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"La Licencia Social para Operar: Análisis de Gobernanza y Modelos de Gestión Sostenible"

"Mapping the Knowledge Landscape of Social License to Operate in Mining: A Bibliometric Study"

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Resumen

Este artículo presenta un análisis bibliométrico de la literatura científica sobre la "licencia social para operar" (SLO) en el sector minero. El estudio tiene como objetivo identificar tendencias, autores relevantes, redes de colaboración y brechas de investigación dentro de este campo. La revisión se basó en una búsqueda realizada el 30 de julio de 2025 en la base de datos Scopus, arrojando un corpus de 275 artículos académicos. El análisis se realizó utilizando el software VOSviewer, que permitió la visualización de las relaciones entre autores, coautorías y citaciones.
Los resultados indican que, si bien la SLO ha ganado una relevancia significativa en el discurso académico, la producción científica se concentra en un número limitado de autores y países, predominantemente del Norte Global. Se destacan figuras prominentes como Kieren Moffat, Justine Lacey y Jason Prno por su volumen de publicación y recuento de citas, aunque las redes de colaboración entre investigadores parecen limitadas y fragmentadas. El estudio identifica una baja representación de contribuciones provenientes de contextos latinoamericanos y una escasa articulación interdisciplinaria. Además, el análisis revela que la consolidación de este campo de conocimiento se ve gravemente obstaculizada por el compromiso insuficiente de las instituciones de educación superior con la investigación y la formación, sumado a una limitada disponibilidad de financiación específica. Se concluye que existe una necesidad urgente de promover una agenda de investigación más inclusiva y específica al contexto que integre perspectivas locales y fomente un enfoque crítico, relacional y participativo de la SLO en minería. Este trabajo contribuye a sistematizar el conocimiento existente y a orientar futuras direcciones de investigación en esta área crucial.

Palabras claves: licencia social para operar; sostenibilidad; minería; análisis bibliométrico; VOSviewer

Abstract
This paper presents a bibliometric analysis of the scientific literature on the "social license to operate" (SLO) in the mining sector. The study aims to identify trends, relevant authors, collaboration networks, and research gaps within this field. The review was based on a search conducted on July 30, 2025, in the Scopus database, yielding a corpus of 275 academic articles. The analysis was performed using VOSviewer software, which enabled the visualization of relationships between authors, co-authorships, and citations.
The results indicate that while SLO has gained significant relevance in academic discourse, the scientific output is concentrated among a limited number of authors and countries, predominantly from the Global North. Prominent figures such as Kieren Moffat, Justine Lacey, and Jason Prno are highlighted for their publication volume and citation count, although the collaboration networks among researchers appear limited and fragmented. The study identifies a low representation of contributions from Latin American contexts and a scarce interdisciplinary articulation. It is concluded that there is an urgent need to promote a more inclusive and context-specific research agenda that integrates local perspectives and fosters a critical, relational, and participatory approach to SLO in mining. This work contributes to systematizing existing knowledge and guiding future research directions in this crucial area.
Keywords: social license to operate; sustainability; mining; bibliometric analysis; VOSviewer
Highlights:

• SLO research production is concentrated in the Global North, among a limited number of authors.

• Co-authorship networks on SLO are limited and fragmented.

• There is low Latin American representation in SLO research.

• SLO is linked to human rights, indigenous peoples, and power dynamics.

1. Introduction

SLO has become a key concept in the global mining industry, reflecting the acceptance and support that communities and other social stakeholders grant to extractive projects. (Boutilier & Thomson, 2023; Olivares Chicahuala & Arias-Valle, 2024). This acceptance extends beyond mere legal permits, encompassing social, cultural, and environmental dimensions that decisively influence the viability and sustainability of mining operations (M.-B. Arias-Valle & Coria Augusto, 2024; Coria Augusto et al., 2025). In this context, the scientific literature on SLO and mining has grown in recent decades, but its evolution, structure, and key actors have not been systematically analyzed from a bibliometric perspective.

This research primarily aims to answer the following question: How is the scientific knowledge on SLO in mining structured, and who are the main authors contributing to it, according to the literature indexed in Scopus?

Through the use of bibliometric techniques and VOSviewer software, a corpus of 275 scientific articles is analyzed to map author collaboration networks, identify the most influential researchers, and understand the production and citation dynamics in this field of study.

The fundamental contribution of this work lies in offering a comprehensive and quantitative overview of the scientific literature on SLO in mining, which allows for the identification of collaboration patterns, key academic communities, and the pinpointing of research gaps or opportunities for future studies. This analysis contributes to strengthening the conceptual and empirical basis for the sustainable management of mining projects, facilitating an informed dialogue among researchers, companies, communities, and policymakers.

Finally, the importance of this study resides in its capacity to systematize current scientific knowledge, support decision-making in the mining industry, and promote an interdisciplinary and collaborative

approach that fosters social legitimacy and the sustainability of mining operations.

