



Understanding the fundamentals of the Social Licence to Operate: Its evolution, current state of development and future avenues for research

Ana Lúcia Santiago^a, Jacques Demajorovic^{a,*}, Dennys Eduardo Rossetto^b, Hanabeth Luke^c

^a Department of Business Administration - University Center of FEI, Rua Tamandaré, 688 - 5^o Andar - CEP: 01525-000 - Liberdade, São Paulo, SP, Brazil

^b SKEMA Business School, Université Côte d'Azur (GREDEG), Rua Bernardo Guimarães, 3071 - Barro Preto, CEP: 30140-083, Belo Horizonte, MG, Brazil

^c School of Environment, Science and Engineering - Southern Cross University, Po Box 157, Lismore, 2480, Nsw, Australia

ARTICLE INFO

Keywords:

Social licence to operate
Systematic literature review
Co-citation analysis

ABSTRACT

The field of studies on social licence to operate (SLO) has grown considerably over the past two decades, leading to the emergence of new approaches, models, and theoretical development. This paper aims to organise, map, and analyse the evolution of SLO over its years of existence. We seek to understand the theoretical body that supports the concept; the rationality of the adopted trajectories for its scientific development; and the most influential studies that have guided these trajectories. A multi-method approach was applied in the procedure adopted to map the evolution of SLO, analysing international academic publications over the last 24 years (1996–2019). This has been achieved through a systematic, longitudinal literature review using citation and co-citation analysis; bibliometric techniques and social network analysis, combined with a thematic analysis of the complete articles. The results from citations show that SLO evolution can be organised into five broadly representative stages, categorised as Historical Bases (1996–2002); SLO Recognition (2003–2006); First Management Models (2007–2011); Evolution of SLO Models and Initial Critical Studies (2012–2016); and Critical Studies and Increasing Complexity (2017–2019). We discuss the clusters formed by co-citation analysis, which is the theoretical body adopted by the authors, allowing the identifying of “invisible colleges”, which can be understood as the formation of conceptual lines used by the authors to support SLO. A comparative analysis of clusters generated by stages of evolution shows that while early research drew heavily on other fields, such as anthropology and engineering, studies primarily focused on citing SLO literature are identified as emerging from 2017, 21 years after the publication of the first identified publication (1996). Thus, SLO emerges as a self-sufficient field of knowledge, no-longer borrowing knowledge from other fields for its intellectual development. Studies become theoretically based, with more rigor as the search for SLO management models continue. The organisation and analysis of this knowledge contributes to understanding the historical foundations of SLO, making the tracing of SLO trends possible while providing a broader understanding of the SLO literature that can assist and guide future research directions.

1. Introduction

Changes in societal expectations in recent decades have influenced how natural resource extractive industries conduct their operations around the world. Increasingly, communities are demanding involvement in the decision-making of these operations and expecting not only to receive a greater share of the benefits, but also to demand assurances that operations are being properly regulated (Bunnell, 2013). In this context, the social licence to operate (SLO) occupies a growing space in the discourse of various sectors as an element of its social responsibility

strategy. With a central idea being that a community can give or withdraw support for a project, the social licence concept originated primarily from an industry perspective, where a business case was identified for properly considering social impacts and perspectives and managing ‘social risks’; thus, there is substantial research developed around the concept from this perspective (Moore, 1996; Owen and Kemp, 2013).

SLO is widely applied in the mining sector (Esteves and Barclay, 2011; Moffat and Zhang, 2014) and is increasingly gaining traction in other productive activities such as silviculture (Ford and Williams, 2016;

* Corresponding author. Coordinator of the Research Group in Social License to Operate in the Mining Sector.

E-mail addresses: analucia@esaconsulting.com.br (A.L. Santiago), jacquesd@fei.edu.br (J. Demajorovic), dennyseduardo.rossetto@skema.edu (D.E. Rossetto), hanabeth.luke@scu.edu.au (H. Luke).

<https://doi.org/10.1016/j.resourpol.2020.101941>

Received 9 April 2020; Received in revised form 13 August 2020; Accepted 20 November 2020
0301-4207/© 2020 Elsevier Ltd. All rights reserved.

