator and refinery construction	Open pit	Länttä, 1.07; Outovesi-Rapasaari, 1.31; Syväjärvi,1.07	Länttä, 300; Outovesi, 200; Rapasaari, 70; Syväjärvi, 210	[82]
Mina do Barroso (Portugal)	Savannah Resources plc	Pegmatite	Exploration, applying for mine permit	Open pit	1.05	293 (subtotal)	[7, 83]

Table 4 Media hits, their reaches, and negative social media posts for the four European lithium projects in the period 2023–2024 (B, billion; M, million)

Project	Media hits		Reaches		Negative social media posts	
	2023	2024	2023	2024	2023	2024
EMILI	241	158	197 M	541 M	-	-
Greenbarrow	274	142	3.56 B	1.02 B	10	9
Keliber	142	131	109 M	135 M	-	2
Mina do Barroso	469	242	1.21 B	547 M	47	36

4.1 EMILI Project, Beauvoir, France

4.1.1 Characteristics of the Project

The Colettes massif in the Echassières district (Allier region, France) hosts several types of rare-metal mineralizations, including the Beauvoir granite, which is composed of albite, lepidolite and quartz with sub-ordinate amounts of K-feldspar [84, 85]. Geochemically, it is a highly specialized, strongly peraluminous RMG with Li-Ta-Nb-Be-Sn mineralization. The mine site is located close to the Échassières town, partly in the Colettes forest natural zone of ecological, faunistic and vegetational interest, which is a Natura 2000 area (Fig. 3). The concession area is surrounded and partly overlaps agricultural land and a forest. The extraction site in Fig. 3 is a quarry for kaolin extraction.

The EMILI project started in 2018, but kaolin has been extracted from quarries in the region, including that of Beauvoir, for decades. Li extraction will take place from fresh granite by underground mining. Sn and Ta-Nb are also intended to be extracted as by-products.

According to Canas [86] and Luodes et al. [87], two local organizations oppose mining in the area, namely the “stopmines03” and “Préservons la forêt des Colettes.” A number of local events have taken place against the opening of the mine. The main concerns are deterioration of water quality and risk for environmental degradation. However, the opinions of the local population are divided, since some are in favor, and some are against the project [88]. The EMILI project is traced within the EJAtlas, while the existing dispute is classified as one of low intensity [89] (Table 1).

4.1.2 Media Analysis

In their preliminary assessment, Eerola and Komnitsas [26] did not trace any evidence regarding existing disputes for this project. Articles extracted through a Google search were quite positive and mainly reflected the project’s economic and industrial perspectives. However, since 2022, critical online articles were published in France [86, 88]. For this reason, a systematic online media report survey was carried out using the Meltwater software. A total of 373 media mentions for the project were found for the period 2023–2024 (Table 3). However, in this period, there was a significant increase in media reaches from 193 to 541 million. According to Meltwater AI-generated analysis, this was due to.

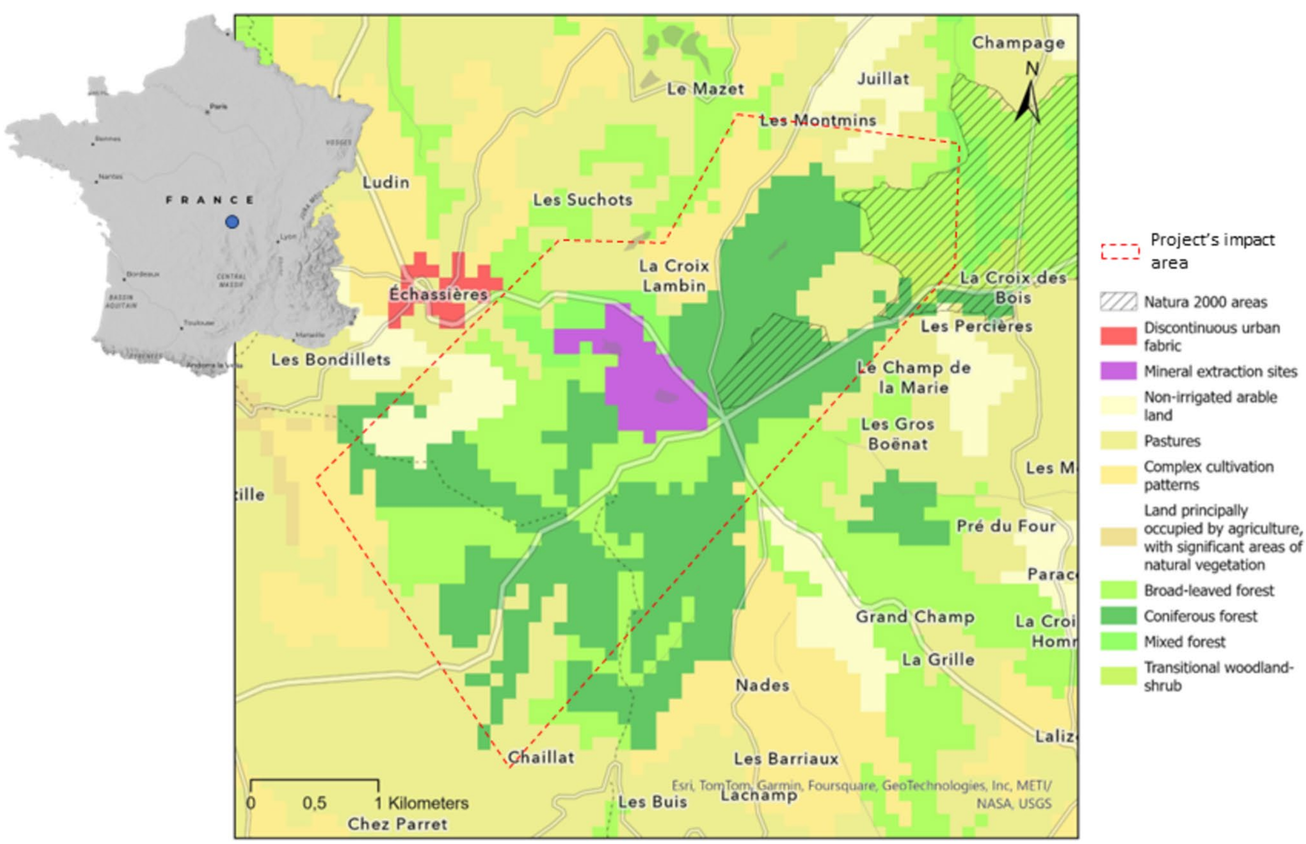


Fig. 3 The EMILI project’s area in Echassières, France, and its associated land uses [79]

"the public debate and opposition" because "local residents are expressing concerns about the potential environmental impact of the project, leading to a significant amount of discussion and debate on the topic".

Unfortunately, Meltwater software is not able to trace all French media reports. Several times, it indicates that "the content is not available in your country," as for the article by Clévenot [90]. The subjects of critical newspaper articles focus on public debate, environmental issues and feelings of the local people towards the project [91]. In several social media posts (X), the EMILI project is referred to as "toxic bomb" [92]. Apparently, the Meltwater's AI report from the year 2023 on the expression of negative sentiments in X posts reflects mainly the view of the opposition:

"There is a mine of lithium in the Allier, which has been reported as being highly toxic. The mine contains high levels of arsenic, lead and copper, posing a significant risk to the environment and human health. The project, supported by the government, has been revealed to be based on a toxic chemical bomb. The information about the toxicity of the mine has been kept secret by the authorities."

However, it should be noted that the lithium mine does not exist yet; at this moment it is just a kaolin quarry. According to Miñano [92], high As and Pb concentrations were detected in soils in the area under study, while drilling and underground mining activities might further impact soils and groundwater. These concentrations were detected outside the Beauvoir quarry but within the Imery's exploration permit area. Nevertheless, according to Geoderis' [93], these high concentrations are due to past mining activities in the region, reflect natural background values of mineralization (i.e., geogenic contamination) and do not constitute an actual environmental health risk.

At the end of 2024 Meltwater's AI-analysis revealed that.

"The increase in volume is due to the public debate and concerns surrounding a proposed lithium mine in Auvergne, France. The project, which would be the first lithium mine in the country, has raised environmental worries and opposition from local residents. The community meeting held to discuss the project attracted a large number of participants, further fueling the discussion and amplifying the concerns."

Canas [86] summarized the results of the public consultation and debate on the project and highlighted concerns on water and groundwater quality, as well as on the impact on agriculture; it is underlined that instead of lithium mining towards meeting the goals of green energy transition, opposers demand for reduced energy use and raw materials consumption.

4.1.3 Corporate Communication

Eerola and Komnitsas [26] mentioned that Imerys communicated its stakeholder engagement practices and dialogue with the local communities. The EMILI project has now its own website [94], but its only reference on community issues is related to the anticipated stimulation of local economy and boosting of the long-term prospects of the region.

4.2 Greenbarrow, St. Austell, UK

4.2.1 Characteristics of the Project

The St. Austell, Cornwall, UK, rare-metal granite deposit is composed of six major granite types and is a world-class kaolin deposit formed from the weathering and alteration of the underlying granite. Kaolin that is mined in St. Austell for over two centuries is used in the paper, ceramics, paint and rubber industries. St Austell is a mining district that hosts several mines in its northern part (Fig. 4). As a result of the kaolinization process, metal-bearing accessory minerals including monazite or cassiterite are liberated from the gangue and the micaceous residue is considered as a potential source for CRMs.

Eerola and Komnitsas [26] already discussed the Cornish Lithium's Trevalour (TreLit) project in St Austell. Thus, the focus in this paper is on the Greenbarrow lithium project of the Imerys British Lithium in the same region. As with the TreLit, the Greenbarrow project is also in the exploration stage [95, 96]. However, while the TreLit project aims to extract lithium also from geothermal brines, British Lithium explores the potential of lithium extraction exclusively from granites. Imerys acquired 80% of British Lithium in June 2023 [97]. The characteristics of the deposit are summarized in Table 2.

4.2.2 Media Analysis

No articles on any disputes or controversies were traced regarding the TreLit project [26]. Nevertheless, Nevett [98] mentioned a few controversial opinions by some community and NGO representatives regarding the lithium project.