2. Literature Review

SLO is a central concept in the field of mining and community relations management, reflecting the degree of acceptance, approval, and trust that communities, stakeholders, and society in general grant to mining activities, beyond formal legal and regulatory requirements (Bice & Moffat, 2014; Prno, 2013). The term emerged in the mining industry during the 1990s and, since then, has evolved both in its conceptualization and practical application, becoming a key indicator of social legitimacy and operational sustainability (Moffat & Zhang, 2014; O'Faircheallaigh, 2015).

Originally, SLO was understood as an implicit consent granted by local communities for mining operations to proceed in their territories without significant social opposition (Wilson & Silva, 2013). However, this approach has been questioned by researchers who argue that SLO is a dynamic and relational process, built through continuous interaction, open dialogue, and responsiveness to social concerns and expectations (Franks & Cohen, 2012; Kemp et al., 2010). SLO implies not only passive acceptance but also active engagement and a relationship of trust between mining companies and their stakeholders (Bice & Moffat, 2014; Vanclay, 2017).

Various studies have sought to disaggregate the dimensions that constitute SLO, identifying factors such as trust, transparency, community participation, equity in benefit sharing, and responsible management of environmental and social impacts (Campero et al., 2024; Moffat & Zhang, 2014). Wilburn y Wilburn (2011) underscore the importance of effective communication and genuine community involvement to build solid and sustainable relationships. Likewise, Marín y Berkes (2010) highlight the role of participatory management and shared governance as key elements for obtaining and maintaining social license.

SLO is also intrinsically linked to the notion of social justice and human rights (Kemp et al., 2010; Owen & Kemp, 2013). The perception of equity and respect by communities directly impacts the legitimacy of mining operations (Bice & Moffat, 2014; Moffat & Zhang, 2014). The lack of recognition of these aspects has led to multiple social conflicts and the halting of mining projects, demonstrating the need for comprehensive approaches to their management (Gamu & Soendergaard, 2024). A qualitative analysis of key terms in SLO literature reveals concepts such as "human right", "indigenous people", "social risk", and "power" are particularly relevant, indicating a shift towards more critical and

normative approaches in the field of study. This also includes the importance of procedural justice and accountability (Raftopoulos, 2017).

Within the framework of the global sustainability agenda, SLO is considered an indispensable component for achieving the Sustainable Development Goals (SDGs), especially regarding the reduction of inequalities (SDG 10), decent work and economic growth (SDG 8), and climate action (SDG 13) (Brueckner et al., 2021). Mining companies that integrate strategies to strengthen SLO tend to adopt more responsible practices (Breakey et al., 2025; Lacey & Lamont, 2014), driving social and environmental innovation, and fostering the inclusive development of communities (Saenz, 2021; Vanclay, 2017).

This link with sustainability has promoted a paradigmatic shift in the mining industry, which increasingly recognizes SLO not only as an operational requirement but as a strategic and ethical component for business management and environmental governance (Boutilier & Thomson, 2023; Prno, 2013).

Despite the widespread acceptance of the concept, the SLO presents significant challenges and controversies (Olivares Chicahuala & Arias-Valle, 2024; Owen & Kemp, 2013). One of the main debates is the lack of consensus on its precise definition and on the metrics for its objective evaluation (Bice, 2014; Komnitsas, 2020). The subjective and contextualized nature of the SLO makes comparison between cases and generalization of results difficult, which has generated criticism about its applicability as a management tool (Moeremans & Dooms, 2025; Moffat & Zhang, 2014).

Another recurring theme in the literature is the risk of instrumentalization of the concept by companies, who might use the SLO as a public relations strategy without adequately addressing structural problems of inequality or environmental impact (Vanclay, 2017; Wilburn & Wilburn, 2011). This phenomenon, known as “social greenwashing,” undermines community trust and can generate greater conflict (Luan, 2024; Ruiz-Blanco et al., 2022).

Despite the growing scientific output on SLO and mining, studies that address the literature from a bibliometric approach are limited (Isfandyari-Moghaddam et al., 2023; Rahimi & Karmi, 2025). Nevertheless, the use of tools like VOSviewer has proven valuable for analyzing the structure of scientific collaboration, identifying influential authors, and mapping thematic trends. These approaches allow for a better understanding of how knowledge is organized and what areas require greater research attention.

In particular, the identification of authors with high productivity and robust collaborative networks helps consolidate an interdisciplinary field of study, integrating perspectives from sociology, economics, environmental management, and public policies (Moffat & Zhang, 2014; Prno, 2013). The visualization of connections among researchers facilitates the construction of joint agendas and the generation of applied knowledge for the sustainable management of mining.

