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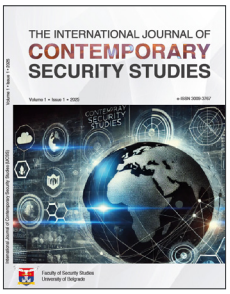

Review article

Social License to Operate: Where Are You? The Role of Risk Communication in Raw Material Extraction

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ABSTRACT

Europe is not only interested in the availability of raw materials, but also in their sustainable extraction and use, as expressed in the Critical Raw Materials Act. The trend towards extracting raw materials in Europe to be independent in politically turbulent times is increasingly being countered by problems with citizens and citizens' initiatives, which are causing such projects to fail. The lack of social acceptance or the so-called social license to operate is becoming a significant problem in this field, and the question is increasingly being asked as to what difference successful communication could make. By applying discourse analytical literature review, in this study, we analyse the role of communication in the context of social acceptance and specifically examine the two cases of Rio Tinto Jadar in Serbia and Koralpe/Weinebene, Austria. Both cases involve lithium mining projects whose realization has so far been prevented by a lack of social acceptance. The results show that not only do comprehensive sustainability measures in line with ESG criteria influence the acceptance of such projects, but also the use of new media (social media channels). Technically legitimate projects can fail if there is a lack of responsible communication. It is worth knowing the cultural circumstances in order to avoid encountering new stumbling blocks when trying to communicate. The findings highlight that the successful implementation of raw material projects increasingly depends on obtaining a social license to operate that is both culturally grounded and responsive to digital communication dynamics.

KEYWORDS

Social license to operate; social acceptance, risk communication; raw material extraction; literature review

1. Introduction

Sustainable extraction and use of raw materials are essential for economic development, technological progress, the energy transition, and digitalisation nationally and globally. Recent or current challenges, such as the pandemic and armed conflicts, especially the Russian invasion of Ukraine, may have encouraged the desire to reduce dependencies and rely on one's own raw materials and energy sources (Anderson, Schirmer, & Abjorensen, 2012; Cesar & Jhony, 2021). The Critical Raw Materials Act (CRMA, (O.A., 2025) adopted in 2022, is an expression of this trend and is intended to strengthen resource autonomy for the European Union and the economy, as well as ensure resilient and sustainable value chains for critical raw materials. As part of the Green Deal Industrial Plan and together with the Net Zero Industry Act, a focus is being placed on availability and

sustainability. Raw materials are essential for producing modern technologies such as smartphones, which can contain a variety of different materials, and for green technologies such as solar panels, wind turbines, electric vehicles, etc. In addition to all these efforts to promote the extraction of raw materials in Europe, however, social resistance often arises, ultimately boycotting extraction projects. Findings suggest that such behaviour is linked to insufficient knowledge of benefits and participation in the process (Vögele, Rübbelke, Mayer, & Kuckshinrichs, 2018).

However, these raw material extraction processes face significant challenges due to environmental pollution and social scepticism. Previous studies (Bezzola, Günther, Brugger, & Lefoll, 2022; Brantly, 2021) show that raw material extraction is often associated with environmental pollution and noise emissions, while positive effects on society (Conde & Le Billon, 2017) - such as employment, tax revenue and reuse potential (e.g. swimming ponds, biotopes, climbing gardens) - remain largely unknown (Huang & Ge, 2024; Souza, Domingues, Spindlegger, Mair-Bauernfeind, & Part, 2025). The low perception of benefits contributes to a negative public image of raw material extraction (Zobernig, 2023) and reduces the likelihood of social licenses for such mining projects.

The concept of a social license to operate (SLO) is criticised by Parsons and Moffat (2014); from their point of view, it does not adequately reflect the inevitable quality of relationships between companies and stakeholders. The authors emphasise the importance of risk participation, understood as a dialogical, collaborative and reflective process that enhances trust. According to Luhmann, trust develops through repeated positive interactions. In this way, we learn that we can rely on others and come to expect similar behavior in similar situations. Distrust, on the other hand, has the opposite effect and leads to negative expectations. Relying on trust is also necessary to reduce the complexity of everyday life (Luhmann, 2017). Trustful relationships are characterised by appreciation, empathy and openness (Renn, 2008). Bourdieu (2005) also speaks of so-called "Beziehungsarbeit", which means continuous investment for maintaining the social relationship and, if the worst comes to the worst, to be able to fall back on it.

Nowadays, it is no longer enough for companies to simply communicate transparently; there is also a positive contribution to broader societal goals (environmental protection, social health, prosperity) expected. Corporate Social Responsibility (CSR) is a tool for managing operational risk that mining companies use to gain SLO. CSR can be viewed as the result of a bargaining process between companies and communities regarding concessions. Mining companies have a strong interest in establishing peaceful relations with local communities to avoid costly consequences. Typically, CSR refers to voluntary actions to mitigate the negative environmental and social impact of mining, or to improve the well-being of populations living near mining operations. These actions may include investments in public services and infrastructure, contributions to agriculture and other economic activities, and support for community cultural or political activities (Bezzola et al., 2022). Also, the so-called ESG criteria, which include Environmental, Social, and Governance aspects, are increasingly important for companies and similarly important to attract investors (Avetisyan & Hockerts, 2017). ESG encompasses a company's efforts to protect the environment, reduce harmful emissions and hazardous waste, promote the well-being of its employees and the broader society, and uphold high standards of business ethics. Governance refers to the regulatory framework and the principles of sound corporate management, including effective quality control (Grunow & Zender, 2020).

Both social and environmental successful contributions require a critical examination of the respective culture and the social conditions. What we know from classic risk communication is no less important here in the context of the social acceptance of mining projects. Communication needs to be targeted and two-sided to mutually learn from each other and to address the different concerns and needs of stakeholder groups. Open and forward-looking communication helps build knowledge about risks, making it easier for people to understand and, ideally, adjust their behaviour, assuming they are aware of the risks involved. To achieve this, communication must be consistent and long-term. Only then can trust be established—an essential foundation for people to actually listen to and accept messages. It is also becoming increasingly important to involve stakeholders in defining what levels of risk are socially acceptable. It is not always sufficient to merely inform civil society about possible adaptation measures; instead, platforms must be created that enable deeper levels of participation, such as dialogue or even joint decision-making (OECD, 2022). In summary, the key functions of risk communication are: education, raising awareness, encouraging behavioral change, building trust, and enabling participation (Renn 2008). Risk communication is rightly recognized as a central element for Disaster

Risk Reduction — not least because it can significantly enhance a society's resilience before, during, and after hazardous events (United Nations Office for Disaster Risk Reduction).

Communication on CSR in the mining industry has been analysed for Argentina by Mutti et al. According to their survey, stakeholders in Argentina expect mining companies to engage in CSR by protecting the environment, supporting sustainable and local economic development, and maintaining transparency and safety standards. Key demands also include anti-corruption policies, infrastructure development, tax payments, and public participation (2012). The results of their study show that the expectations of communities that surround mining sites vary considerably. They are directly related to the community's perception of "what the mine company owes them", and the concept of corporate social responsibility in the mining sector in the surveyed countries is malleable and subject to change in accordance with the divergent expectations and objectives of stakeholders (2011). According to Ansuh-Mensah et al., mining companies need to intensify efforts to engage diverse stakeholders in their CSR activities in order to enhance relevance and effectiveness (Ansu-Mensah, Marfo, Awuah, & Amoako, 2021).

Conde and Le Billon (2017) emphasize the important role of adequate communication for the acceptance of raw material extraction: building trust, proactive action, involvement and adaptations such as in Australia or Portugal (Ashworth, Rodriguez, & Miller, 2010; Chaves, Pereira, Ferreira, & Guerner Dias, 2021; Dall-Orsoletta, Verrier, Uriona-Maldonado, Dranka, & Ferreira, 2025; Domingues, 2022) and stakeholder management are key points for successful project management (Daemi, Chugh, & Kanagarajoo, 2020; Kanagarajoo, Fulford, & Standing, 2020; Muninger, Mahr, & Hammedi, 2022; Ram & Titarenko, 2022; Rathobei, Ranängen, & Lindman, 2024; Surucu-Balci, Balci, & Yuen, 2020; Sutterfield, Friday-Stroud, & Shivers-Blackwell, 2006; Vadhanasin, Ratanakuakangwan, & Santivejkul, 2017). However, this also harbors risks (Hysa & Spalek, 2019), as the timing of participation and stakeholder selection are key criteria for success. According to Williams et al. (2015), online stakeholder interaction at an early stage is proven to be crucial for a positive project outcome. Likewise, inclusion from the outset is equally essential (Agudo Valiente, Garcés Ayerbe, & Salvador Figueras, 2015; Ashworth et al., 2010; Ivanović, Tomićević-Dubljević, Bjedov, & Đorđević, 2021; McGookin, Ó Gallachóir, & Byrne, 2021; Perrone, Inam, Albano, Adamowski, & Sole, 2020).