The search carried out indicated that in 2023, the Imerys British Lithium had 273 media hits, 10 of which were negative (Table 3). According to the Meltwater's AI generated analysis on social media, the negative hits regarding British Lithium indicated that:

"Several posts discuss the joint UK mining venture between Imerys and British Lithium to extract lithium from granite mines in Cornwall, with financial support from the government. There is concern and criticism about the environmental impact of lithium mining and

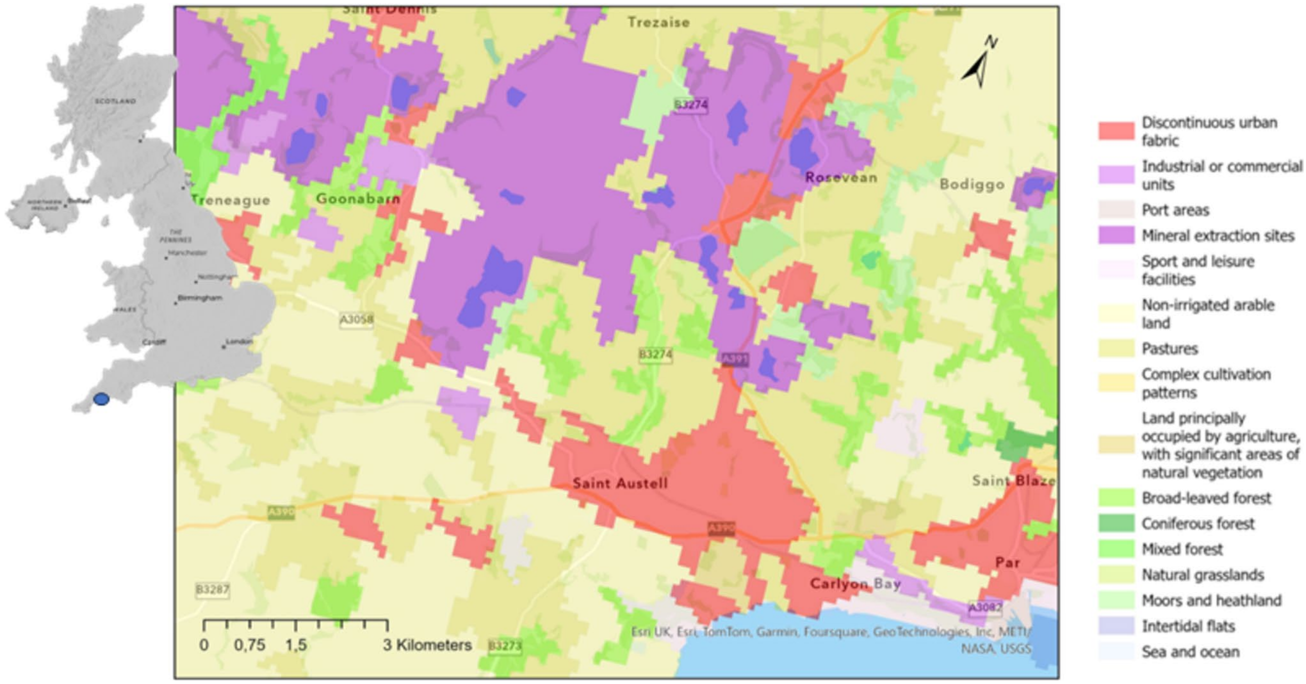


Fig. 4 St Austell region in Cornwall, UK, and its associated land uses [79]. The region is a mining district with numerous sites of mineral extraction in its northern part

the potential damage to the earth. Some posts mention other companies and industries related to lithium mining, such as Volvo and British power."

In May 2024, Meltwater's AI-generated analysis revealed that:

"The posts mention a mining company in Cornwall, UK, jointly owned by a French company. The French company is involved in lithium mining, which requires significant investment. The mining project has raised concerns about the asset stripping and potential benefits to foreign companies."

Finally, in December 2024, the Meltwater's AI analyses of negative sentiments indicated that:

"Several posts mention a desalination plant plan by SWW in Par, which is linked to Imerys and British Lithium. There is a concern that the plan stinks and that Cornwall Council and our new MP should oppose it. The link between British Lithium and Imerys is highlighted as an issue."

4.2.3 Corporate Communication

British Lithium [99] emphasizes company-community issues in its website where it states:

"The project will prioritise environmental protection, benefit to the local community and wider socio-economic benefit to Cornwall. It will be delivered in consultation with all local and national stakeholders – while aligning with the IRMA benchmark – the international reference certification for responsible mining."

The Initiative for Responsible Mining (IRMA) offers independent assessment against a comprehensive standard for all mined materials that provides "one-stop coverage" of the full range of issues related to the impacts of industrial-scale mines [99].

4.3 Keliber, Finland

4.3.1 Characteristics of the Project

Keliber Oy owns the LCT-pegmatite deposits Rapasaari and Syväjärvi as well as the smaller ones Länttä and Outovesi in Kaustinen, Finland [100]. The main prospects Rapasaari and Syväjärvi of the Keliber lithium project are shown in Fig. 5. The characteristics of the deposits are given in Table 3. The mineralization of these deposits is found in subvertical or flat lying veins. The Keliber Lithium Refinery in Kokkola has an annual feed capacity of 156,000 t of spodumene concentrate, from which 15,000 t of lithium hydroxide monohydrate ($LiOH.H_2O$) at 99.0% purity, can be produced.

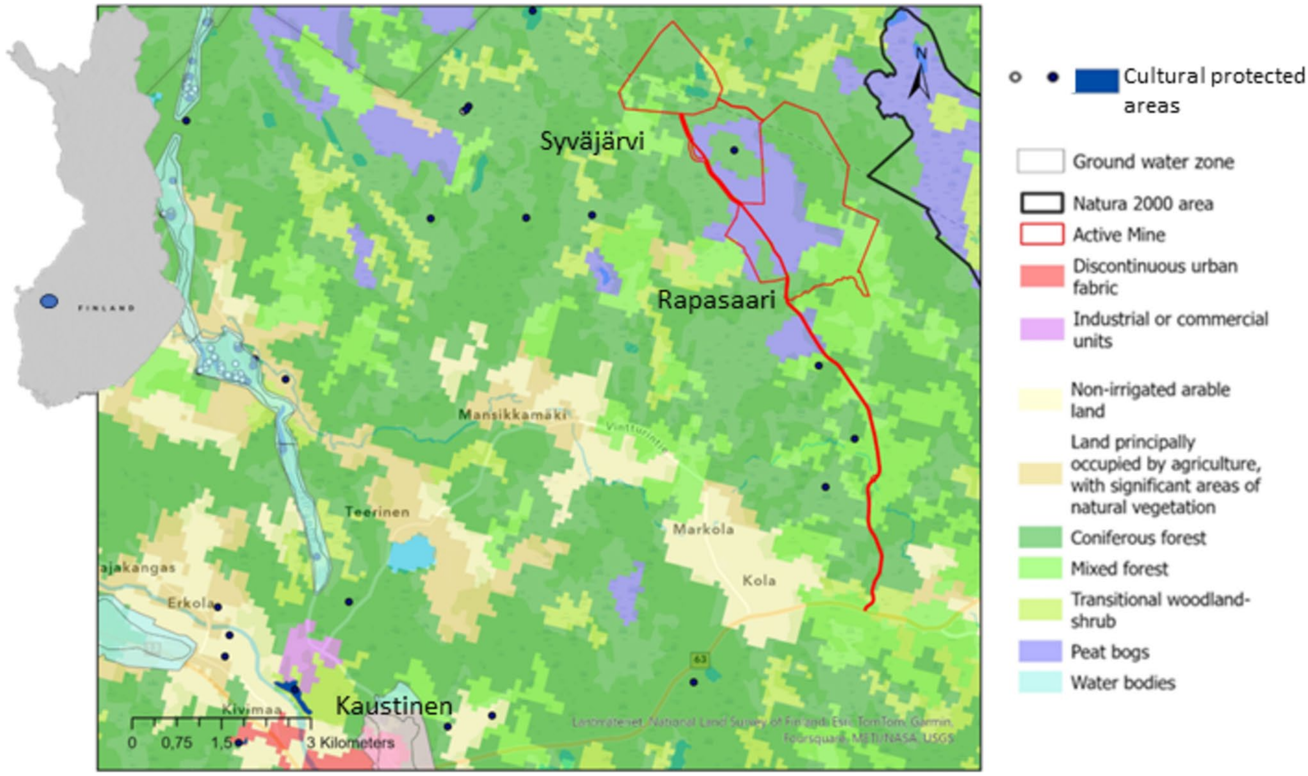


Fig. 5 The Kaustinen lithium project in western Finland with its Rapasaari and Syväjärvi prospects and associated land use [79]

The South African Sibanye-Stillwater, a multinational mining and metals processing group, acquired the majority of Keliber Oy in 2022 and holds valid environmental permits for the Syväjärvi mine and the lithium refinery. The concentrator and the Rapasaari mine have been granted environmental permits, but in both sites, some aspects need to be reviewed [101, 102]. Until January 2025, mining permits have been granted for Syväjärvi, Rapasaari, and Läntta deposits.

According to a report published by a consultant [102], the results of a questionnaire related to environmental impact assessment (EIA) indicated that most respondents (60%) supported the project, while 27% were against it. The remaining 13% did not express either positive or negative views. The concerns raised included potential impacts associated with traffic, generation of noise from blasting and potential impacts to birds and the moor frog.

According to SRK Consulting [82], the most decisive factors for those who voted positively were employment prospects (49%) as well as environmental management and sustainable development (42%). Regional development was also rated positively. There were expectations that the project will start soon. On the other hand, some negative impacts were anticipated due to risk for contamination of surface waters, generation of dust and noise as well as possible post-closure impacts.

Syväjärvi, Rapasaari, and Outovesi mining areas are considered important for recreational activities, mainly including hunting as well as berry and mushroom picking. Also, care should be taken regarding potential nuisance to second homeowners in the Outovesi mine area due to higher levels of noise. According to Eerola [15, 103], second-home owners are an important, influential and potentially critical stakeholder group of mining and mineral exploration in Finland together with tourists and tourism entrepreneurs; their trans-local opposition is called as "not in my leisure area" (NIMLA) phenomenon.