A critical analysis of the literature reveals that important gaps persist, especially in the study of SLO in specific geographical contexts, such as Latin America, where the social and political dynamics of mining present particular characteristics (Kemp et al., 2010; Saenz, 2021, 2024). Furthermore, more research is needed on the temporal evolution of SLO and its relationship with new forms of governance, technological innovation, and changes in international regulations (Arantes & Ferreira, 2025; Saenz, 2023). To achieve this objective, a commitment from universities to sustainability is required (Arias Valle et al., 2021a; 2021b, 2024), i n their teaching, research, and collaboration with the mining industry (M.-B. Arias-Valle & Marimon, 2024b, 2024a).

Furthermore, the integration of quantitative methods such as bibliometric analyses with qualitative case studies can enrich the understanding of the phenomenon and provide input for strategic decision-making in the industry (Glückler & Gutiérrez, 2025).

3. Methodology

This study employs a bibliometric approach to analyze the scientific output related to the SLO in the mining context. For this purpose, the Scopus database was utilized, recognized for its thematic breadth and rigor in indexing peer-reviewed scientific literature.

3.1. Data Collection

The bibliographic search was conducted on July 30, 2025, using the key terms "social license to operate" and "mining". These terms were applied to the title, abstract, and keyword fields of the database. The search was restricted exclusively to scientific articles (articles) published in peer-reviewed academic journals, excluding documents such as conference proceedings, reviews, editorials, and technical notes. No temporal or language limits were imposed, aiming to obtain a comprehensive and longitudinal overview of the field's development. As a result, a corpus of 275 scientific articles was obtained.

3.2. Data Analysis

The bibliographical data were exported directly from Scopus in a format compatible with the VOSviewer software (version 1.6.20). This tool was used to perform co-authorship and citation network analysis, as well as to generate visual representations facilitating the interpretation of relationships among the most relevant authors in the field. The bibliometric analysis included:

• Co-authorship analysis, to identify the most productive authors and scientific collaboration networks concerning SLO and mining.

• Citation analysis, which allowed for determining the academic impact of key researchers based on the number of citations received.

• Total Link Strength analysis, an indicator showing the intensity of connections between authors within the academic network

3.3 Visualization and mapping

The results were visualized using network maps generated by VOSviewer. In these maps, nodes represent individual authors, while links indicate co-authorship relationships. The size of the nodes reflects productivity or impact (depending on the analyzed indicator), and the thickness of the links represents the strength of the relationship between pairs. Additionally, clustering algorithms were applied to identify thematic communities within the analyzed dataset.

4. Results

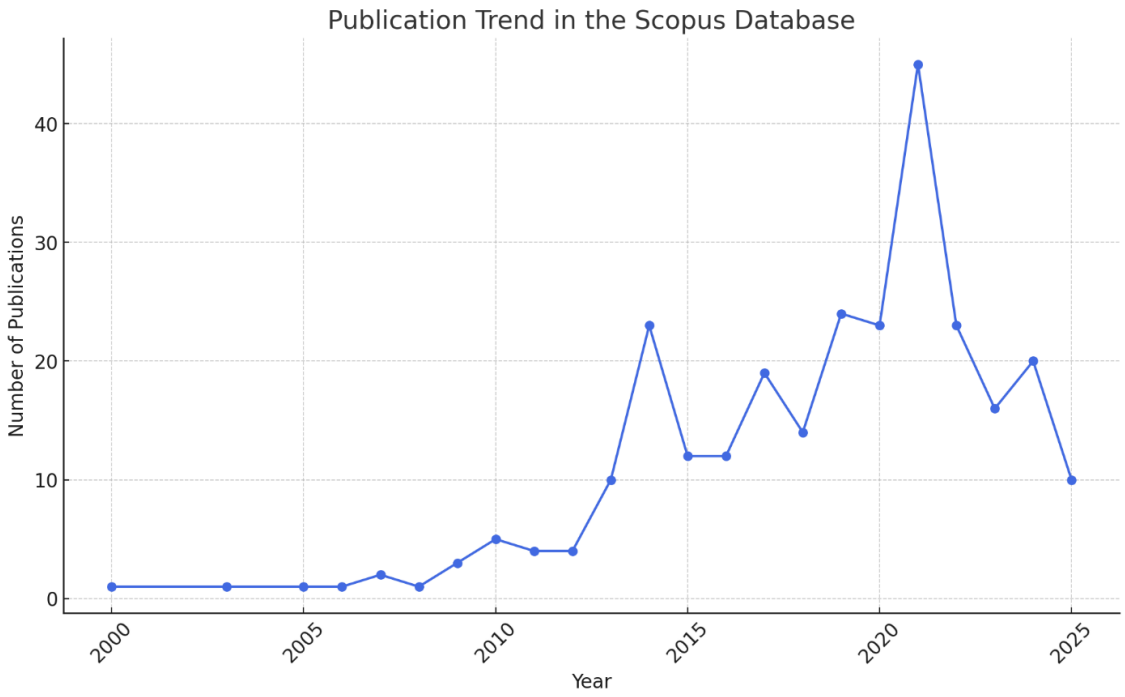
In recent decades, SLO has emerged as a central analytical category in studies related to the governance of natural resources, sustainable development, and the relationship between companies and communitie (Lacoursière, 2025; Moffat et al., 2016). To identify trends in academic production on this concept, a bibliometric analysis of publications indexed in Scopus was conducted. A total of 274 documents were identified, a significant subset of which included explicit references to SLO in the title or keywords.