Society is pressuring companies to improve their social responsibility practices. However, a study by Ränigen and Lindmann shows that many corporate management teams still regard community stakeholders as secondary (Ranängen & Lindman, 2020). Early public participation and inclusion are essential (Denktaş-Şakar & Sürücü, 2020; Sashi, Brynildsen, & Bilgihan, 2019; Williams et al., 2015), as greater knowledge within society leads to higher acceptance (Vögele et al. 2018). Numerous studies emphasize the importance of participatory processes (Perrone et al. 2020; Ashworth et al. 2010; Ivanović et al. 2021; Agudo Valiente et al. 2015; McGookin et al. 2021).

This paper assumes that participation and communication play a crucial role and that the lack of social acceptance often stems from a failure to follow fundamental principles of effective and target group-oriented communication. Moreover, we assume that some communication factors play a key role in reaching social acceptance of raw material extraction, especially when communication is supported by credible and positive action. Therefore, our research focuses on which communication-specific factors are influencing the social acceptance of raw material extraction, using the examples of Koralpe/Weinebene in Austria and Rio Tinto Jardar in Serbia.

2. Methods

Accordingly, our aim is to identify communication-related influencing factors and shed light on the circumstances that shape social acceptance of such projects. We have selected two projects with missing social license to operate, which serve as negative examples and offer a valuable learning environment. This study investigates existing literature to explore the above-mentioned research question and derive theoretical assumptions.

To address our research question, we applied a mixed methods approach (Johnson, Onwuegbuzie, & Turner, 2007), a type of research in which we combine elements of qualitative and quantitative approaches to enlarge our understanding of patterns and influence factors regarding the social acceptance of mining projects. The qualitative part predominates, and an inductive approach was chosen, meaning that categories for theory development were derived from the data.

First, we conducted a literature review, focusing on the Koralpe and Jadar Valley cases and using the scientific platforms Science Direct and Google Scholar to generate our data set. We considered peer-reviewed literature and documents as well as grey literature (e.g. online Media documents, except of Social Media Sources) in order to search for information that provided indications of factors relevant to communication and social acceptance. Instead of merely summarising literature in terms of content (classic literature review), a discourse-analytical (Boell & Cecez-Kecmanovic, 2014) literature review (Dunne & Ustundag, 2020) was applied. This allowed us to examine how the topic is discussed, argued and framed - in other words, which discourses arise in the literature itself. We approached the identified literature with the following questions: Which concepts seem to be important within the literature? Which patterns of interpretation or framing appear repeatedly? Which narrative patterns structure the argumentation? Who is communicating, and what interests are presented? Are there any topics relevant to communication but excluded or not considered? Identifying the underlying framework conditions of the discourses helps to further develop communication strategies (Hannigan et al. 2019).

In addition, explorative world clouds were used to reflect frequently mentioned words and concepts within parts of the dataset. To gain an assessment of the tone in online media coverage – excluding social media posts and also excluding scientific articels or reports – 17 articles about the Austrian Koralpe/Weinebene project and 9 articles about the Rio Tinto Jadar project were identified and analyzed. The respective articles were examined for word frequency. This quantitative approach is complementary and does not replace the in-depth critical analysis of the discourses. However, it provides an initial insight into word frequencies and helps visualize topics, emerging trends, and relevant categories.

To conduct this analysis, two contrasting case studies were selected, which share certain similarities while also differing in key aspects: Both cases involve a.) extraction projects (specifically lithium) in which the planned implementation was hindered by a lack of social acceptance. Resistance is growing, and the actual realisation of the project is dragging on. For this reason, the two study examples are very well suited to illustrate the importance of communication for the social acceptance of mining projects, especially because the growing resistance is increasingly expressed by members of the society. The cases originate from two regions with distinct b.) cultural backgrounds, allowing us to examine the importance of target-group-specific communication and cultural particularities. The cases differ in their level of c.) public visibility: while the Jadar Valley project gained international attention due to Rio Tinto's mining plans, the Koralpe/Weinebene project in Austria has remained largely a topic of national or local debate.

2.1 Study Area

Austria is a landlocked nation located in the southern part of Central Europe. It shares borders with Hungary, Slovakia, Czechia, Germany, Switzerland, Italy, and Slovenia. Following the Second World War, Austria declared its permanent neutrality and became a member of the United Nations. Today, it is a democratic country and has been part of the European Union since 1995. The federal republic is divided into nine provinces: Burgenland, Lower Austria, Carinthia, Upper Austria, Salzburg, Styria, Tyrol, Vorarlberg, and the capital city Vienna, covering a total area of approximately 84,000 square kilometers (STATISTICS AUSTRIA, 2025c). In 2024, Austria's total population was recorded at 9,158,750 individuals, with females comprising 50.7% of the population (STATISTICS AUSTRIA, 2025b). Life expectancy in Austria has been steadily increasing, while fertility rates are declining. As a result, population ageing represents a significant demographic challenge in Austria, as it does in most industrialized nations (STATISTICS AUSTRIA, 2025a). Austria has a developed, export-oriented economy with strong industrial, service, and tourism sectors, serving as a key trade hub between Western and Eastern Europe because of its central location. It boasts a highly educated workforce and a robust industrial sector, particularly in mechanical engineering, chemicals, and automotive production. The country also has a significant renewable energy sector. However, Austria faces challenges like inflation, labor shortages in healthcare, and an aging population. Economic growth is influenced by ties to Germany, but the economy is expected to remain resilient due to its strong industrial base, sustainable services, and investments in green technologies . Austria is rich in some raw materials, such as Iron ore (incl. Micaceous), Limestone & Marble, Quartz sands, Gypsum, Magnesite, Tungsten ore, as well as Rock salt and Salt brine. According to data for 2022, Austria's mining sector accounts for about 1.5% of the country's total GDP (Trading Economics, n.d.)The study area is located exactly in the border region of Styria and Carinthia on the Koralpe in southern Austria, where there is one of the largest lithium deposits in Europe. Various terms are used, such as Wolfsberg

Lithium Project, the Wolfsberg Project or Project at Koralpe or Weinebene (Kowasch et al., 2025), which all refer to the same mining area. The Definitive Feasibility Study (DFS) (ASX European Lithium Limited, 2023) confirms that the Wolfsberg Lithium Project is well positioned to generate high returns due to low operating costs and a steadily growing lithium market. The trend for decarbonization, the ongoing energy transition and the rising number of electric vehicles are increasing the demand for lithium. In summary, the feasibility study for this region sounds very promising.

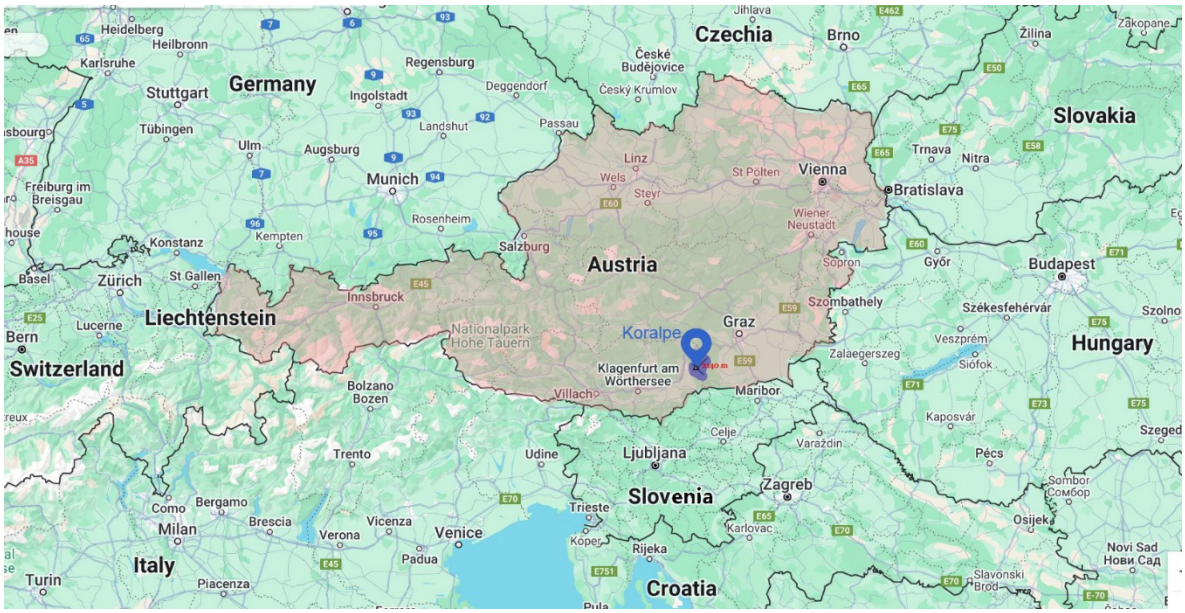

Figure 1. Overview map of Austria and its neighboring countries within Europe and an outline of the case study region. Source Google Maps, 12.05.2025.