4.3.2 Media Analysis

Even though the Rapasaari deposit is located 2 km away from a Natura 2000 area (Fig. 4), the Keliber's Li projects are quite positively by the media and only few contentious articles are traced [104–106]. It is underlined that the relevant news articles reflect mostly economic and industrial perspectives. However, official complaints were made by local fishing and residential associations as well as by an environmental non-governmental organization (ENGO) [105], but most of them were rejected by the Supreme Court ruling [106].

In a more recent and systematic media analysis, 6 records of critical media hits were identified. One of them was a news article written by the ENGOs as a result of complaints for the environmental permit due to increased levels of noise and dust [106]. It is also underlined that the permit application needs to be partially reconsidered by the company, while the processing plant did not obtain permit due to the need for an improved mine waste management plan.

Some of the critical media hits concerned social media (X), in which the same message was reposted several times in 2023, even though the sites overlay and are surrounded by peat production areas [82] (Fig. 4).

> "…5 different mines are to be set up in the middle of a deer forest",

For 2023, the Meltwater's AI-analysis indicated that:

> "Several posts mention the development of the lithium industry in Finland, with the establishment of the country's first lithium plant. The posts also highlight the impact of the new lithium industry on the local economy, with the creation of new jobs and investment opportunities. Some posts discuss the challenges and controversies surrounding the development of the lithium industry, including environmental concerns and competition with other countries."

During 2024, some environmental concerns were raised regarding the disposal of arsenic containing analcime wastes, deriving from lithium processing [107].

4.3.3 Corporate Communication

According to Eerola [65], Keliber Oy was among the 20 out of 73 companies operating in Finland that mention PA-related issues in their website. Keliber Oy uses a sustainability excellence system (SES) that is adapted from the Global Reporting Initiative (GRI). SES is promoted by "open dialogue, community involvement and transparency" and is monitored with the establishment of key performance indicators [108]. After acquisition, Sibanye Stillwater's corporate website has a description in Finnish about the Keliber's project [109], for which sustainability is based on the iCARES values—"innovation, commitment, accountability, respect, enabling and safety" [110].

4.3.4 Academic Literature

The published academic social science literature for the Kaustinen project is limited [26, 38]. According to Leino et al. [38], local people in the area have much lower perception for any environmental injustice regarding the project or the permitting process compared for example with the Heinävesi case in Finland [111]. Despite the fact the Kaustinen region is subject to intense lithium exploration activities, the lack of organized opposition is most probably related to the local culture and livelihoods.

4.4 Mina do Barroso, Portugal

4.4.1 Characteristics of the Project

The Mina do Barroso is a high-grade Li project in the Boticas region in northern Portugal (Fig. 6). It is owned and developed by the British company Savannah Resources plc. Most of the Li mineralization is hosted in spodumene-bearing pegmatites. Previously, the region has been mined for tungsten and explored for lithium, and quartz and feldspar required by the ceramics industry. The mineable material of Mina do Barroso is estimated at 17.34 Mt, while the anticipated annual average ore mining and processing rate is approximately 1.5 Mt for the annual production of about 200,000 t of spodumene concentrate. The total project duration, including construction, operation, rehabilitation, and closure is estimated at 17 years, while the operation phase will last 12 years. There is a plan to open and close four successive open pits namely Grandão, Pinheiro, Reservatório, and NOA. The characteristics of the project are presented in Table 3.

Mina do Barroso was one of the fourteen Li extraction projects around the world, which were evaluated using multi-criteria decision making (MCDM) models [112]. The project had difficulties in starting operations due to opposition from part of the local population [57]. As shown in Fig. 6, the concession area is located along several Natura 2000 areas. The project obtained a positive declaration for its environmental impact assessment study from the Portuguese Environmental Agency on May 31, 2023; however, the company still needs to comply with specific conditions, perform some actions and pay compensations [113]. Nevertheless, according to Expresso [114], the Public Prosecutor has requested its annulation based on suspected illegalities involved in its concession. Mina do Barroso is included in the EJAtlas [115] and is classified as a case of medium level intensity, characterized by visible mobilization expressed by vandalism, and street protests (Table 1) [57, 115].

4.4.2 Media Analysis

Although the Mina do Barroso project was already known as a dispute case and was discussed in authors' previous publication [26], a new systematic online media report survey was performed for the period 2023–2024 (Table 3).

In the analysis of negative sentiments in social media posts (X) for the year 2023, Meltwater's AI-generated report includes that:

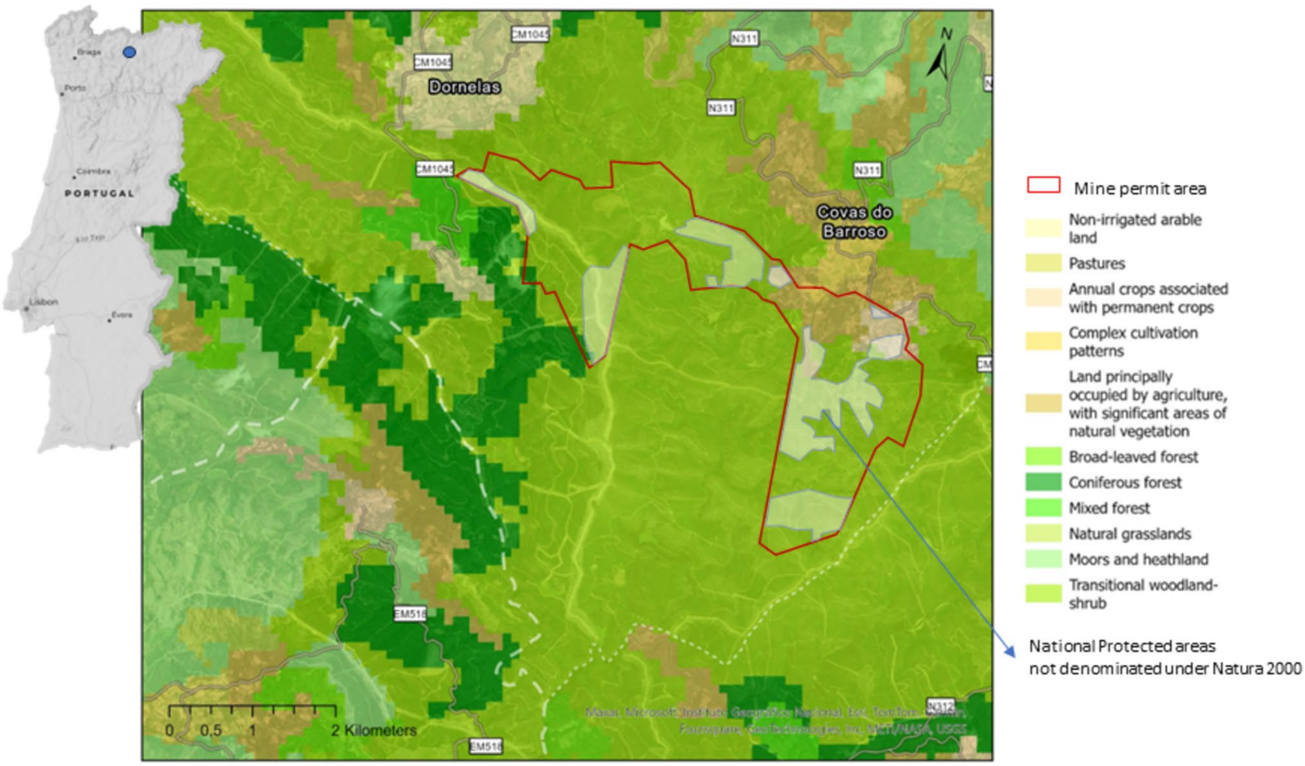


Fig. 6 The concession area of the Mina do Barroso lithium project, Portugal, and its associated land uses [79]

> "Several posts mention the issue of the lithium mine in Boticas, with concerns about the environmental impact, protests, and legal actions being taken. The mayor of Boticas expresses perplexity and disappointment over the refusal of the Agência Portuguesa do Ambiente (APA) to extend the time for analyzing the Environmental Impact Assessment (EIA) for the lithium mine."

These critical media hits are found in newspapers, social media, blogs, and websites. It is mentioned that the project's environmental report, mine plan and associated documents are publicly available on the APA website [116], while the public consultation period ended on 4 April 2023.

In 2024, most of the negative media hits refer to local mobilizations and rumors for illegal procedures that were followed by the company to obtain environmental permit. On 3 September 2024, AI report on X posts mentions that:

> "Several posts mention the controversy surrounding the exploration of lithium in the Barroso mine in Boticas. The Ministério Público is defending the nullity of the Declaration of Impact Ambiental, and the local population is opposed to the project. The concerns raised by the Ministério Público and the local population about the environmental impact of the lithium mine are being taken into account."

4.4.3 Corporate Communication

Eerola and Komnitsas [26] mention that Savannah Resources plc recognizes in its website the dispute and replies to concerns and complaints, an approach that is not very common in the mining industry [64, 117]. Similarly, the company also describes its stakeholder engagement and benefit sharing plans and practices, while numerous fact sheets that provide answers to the allegations raised are also available in Portuguese [118, 119].

4.4.4 Academic Literature

Apart from geo- and biosciences, Mina do Barroso is mentioned in several critical peer-reviewed articles and social science theses written both in English and Portuguese [50, 120–125].

Dunlap and Riquito [57] summarize the main land use aspects that may be affected by the Mina do Barroso project. The dispute is mainly related to the project location within an agricultural area (Fig. 6) which is a World Agricultural Heritage Site, a biodiversity hotspot that also involves cattle ranching activities. The project occupies 0.13 km^2 (~ 0.01%) out of the total area of 1124.4 km^2 of the World Agricultural Heritage Site.