Lester, 2016), oil and gas (Luke, 2017), the marine sector (Cullen-Knox et al., 2017; Kelly et al., 2017), energy (Gallois et al., 2017), and within the industries of the new Blue Economy, an ocean-based economic growth model involving the private sector (Voyer and van Leeuwen, 2019). More recently, the term has been used in new sectors such as biosecurity (Ogilvie et al., 2019), sports organisations (Miller, 2016), and biotechnology (Thresher et al., 2019). In the minerals sector particularly, recent socio-environmental catastrophes involving the rupture of the Brazilian tailings dams at the cities of Mariana, in 2015, and Brumadinho, in 2019, have further heightened interest in SLO, with these cases highlighting the vulnerability of communities around mineral projects, as well as that of the perpetuity of companies themselves who do not properly address the risks of their operations (e.g. Demajorovic et al., 2019; Mazzola and Esteves, 2018).

Since SLO is a fairly recent theoretical construction, a relatively small quantity of systematic literature reviews have been dedicated to understanding its conceptual evolution and implications for management practices. Gupta and Kumar (2018), through a systematic literature review of 104 articles from 31 academic journals, show that SLO is an emerging concept for many areas, and that a better understanding of this phenomenon is an important research gap to be filled. This study attempts to bring a deeper understanding of the theoretical basis supporting SLO studies, showing its evolution over time, how it is being used on current research, and future directions to help fill this research gap.

In terms of relatively recent reviews, Brueckner and Eabrasu (2018) address the normative complexity of SLO and propose the need for further conceptual analysis in future studies. Karakaya and Nuur (2018), in a systematic review of social sciences in the mineral sector, present SLO as one of the top five terms cited in social sector research, highlighting the small number of researchers present in countries with the largest mineral reserves, and point to the need for future studies to expand research on social issues within the mineral sector. Luke et al. (2018) conducted a thematic review of 90 academic articles and 23 reports on SLO in the Australian energy context, identifying substantial knowledge gaps, including understanding the evolution of SLO in space and time.

This study distinguishes itself from these contributions by choosing to discuss SLO in depth and globally, over time. A multi-method approach combines a systematic literature review with longitudinal content analysis; citations; co-citations; and social network analysis, which can together support the development of a deeper, longitudinal understanding of the SLO research field (Lievrouw, 1990). Additionally, we seek to understand how networks in SLO research form by the creation of 'invisible colleges' (Price, 1963). This is particularly important for SLO studies, which were initially drawn together from knowledge produced within different fields of knowledge. From the first technical bulletins (Joyce and Thomson, 2000) to the contribution of the legal perspective (Thornton et al., 2003), SLO debate has advanced to the development of management and measurement models which have become quite influential in the literature (Bice et al., 2017; Luke, 2017; Moffat and Zhang, 2014; Prno, 2013; Thomson and Boutilier, 2011).

In more recent times, studies on SLO address a critical perspective focused on the limits of this strategy. An overvaluation of it as a concept (Owen and Kemp, 2013) is identified as potentially masking complexities and power relationships between companies, governance, and communities (Meesters and Behagel, 2017). Other recent publications contain further analysis of complexities within the field, drawing on new case studies to develop and refine management tools and conceptual understandings of SLO (e.g. Demajorovic et al., 2019; Luke et al., 2018).

The objective of this paper is to describe the processes of SLO evolution from 1996 to 2019. To this end, the research seeks to identify and understand the theoretical body supporting the concept; the rationality of the trajectories adopted for its scientific development; and to identify the most influential studies guiding those trajectories.

This study is organised into four sections, with the first being this

introduction; the second section presents the methodological procedures; the third section the results and trends; with the final section concluding the study and suggesting trajectories for future research in this field.

2. Methodological procedures

The study of informal collaborative networks and invisible colleges (Burt, 1977; Price, 1963) that constitute a field of research, such as SLO, can contribute significantly to understandings of its historical and intellectual roots. Presenting a picture of its evolutionary development and current dynamics (Culnan, 1986) can make a significant contribution to the direction of a field, identifying prospects for future studies (Culnan, 1986, 1987; Culnan et al., 1990; Price, 1965).