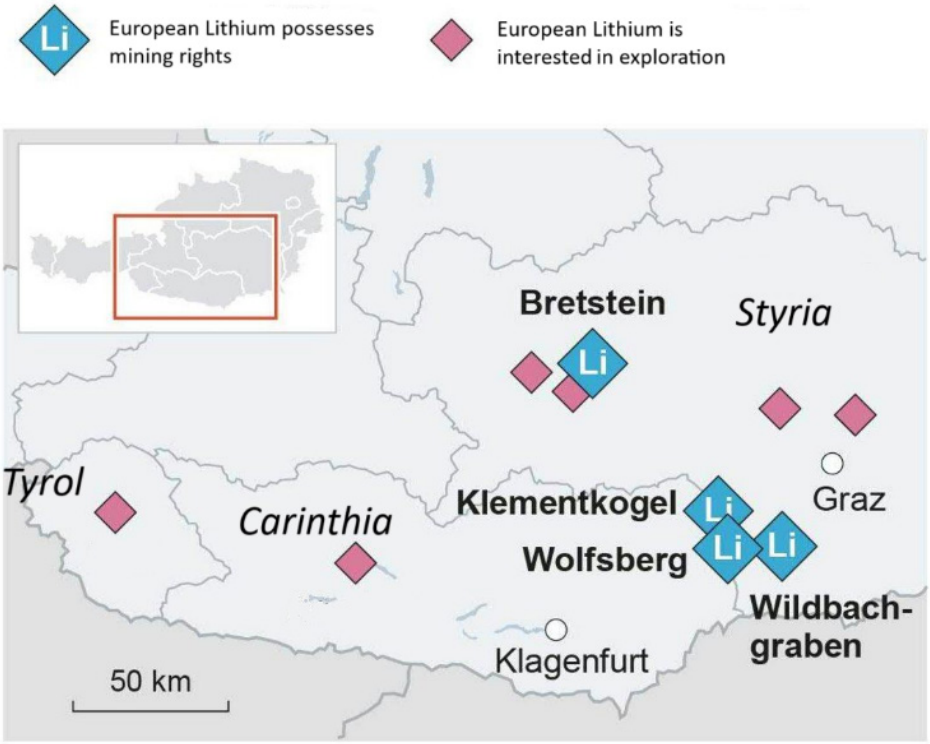

Figure 2. European Lithium mining rights in possession and mining rights of interest. Altered map based on Reports published via ASX (Futurzone, 2023).

Figure 2 shows the interests of European Lithium in Austria. The company is already in possession of exploration licenses in several locations and plans to gather more.

Serbia is a landlocked country located in the central part of the Balkan Peninsula in Southeast Europe. It shares borders with Hungary to the north, Romania and Bulgaria to the east, North Macedonia to the south, and Montenegro, Bosnia and Herzegovina, and Croatia to the west (Kovačević, 2023). Serbia is a parliamentary republic and a candidate country for membership in the European Union It has been a member of the United Nations since 2000 (as the Federal Republic of Yugoslavia, and later as Serbia), and is also a member of numerous regional and international organizations (Enlargement and Eastern Neighbourhood, n.d.).

The country is administratively divided into 29 districts, including the autonomous province of Vojvodina in the north and the City of Belgrade, which serves as the capital and largest city. Serbia covers a total area of approximately 88,500 square kilometers (Srbija.gov.rs, n.d.) kilometers.

According to the Statistical Office of the Republic of Serbia, the country's estimated population in 2023 was 6,611,382, with women making up approximately 51.3% of the population. Like many European nations, Serbia is facing significant demographic challenges. Life expectancy has gradually increased, while fertility rates remain below the replacement level (Josipović, 2025). As a result, population ageing is one of the most pressing social issues, affecting the labor market, healthcare system, and pension sustainability. Serbia's demographic trends reflect those of many post-transition and industrializing nations, marked by emigration of young people, declining birth rates, and increasing longevity (European Commission, 2022). Economically, Serbia is classified as an upper-middle-income economy by the World Bank. The country has a mixed economy with strong sectors in agriculture, energy, manufacturing, and information technology. In recent years, Serbia has shown steady GDP growth and increased foreign direct investment, particularly in the automotive and electronics sectors. However, challenges remain, including relatively high unemployment among youth, regional economic disparities, and ongoing structural reforms required for EU accession. Inflation and global economic pressures also affect consumer prices and purchasing power (World Bank, 2025).

The mining sector in Serbia is currently relatively small but not insignificant, with a tendency toward growth. There are currently several active metal mines. The largest ones are part of the Bor mining and metallurgical basin. In addition to these ores, various amounts of lead, zinc, molybdenum, manganese, cadmium, and antimony, for example, are also exploited or used to be exploited in the territory of Serbia. In 2022, the mining sector constituted 2.7% of Serbia's total gross domestic product (GDP) (Giebel & Sydow, 2022). Around 90% of the territory for which the state has issued permits for exploration is controlled by a dozen companies based in Australia, Canada, and China through offshore companies and affiliated entities in Serbia. (Marković, 2025) In some cases, exploration areas encroach on the territory of protected natural reserves. According to the spatial plan draft for 2021 until 2035, Serbia intends to have at least 40 mines – including 10 lithium and boron mines – and to open mines for other critical minerals (Insajder, 2022). The Jadar Valley is located in western Serbia, near the town of Loznica, not far from the border with Bosnia and Herzegovina. Geographically, it is located in the Mačva district, along the Jadar River, a tributary of the Drina. The valley has become particularly well known internationally due to Rio Tinto's planned lithium mining project, as it contains one of the world's largest deposits of the lithium-bearing mineral jadarite.

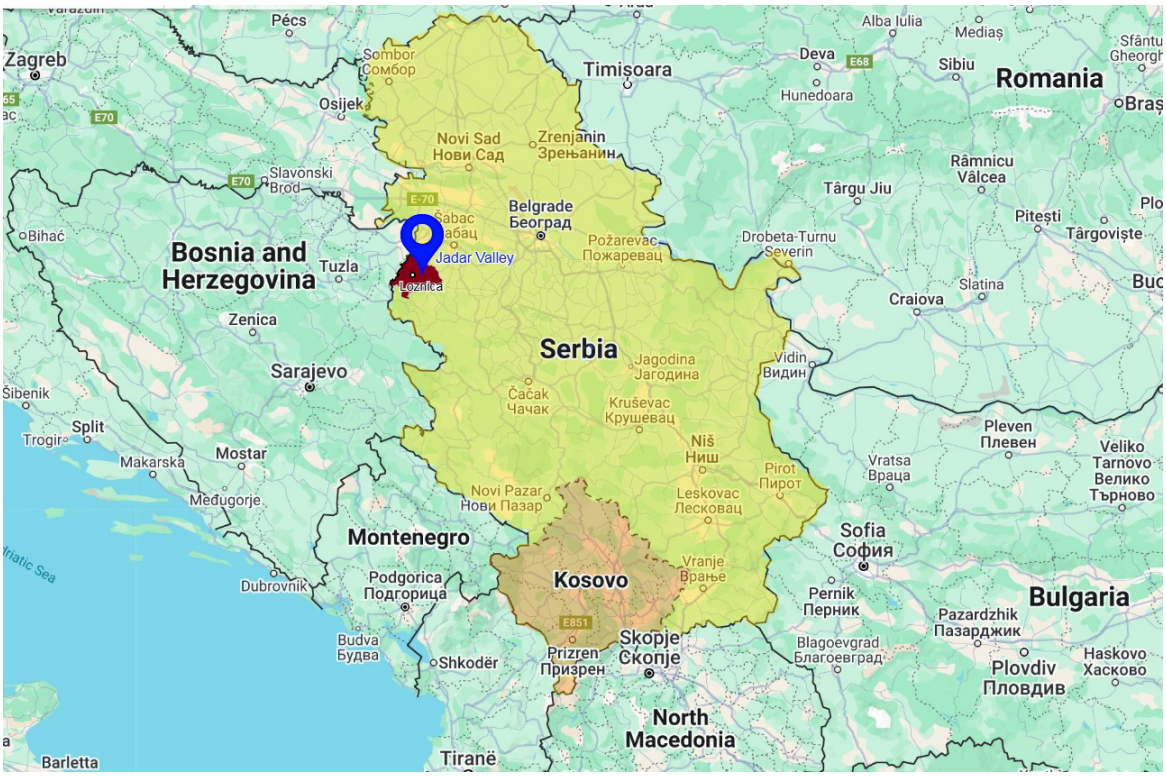

Figure 3. Overview map of Serbia and its neighboring countries and an outline of the case study region. Source Google Maps, 12.05.2025