Several scientific papers also criticize the Portuguese government for attracting mining investments in the country. Instead of that and the “capitalist” proposal for a green energy transition, the opposers demand for degrowth (i.e., reduction of consumption and economic growth) that can be achieved “by any means necessary” [57]. The company’s stakeholder engagement, communication, and benefit sharing practices have been considered as “social warfare,” “social engineering,” and “counter-insurgence tactics” towards building up a “sacrifice zone” by “land grabbing” [57, 123]. Four main reasons justifying the opposition have been provided by the local community, namely:

- environmental impacts of former tungsten mining in the region,
- environmental impacts of ongoing mining in other regions and countries,
- interpretation of the green energy transition discourse as a “fallacy,” and
- lack of trust as well as clear and transparent information by the company because of its poor communication plan

In order to find a solution for the case of Mina do Barroso, Ribeiro et al. [124] emphasized the importance of transparent corporate communication for mining and mineral exploration activities and the need for an improved geoethics plan. Furthermore, Araújo et al. [118] also identified a tendency of resource nationalism in the country as well as opposition because the permits were granted in the capital, away from the area under study. Other concerns are related to potential water contamination and negative impacts on local activities (e.g., agriculture, tourism) [126, 127].

Most of the literature related to the Mina do Barroso case favors opposers’ views and allegations for the probable environmental and social impacts, as a result of lithium extraction. In addition, Lazarević [16] also indicates that the difference in the level of economic development in several parts of Europe, i.e., south/eastern compared to north, is another cause for protests. According to the mining-skeptical movement, the countrysides of Serbia and Portugal do not wish to become “sacrifice zones” and produce lithium that will be used in EVs driven by north Europeans [16]. However, despite the dispute, Araújo et al. [125] provided several examples of positive business-minded media discourses in Portugal that did not mention any problems associated with lithium extraction.

5 Discussion

The PA-related issues of the four projects assessed are summarized in Table 5.

Table 5 Summary of public acceptance-related issues of four European lithium projects

Project	Mining history in the area	Land use issues	Corporate website language	Organized opposition	Contentious actor(s)	Dispute intensity
EMILI	Kaolin extraction for the ceramics industry	Close to a protected area	French, English	Yes	Stopmines, Préservons la forêt des Colettes	Low
Keliber	No mining heritage	Close to a protected area	Finnish, English	No, but appeals have been made	-	Inexistent/latent
Mina do Barroso	Tin and tungsten mining, quartz, and feldspar quarrying for the ceramics industry	Agricultural heritage area, protected areas within the concession area	Portuguese, English	Yes	Unidos em Defesa de Covas do Barroso, MineWatch Portugal, Boticas Municipality	Medium
Greenbarrow	Kaolin extraction for the ceramics industry Cornwall has a global reputation for its mining heritage	Cornwall has heritage areas, as well as protected wildlife areas and seal sanctuaries	English	No, but with potential to be ignited	-	Inexistent/latent

As also shown in previous studies, not all mining projects face opposition [15, 61]. This is the case with Kaustinen and Greenbarrow projects (Table 5). This may depend on several factors, the most important of which are the corporate conduct, the project location and the associated land uses and local culture [15, 26, 61].

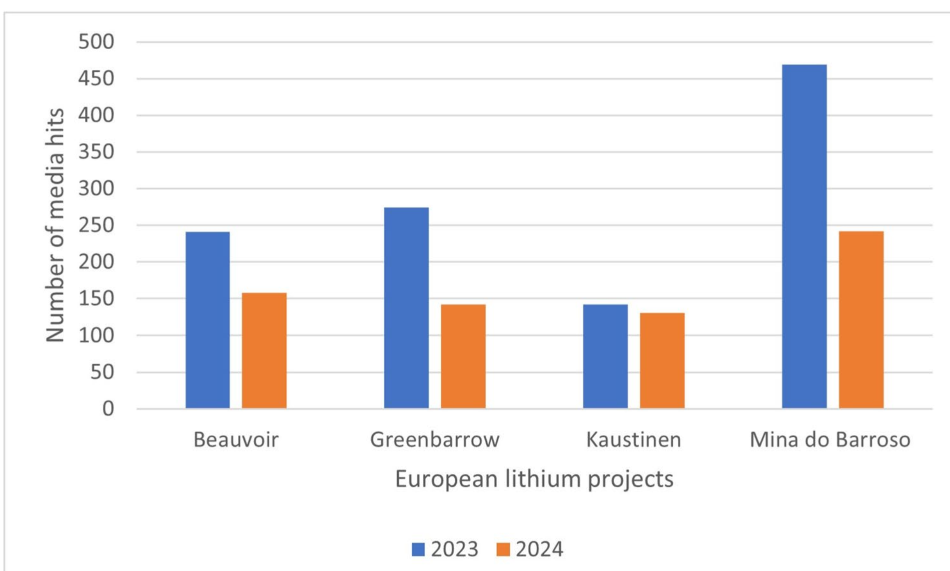
However, it is notable that Portugal has been producing lithium and kaolin from quarries for the ceramics industry already for decades, and Mina do Barroso is not an exception (Table 5). Suddenly, opposition emerged when plans for the development of four open pits were announced to produce Li for EV batteries. According to Luodes et al. [87], the same situation was noted in the EMILI project in France (Table 5). In fact, lithium caused a new boost in the Portuguese and French mining and mineral exploration industry and this new activity raised concerns due to the anticipated environmental and social impacts. This reaction is a side effect of the green energy transition which is also observed elsewhere [15, 16, 20]. It is known that a mining boom often raises concerns and multiplies disputes, especially when different land uses are affected [35]. Furthermore, based on the analysis of social media records, the Greenbarrow project in the UK is also a subject of environmental concern and resource nationalism; it is mentioned that the Cornwall Council and a Member of Parliament called for opposition to the project.

Based on the data presented in Table 4, the relative share of media hits for the four projects is presented in Fig. 6. Kaustinen (Keliber) has the lowest record for both years, 2023 and 2024, while Mina do Barroso the highest. As anticipated, the Mina do Barroso has the highest record of negative social media posts followed by Greenbarrow (Table 4). On the other hand, Greenbarrow has the highest number of reaches, followed by Mina do Barroso. These results differentiate the projects and may be explained by the level of opposition; high number of media hits and reaches indicates higher media attention, mainly due to environmental concerns and ongoing disputes. The higher media attention of Mina do Barroso may also reflect its higher conflict intensity within the EJAtlas (medium, Table 5) and the overall attention this project gets in Europe. However, it should be noted that the media attention was lower in 2024 for all studied projects (Fig. 7), probably because other significant events attracted more interest in the social media. It will be interesting to follow how these figures will evolve by the end of 2025 because of the pressure of the new US government on several countries towards securing American's access to CRMs and the new geopolitical reality that tends to consolidate in various parts of the planet.

A constant issue raised in all cases discussed in this paper is environmental concern towards lithium extraction. However, according to Domingues [128], environmental impacts of Li extraction from hard rocks are like those of quarrying and definitely they are not comparable to those of sulfide ore mining, which may involve the generation of acid mine drainage [129]. Nevertheless, if disposal of tailings is not properly designed, several impacts are anticipated for soils and water reservoirs due to potential leaching of metal(loid)s [8, 130, 131]. It is known that similar negative reactions occur in other countries, due to inaccurate information provided by the involved companies and the regional/state authorities [59]. These impacts can be only reliably assessed through carefully designed and properly implemented environmental tests and risk analyses [132, 133].

Apparently, the opponents compare hard rock lithium mining to that from brines in South America. However, in the published social science papers regarding Mina do Barroso, allegations for social and environmental impacts due to lithium extraction are often adopted without full scientific

Fig. 7 Media hits of European lithium projects in the period 2023–2024, based on data of Table 4



justification and validation. According to Buttel and Taylor [134], this is a typical activist's approach that is also adopted in some cases by engaged scholars; this is mainly due to lack of relevant scientific background for a proper understanding of environmental impacts [134, 135]. For activists, geogenic contamination of soils and waters in mineralized regions with elements exhibiting natural background values seems to be an unknown and unacceptable phenomenon [136]. Also, from their perspective, the nature is idealized, while economic activities, especially those related to mining, are "bad" and constitute "threats" [136–138].

All companies have their corporate websites, and they communicate their PA-related issues in local language (Table 5). This may be an important factor as it shows respect towards the local people and their culture [26], especially in regions where the ability of the people to speak and understand English may be low. However, even if a company communicates and engages with its stakeholders as in all the cases hereby, it is expected that some opposers will complain and protest because they think that this is done in an unsatisfactory manner and the region of concern will be affected in multiple ways (e.g., impact on tourism) [139–141]. While stakeholder engagement and communication can be always improved, the evidence and the extent that mining and mineral exploration affects tourism for example in a specific region remains to be seen. The same allegation was also made by activists and tourism entrepreneurs in Kuusamo, Finland, regarding uranium exploration the period 2006–2008. However, based on data provided by the Tourism Association of Kuusamo, tourism increased in the region that period [139]. According to Harju [76], and Suopajärvi et al. [142], there are also cases of harmonious co-existence of mining and tourism such as in Kittilä and Sotkamo in Finland.

In another case, in Milos, an extremely beautiful Greek touristic island in the Cyclades region where mining activities are known since the antiquity, contested interests were recorded as various stakeholder groups interpreted in a different way the relationship and the inevitable interaction between the mining and the tourism sectors. In addition, it is mentioned that in Milos mining of industrial minerals takes place, thus the environmental impacts are mainly visual, and also include dust generation, road transport and disposal of inert material [143].

It is important to underline that all projects reviewed in this paper are located close to mining heritage sites, except that of Kaustinen (Table 5). However, in the Portuguese and French cases, environmental impacts of past mining generate negative attitudes towards new mine plans. Another issue to mention is that the Mina do Barroso project covers a small part of a world agricultural heritage site (Table 5). However, this heritage status was obtained in 2018, much later than Savannah's application for a mine concession in 2006, while lithium is explored in the region since 2000.

Western Finland, where Keliber lithium project is located, is almost devoid of any other MMEDs [15]. In this region, in contrast to the industrial coast of the region, other natural resource-based activities including agriculture, forestry as well as fur and peat production, are carried out. Together with a little perception of environmental injustice by locals, as observed by Leino et al. [38], the nature of these livelihoods may also explain the positive attitude towards mining and mineral exploration. As fur and peat industries are in decline, it is expected that lithium mining can take their place. Also, the more conservative culture of western Finland may also promote positive responses to mining.