The chronological analysis of publications addressing SLO reveals a pattern of sustained growth, particularly since 2014. Between 2010 and 2013, production was scarce and sporadic, averaging one

or two articles per year. From 2014 onwards, a more marked increase was observed, reaching a peak between 2020 and 2022, a period during which the largest number of annual publications was recorded. This increase coincides with a growing concern for the social legitimacy of extractive projects, as well as the incorporation of ESG (Environmental, Social, and Governance) criteria into companies' regulatory and strategic frameworks.

These results not only demonstrate a consolidation of the SLO concept in academic discourse, but also a greater interest in understanding its operational, ethical, and communicational dimensions. The increasing volume of literature suggests the need for more systematic and comparative studies that delve into the approaches, methods, and contexts in which SLO has been addressed. Figure 1 below illustrates the annual evolution of publications related to SLO.

Figure 1. Evolution of publications on SLO by year



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4.1. Qualitative Content Analysis and Conceptual Debates

"This qualitative analysis allows for a more nuanced, critical, and situated understanding of what can be termed a "mapping of knowledge" concerning the SLO.

The specialized literature evidences a significant evolution in the conceptualization of SLO. Initially understood as a form of implicit consent or passive acceptance by local communities, the notion has transitioned towards a relational, dynamic, and process-oriented understanding. Originally, SLO was seen as communities implicitly agreeing to mining operations without significant social opposition. However, researchers have challenged this, arguing that SLO is a dynamic and relational process built through continuous interaction, open dialogue, and responsiveness to social concerns and expectations. This updated approach highlights that SLO is constructed through ongoing processes of interaction, dialogue, and response to social concerns, implying an active and sustained commitment based on trust between mining companies and their stakeholders (Nxele, 2025).

In this updated approach, SLO is built through continuous processes of interaction, dialogue, and responsiveness to social concerns, which implies an active and sustained commitment, supported by trust relationships between mining companies and their stakeholders (Mufungizi & Mpaka, 2025).

Nevertheless, significant conceptual tensions persist. One of the most notable is the absence of consensus regarding a precise definition and standardized methodologies for its evaluation. The subjective, contextual, and relational nature of SLO hinders its empirical operationalization and limits its utility as a comparative management tool across projects. This conceptual ambiguity has led to substantial critiques regarding its functionality and analytical legitimacy.

Another central point of debate is the risk of instrumentalization of SLO by companies, which might use the concept as a communication or public relations strategy without adequately addressing the structural causes of socio-environmental conflict. This phenomenon, referred to in the literature as "social greenwashing," calls into question the authenticity of the commitments made and can erode public trust, exacerbating tensions with affected communities

4.2 Results of Terms Analysis

The qualitative analysis of terms highlighted by the bibliometric "relevance score" reveals a series of emerging themes with high interpretive value. Concepts such as "human right" (8.3543), "indigenous people" (4.7617), "social risk" (3.842), and "power" (1.2678) reflect a growing academic concern for issues related to human rights, the participation of indigenous communities, social risks, and power dynamics. These themes indicate a reconfiguration of the field towards more critical and normative approaches.

In particular, SLO is increasingly linked to frameworks of social justice, human rights, and sustainability. The perception of equity, recognition, and respect by communities directly impacts the legitimacy of extractive projects. Thus, SLO is conceived as a necessary component for the effective implementation of the Sustainable Development Goals (SDGs), especially those related to reducing inequalities (SDG 10), decent work and economic growth (SDG 8), and climate action (SDG 13).

Furthermore, the literature highlights the central role of power dynamics in the configuration and sustainability of SLO. The frequency of the term "power" (1.2678) underscores the importance of analyzing the asymmetric relationships among companies, the State, and communities, as well as the need to foster participatory and deliberative governance models.

The bibliometric analysis performed using VOSviewer software facilitated the identification of the most relevant terms in the academic literature concerning SLO within the mining context. From the co-occurrence analysis of terms, 133 key concepts were identified, particularly highlighting those directly related to social processes, key stakeholders, territories, impacts, and methodological approaches.

The most frequent terms in the analyzed corpus were 'license' (284 occurrences), 'licence' (266), 'trust' (98), 'factor' (88), 'management' (82), 'csr' (65), and 'relationship' (64). This indicates a strong orientation of the literature towards management aspects, trust, and corporate social responsibility as central components of SLO.