2.1. Database

Scientometric and bibliometric analyses are widely used to support empirical investigations of the intellectual structure and academic activities of various disciplines (Rossetto et al., 2018; Silva et al., 2018; Üsdiken and Pasadeos, 1995). In line with the study objective to undertake an extensive and big-picture, network analysis of literature on social licence to operate over time, a systematic and integrative literature review was performed, providing an understanding of the evolutionary stages undergone by SLO since its inception. Research and database formation followed a rigorous multi-step research procedure as indicated by McCain (1990), followed by citation and co-citation analysis (Aria and Cuccurullo, 2017).

The database's formation was the result of an advanced search of all articles obtained from the Web of Science's core collection (Reuters, 2014). The search was performed using the keywords "social licence to operate" OR "social license" OR "SLO", using the Boolean operation "?": "in order to capture all published work on "Social License" that make use of both British and American English despite their spelling differences (i.e. license or licence), along with the abbreviation most commonly found in the literature. In addition, all publications of articles in the literature review on SLO considered to be seminal works were included in the sample, excluding duplicates.

The search focused on the use of the Science Citation Index Expanded (SCI-EXPANDED); the Social Science Citation Index (SSCI); the Arts and Humanities Citation Index (A and HCI); and the Emerging Sources Citation Index (ESCI), resulting in a search that reflected all available academic production on SLO for all years to date. Results were restricted to English language articles only. The search using Boolean operators resulted in the following expression: ((TS = "Social licence to operate") OR (TS = "Social license") OR (TS = "SLO")) AND LANGUAGE: (English) AND DOCUMENT TYPES: (Article) Indexes = SCI-EXPANDED, SSCI, A&HCI, ESCI Timespan = All years".

Initially, 453 articles were obtained, from which, after cross-referenced reading, 75 non-contributory articles were discarded. The final sample remained with 378 SLO-related articles published between 1996 and 2019, which, after clearing up and normalising¹ data ensuring consistency among their respective bibliographic references, resulted in a "knowledge base" composed of 18,677 articles used as a source basis for the production of knowledge in the area of SLO throughout the study analysis.

To perform a longitudinal study of the evolution of SLO, an integrative systematic review was performed based on the critical reading of all 378 SLO articles. As a result of this integrative review, we identified broad stages of evolution in which SLO literature undergoes significant

¹ A statistical procedure usually applied to correct an eventual misspelling or mistakes on Authors' names, journal titles, etc. In the same way, this normalization also was applied to correct the magnitude of the numbers in order to avoid huge discrepancies among expressive authors and inexpressive ones.

changes. These stages were then used as a criterion for defining the temporal division of the longitudinal analysis. As a result, all 378 selected articles that were published in the previous 24 years fit within five evolutionary stages (identified in section 3.2), thus allowing for a comparison of the leading edge of scientific publications over time and its evolution.

Importantly, any references without an author identified were taken from the analysis, as well as statistical documents, working papers, reviews, books, or any other type of work other than a scientific article published in an academic journal. Also, only works published in the English language were considered, precisely to take into account the power of dissemination of knowledge on a global scale. However, in the analysis of co-citations, all references used were considered, including the technical reports that composed some of the first seminal documents that supported the emergence of academic literature on SLO, which we summarised in Table 1.

2.2. Citation analysis

One of the basic assumptions of citation analysis is that it is able to reveal the influence of a given article by the citation it receives in another article (Culnan et al., 1990). Therefore, the sum of citations of a given article, author, or journal, from a representative sample, i.e. SLO articles published during the 24-year period covered by this study, is able to provide evidence of the extent to which a given article, author, or journal, has influenced a particular field of research (Culnan, 1986, 1987). The comparison of the five periods investigated was based on a citation value calculated as the ratio of the “number of individual

citations” to the “total citations received” for a specified period. This is because publications are usually cited once per article, the denominator for this unit of analysis is equal to the total number of publications investigated. For authors or journals, the total number of citations is equal to the sum of all references, because multiple citations are possible in this case. In these cases, multiple citations may distort the assessment of their influence, so the analysis includes only those authors for whom the number of citing articles represents at least 30% of the sum of citations received.