In all cases, as the projects develop, proper monitoring of the activities is required since any misconduct or negative economic, social, and environmental issues perceived by the local community can ignite or expand opposition. Once PA is lost, it is very difficult to be regained, and this may adversely impact the project development.

The way obstacles are overcome, and PA is obtained may be a good practice or guidance for the development of other Li projects in the EU, as for example the Cínovec project in the Czech Republic. The Cínovec hard rock greisen lithium-tin deposit has an important by-product potential, including tungsten, potash, rubidium, scandium, niobium and tantalum [144]. Cínovec has a long mining history with tin production, dated back in the fourteenth century. Later, in the twentieth century, tungsten ores were exploited, while mining operations in the area ceased in 1990.

On the other hand, light needs to be shed to all sides of energy transition in the present climate crisis. Despite of the urgency to find the optimum approach, there are many controversies that need to be discussed and resolved by the society [103]: part of the global environmental movement that for decades has demanded for green energy transition, has recently realized that the required raw materials need to be extracted from mines because recycling can only cover a tiny percentage of their demand. Part of this movement, supported by engaged scholars, started to oppose the transition and demand degrowth instead [57]. At the same time, radical greens and far-left groups join forces with nationalist, far-right and anti-EU movements, which oppose the green energy transition and deny climate change [145].

All these discrepancies prove that the green energy transition has not been deeply reflected and discussed by the society. Therefore, Li-mining controversies should be clarified, and the overall situation should be seen both from socio-economic and environmental perspectives. This can be made possible by considering mining projects targeting other energy transition metals, renewable energy infrastructure and other regional forms of development (e.g., agro-industrial, touristic) and by avoiding extractivism which may result in social injustice and unrest [115].

Three of the case studies examined in this paper were recently selected as strategic projects under the CRMA, namely EMILI, Kaustinen and Mina do Barroso [146]. It is mentioned that the European Commission adopted on March 25, 2025, 47 strategic projects for the extraction, processing, recycling or substitution of strategic raw materials (SRMs), to substantially improve its domestic capacities and strengthen the European raw materials value chain by modifying and broadening the sources of supply. This selection will accelerate their permitting process. It will be interesting to monitor in the coming years whether these developments will have any impact on the public views regarding PA of lithium mining in Europe.

6 Conclusions

In the present study, the PA status of four European lithium projects, namely EMILI in France, Greenbarrow in the UK, Kaustinen in Finland, and Mina do Barroso in Portugal was evaluated. Results were compared to an earlier study carried out by the same authors.

The study innovated as it applied PEA on European lithium projects with use of online media reports and social media data. Based on the results, only the projects of Mina do Barroso and EMILI face community-based opposition. In the activist and social media, the French EMILI project is called as a "toxic bomb," whereas the media records for the Mina do Barroso project in Portugal focus on mobilization against its development and suspicions of corruption. There are also environmental concerns and resource nationalism towards the British Lithium's and Mina do Barroso projects. In this sense, social media seem to be a good "thermometer" for a remote attitude assessment since it may detect the early signs of a potential emergent opposition.

Mina do Barroso and EMILI are the only cases reported within the EJAtlas. The first is also the only project regarding a dispute case for which critical academic papers are published. This literature seems to be quite biased and favors opposition's perspectives. It mainly expresses political ecology and environmental justice views using peculiar concepts and terminologies while systematically oppose the green transition and are in favor of degrowth. On the other hand, Kaustinen does not seem to face open and organized public opposition, apart from some complaints.

Indeed, the present study shows that not all mine projects are opposed. However, the lack of PA in other cases may limit future attempts to develop Li mines in Europe, challenge green energy transition and reduce European supply security for Li. As a result, a transparent framework needs to be developed, while more attention needs to be paid for the PA-related issues.

Environmental activism has a crucial role in the society and is an important driver for responsible mining. However, one question that deserves further attention is related to social (psycho)geology: a sudden change in mindset when the same site shifts from kaolin or quartz and feldspar production for the ceramics industry to Li extraction and/or from an open pit to underground mining, as for example in Mina do Barroso and EMILI projects. Another additional topic that may bridge the gap between the industry and the involved stakeholders and ease opposition, is the development of reliable mine closure plans and sustainable post mining uses which are accompanied by a clear roadmap, specific milestones, and key performance indicators (KPIs).

This study also innovates as it examines anti-mining activism from a critical perspective. This is because it may also have its social impact. Thus, the spread of fears with groundless allegations may affect local livelihoods (e.g., tourism) and the image of municipalities. As a result, critical self-reflection, geoethics, and social responsibility should be considered when such allegations are created and spread. More efficient dialogue between companies, activists as well as the local and regional authorities and the central government is needed to improve trust among all of them. In fact, Li-mining controversy needs to be reliably assessed and clarified by considering socio-economic and environmental aspects as well as the attitude of the people living in the vicinity of each affected region. It is known that every mining project is unique and different approaches need to be followed in different regions to achieve and maintain PA. Diverse sources need to be extensively and carefully searched and critically and reliably analyzed. This way, the magnitude of the challenge, the attitudes towards Li-mining projects, the companies' willingness to achieve PA and the overall goals of the Green Deal can be reliably determined. If a consensus is reached, this will improve the quality of life for the future generations, with or without considering the green transition concept.

Finally, after their start, the progress of all project activities and the company-community relationships need to be closely monitored. Any misconduct may ignite opposition that can be unpleasant or even destructive for the industry and jeopardize EU's quest to ditch fossil fuels and switch to clean energy. Selection of three projects mentioned hereby as strategic ones may increase resistance towards them as their permitting process will be accelerated.

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Author Contribution Both authors contributed equally to all stages of the manuscript including conceptualization, methodology, formal analysis, investigation, writing—original draft preparation, review and editing, supervision, project administration, funding acquisition, etc. Both authors have read and agreed to the published version of the manuscript.

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Declarations

Conflict of interest The authors declare no competing interests.

References

1. IEA (2021) The role of critical minerals in clean energy transitions. Special Report of the World Energy Outlook (WEO) team of the IEA. Paris: IEA. 283 p. https://www.iea.org/reports/the-role-ofcritical-minerals-in-clean-energy-transitions (accessed 3 December 2023)
2. IEA (2020) Global EV Outlook 2020, Paris. https://www.iea.org/reports/global-ev-outlook-2020
3. Ibarra-Gutiérrez S, Bouchard J, Laflamme M, Fytas K (2021) Assessing the potential of Quebec lithium industry: mineral reserves, lithium-ion batteries production and greenhouse gas emissions. Resour Policy 74:102371. https://doi.org/10.1016/j.resourpol.2021.102371
4. Granvik P (2021) The demand and adequacy of natural resources needed for renewable energy utilization and electrification of traffic (in Finnish, with English abstract). MSc Thesis, Aalto University, https://aaltodoc.aalto.fi/server/api/core/bitstreams/22e7d7b9-6978-4f4f-a0b4-3484d43bec3e/content (assessed 3 December 2023)
5. Michaux S (2021) The mining of minerals and the limits to growth. Geological Survey of Finland, Open File Work Report 16/2021, 68 p. https://tupa.gtk.fi/raportti/arkisto/16_2021.pdf (accessed 6 December 2023)
6. Michaux S (2024) Estimation of the quantity of metals to phase out fossil fuels in a full system replacement, compared to mineral resources. Bulletin of the Geological Survey of Finland 416, 293 p. https://tupa.gtk.fi/julkaisu/bulletin/bt_416.pdf
7. Gourcerol B, Gloaguen E, Melleton J, Tuduri J, Galiegue X (2019) Re-assessing the European lithium resource potential – a review of hard-rock resources and metallogeny. Ore Geol Rev 109:494–519. https://doi.org/10.1016/j.oregeorev.2019.04.015
8. Toupal J, Vann DR, Zhu C, Gieré R (2022) Geochemistry of surface waters around four hard-rock lithium deposits in Central Europe. J Geochem Explor 234:106937. https://doi.org/10.1016/j.gexplo.2021.106937
9. Durán AP, Rauch J, Gaston KJ (2013) Global spatial coincidence between protected areas and metal mining activities. Biol Conserv 160:272–278. https://doi.org/10.1016/j.biocon.2013.02.003
10. Lèbre É, Stringer M, Svobodova K, Owen JR, Kemp D, Côte C, Arratia-Solar A, Valenta RK (2020) The social and environmental complexities of extracting energy transition metals. Nat Commun 11:4823. https://doi.org/10.1038/s41467-020-18661-9
11. Sonter LJ, Dade MC, Watson JEM, Valenta RK (2020) Renewable energy production will exacerbate mining threats to biodiversity. Nat Commun 1:4174. https://doi.org/10.1038/s41467-020-17928-5
12. Owen JR, Kemp D, Harris J, Lechner AM, Lèbre E (2022) Fast track to failure? Energy transition minerals and the future of consultation and consent. Energy Res Soc Sci 89:102665. https://doi.org/10.1016/j.erss.2022.102665
13. Lawley C, Haynes M, Chasama B, Goodenough K, Eerola T, Golev A, Zhang S, Park J, Lèbre E (2024) Geospatial data and deep learning expose ESG risks to critical raw materials supply: The case of lithium. Earth Sci Syst Soc 4:10109. https://doi.org/10.3389/esss.2024.10109
14. Graham DG, Rupp JA, Brungard E (2021) Lithium in the green energy transition: The quest for both sustainability and security. Sustainability 13:11274. https://doi.org/10.3390/su132011274
15. Eerola T (2022) Corporate conduct, commodity, and place: ongoing mining and mineral exploration disputes in Finland and their implications for the social license to operate. Resour Policy 76:102568. https://doi.org/10.1016/j.resourpol.2022.102568
16. Lazarević N (2024) Inequities in the green transition: anti-mining protests in the European periphery. Glob Polit Econ 3:250–272. https://doi.org/10.1332/26352257Y2024D000000023
17. Que S, Awuah-Offei K, Demirel A, Wang L, Demirel N, Chen Y (2019) Comparative study of factors affecting public acceptance of mining projects: evidence from USA, China and Turkey. J Clean Prod 237:117634. https://doi.org/10.1016/j.jclepro.2019.117634
18. França Pimenta AA, Demajorovic J, Saraiva de Souza MT, de Carvalho PS, Pisano V (2021) Social licence to operate model: critical factors of social acceptance of mining in the Brazilian Amazon. Resour Policy 74:102237. https://doi.org/10.1016/j.resourpol.2021.102237
19. Thomson I, Boutilier RG (2011) The social license to operate. In: Darling, P. (ed.) SME Mining and Engineering Handbook. Littleton, Co., 1779−1796.
20. Scheyder E (2024) The War Below. Lithium, Copper, and the Global Battle to Power Our Lives. New York: Atria/One Signal Publishers
21. European Commission (2019) European Green Deal. Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions,COM (2019) 640 final. (28 February 2025). https://eur-lex.europa.eu/resource.html?uri=cellar:b828d165-1c22-11ea-8c1f-01aa75ed71a1.0002.02/DOC_1&format=PDF
22. European Commission (2024) Critical Raw Materials Act. https://single-market-economy.ec.europa.eu/sectors/raw-materials/areas-specific-interest/critical-raw-materials/critical-raw-materials-act_en (accessed 28 February 2025)
23. Franks DM, Davis R, Bebbington AJ, Ali SH, Kemp D, Scurrah M (2014) Conflict translates environmental and social risk into