However, when considering the 'relevance score,' which weights the relative importance of the terms, particularly significant concepts emerge in the field. These include:

- 'human right' (relevance score: 8.3543)
- 'indigenous people' (4.7617)
- 'social risk' (3.842)
- 'social impact assessment' (2.4757)
- 'stakeholder engagement' (2.6047)
- 'sustainable mining' (3.154)

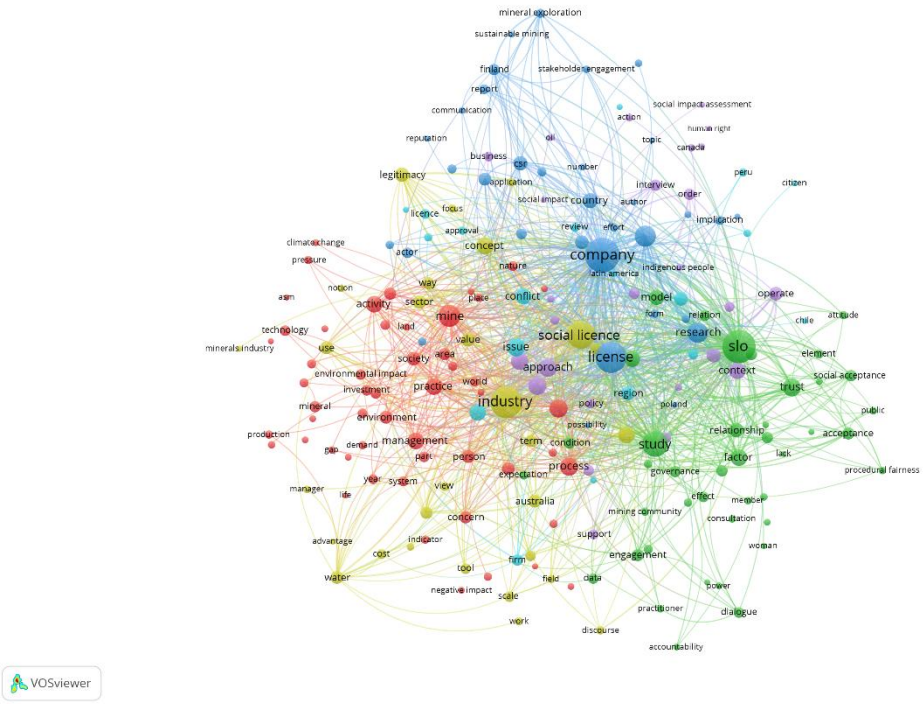
- 'mineral exploration' (3.2504)
- 'dialogue' (2.1715)
- 'practitioner' (2.266)
- 'communication' (1.8162)
- 'water' (1.8479)

These results indicate that, beyond the usage frequency of certain terms, the academic debate emphasizes issues associated with human rights, the participation of key stakeholders (particularly indigenous communities), social risks, and sustainability and inclusion approaches.

Furthermore, SLO is linked to practices such as consultation (18 mentions, 1.2896), community engagement (19 mentions, 1.4422), social acceptance (40 mentions, 1.241), and values like procedural justice (19 mentions, 1.6932) and accountability (14 mentions, 1.0107). The term "power" also achieves a high score (1.2678), reflecting the centrality of power dynamics in obtaining and maintaining SLO.

Collectively, these findings enable the identification of the main thematic and conceptual axes surrounding SLO in the mining sector, highlighting the evolution from an instrumental vision towards a more complex, participatory, and social and environmental justice-oriented approach. Figure 2 illustrates these findings.

Figura 2. Thematic Clusters and Research Trends in LSO



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4.3 Author Results

The co-authorship analysis revealed a diverse group of researchers who have addressed the topic of SLO in the mining sector. Key authors were identified based on their publication volume, impact (citations received), and connection strength within the academic network (total link strength).

Highlighted findings include authors with the highest number of publications: Kieren Moffat, with 9 documents and a total of 1102 citations, positions himself as the most influential author in the dataset, also demonstrating the highest connection strength (18) with other authors, which indicates a high degree of collaboration and impact within the academic community.

Justine Lacey, with 5 publications and 647 citations, also exhibits a high link strength (8), consolidating her as a central figure in SLO studies in mining.

Pamela Lesser and Gregory Poelzer are also notable for their number of publications (5 and 6 respectively), with 175 and 162 citations, and significant participation in collaborative networks (link strength 11 and 15 respectively).

Authors with high impact (citations), regardless of publication volume, include Jason Prno, who, with only 3 documents, achieved 1067 citations, evidencing the weight and influence of his contributions. Frank Vanclay, with 4 publications and 323 citations, is another established reference. Sara Bice (4 documents, 317 citations) and Richard Parsons (2 documents, 234 citations) also show significant impact.

Notable collaborations (highest Total Link Strength) include Pamela Lesser (11), Gregory Poelzer (15), Michael Tost (9), Leena Suopajärvi (8), and Toni Eerola (8), demonstrating intense interaction with other researchers in the network, which suggests their articulating role in academic production on SLO and mining.