2.3. Co-citation analysis

Co-citation analysis is a form of analysis that can reveal the intellectual structure of research fields (White and McCain, 1998). It records the frequency with which two authors are cited in a set of articles, thus indicating their perceived affinity (Bellardo, 1980; Small, 1973; Small et al., 2014). Cited and closely related co-author groups summarise certain areas, research specialties, or schools of thought within a discipline (McCain, 1990). This type of analysis is therefore able to provide an adequate means of exploring the intellectual structure of a scientific discipline (Nerur et al., 2008). Several studies have validated the results of the analysis of co-citations, as well as the broad structure they provide, corresponding to the judgment of researchers and other studies in the area. This approach provides a broader view of the field structure, which would be an equal number of individual publications (such as the unit of analysis) represented on a network image or map.

For ease of comparison, the number of authors represented on the network maps for the analysis of co-citation for all five periods,

Table 1
Database collection overview.

Metrics	1st Period	2nd Period	3rd Period	4th Period	5th Period	Total
	1996–2002	2003–2006	2007–2011	2012–2016	2017–2019	1996–2019
Citation Years	4	4	5	5	3	21
Number of Authors	6	13	38	323	551	875
Total # of published papers ¹	4	7	21	155	245	432
Base of SLO-papers (final sample) ²	4	7	17	142	208	378
Cited references (total) ³	18	256	918	7,780	10,738	18,677
Citations per year ⁴	17.8	261.8	108.4	578.8	233.3	250.2
Citations ⁵	71	1047	542	2,894	700	5,254
Citations per Paper ⁶	17.8	149.6	31.9	20.4	3.4	13.9
Citations per Author ⁷	11.8	80.5	14.3	9.0	1.3	6.0
Papers per Author ⁸	0.67	0.54	0.45	0.44	0.38	0.43
Authors per Paper ⁹	1.50	1.86	2.24	2.27	2.65	2.31
Collaboration Index	3	1.83	3.44	2.74	3.05	2.74
Authors of single-authored papers	2	2	7	35	36	79
Authors of multi-authored papers	2	11	31	288	515	796
Single-authored documents	2	2	7	37	38	86
h-index ¹⁰	3	7	14	26	12	32
g-index ¹¹	4	7	17	47	16	61
# of different periodicals ¹²	3	7	14	65	100	155

Source: Research Data. **Notes:** (1) The total number of articles published in the SCI-EXPANDED, SSCI, A&HCI, ESCI databases with the word “social license” or “Social licence to operate” or “SLO” in the title, abstract, words keywords or additional keywords (keywords plus®). (2) SLO article base after deleting all articles that had not been published about SLO specifically or were non-contributory. (3) Sum of the total number of unique references cited in each of the articles in the SLO article base by each period. There were 1,033 repeated references dropped. (4) The average number of citations that each period of articles got. (5) The sum of citation received by all papers of the sample. (6) The sum of the citation counts of all articles divided by the total number of articles on the final sample. (7) Average number of citations by author, calculated as follows: For each paper, its citation count is divided by the number of authors for that article to provide the normalised citation count by author for the article. Normalised citation counts are then summed across all articles to provide the number of citations by author on the result set. (8) Average number of papers by author, calculated as follows: For each piece of work, 1 divided by number of authors is calculated to give the standard author count for the article. A normalised number of authors are then summed across all articles to provide the number of articles per author. (9) The average number of authors per article, calculated as the sum of the author counts in all articles divided by the total number of articles. (10) The H-index is defined as the value “h” that a scientist receives for his/her “Nh” (number of articles) which has at least “h” citations each. That is, an author or journal that has an h-index = 25 means that it has at least 25 publications with at least 25 citations each. Thus, the h index is an articulation that evaluates the number of publications (number of articles) and the quality of publications (impact or number of citations received) (Hirsch, 2005). (11) The G-index is considered an improvement on the h-index, which is calculated on the basis of the distribution and citations received by the publications of a particular researcher, as given a set of articles in descending order by the number of citations received. The G-index is the largest and only number, in which the main G-articles received, on average, at least G citations, in order to give more weight to the most cited articles, as a way to overcome an existing disadvantage in the h-index. Thus, once an article reaches the position of being among the best articles, subsequent citations received by it will no longer affect its position among the top G. This is why the G index is considered to be an improvement of the H-index, generating higher values than the H-index counterpart in the same database (Eghe, 2006). (12) The number of distinct journals resulting from the analysis of the collected database.