Figure 5 shows Serbias mining sites. Rio Sava (Rio Tinto) conducted basic geological research between 2002 and 2015, primarily focused on borates, in the municipalities of Užice (Zlatibor Basin), Gornji Milanovac (Pranjani), Raška (Baljevac on the Ibar River and Gradac), and Kraljevo (Konarevo). Furthermore, from 2010 to 2015, investigations into the presence of lithium and borates were also carried out in the municipalities of Valjevo (Valjevo Basin, Osladić and Dobrinja) and Požega (Ježevica) (Jovanović, 2024).

Figure 4. Map of Mines in Serbia (Nastevski, 2022).

3. Results

The discourse analysis, focusing mainly on statements by officials in charge, disptaches by the selected companies, and movements, citizens' initiatives, and opposition politicians reveals noteworthy insights to public perception, communication strategies, and stakeholder engagement on large-scaling mining initiatives. The role of social media in disseminating and influencing sustainability-related communication has been described here (OECD, 2022). As Ranägen and Lindmann showed in their study on raw extraction and minig companies in Nordic countries, (Social) Media discourse analysis revelas that in communication, a top-down approach identifies stakeholder needs and expectations, incorporating them into traditional management systems. This is where most stakeholders' needs and expectations are translated into CSR goals and processes. The bottom-up approach engages with the community to understand its impact and how to improve living standards, and measures improvements in quality of life. It provides a systematic way of involving stakeholders, often overlooked in other approaches. Thus, identified needs and expectations are translated into CSR goals and processes, which ultimately correspondeces with SLO. Similar outcome was identified throughought our review. We identified several narratives that influence, emphasise and condition each other in Serbia: a) the negative environmental impact, especially on the water supply and protected ecological areas, b) a negative outcome for the community, in terms of job and livelihood losses due to the unfeasibility of livestock farming and agriculture, c) foreign powers dictate the implementation of the mine, there will be no benefit to Serbia's citizens, only loss and d) the company complies with all laws and regulations, environmental impact assessments are carried out and acted upon. In somewhat contradistinction to the aforementioned, the following narratives assume a pivotal role in Austria: a) the absence of any concomitant advantage for the community (employment opportunities or analogous), given that extraction and subsequent processing will be outsourced, b) the complete disregard of community concerns in terms of the absence of interaction between the company and its stakeholders, c sell-off of state resources from which the general public should benefit (Pflügl, 2023).

3.1 The Lithium Extraction Project in Jadar Valley, Serbia

To express environmental concerns, particularly regarding potential groundwater contamination (the Jadar valley is home to approximately 18.000 people and livestock) and ecological degradation, social media platforms have been in heavy use in mobilizing opposition against the Jadar project. Information dissemination and protest organization have been largely coordinated via social media channels, and other new media platforms, amplifiyng and internationalizing the voices of those opposing the project.

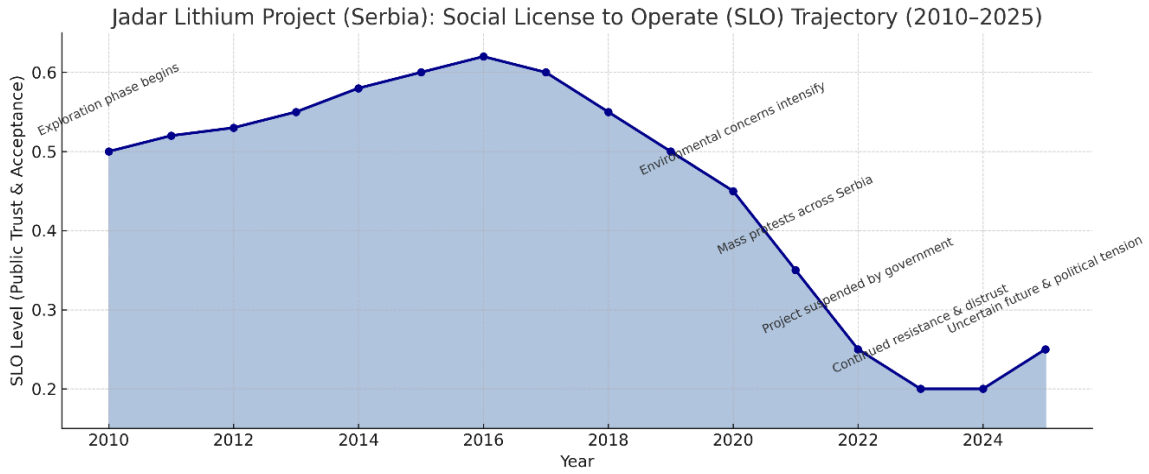

Figure 5. SLO troughout time, Jadar.

The Jadar Lithium Project's Social License to Operate declined from moderate acceptance in 2017 to deep public mistrust by 2024, as environmental concerns, mass protests and inadequate community engagement undermined its legitimacy despite the project's permit being reinstated. Regarding communication and usage of online tools for doing so, it became implement that missuse of communication tools, spread of false or not fully truthful information by officials (Pflügl & Hahn, 2025) happen in regualar amount. On the other side,

oppositioners to the project use this tools for gathering, information transfer and creative forms of protest. As shown below, opositioneers to Rio Tinto's mining activities in Serbia, but also neighbouring Bosnia, pins were set with the following description nećeš kopati/нешеш копати, ovde nećete kopati (you won't dig/here). In the action's pike, several locations with the inscription where visible as shown in Figure, while in May 2025 only two locations remained in Serbia.

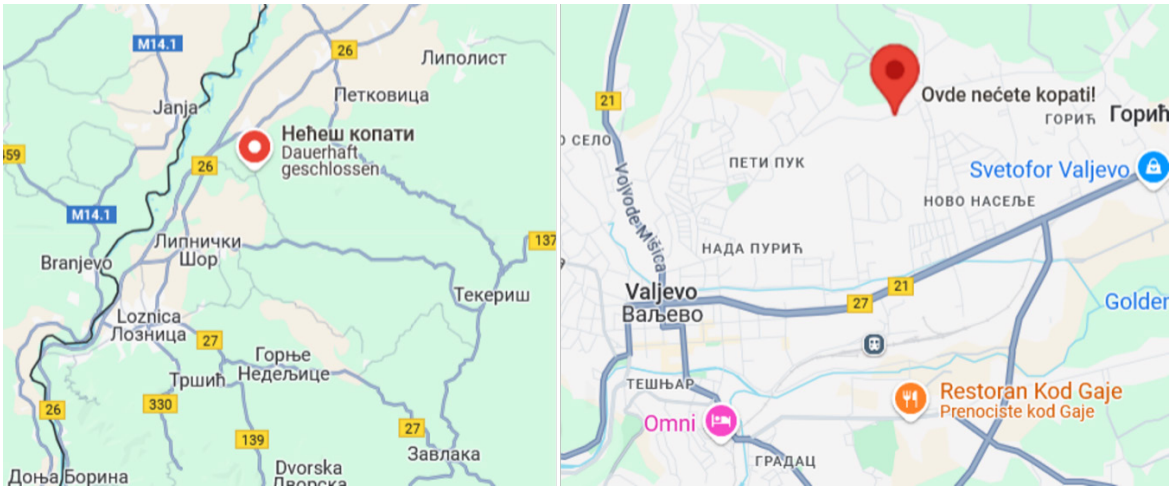

Figure 6. Illustrative examples of entries that reflect social resistance in relation to mining projects.
Source: https://www.masina.rs/neces-kopati-litijumski-rat-na-google-mapama/ - Maps at the pike, 13.05.2025.