business cost. PNAS 111:7576–7581. https://doi.org/10.1073/pnas.1405135111
24. Kivinen S, Kotilainen J, Kumpula T (2020) Mining conflicts in the European Union: environmental and political perspectives. Fennia 198: 163–179. https://doi.org/10.11143/fennia.87223
25. Gallois C, Ashworth P, Leach J, Moffat K (2016) The language of science and social license to operate. J Lang Soc Psych 36:45–60. https://doi.org/10.1177/0261927X16663254
26. Eerola T, Komnitsas K (2023) Preliminary assessment of social license to operate (SLO) and corporate communication in four European lithium projects. Mater Proc 15:35. https://doi.org/10.3390/materproc2023015035
27. Mata-Perelló J, Mata-Lleonart R, Vintró-Sánchez C, Restrepo-Martínez C (2012) Social geology: a new perspective on geology. Dyna 79: 158–166. http://www.scielo.org.co/scielo.php?script=sci_arttext&pid=S0012-73532012000100020
28. Stewart IS, Gill GC (2017) Social geology — integrating sustainability concepts into Earth sciences. Proc Geol Assoc 128:165–172. https://doi.org/10.1016/j.pgeola.2017.01.002
29. Erb M, Mucek AE, Robinson K (2021) Exploring a social geology approach in eastern Indonesia: What are mining territories? Extr Ind Soc 8:89–103. https://doi.org/10.1016/j.exis.2020.09.005
30. Eerola T (2024) Ethics, aesthetics, philosophy, and social impacts of mining (in Finnish). Tieteessä tapahtuu 1: 6–10. https://journal.fi/tt/article/view/143485/90889 (accessed 30 April 2024)
31. Hilson G, Murck B (2000) Sustainable development in the mining industry: Clarifying the corporate perspective. Resour Policy 26:227–238. https://doi.org/10.1016/S0301-4207(00)00041-6
32. Martinez-Alier J (2001) Mining conflicts, environmental justice, and valuation. J Hazard Mater 86:153–170. https://doi.org/10.1016/S0304-3894(01)00252-7
33. Komnitsas K (2020) Social license to operate in mining: present views and future trends. Resources 9:79. https://doi.org/10.3390/resources9060079
34. Ruokonen E (2020) Preconditions for successful implementation of the Finnish standard for sustainable mining. Extr Ind Soc 7:611–620. https://doi.org/10.1016/j.exis.2020.03.008
35. Conde M (2017) Resistance to mining. A review Ecol Econ 132:80–90. https://doi.org/10.1016/j.ecolecon.2016.08.025
36. Emmerich P, Hülemeier AG, Jendryczko D, Baumann MJ, Weil M, Baur D (2020) Public acceptance of emerging energy technologies in context of the German energy transition. Energy Policy 142:111516. https://doi.org/10.1016/j.enpol.2020.111516
37. Terwel BW, Harnick F, Ellemers N, Daamen DDL (2010) Voice in political decision-making: the effect of group voice on perceived trustworthiness of decision makers and subsequent acceptance of decisions. J Exp Psychol 16(2):173–186. https://doi.org/10.1037/a0019977
38. Leino J, Kivinen S, Mononen T, Sihvonen J (2023) Common and private good: experiences of mining and environmental justice in rural areas (in Finnish, with English summary). Alue ja ympäristö 52: 1–24. https://doi.org/10.30663/ay.130927
39. Johnson EL, Ericsson M, Löf A (2023) The mining permitting process in selected developed economies. Land Use Policy 131:106762. https://doi.org/10.1016/j.landusepol.2023.106762
40. Escosteguy M, Clavijo A, Paz WFD, Hufty M, Seghezzo L (2022) "We are not allowed to speak": Some thoughts about a consultation process around lithium mining in Northern Argentina Extr Ind Soc 11: 101134. https://doi.org/10.1016/j.exis.2022.101134
41. Selmier WT, Newenham-Kahindi A, Oh CH (2015) "Understanding the words of relationships": Language as an essential tool to manage CSR in communities of place. J Int Bus Stud 46:153–179. https://doi.org/10.1057/jibs.2014.58
42. Breakey H, Wood G, Sampford C (2025) Understanding and defining the social license to operate: Social acceptance, local values, overall moral legitimacy, and 'moral authority.' Resour Policy 102:105488. https://doi.org/10.1016/j.resourpol.2025.105488
43. Kuo L, Chang BG (2021) The affecting factors of circular economy information and its impact on corporate economic sustainability - Evidence from China. Sustain Prod Consum 27:986–997. https://doi.org/10.1016/j.spc.2021.02.014
44. Sulista S, Rosyid FA, Wibowo AP (2023) Turning waste into profit: Circular economic optimization of quartz sand from tin mining and processing. Sustain Prod Consum 39:53–62. https://doi.org/10.1016/j.spc.2023.05.002
45. Huijts NM, Molin EJ, Steg L (2012) Psychological factors influencing sustainable energy technology acceptance: a review-based comprehensive framework. Renew Sustain Energy Rev 16:525–531. https://doi.org/10.1016/j.rser.2011.08.018
46. Lacey J, Malakar Y, McCrea R, Moffat K (2019) Public perceptions of established and emerging mining technologies in Australia. Resour Policy 62:125–135. https://doi.org/10.1016/j.resourpol.2019.03.018
47. Barakos G, Mischo H (2021) Insertion of the social license to operate into the early evaluation of technical and economic aspects of mining projects: Experiences from the Norra Kärr and Bokan Dotson rare earth element projects. Extr Ind Soc 8:100814. https://doi.org/10.1016/j.exis.2020.09.008
48. Saaty TL (1980) The analytic hierarchy process: planning, priority setting, resource allocation. McGraw Hill International, New York: U.S.A., p. 287p
49. de la Torre de Palacios L, Espí Rodríguez JA (2022) In mining, not everything is a circular economy: Case studies from recent mining projects in Iberia. Resour Policy 78: 102798. https://doi.org/10.1016/j.resourpol.2022.102798
50. Zachrisson A, Beland Lindahl K (2019) Political opportunity and mobilization: The evolution of a Swedish mining-sceptical movement. Resour Policy 64:1–12. https://doi.org/10.1016/j.resourpol.2019.101477
51. Jartti T, Litmanen T, Lacey J, Moffat K (2020) National level paths to the mining industry's social licence to operate (SLO) in Northern Europe: the case of Finland. Extr Ind Soc 7:97–109. https://doi.org/10.1016/j.exis.2020.01.006
52. Obaya M (2021) The evolution of resource nationalism: the case of Bolivian lithium. Extr Ind Soc 8(3):100932. https://doi.org/10.1016/j.exis.2021.100932
53. Arce M, Nieto-Matiz C (2024) Mining and violence in Latin America: the state's coercive responses to anti-mining resistance. World Dev 173:106404. https://doi.org/10.1016/j.worlddev.2023.106404
54. Badera J (2014) Problems of the social non-acceptance of mining projects with particular emphasis on the European Union – a literature review. Environ Socio-Econ Stud 2:27–34. https://doi.org/10.1515/environ-2015-0029
55. Lesser P, Gugerell K, Poelzer G, Hitch M, Tost M (2021) European mining and the social license to operate. Extr Ind Soc 8(2):100787. https://doi.org/10.1016/j.exis.2020.07.021
56. Temper L, del Bene D, Martinez-Alier J (2015) Mapping the frontiers and front lines of global environmental justice: the EJAtlas. J Polit Ecol 22:255–278. https://doi.org/10.2458/v22i1.21108
57. Dunlap A, Riquito M (2023) Social warfare for lithium extraction? Open-pit lithium mining, counterinsurgency tactics and enforcing green extractivism in northern Portugal. Energy Res Soc Sci 95:102912. https://doi.org/10.1016/j.erss.2022.102912
58. Collins BC, Kumral M (2021) A critical perspective on social license to operate terminology for Canada's most vulnerable mining communities. Extr Ind Soc 8:100836. https://doi.org/10.1016/j.exis.2020.11.002