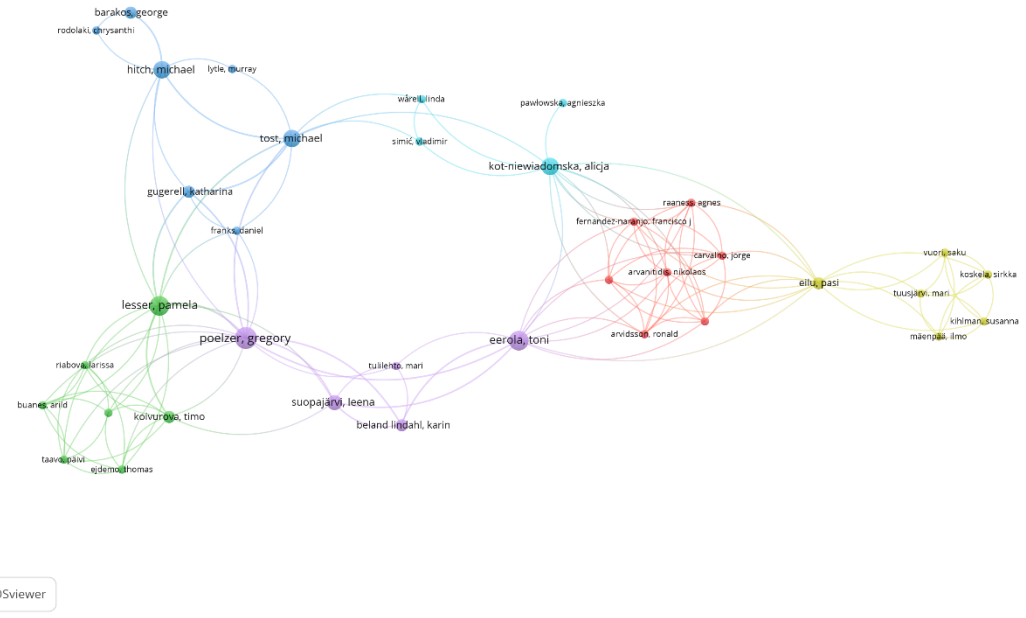
Emerging or regionally-focused authors, such as Demajorovic, Jacques (3 publications, 61 citations) and De Tomi, Giorgio (4 publications, 14 citations), indicate an incipient Latin American participation in this agenda, which may reflect a growing interest in SLO analysis within Global South contexts.

The field of study on SLO in mining is dominated by a relatively small group of highly productive and collaborative authors, primarily from Anglo-Saxon countries. The co-authorship networks are dense among the most cited researchers, suggesting the existence of well-established academic communities that lead thought on sustainability, governance, and social acceptance in extractive projects.

The presence of Latin American authors is still limited, which presents an opportunity to consolidate regional networks and contextualized research. The analysis of co-authorships and citations reveals a limited interconnection among some of the field's leading authors, which can be interpreted as thematic and disciplinary fragmentation. SLO research draws contributions from sociology, economics, environmental management, political science, and law, among other disciplines. Nevertheless, the lack of dialogue among these approaches limits the possibility of constructing comprehensive theoretical frameworks that can capture the complexity of extractive conflicts and social legitimation processes.

Despite this, a progressive thematic diversification is observed in recent literature, with the incorporation of perspectives related to environmental justice, free, prior, and informed consent, indigenous peoples' rights, a gender approach, and intersectionality. This theoretical openness indicates a trend towards more holistic and critical approaches, capable of responding to the contemporary challenges of natural resource governance. Figure 3 illustrates these findings.

Figure 3. Productivity and Influence of Authors in LSO



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4.4 Country Results

The country co-authorship analysis, conducted using VOSviewer software, allowed for the identification of the main countries contributing to the scientific production in the studied thematic area. The variable "documents" indicates the number of publications associated with each country, while "citations" reflects the impact measured by the number of received citations, and "total link strength" represents the intensity of international collaboration.

Among the most prominent countries are Australia, with 88 documents, 3,818 citations, and a total link strength of 48, followed by Canada (37 documents, 1,844 citations, link strength 21), and Finland (27 documents, 673 citations, link strength 28). These data suggest not only high productivity but also a significant presence in international research networks.

Furthermore, the United States and South Africa also emerge as relevant actors, with 27 and 23 publications respectively, both with significant levels of citations (649 and 295) and collaboration

strength (22 and 19). Likewise, Sweden presents a notable link strength (34) with 20 publications and 522 citations, highlighting its role as a connecting node in the international network.