Throughout the initial process, the project indicates fluctuating governmental support – from approvement to subsequent suspension in 2022 due to public outcry and upcoming elections, to a recent revival in collaboration with the European Union, especially Germany, to again be set on hold for now. The revival 2024 has been met with renewed protests, highlighting the persistant public resistance, cummulating in a merge of overall protests in Serbia starting with the construction collapse of the Novi Sad trainstation roof on November 1st, 2024. European lawmakers and professionals have also expressed concernes, urging adherence to the rule of law and the protection of activist's rights, emphazising the importance of transparency and community engagement in such projects. The whole process was and is accompanied by excessive media coverage, influencing communication between stakeholders. Therefore, the project cannot demonstrate a positive SLO now, nor will this happen due to the entrenched positions (Beta, 2024).

Figure 7: Visualization of key term frequencies in online media regarding Jadar Valley Project, Serbia.

The word cloud includes 9 online media articles discussing the planned mining project in the Jadar Valley. While the neutral tone is reflected through terms such as "Serbia, Rio, lithium, Jadar, project, mining"—similar to the coverage of the Koralpe/Weinebene project—activism is more visibly present here, with words like "against, group, activist" standing out.

3.2 The Lithium Extraction project at Koralpe (Weinebene), Austria

The Wolfsberg Lithium project in Austria has faced public scrutiny, but in much lesser amount. Social media served as platform for debate and sissemination of information. Partially, local residents and politicians have raised concerns about environmental impacst such as increased traffic and CO_2 emissions, which contradict the project's alignment with the European Green Deal's decarbonization objectives. Likewise, Lithium from own deposits is a pillar of the 'Masterplan Raw Materials 2030', as announced in 2019 by the former Mining Minister Elisabeth Köstinger (ÖVP, Austrians People's Party). At the time, Karlheinz Kopf, Secretary General of the Chamber of Commerce, supported her opinion, stating that the 'not in my backyard' approach was 'problematic'. Shortening transport routes is better, especially for heavy minerals (Pflügl, 2023), which made recent developments even more questionable. The federal government is currently not subsidising lithium extraction. The company's communication strategy has been critisized for lacking transparency and failing to involve stakeholders adequatly in the planning and permitting process, what left affected individuals with a feeling of being ignored (Michl, 2024) and in doubt if it will ever start or is just financial speculation (red, 2024). Additionally, the fact that the project will be approved without the need for carrying out an EIA (N. A., 2024; Redaktion, 2025) did not contribute to greater acceptance among the population. Especially when considering that land utilisation is 9.8 hectares, an Environmental Impact Assessment (EIA) would be required from 10 hectars onwards. The power supply and gas pipeline routes, as well as the clearing, are not included in the project, notes Günther Vallant (SPÖ Socialist Party of Austria), Mayor of Frantschach-St. Gertraud (Kakl, 2025; Zarfl, 2024). In February 2024, eight complainants challenged the decision of the Carinthian provincial government (Swersina 2025).

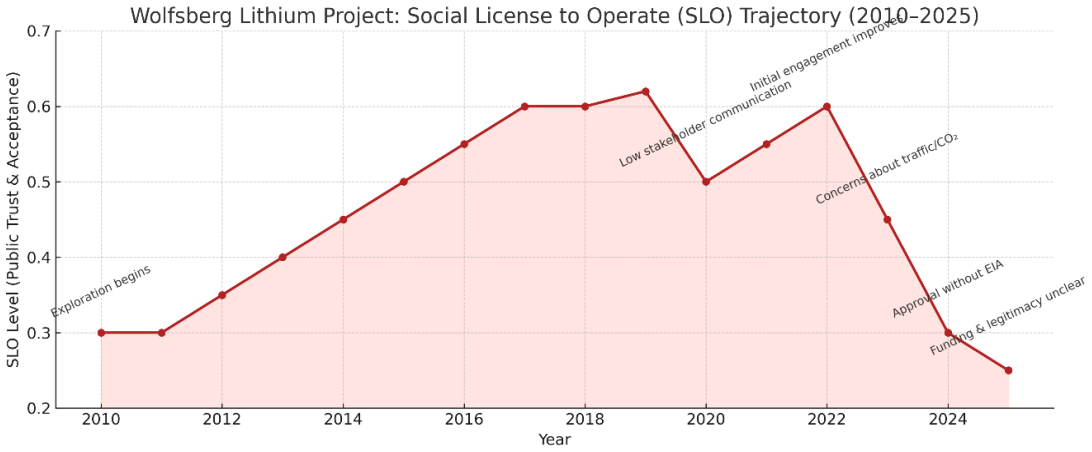

Figure 8. SLO throughout time, Wolfsberg.

The Wolfsberg Lithium Project's social licence to operate improved gradually until 2019. However, it declined sharply after 2020 due to low engagement, environmental concerns and approval without an Environmental Impact Assessment (EIA). This left public trust critically low by 2025.

This visualisation emphasises the importance of transparent communication, the early inclusion of stakeholders, and the monitoring of digital discourse for maintaining community acceptance of large-scale mining projects.

Despite the geological promise of the Koralpe/Weinebene Lithium deposit, the SLO remains uncertain. As significant barriers to the project's advancement the lack of open public dialogue, and insufficient local residents' integration into decision-making processes have been identified. This is underpinned by the fact that the local community is only now obtaining information on site for the first time, after the provincial decision in December 2024. The Weinebene alpine hut village, its mountain huts, restaurants, and Weinebene Ski GmbH are in immediate vicinity and were not considered in the EIA. The municipal council has unanimously approved the appeal to the Federal Administrative Court against the provincial government's decision. The nature conservation organisation 'Alliance For Nature' (AFN) has already lodged an appeal (Zarfl, 2024). Not only SLO is lacking, but, funding as well. The commencement of lithium mining is still pending financing options (Gaisch-faustmann & Sommersguter, 2023); at present, the primary focus is on securing investment from US-based investors (Redaktion, 2025).

Figure 9. Visualization of key term frequencies in online media regarding Koralpe/Weinebene, Austria.

Lithium" and "not" dominate this word frequency analysis of the Weinebene project. A total of 17 online media reports about the project were considered in the creation of the word cloud. The overall tone appears largely neutral; however, without being marked by activism, the project is already portrayed as dead. The word "year" also appears frequently, which may indicate delays in the start of the project.

In both cases social media played a critical role in shaping public discourse and influencing the trajectory of mining projects. The platforms have enhanced the rapid spread of information, and in consequence, amplified community concerns and the mobilization of opposition. Dynamics like these highlight the necessity for mining companies and governments alike to engage proactively with stakeholders through transparent communication strategies and inclusive decision-making processes.

At first sight, our findings suggest that neglecting the power of social media and the importance of community engagement can lead to project delays, reputational damage, and potential project cancellations. The SLO trajectory of the Wolfsberg project has been shaped by limited stakeholder engagement in the early stages, a lack of transparent communication and mounting environmental concerns, such as increased traffic and CO_2 emissions. The absence of an Environmental Impact Assessment (EIA), combined with political and regulatory uncertainty, has further undermined public trust, particularly as local communities have felt excluded from decision-making processes. In contrast, the Jadar project in Serbia initially benefited from government support during the exploration phase, but opposition to the project grew as concerns about pollution and displacement increased. The situation escalated with mass protests and the mobilisation of civil society, amplified by social media campaigns. Although the Serbian government revoked Rio Tinto's permit in 2022 due to public pressure, reinstating it in 2024 did little to restore trust as local communities continued to experience a lack of inclusive and transparent dialogue. Therefore, integrating comprehensive social media strategies and fostering genuine stakeholder participation are crucial components for the successful implementation of large-scale mining projects in the digital age.