59. Bergeron KM (2021) What can a hundred mining exploration projects in Canada tell us about social risk? Considering an area's trajectory to understand its sociogeological potential. Extr Ind Soc 8:83–88. https://doi.org/10.1016/j.exis.2020.09.004
60. Sanchez-Lopez MD (2021) Territory and lithium extraction: The Great Land of Lipez and the Uyuni Salt Flat in Bolivia. Political Geogr 90:102456. https://doi.org/10.1016/j.polgeo.2021.102456
61. Conde M, Le Billon P (2017) Why do some communities resist mining projects while others do not? Extr Ind Soc 4:681–697. https://doi.org/10.1016/j.exis.2017.04.009
62. Guimarães RN, Moreira VR, Cruz JRA, Saliba APM, Amaral MCS (2022) History of tailings dam failure: Impacts on access to safe water and influence on the legislative framework. Sci Tot Environ 852:158536. https://doi.org/10.1016/j.scitotenv.2022.158536
63. Coetzee E, Govender U, Ndeunyema P, Genc B, Maré Y, Roux J, Nel J, van Eck G (2023) An integrated safety framework for the diamond mines: A case study from Namibia. Resour Policy 82:103564. https://doi.org/10.1016/j.resourpol.2023.103564
64. Eerola T (2021) New low-impact mineral exploration technologies and the social license to explore: Insights from corporate websites in Finland. Clean Environ Syst 3:100059. https://doi.org/10.1016/j.cesys.2021.100059
65. Bajic V (2024) Serbia's top court overturns ban on Rio Tinto lithium mine project. SeeNews https://seenews.com/news/serbias-top-court-overturns-ban-on-rio-tinto-lithium-mine-project-1260469 (accessed 12 July 2024)
66. De Layne G (2022) Serbia revokes Rio Tinto lithium mine permits following protests. BBC News (21 January 2022). https://www.bbc.com/news/world-europe-60081853
67. Storyrunner/SIM2 KU Leuven (2025) "Not in My Country, Serbia's Lithium Dilemma", New documentary on Europe's most controversial lithium mining project, https://kuleuven.sim2.be/press-release-not-in-my-country-serbias-lithium-dilemma/ (accessed 5 February 2025)
68. Koopmans R, Rucht D (2002) Protest event analysis. In: Klandermans B, Staggenborg S (eds) Methods of social movement research. MN, University of Minnesota Press, Minneapolis, pp 231–259
69. Bengston DN, Fan DP (1999) Conflict over natural resource management: A social indicator based on analysis of online news media text. Soc Nat Res 12:493–500. https://doi.org/10.1080/089419299279560
70. Haslam PA, Tanimoune NA (2015) The determinants of social conflict in the Latin American mining sector: new evidence with quantitative data. World Dev 78:401–419. https://doi.org/10.1016/j.worlddev.2015.10.020
71. Earl J, Martin A, McCarthy JD, Soule S (2004) The use of newspaper data in the study of collective action. Annu Rev Sociol 30:65–80. https://doi.org/10.1146/annurev.soc.30.012703.110603
72. Montti R (2024) Why Google seems to favor big brands & low-quality content. Search Engine Journal. https://www.searchenginejournal.com/why-google-seems-to-favor-big-brands-low-quality-content/509092/ (assessed 10 January 2025)
73. Liu B (2012) Sentiment analysis and opinion mining. Series ISSN1947–4040. https://doi.org/10.2200/S00416ED1V01Y201204HLT016
74. Greenleaf Book Group (2025) How to promote your media hits. https://greenleafbookgroup.com/learning-center/book-marketing/how-to-promote-your-media-hits-1 (assessed 2 May 2025)
75. Marx J, Mirbabaie M (2022) The Investigator's dilemma - a review of social media analytics research ethics in information systems. Australas J Inf Sys 26. https://doi.org/10.3127/ajis.v26i0.3287
76. Harju A (2019) Media coverage of two northern mines (in Finnish, with English abstract). Akateeminen väitöskirja, Oulun yliopiston tutkijakoulu; Oulun yliopisto, Humanistinen tiedekunta, Tiedeviestintä. Universitatis Ouluensis B 170, 501 s. https://oulurepo.oulu.fi/bitstream/handle/10024/36780/isbn978-952-62-2174-8.pdf?sequence=1&isAllowed=y
77. Holsti OR (1969) Content analysis for the social sciences and humanities. Addison-Wesley, Ontario
78. Jose A, Lee SM (2007) Environmental reporting of global corporations: a content analysis based on website disclosures. J Bus Ethics 72:307–321. https://doi.org/10.1007/s10551-006-9172-8
79. European Environment Agency (2024) Corine land cover. https://land.copernicus.eu/en/products/corine-land-cover(accessed 28 February 2025)
80. Commission Nationale du Debat Publique (2024) IMERYS projet EMILI, débat public, synthèse du dossier du maître d'ouvrage. https://www.debatpublic.fr/mine-de-lithium-allier/le-dossier-du-maitre-douvrage-5411 (accessed 16 August 2024).
81. British Lithium Ltd. (2023) Mineral resource estimate. https://imerysbritishlithium.com/lithium-exploration/mineral-resource-estimate/ (accessed 16 August 2024).
82. SRK Consulting (2023) Keliber Lithium Project, Finland: Technical Report Summary. Report Number 592138, 237 p. https://fintel.io/doc/sec-sibanye-stillwater-ltd-1786909-ex967-2023-april-24-19471-6286 (assessed 27 June 2024).
83. Savannah Resources plc. (2024) Barroso lithium project, Portugal. https://www.savannahresources.com/project/barroso-lithium-project-portugal/ (accessed 3 September 2024)
84. Monnier L, Lach P, Salvi S, Melleton J, Bailly L, Monnier Y, Gouy S (2018) Quartz trace-element composition by LA-ICP-MS as proxy for granite differentiation, hydrothermal episodes, and related mineralization: the Beauvoir Granite (Echassières dis-trict), France. Lithos 320–321:355–377. https://doi.org/10.1016/j.lithos.2018.09.024
85. Monnier L, Salvi S, Melleton J, Lach P, Pochon A, Bailly L, Béziat D, De Parseval P (2022) Mica trace-element signatures: highlighting superimposed W-Sn mineralizations and fluid sources. Chem Geol 600:120866. https://doi.org/10.1016/j.chemgeo.2022.120866
86. Canas N (2024) Questions remain over France's largest lithium mine project. Euractive (02 October 2024). https://www.euractiv.com/section/eet/news/questions-remain-over-frances-largest-lithium-mine-project/
87. Luodes N, Panttila H, Eerola T, Correia V, Hermann L, Berne S, Barnes J, Christian M, Marcello N, Castelo Branco JM, Pereira M, Carvalho J, Ortega A, Bordehore RJ, Medina Sanchez E, Lopes L, Arvidsson R, Apler A, Johansson M, Hilton J, Moussaid-Hilton M, Falck E (2024) Description of good-practice case studies. Deliverable 2.1 of the Critical raw materials extraction in environmentally protected areas (CIRAN) project, 167 p.
88. Vincent C (2022) Exploitation du lithium: "Il ne faut pas passer à côté", estiment les riverains d'une future mine dans l'Allier. Franceinfo 31 October 2022, https://www.francetvinfo.fr/economie/automobile/crise-automobile/exploitation-du-lithium-il-ne-faut-pas-passer-a-cote-estiment-les-riverains-d-une-future-mine-dans-l-allier_5450077.html
89. Limacher N (2024) Imerys "major national interest" lithium mine project in Allier, France. Environmental Justice Atlas. https://ejatlas.org/conflict/major-national-interest-lithium-mine-projet-in-allier-france [accessed 19 December 2024)
90. Clévenot E (2022) Lithium mine in l'Allier, residents in fury (in French). Reporterre 01 December 2022. https://reporterre.net/Mine-de-lithium-dans-l-Allier-les-habitants-en-colere (accessed 10 April 2024)
91. Scharff C (2023) Reportage à Echassières: 373 habitants et capitale européenne du lithium. L'Echo 13/11/23, pp. 1–13. https://www.lecho.be/economie-politique/belgique/general/repor