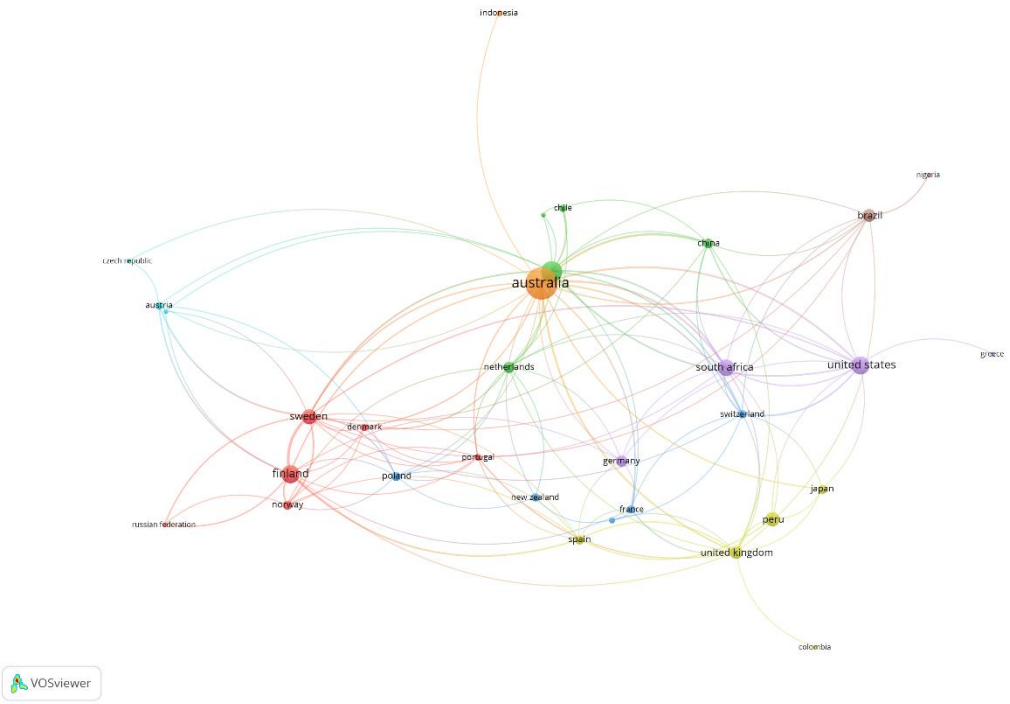
In Latin America, Brazil and Peru lead regional participation with 14 and 17 documents respectively, albeit with differentiated citation levels (214 in Brazil and 249 in Peru) and lower link strength (12 and 6). Meanwhile, countries such as Chile, Mexico, and Colombia show minor, yet significant, participation in terms of thematic inclusion.

Finally, a broad geographical diversity is observed in the contributions, although with a marked concentration of production and collaboration in Northern Hemisphere countries. This distribution highlights the necessity of strengthening scientific networks and cooperation among Global South countries to balance knowledge generation and circulation.

The analysis ultimately evidences a marked geographical concentration in scientific production, dominated by authors and institutions from the Northern Hemisphere, especially from countries such as Australia, Canada, and the United Kingdom. Key figures like Moffat, Lacey, and Prno lead the academic agenda, which raises questions about the representativeness and contextual relevance of the predominant approaches.

The low presence of contributions from the Global South, particularly from Latin America, Africa, and Asia, limits the inclusion of more contextualized, situated, and critical perspectives. Consequently, the widely disseminated theoretical and methodological frameworks might not adequately capture the sociopolitical, cultural, and normative specificities of extractive territories in the South. This epistemic bias reinforces the need to incorporate the voices and experiences of local researchers, affected communities, and regional institutional actors, in order to build more plural, just, and situated knowledge. Figure 4 illustrates these findings.

Figure 4. Geographical Distribution of Scientific Production in LSO



Source: Own elaboration

5. Discussion

The results of the present bibliometric analysis provide substantial evidence regarding the configuration of the academic field surrounding SLO in mining (Boutilier & Thomson, 2023). First, the concentration of scientific production in a relatively small group of highly cited authors, such as Moffat, Lacey, Prno, and Lesser, reflects a thematic and conceptual consolidation led by researchers from the Global North (Moffat et al., 2016). This concentration, while it has allowed for the development of solid theoretical frameworks and widely accepted relational approaches, can also limit the inclusion of diverse and contextualized perspectives, particularly those originating from regions that directly experience the socio-environmental impacts of mining (M.-B. Arias-Valle et al., 2022).

Likewise, the co-authorship network analysis reveals a high density of links among influential authors, but a limited representation of researchers from Latin America, Africa, and Asia, suggesting the persistence of geographic and epistemological asymmetries in the production of knowledge on Social License to Operate (Lee, 2025). This situation has significant implications, as the prevailing approaches may fail to adequately address the sociopolitical, cultural, and regulatory particularities of extractive

contexts in the Global South (Abuya, 2023; Olivares Chicahuala & Arias-Valle, 2024). The limited presence of regional leadership in the literature not only reflects structural barriers to accessing international scientific publishing, but also underscores the need to strengthen local research capacities and promote the active participation of scholars in global research networks. (M.-B. Arias-Valle et al., 2024; Saenz, 2023).