3.3 It's a cultural thing

One must not forget that cultural specifics have to be considered (Joint Research Centre [JRC], 2024; Kivinen, Kotilainen, & Kumpula, 2020; Lesser, Gugerell, Poelzer, Hitch, & Tost, 2021) for an overview on Europe see (Eerola & Komnitsas; Giebel & Sydow, 2022; Gourcerol, Gloaguen, Melleton, Tuduri, & Galiegue, 2019) ,Sweden in particular (Poelzer, 2020), the Amazon region (Cruz, 2021). The results of our study underscore that successful implementation of raw material and CCS projects increasingly hinges on securing a culturally

embedded and digitally responsive SLO. In both the Jadar (Serbia) and Koralpe (Austria) lithium projects, resistance movements evolved within distinct historical, institutional, and media contexts, yet both illustrate how technical legitimacy fails without communicative and social legitimacy. Thus, in order to generate SLO, companies must show effective CSR, according to the country where mining or exploring takes place. Companies like Rio Tinto approach the mentioned CSR within a complex socio-political environment (Reutner, 2025). To achieve socially sustainable mining operations, stakeholder engagement must play a crucial part, particularly in contexts marked by historical mistrust and conflict. Implementing CSR initiatives is insufficient without participatory mechanisms that foster local ownership and dialogue. Therefore, deeper, more inclusive engagement practices are necessary to ensure legitimacy and long-term acceptance of mining projects (Wirth, Kulczycka, Hausner, & Koński, 2016), where issues and conflict with local communities may take place more often (Bezzola et al., 2022). Guo and Capucu showed that minority actors with e most influential in all networks. Overall, different stakeholder participation is not developed evenly in SSRA and there is fragmentation. It is hard for those at the core to participate at the later stages and this reveals barriers to effective learning and accountability. In addition, grassroots representatives do get involved, higher-level governments can achieve more intensive stakeholder participation in SSRA as they have more authorities and resources, while participation is ignored intentionally or unintentionally at the grassroots level due to weak institutions and insufficient funds of movements (Guo und Capucu 2019). Results show that 'authority' is essential for effective stakeholder participation, which makes states with weak institutions or missing rule of law susceptible to the failure of megaprojects, as shown in our case study.

4. Discussion

By law, numerous technical and economic requirements must be met for the realization of raw materials projects and society should at least tolerate the extraction. However, our case studies proved the opposite in Serbia's case (Todorović 2025). The Jadar mine in Serbia and the Wolfsberg-Koralpe lithium project in Carinthia, both are of strategic importance to reduce Europe's dependency on external suppliers and encourage a green transition (Endl, 2017; O.A., 2025). Both have met with significant public resistance. Bibienne et al. highlight the risks of lithium extraction, including land degradation, water scarcity and community disruption, which are central to opposition movements in both regions. The tension between strategic ambition and local resistance is important because it shows the need for a SLO. This can be secured through transparent communication, community dialogue and participatory planning to ensure legitimacy and long-term project viability (2020). Public support for the SLO required for mining raw materials is dwindling and public resistance appears to be increasing globally, combined with an overall rise of environmental awareness in social media (Wang et al. 2019; Rwitabrata Mallick und Shri Prakash Bajpai).

The importance of SLOs is continuously increasing in the realization of raw material and energy supply projects. In January 2022 the Serbian government temporarily withdrew a necessary permit for Rio Tinto's 2.4 billion dollar lithium project in Jadar valley in face of growing public opposition, although the communicated benefits for the local population, the low land use and the minimal impact on the landscape and environment provided positive arguments. Factual arguments from politicians and industry representatives are often no longer accepted, statements from experts are sometimes questioned and project applicants, parliaments, approval authorities and even courts are experiencing massive public criticism. The case of Rio Tinto in Serbia demonstrates the dualities of corporate-led development, particularly in instances where community expectations are not thoroughly assimilated into CSR strategies. The findings indicate that the implementation of CSR initiatives alone is inadequate in the absence of participatory mechanisms that facilitate local ownership and dialogue (Mercer-Mapstone et al. 2018; Mononen 2021; Mishrif und Khan 2023).

Paragreen and Woodley look at the idea of a SLO within the coal seam gas sector, focusing on how stakeholders are key in getting public backing for resource extraction projects. The argument is made that companies must go beyond mere regulatory compliance by actively involving communities and addressing their concerns if they are to maintain legitimacy and trust (Paragreen & Woodley, 2013). European Lithium officials invited critical citizens to „come and see for themselves", as they would also benefit. The project had previously encountered some mistrust among the local population. This had previously prevented the construction of the condenser in Wolfsberg (Futurzone, 2023). A 2021 report on the Jadar mine's environmental impact was commissioned by the Rio Tinto company. The study by Belgrade University's Faculty of Biology found that the mine

will cause "irredeemable damage to the biosphere […and] the implementation of the planned activities will significantly impair biodiversity in the entire area of the planned works […], there will be complete and direct destruction of habitats", in the direct impact zone of the mine. Rio Tinto argued that the biodiversity study was part of a wider feasibility study ("RGF (2023). Environmental impact assessment study for the underground exploitation project of lithium and boron deposits in Jadar. [In Serbian]," 2023; Nikola, 2023) and it would conduct further research to "support the most advanced and most expensive solutions in nature protection" (Sekularac & Vasovic, 2021). Several years later, addressing fears and concernes raised by critics, Rio Tinto has on previous occasions issued a formal denunciation of what it terms a "misinformation campaign", which the company has described as "defamatory" in nature, and which it claims to be based upon claims that remain unproven. It is asserted that this aforementioned campaign is advancing unsubstantiated claims that the proposed project will have an adverse effect upon water resources, soil, biodiversity, air quality and human health (Sadden, 2024). Similar concerns regarding water supply raised by critics in Austria (Michl, 2024 are addressed by European Lithium officials, who claim to overview water security by conducting continuous monitoring since 2016 to ensure water quality and quantity. This monitoring is crucial for approval and as evidence in case of mining's impact on the water balance. Allegedly, the company purifes raw material water as drinking water to benefit the public (Futurzone, 2023) and claims to generously protect the environment (DLA Piper, 2021). These efforts aim to overcome the environmental hurdles associated with mining projects and demonstrate a commitment to environmental protection and community well-being.

Within the context of lithium mining, the Jadar project in Serbia, led by Rio Tinto, serves to illustrate the challenges associated with obtaining an SLO. Notwithstanding the project's capacity to meet a substantial proportion of Europe's lithium requirements, it encountered substantial public opposition (Blake-Persen, 2024) due to environmental concerns, resulting in the revocation of its licenses in 2022. Despite the Serbian government's reinstatement of the permits in 2024, widespread protests and scepticism persist, underscoring the necessity for genuine community engagement and transparent communication. The two groups also contested the lack of a legal avenue for NGOs to dispute the matter. In Serbia, the Jadar proposal's shortcomings add strong legal arguments against granting any environmental permit. Serbian collective Marš sa Drine and German NGO Green Legal Impact have asked the European Commission not to recognise the Jadar lithium mining project in Serbia under the EU's Critical Raw Materials Act (Todorović, 2024). Their report indicates environmental, human rights and human health dangers, lack of transparency and inconsistency with good business practice, legal irregularity, impacts on soil, agriculture, water, protected sites and species and the land acquisition process, lack of transparency and intimidation, impact on the social structure of the region, job creation, tax revenue, effects on existing business, particularly agriculture, irregularities in terms of permitting, timelines and governance issues, as well as violations of Serbian law (Stojanovic, 2024). This does not only refer to the mining company itself, but, also to politicians incharge. Though than Serbian prime minister Ana Brnabić stated that they neither have "made promises, nor have we done anything that the people did not know about […] We have worked in a transparent way, we have listened to the people" (Reuters, 2022) public perception was a total lack of information or right to participate in the decision-making process.

At European level, for example, so-called SLO guidelines for the European extractive industry were developed in the MIREU project. However, this is a social change affecting all sectors. Examples of a lack of SLOs are increasing both nationally and globally, which has led to considerable delays in extractive projects in Greece, Portugal and Lapland, for example, and may be an expression of widespread NIMBYism (Galjak & Budić, 2024; Terwel, Daamen, & Mors, 2013). Kowasch et. al. argue that to avoid green colonialism, minimize the feeling of being "Europe's backyard" and reduce import dependency, Europe must localize critical raw material extraction while ensuring transparent, inclusive decision-making that involves local communities, particularly in politically sensitive areas (Kowasch et al., 2025). Furthermore, this makes the extractive sector unattractive for students and skilled workers, who are necessary for the implementation of Europe's digital and green transformation agenda.

The feeling of beeing colonialized was multiplicated when it was made official that further processing will be outsourced. The further processing of lithium ore into battery-grade lithium was originally going to take place in Wolfsberg, but is now being outsourced to Saudi Arabia (Michl, 2024). The planned lithium mining on the Weinebene is unlikely to create new jobs for the Lavanttal (red, 2023) though this was used to gain SLO and promoted by European Lithium officials until the early 2020ies (Metzger, 2018; Steinbauer, 2025). 'Processing lithium ore is very energy-intensive and simply not feasible in Europe due to high energy costs,' notes European Lithium CEO Dietrich Wanke, adding "[a] megawatt hour of natural gas costs around 400 euros in Europe and

20 euros in Saudi Arabia. That would add 35 million US dollars per year to the costs. Extra costs over the initial 14-year mine life would be over 750 million [making the] site [...]uncompetitive", explaining why the energy-intensive processing of ore into lithium cannot take place in Carinthia (Futurzone, 2023; Hoisl, 2023/2023; Rössler, 2024).