tage-a-echassieres-373-habitants-et-capitale-europeenne-du-lithium/10503850.html (accessed 3 September 2023)
92. Miñano L (2023) Mine de lithium dans l'Allier : le rapport qui dévoile une bombe toxique. Disclosure https://disclose.ngo/fr/article/mine-de-lithium-dans-lallier-le-rapport-qui-devoile-une-bombe-toxique
93. Geoderis (2018) Health and environmental study. Sectors of Montmins and Nades (03) (in French). Rapport S2018/031DE –18AUV24040, 174 p.
94. Imerys (2024) EMILI: A project for energy transition and European sovereignty. https://emili.imerys.com/en (accessed 19 December 2024)
95. Ellis RJ, Scott PW (2004) Evaluation of hyperspectral remote sensing as a means of environmental monitoring in the St. Austell China clay (kaolin) region, Cornwall. UK Remote Sens Environ 93:118–130. https://doi.org/10.1016/j.rse.2004.07.004
96. Tierney RL, Glass HJ (2016) Modelling the structural controls of primary kaolinite formation. Geomorphology 268:48–53. https://doi.org/10.1016/j.geomorph.2016.05.022
97. Breiter K, Vašinová Galiová M, Hložková M, Korbelová Z, Kynický J, Costi HT (2023) Trace element composition of micas from rare-metal granites of different geochemical affiliations. Lithos 446–447:107135. https://doi.org/10.1016/j.lithos.2023.107135
98. Nevett J (2023) Lithium: A white gold rush excites Cornwall - but who gains? BBC, 10 April 2023. https://www.bbc.com/news/uk-politics-65184600
99. IRMA (2024) Initiative for Responsible Mining, https://responsiblemining.net/ (accessed 8 August 2024)
100. Müller S, Meima JA (2022) Mineral classification of lithium-bearing pegmatites based on laser-induced breakdown spectroscopy: application of semi-supervised learning to detect known minerals and unknown material. Spectrochim Acta B 189:106370. https://doi.org/10.1016/j.sab.2022.106370
101. Kemiamedia (2023) The Keliber's lithium project advances – permits for the Rapasaari mine and processing plant (in Finnish). Kemiamedia 8.2.2023. https://www.kemiamedia.fi/keliberin-litiumhanke-etenee-luvat-rapasaaren-kaivokselle-ja-rikastamolle/
102. Hatch 2019. Definitive Feasibility Study Report Volume 1 - Executive Summary. 64 p. (Feb 28, 2019)
103. Eerola T (2024) The evolution and impacts of the Finnish mining-sceptical movement from uranium exploration to the green energy transition. Extr Ind Soc 19:101486. https://doi.org/10.1016/j.exis.2024.101486
104. Vihanta S (2019) Eutrophication of Perho River is feared – fishery, nature conservation and landowner associations appealed on Keliber's environmental permit (in Finnish). Yle Uutiset, 2 July 2019. https://yle.fi/a/3-10709728
105. Holopainen H (2021) The lithium mining company Keliber can start to prepare mine opening – appeals on environmental permit were rejected in great part (in Finnish). Yle Uutiset, 18.6.2021. https://yle.fi/a/3-11988940
106. Vihanta S (2024) Keliber's environmental permit needs to be partially retreated – However, the main part of the complaints' requests were rejected by the Administrative Court. Yle Uutiset, 23 February 2024. https://yle.fi/a/74-20076148
107. Kuikka P (2024) Mining company came into a backyard – villagers get concerned with analcime sand with arsenic (in Finnish). Yle 16.9.2024. https://yle.fi/a/74-20110976
108. Keliber Oy (2020) Sustainability review 2019. https://www.keliber.fi/site/assets/files/1935/07g_keliber_sustainability_review_2019_id_25511.pdf (accessed 26 July 2020).
109. Sibanye Stillwater (2023a). Keliber. https://www.sibanyestillwater.com/fi/liiketoiminta/eurooppa/keliber/ (accessed 16 June 2023)
110. Sibanye Stillwater (2023b) Sustainability. https://www.sibanyestillwater.com/sustainability/ (accessed 16 June 2023)
111. Leino J, Miettinen E (2020) Mineral exploration, acceptance, and possibilities of participation – the case of Heinävesi mineral exploration conflict (in Finnish). Ympäristöoikeuden vuosikirja XIII, 265–367. https://www.edilex.fi/ymparistopolitiikka_ja_oikeus/218040005 (accessed 27 May 2023)
112. Wang C-N, Bayer J, Dang T-T, Hsu H-P (2022) Evaluation of world lithium mining projects using hybrid MCDM model. Miner Eng 189:107905. https://doi.org/10.1016/j.mineng.2022.107905
113. Silva B (2023) Savannah tem "luz verde" condicionada da APA para constuir mina de lítio do Barroso. Negócios 31.5.2023. https://www.jornaldenegocios.pt/empresas/energia/detalhe/savannah-tem-luz-verde-condicionada-da-apa-para-constuir-mina-de-litio-do-barroso
114. Expresso (2024) Lithium: The Public Ministry defends annulation of environmental permit of the Barroso mine for "illegalities" (in Portguese). (08 August 2024). https://expresso.pt/sustentabilidade/ambiente/2024-02-08-Litio-MP-defende-nulidade-da-Declaracao-de-Impacto-Ambiental-da-mina-do-Barroso-por-padecer-do-vicio-de-violacao-da-lei-78f4f36e
115. EJAtlas (2023) Covas do Barroso, Portugal. https://ejatlas.org/conflict/savannahs-lithium-extraction-conflict-in-barroso-portugal (assessed 28 July 2024)
116. República Portuguesa (2024) Participa: Alteração ao Projeto de Ampliação da Mina do Barroso. https://participa.pt/pt/consulta/alteracao-ao-projeto-de-ampliacao-da-mina-do-barroso (accessed 16 August 2024)
117. Murguía DI, Böhling K (2013) Sustainability reporting on large-scale mining conflicts: The case of Bajo de La Alumbrera, Argentina. J Clean Prod 41:202–209. https://doi.org/10.1016/j.jclepro.2012.10.012
118. Savannah Resources plc. (2023) Barroso Lithium Project EIA Update Documentation made public & start of public consultation period. https://www.rns-pdf.londonstockexchange.com/rns/9389T_1-2023-3-23.pdf (accessed 3 September 2024)
119. Savannah Resources plc. (2023) Comunidade. https://savannahresources-wwwsavannahresourcescom.azurewebsites.net/pt/esg-comunidade/comunidade/ (Accessed 17 June 2023)
120. Chaves C, Pereira E, Ferreira P, Dias AG (2021) Concerns about lithium extraction: a review and application for Portugal. Extr Ind Soc 8:100928. https://doi.org/10.1016/j.exis.2021.100928
121. Menendez S (2022) "Dizemos nosso rio, mas não é nosso": Dispossession and resistance against a lithium mining project in Covas do Barroso, Northern Portugal. MSc Dissertation, Department of Anthropology, Instituto Universitário de Lisboa. Lisboa, 80 p. file:///C:/Users/teerola/Downloads/master_shandra_menendez.pdf
122. Canelas J, Carvalho A (2023) The dark side of the energy transition: Extractivist violence, energy (in)justice and lithium mining in Portugal. Energy Res Soc Sci 100:103096. https://doi.org/10.1016/j.erss.2023.103096
123. Saleth AL, Varov I (2023) Anticipating lithium extraction in northern Portugal: a Sacrifice Zone in the making? J Polit Ecol 30:294–315. https://doi.org/10.2458/jpe.4849
124. Ribeiro T, Lima A, Vasconcelos C (2021) The need for transparent communication in mining: a case study in lithium exploitation. Int J Sci Educ Part B: 1–20. https://doi.org/10.1080/21548455.2021.1999530
125. Araújo E, Bento S, Silva M (2022) Politicizing the future: on lithium exploration in Portugal. Eur J Futures Res 10:23. https://doi.org/10.1186/s40309-022-00209-3
126. Kavanagh L, Keohane J, Cleary J, Cabellos GG, Lloyd A (2017) Lithium in the natural waters of the southeast of Ireland. Int J Environ Res Public Health 14:561. https://doi.org/10.3390/ijerph14060561

127. Rodrigues PMSM, Antão AMMC, Rodrigues R (2019) Evolution of the impact of lithium exploitation at the C57 mine (Gonçalo, Portugal) on water, soil, and air quality. Environ Earth Sci 78:533. https://doi.org/10.1007/s12665-019-8541-4
128. Domingues N (2022) Lithium prospection in Portugal for E-mobility and solar PV expansion. Commodity 1:98–114. https://doi.org/10.3390/commodities1020007
129. Antivachis DN, Chatzitheodoridis E, Skarpelis N, Komnitsas K (2017) Secondary sulphate minerals in a Cyprus-type ore deposit, Apliki, Cyprus: Mineralogy and its implications regarding the chemistry of pit lake waters. Mine Water Environ 36:226–238. https://doi.org/10.1007/s10230-016-0398-0
130. Komnitsas K, Modis K (2009) Geostatistical risk assessment at waste disposal sites in the presence of hot spots. J Hazard Mater 164(2–3):1185–1190. https://doi.org/10.1016/j.jhazmat.2008.09.027
131. Gao J-Q, Yu Y, Wang D-H, Wang W, Wang C-H, Dai H-Z, Hao X-F, Cen K (2021) Effects of lithium resource exploitation on surface water at Jiajika mine. China Environ Monit Assess 193:81. https://doi.org/10.1007/s10661-021-08867-9
132. Komnitsas K, Modis K (2006) Soil risk assessment of As and Zn contamination in a coal mining region using geostatistics. Sci Tot Environ 371(1–3):190–196. https://doi.org/10.1016/j.scitotenv.2006.08.047
133. Acharya BS, Kharel G (2017) Acid mine drainage from coal mining in the United States – An overview. J Hydrol 588:125061. https://doi.org/10.1016/j.jhydrol.2020.125061
134. Buttel F, Taylor P (1992) Environmental sociology and global environmental change. A critical assessment Soc Nat Resour 5:211–230. https://doi.org/10.1080/08941929209380788
135. Fähnrich B (2018) Digging deeper? Muddling through? How environmental activists make sense and use of science — an exploratory study. J Sci Commun 17: 1–18. https://doi.org/10.22323/2.17030208
136. Eerola T (2014) The anthropology of activism: why the alleged threats of uranium exploration are created, presented and believed? (in Finnish, with English abstract). Geologi 66: 60–73. https://www.geologinenseura.fi/sites/geologinenseura.fi/files/geologi_-_artikkelit/geologi_3_2014_aktivismi.pdf
137. Melucci A (1996) Challenging codes. Collective action in the transformation age. Cambridge, Cambridge University Press, 182 s.
138. Davison A (2008) The trouble with nature: Ambivalence in the lives of urban Australian environmentalists. Geoforum 39:1284–1295. https://doi.org/10.1016/j.geoforum.2007.06.011
139. Eerola T (2010) The social impact of Kouvervaara "uranium minining project" on Kuusamo, NE Finland: Does uranium exploration and uranium mines affect tourism and image of municipalities? (in Finnish, with English abstract). Geologi 62: 208–222. https://www.geologinenseura.fi/sites/geologinenseura.fi/files/geologi_-_artikkelit/eerola3.pdf
140. Van der Plank S, Walsh B, Behrens P (2016) The expected impacts of mining: Stakeholder perceptions of a proposed mineral sands mine in rural Australia. Resour Policy 48:129–136. https://doi.org/10.1016/j.resourpol.2016.03.005
141. Leonard L, Lebogang T (2018) Exploring the impacts of mining on tourism growth and local sustainability: The case of Mapungubwe Heritage Site, Limpopo, South Africa. Sustain Dev 26:206–216. https://doi.org/10.1002/sd.1695
142. Suopajärvi L, Umander K, Leneisja J (2019) Social license to operate in the frame of social capital exploring local acceptance of mining in two rural municipalities in the European North. Resour Policy 64:1–7. https://doi.org/10.1016/j.resourpol.2019.101498
143. Lichrou M, O'malley, L, (2006) Mining and tourism: conflicts in the marketing of Milos Island as a tourism destination. Tour Hosp Plan Dev 3(1):35–46. https://doi.org/10.1080/14790530600640834
144. Sterba J, Krzemień A, Fidalgo Valverde G, Álvarez ID, Castañón Fernández C (2020) Energy-sustainable industrialized growth in the Czech Republic: The Cínovec lithium mining project. Resour Policy 68:101707. https://doi.org/10.1016/j.resourpol.2020.101707
145. Dickson ZP, Hobolt SB (2024) Going against the grain: climate change as a wedge issue for the radical right. Comp Polit Stud. https://doi.org/10.1177/00104140241271297
146. European Commission (2025). Selected strategic projects. https://single-market-economy.ec.europa.eu/sectors/raw-materials/areas-specific-interest/critical-raw-materials/strategic-projects-under-crma/selected-projects_en (assessed 4 May 2025)