Another relevant finding is the limited interconnectivity among some of the most cited authors, which may indicate a degree of thematic or disciplinary fragmentation within the field. This lack of dialogue between approaches and analytical frameworks may hinder progress toward a more comprehensive and nuanced understanding of the concept of SLO, thereby limiting its applicability across diverse contexts. Nevertheless, an incipient thematic diversification can be observed, with the incorporation of new analytical dimensions such as environmental justice, free, prior and informed consent, Indigenous peoples' rights, and gender issues topics explored by Breakey (2025). This broadening signals an evolution of the field toward more critical and intersectional approaches, which is essential for addressing the current challenges of extractive governance (Murphy & Bertignoll, 2025) .

The consolidation of the Social License to Operate (SLO) field in the mining sector is hindered by the insufficient commitment of higher education institutions (Arias-Valle & Marimon, 2025a; 2025b). A more proactive and articulated response is required, as current literature suggests a deep lack of engagement from universities in the training (Arias-Valle & Marimon, 2024a), research (Arias Valle & Marimon, 2025), and outreach (Arias-Valle & Marimon, 2024) regarding these critical issues. It is imperative that universities integrate principles of sustainability, social management, and extractive governance into their curricula and actively strengthen collaboration with the mining industry and affected communities (Coria Augusto et al., 2025). Furthermore, a major structural challenge is the limited availability of specific funding for SLO research, which restricts the development of robust regional networks, particularly in the Global South, and hampers the necessary interdisciplinary articulation to generate complex theoretical frameworks. Therefore, there is a critical need for a more inclusive, context-specific research agenda supported by robust financing to ensure that future professionals can effectively manage socio-environmental conflicts.

This study, however, presents several limitations that should be taken into account when interpreting its findings. First, it relies exclusively on the Scopus database, which restricts the analysis to publications indexed on this platform and may exclude relevant work published in regional or non-indexed journals.

Furthermore, the study focused solely on peer-reviewed journal articles, excluding other sources such as books, book chapters, theses, or policy documents, thereby limiting the capacity to capture applied knowledge or insights produced in non-traditional academic spaces. The analysis was centered on quantitative indicators such as co-authorship, citations, and total link strength, without addressing qualitative dimensions of the content, such as theoretical frameworks, research methodologies, or empirical contexts. Additionally, the bibliometric search was conducted on a single date (July 30, 2025), which means that recently published or still-indexing works were not considered.

Based on these findings and limitations, several avenues for future research emerge. One promising direction is to broaden the geographic coverage of bibliometric studies by incorporating complementary databases and examining literature published in other languages, thereby making visible the contributions of underrepresented scientific communities. It is also relevant to combine quantitative and qualitative approaches, integrating network analysis with case studies or systematic reviews that delve deeper into the content, findings, and contextual approaches of the literature. Another key line of inquiry involves exploring the temporal evolution of the SLO concept, analyzing how its dimensions and approaches have changed in response to social, regulatory, and environmental transformations..

6. Conclusion

The results obtained from the bibliometric analysis of the scientific literature on SLO in the mining sector confirm that it is a field in consolidation, with growing academic and practical relevance in the context of natural resource governance. The concentration of production in a reduced set of authors and institutions from the Global North, coupled with the low representation of researchers and approaches from the Global South, reveals an unequal distribution of knowledge that poses challenges in terms of inclusion, epistemic diversity, and contextualization of analytical frameworks.

Through the mapping of co-authorship and citation networks, the existence of consolidated thematic cores is evidenced, but also a fragmentation that limits interdisciplinary dialogues and the integration of emerging perspectives. The limited connection among key authors suggests the need to foster greater international and transdisciplinary collaboration to address the complexity inherent to the SLO concept from multiple dimensions: social, political, environmental, economic, and cultural.

This study contributes to current knowledge by offering a structural characterization of the field,

identifying gaps, and proposing avenues for its strengthening. In particular, it highlights the urgency of including voices and experiences from extractive territories, especially from communities affected by mining projects, local researchers, and regional regulatory frameworks. Only through a more inclusive and situated construction of knowledge will it be possible to advance towards SLO approaches that truly respond to the demands of legitimacy, justice, and sustainability in diverse contexts.In summary, the present work not only contributes to the understanding of the academic evolution of the SLO concept, but also invites a re-evaluation of its foundations, scope, and applications from a critical, plural, and transformative perspective regarding the relationships among extractive companies, communities, and states.

Data Availability Statement

The data used for this bibliometric study were obtained from the Scopus database on July 30, 2025, through an institutional subscription. The corpus of 275 academic articles and their associated metadata are available for access via a Scopus subscription. The data files generated for analysis with VOSviewer (version 1.6.20), including co-authorship and citation networks, can be shared upon reasonable request to the corresponding autor.

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