CCS and mining projects (Tcvetkov, Cherepovitsyn, & Fedoseev, 2019) depend on the trust of the population in the government and its legitimacy (Poelzer und Yu 2021), but trust in institutions is country-specific and often historically conditioned (Houston et al. 2016). In addition, inaccurate knowledge of cultural specifics usually contributes to a negative project outcome (Farrell, Hamann, & Mackres, 2012), as national interests play a major role in the success of projects (Fan, 2010; C. A. Johnson, Clavijo, Lorca, & Andrade, 2024). An understanding of local circumstances (Obradović, Stojanović, & Milić, 2023) as well as intercultural differences and challenges (Rodolaki, 2023a, 2023b) is therefore required to establish a project or an innovative technology. In a meta-analysis of innovative energy technology projects, critical key acceptance factors were already identified in 2006 (Sutterfield et al., 2006); for Austria it was established in 2016 (Institut für empirische Sozialforschung [IFES], 2016) that there are correlations between social perception, SLO and the need for participation. Multiple crises such as the recession, pandemic and armed conflicts in the last decade have very likely had an impact on public attitudes and the use of social networks, which is why a new analysis is needed to map current trends in perception and SLO.

4.1 Social Media as SLO's Maat

Social Media offers the possibility of mapping cyber-physical-social systems and identifying factors (Zeng, Yang, Lin, Ning, & Ma, 2020), provides information about the interaction between stakeholders and brands (Dhaoui & Webster, 2021) and sustainability goals alike (Grover, Kar, & Ilavarasan, 2019). Even so, digitalization influences the view on Corporate Social Responsibility, CSR, as well (Esposito & Ricci, 2021). Despite the potential for enhancement of CSR in domains such as corporate communication, transparency, stakeholder engagement, and dialogue, it is not perceived as a comprehensive solution for the social conflicts prevalent in the sector (Mutti et al., 2012). Engagement is considered a form of communication (Dunne & Ustundag, 2020; Johnston, 2018) and influences the online-appearance of companies. According to Sung et al., in order to implement effective corporate social innovation and innovatives, multinational enterprises must navigate stakeholder engagement, and have to employ both complementary and substitutionary engagement strategies. Balancing internal and societal goals through routine processes helps managing stakeholder tensions and allocate resources more efficiently, enhancing the societal impact of their CSR initiatives (Boell & Cecez-Kecmanovic, 2014; Sung, Tao, & Lee, 2025).

As Kumar et. al. stated, knowledge transfer takes place in cyber-physical-social systems (2022) and reveal influental dynamics (Rueger, Dolfsma, & Aalbers, 2023). This predestinates social media as a suitable field of research (Groenewegen & Moser, 2024) which provide valid insight information about public opinion on megaprojects (Zhou, Zhou, & Qian, 2021), which in turn allows the analysis of uncertainty and risk perception (Brantly, 2021). A critical insight emerging from our study is the transformative role of social media in shaping perceptions, organizing opposition, and generating SLO. SM platforms serve as a mirror and amplifier of socio-political dynamics (Zeng et al., 2020), that enables stakeholders to contest project narratives, visualize risk, and assert agency. In addition, forums and comment functions for online articles are used to share personal views or create a mood. Analysing them therefore offers the opportunity to gain an initial insight into the SLO for the respective project (Pflügl & Hahn, 2025; Rössler, 2024).

Although the influence of social media on consumer participation has been beyond question for years (Dholakia, Bagozzi, & Pearo, 2004), the narrative and who determines it also plays a major role (Ninan & Sergeeva, 2022). Incorrect social media strategies have been shown to have negative consequences for the overall project (Pizzi, Moggi, Caputo, & Rosato, 2021). Their significance let social media *become* not only an amplifier, but genereator of SLO and the consequences thereof range from a positive or negative outcome (Ninan, Clegg, & Mahalingam, 2019; Prno, 2013), to even protest or boycott (Bryson & Atwal, 2019; Lobo & Abid, 2020). Nevertheless, SLO is something that can be granted and withdrawn again by the population (Dare, Schirmer, & Vanclay, 2014). A plethora of case studies conducted across the globe, encompassing countries such as Australia and Argentina, have demonstrated that both support and resistance are progressively mediated through

SM (Bryson & Atwal, 2019; Ciftci & Lemaire, 2023; Wang, Narula, Rai, & Sharma, 2019). Protest movements, consumer boycotts, and digital campaigns have been shown to gain visibility and legitimacy, especially in circumstances where trust in institutions is low or corruption is perceived (Kis Katos & Schulze, 2013; Poelzer & Yu, 2021).

This phenomenon is especially evident in countries with intricate political histories or diminished public confidence in institutions (Houston, Aitalieva, Morelock, & Shults, 2016), a category that includes Serbia (Todorović, 2025). In contrast, the Austrian context, while politically stable, still exhibits growing scepticism and SLO erosion due to top-down communication strategies and technocratic framing of projects such as Koralpe, where interaction between stakeholders is more or less not evident (McGookin et al., 2021; Mercer-Mapstone, Rifkin, Louis, & Moffat, 2018), one exception being at the 2017 annual general meeting of the Lavanttal Business Association, where Nikolaus Sifferlinger, a university professor and mining process engineering expert from the University of Leoben, gave a presentation on lithium mining in the Lavanttal, which was not aimed directly at concerned citizens (Verein Lavanttaler Wirtschaft, 2025).

The critical role of stakeholder engagement in securing public approval for resource extraction projects is eminent. Companies must go beyond mere regulatory compliance by actively involving communities and addressing their concerns if they are to maintain legitimacy and trust (Mishrif & Khan, 2023). Within the context of lithium mining, the Jadar project in Serbia, led by Rio Tinto, serves to illustrate the challenges associated with obtaining an SLO. Notwithstanding the project's capacity to meet a substantial proportion of Europe's lithium requirements, it encountered substantial public opposition due to environmental concerns, resulting in the revocation of its licenses in 2022. Despite the Serbian government's reinstatement of the permits in 2024, widespread protests and skepticism persist, underscoring the necessity for genuine community engagement and transparent communication.

The results underscore that successful implementation of raw material and CCS projects increasingly hinges on securing a culturally embedded and digitally responsive social license to operate. In both the Jadar (Serbia) and Koralpe (Austria) lithium projects, resistance movements evolved within distinct historical, institutional, and media contexts – yet both illustrate how technical legitimacy fails without communicative and social legitimacy. Insufficient knowledge of cultural specifics usually contributes to a suboptimal result (Farrell et al., 2012). National interests play a significant role (Fan, 2010; C. A. Johnson et al., 2024). A high quality of communication is associated with an increased probability of a positive outcome (Mercer-Mapstone et al., 2018), the potential for acceptance in SM was investigated by (Mulyasari, Harahap, Rio, Sule, & Kadir, 2021). In this context, the question arises as to what acceptance is like in Jadar (Ivanović, Tomićević-Dubljević, Bjedov, Đorđević, & Živojinović, 2023). Another point that should be investigated is the trust effect, for which a case study from Mongolia can be used (Dagvadorj, Byamba, & Ishikawa, 2018). Finally, the importance of the land acquisition phase needs to be clarified (Mangioni, 2018). The present study addresses the question of the extent to which the acceptance of CCS influences social and human capital and thus influences the discussion on climate change (cf.Anderson et al., 2012). Local examples, such as Sweden (cf. Stenseke, 2009), are used to shed light on the effects of CCS on public perception. In addition, strategies for SM are developed to promote understanding of local specificities (Leiss & Larkin, 2019; Obradović et al., 2023). It is crucial to consider intercultural differences and challenges (Rodolaki, 2023a, 2023b) in order to ensure successful communication and collaboration in this area.

As demonstrated in preceding studies, both projects reiterate the significance of effective communication between the operating companies and the involved population residing in the area from the project's inception. Additionally, an existing SLO at the very beginning or up-front of a mining project does necessarily mean that SLO remains stable or increases, in the contrary, a decline or complete withdrawal of the SLO is likely, as both case studies confirm (Rössler, 2024). The necessity of conducting feasibility studies in technical domains such as plant safety and machinery safety is widely in use. However, the application of this approach to the mining industry regarding social acceptance, preferably entangled with corporates' social responsibility, remains in its infancy. It remains astonishing, that SLO seems still not being considered as part of the preliminary project assessment stages (Barakos & Mischo, 2021). The fact that social and community relations costs prior to the commencement of income generation underscores the necessity for the comprehensive integration of social management issues into corporate strategic planning, instead of considering it part of public relations. Understanding the 'community' surrounding a mining operation, and recognizing the differences between communities and corporate decision-makers' perspectives on development and quality of life, can also under-

mine corporate efforts to support local sustainable development activities (Farrell et al., 2012). Conversely, this enables or can positively influence the generation of SLO. In May 2024, Chad Blewitt, Rio Tinto's managing director of the project, said the company was waiting for another election cycle, including local elections on 2 June, for its mine. He said the company is fighting 'disinformation', such as rumours the mine will be opencast and pollute the water supply, and that it will be built underground. The waste will end up as brick-like blocks for road construction, rather than sit in a potentially unstable tailings dam. He further noted that Rio Tinto had initially thought people would not believe more outlandish claims on social media, but came to understand the need to communicate with stakeholders at an earlier stage (Blenkinsop, 2024). These "outlandish claims" have already been dismissed in 2022 by Serbian president Aleksandar Vučić (Reuters, 2022), the claim of alien powers intruding and implementing licenses to operate seem to be a recurring narrative.

EIT RawMaterials CEO Bernd Schafer said in an interview that permits for mining and recycling are challenging, and "[p]ermitting is a major concern, and so is social licence to operate, which is necessary to obtain a permit," he stated at a conference in Brussels. According to him, the key to social acceptance is engagement and proactive communication with local communities, citing the Nordics as examples (Blenkinsop, 2024). Ranängen and Lindman concluded that in order to gain social acceptance within the local community, mining companies should reflect on their evaluation of the sustainability aspects that are important for stakeholders. They further concluded that the Nordic way of primarly focusing on the benefits as environmental and or/social impact assessments instead of emphasizing on communities' and stakeholders' needs and expectations play a key role (Ranängen & Lindman, 2020).

Narrative control is a core factor in the SM environment. Discourses surrounding lithium extraction and CCS are emotionally charged, and SM facilitates not only information sharing but also emotional mobilization (Kowalik, 2021). Who frames the discourse, what values are embedded, and how stakeholders are engaged determine the trajectory of acceptance or rejection (Hannigan et al., 2019; Ninan & Sergeeva, 2022). In Serbia, the majority of the media are loyal to the government and in line with President Vučić's party. This means these outlets primarily emphasise the advantages of the contracts with Rio Tinto, while also publicly stoking fears of possible fines if the project is not approved. In Austria, the *Unterkärntner Nachrichten*, a Carinthian district newspaper run by a former FPÖ politician, is a particularly noteworthy supporter of the project. The FPÖ (Liberal Party of Austria) also supports the project. Christian Ragger, a lawyer and district party leader as well as a member of the National Council, represents the company on minor legal issues. Ragger confirms the mandate but declines to comment further. In more sensitive cases, such as when European Lithium takes action against critics, renowned Viennese business lawyer Thomas Kralik is called in (Rössler, 2024). Our findings show for Serbia that Press releases, (e.g. European Lithium Limited, 2024) which are meant to promote mining projects, can backfire tremendously.

However, **limitations** must be acknowledged. This study does not yet provide primary empirical social media analysis of the Jadar or Koralpe projects—highlighting a significant research gap. Future studies should engage in a deeper analysis of the discourse taking place on social media platforms

This is particularly relevant, as social media can both enable awareness and participation and serve as a platform for the formation of strong social resistance. Further work should include discourse and network analysis across platforms (Twitter/X, Facebook, local forums), with attention to temporal dynamics and emotional resonance. Such research would enhance understanding of how digital narratives shape trust, influence institutional legitimacy, and modulate public engagement in real time. Beyond the analysis of social media posts, future studies should adopt a comprehensive case study approach, including qualitative interviews and a quantitative survey, that combines documented and published sources with the subjective experiences of the actors involved. Figures 5 and 8 were generated with the assistance of artificial intelligence, based on available literature, media reports, and inferred public sentiment trends related to SLO. They serve as illustrative models and are not derived from quantitative public opinion surveys.

The study pursues a predominantly qualitative, interpretative approach. Although the chosen discourse-analytical approach allows us to present a structuring or summary of previous literature and critically examine it, it lacks a certain generalizability that would be possible through a comprehensive quantitative analysis. A mixed methods approach proves especially useful at the stage of data collection to ensure a more holistic understanding. The case selection (Jadar project and Koralpe/Weinebene project) in this study is largely reasonable and offers valuable insights by focusing on unsuccessful examples. However, future research should also aim to

include a contrasting perspective by comparing successful and less successful projects. Thus, learning from case comparison can provide valuable insights into the social acceptance of such initiatives.

5. Conclusions

The majority of the population is unaware or insufficiently aware of the need to use mineral resources. Yet raw materials, just like soil, water and energy, are vital for human survival. Measures for climate protection and the promotion of sustainable extraction and consumption of resources are therefore essential. Uncertainties due to inadequate information exchange, lack of participation and ignorance generally lead to a negative attitude towards such projects at both national and global level.

Knowledge creates awareness, and transparent communication enables barrier-free participation of the affected population, which in turn increases social acceptance in the long term.

The increase in the world's population and the efforts of the international community to increase the general level of welfare (e.g. United Nations Sustainable Development Goals) are leading to an increased demand for resources, energy and raw materials. Industry, politics and science are endeavoring to extract raw materials more efficiently and use them more sustainably. However, neither the current nor the future demand for raw materials can be covered by recycling, savings and increased efficiency alone. The industry is dependent on imports, with individual countries rich in raw materials having a pronounced market power and an increasingly small number of players controlling ever larger quantities of raw materials. These facts have led, among other things, to the publication of the Critical Raw Materials Act (O.A. 2025) at European level, which is intended to counteract this.

This study confirms that the success or failure of raw material projects like Jadar and Koralpe are deeply intertwined with the dynamics of digital communication, emotional narratives, and culturally specific trust relations (Barakos & Mischo, 2021). As demonstrated in the short literary overview, social media has emerged as both a risk and a resource, since it amplifies public concerns, but also offers an opportunity to create transparency, dialogue, and legitimacy if used strategically and ethically. Holistic engagement with stakeholders can enhance SLO. Stronger relationships, increased fairness perceptions and trust can lead to social acceptance of mining (Ranängen & Lindman, 2020).

As demonstrated above, strategies that involve mostly reactions to public concern – e.g. press releases in response to protests, but no invitation of the broader public to presentations on the project or the foreseen outcome itself – instead of actively seeking to include as many different stakeholders as possible, providing barrier-free access to information via social media accounts, open debates, etc., hence act upfront, will ultimately fail. Conversely, little to no communication at all at least enables the implementation of the project, as projects are easier to pull through if the broader public does not know what is going on (no timely filing of complaints, media-effective protest, etc. possible). Not involving key stakeholders like politicians and residents shows a lack of understanding of the public opinion, which could be guided in a more effective way if the significance of risk communication was recognized. This would generate SLO and leave the community with more positive views regarding the outcome for themselves, and the environment in general.

The role of SM in stakeholder engagement, knowledge transfer, and sustainability communication (Dhaoui & Webster, 2021; Grover et al., 2019) must be recognized as a cornerstone of project success in the 21st century. However, it also requires careful management to prevent misinformation, polarization, and reputational risks (Chaudhuri, Gupta, Bagherzadeh, Daim, & Yalcin, 2024; Samson & Swink, 2023).

We recommend the following: a) integrate social media analysis into environmental impact assessments and public communication strategies (Matthew E. Brashears & Eric Quintane, 2018; McCombs & Shaw, 1972; McGookin et al., 2021); b) conduct real-time digital discourse monitoring during project lifecycles to anticipate resistance and identify engagement gaps (Mangioni, 2018; Mulyasari et al., 2021); c) embed stakeholder analysis within SM ecosystems, recognizing both formal and informal actors, narratives, and influence networks (Margeson, 2023; Marshall, 2023); d) Develop training modules for project developers and public institutions on narrative competence, cultural adaptation, and digital crisis management. The importance of SM analysis in brand advertisement has been shown by (Men, Tsai, Chen, & Ji, 2018). If companies want to engage with the community and not just leave a trail of destruction in their wake, it is inevitable that the same strategies should

be implemented in environmental impact assessments and public communication strategies. By doing this, the management of resources can change from being reactive to being proactive, from being technocratic to being inclusive, and from being risk-prone to being resilient. This is especially important in critical projects such as Jadar and Koralpe, where SLO is contested, trust is fragile, and the digital public sphere is crucial. Such strategic realignments are no longer optional, but essential.

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