employed a cut based on the number of co-citations. Based on the “citation value”, a representative number of the most cited authors were selected, always considering the volume of co-citations present at the base for each period. A cut-off value was applied to obtain a compatible number to generate an intelligible map. Therefore, the cut-off note for the minimum citations of an author was applied for each of the five stages, such as 1 (1996–2002), 2 (2003–2006), 3 (2007–2011), 4 (2012–2016) and 5 (2017–2019). Regarding the similarity value, Gmür (2003) demonstrated that counting absolute citations among the authors is not suitable for generating clearly defined groups. Instead, this study uses the relative co-citation value, the “CoCit” score, as a measure of similarity between authors A and B, and the fractional counting method was used. Absolute citation counts are plotted against each author’s individual citation count, as shown below.

$$CoCit_{AB} = \frac{(Co - citation_{AB})^2}{Minimum (Citation_A : Citation_B) \times Average (Citation_A : Citation_B)}$$

Where A = Author A and B=Author B.

Two less cited authors (both cited 40 times) with an equal absolute co-citation count (20 co-citations) compared to two more cited authors (both cited 100 times) with similar absolute values could thus receive a higher CoCit score (0.25 vs 0.04) because the latter is probably more closely related to the content they publish. The CoCit score ranges from 0 to 1. Several citations and co-citations from authors within a reference list are counted only once. Based on the CoCit score, the upper 1.25% of investigated co-citation ratios (e.g. author pairs) with a minimum of at least three absolute co-citations provides data for further investigation. Since the number of author pairs at the beginning of the periods is significantly lower than at later stages, different cut-offs were applied to ensure sufficient insight into the intellectual structure for each stage. The relationship between the selected citations was generated using PAJEK Software (Batagelj and Mrvar, 1996).

The proximity of the authors to the maps was determined algorithmically (using the Fruchterman-Reingold algorithm) to their perceived affinity. This algorithm assumes that all nodes repel each other, even between linked nodes, by a force of attraction that unites the divergent nodes. Starting with random positioning, a stable system can be created through interactions (Fruchterman and Reingold, 1991) in which it positions authors close to co-authors. They form a group if there are at least four authors who are linked to each other through co-citation relations. Authors linked to only one other author, so-called ‘isolated’ authors, were eliminated. To confirm the innovation framework detected within the maps, a single-linkage cluster analysis was also applied.

2.4. Main assumptions and limitations of the study

The basic assumption of citation and co-citation analysis is to consider that the authors cite their influences so that citations are adequate substitutes for the influence of the cited work (Smith, 1981). However, the reasons why authors make certain citations may differ in motivation (Üsdiken and Pasadeos, 1995), as some authors may cite other researchers, not according to the content they publish, but as a mutually friendly way to increase citation counting (Garfield and Merton, 1979), or as a way to meet a requirement of the journal to be published, citing, for example, articles previously published in that journal. As it is impossible to distinguish behavioural citations like these, it is important to highlight that this type of behaviour can affect the study results. However, the number of citations motivated by some factor other than the actual influence is likely to be a small percentage. In addition, most unscientific reasons should be mitigated by the peer review processes (Ramos-Rodríguez and Ruíz-Navarro, 2004). Regarding the unit of analysis, the main limitation of this study is that only the first cited author of a reference is recorded in the Citation Index database for use in the analysis of citation. In this case, Garfield and Merton (1979) indicate that the influence of co-authors may be

underestimated, and some authors, depending on how they use their names for each publication, may be under-represented or over-represented, although in this paper a normalization and standardisation was made in the references. As a result, the authors’ names in network maps represent the conceptual themes developed by their contribution, not necessarily by themselves alone (Culnan, 1987; Nerur et al., 2008). Additionally, while the Web of Science was selected as a primary search tool due to its functionality, as well as it being a highly reputable source, the authors acknowledge that this database may not contain an exhaustive record of all relevant published and cited works on SLO.

3. Citation and Co-Citation analysis results

3.1. A radiograph of the research: a descriptive analysis

SLO emerges as a recent phenomenon in literature. Cited in 1996 for the first time in technical bulletins (Moore, 1996), it gains relevance particularly from 2011 when the number of publications accelerates considerably (Fig. 1).

The growing volume of publications, besides being consistent and significant, accompanies a change in mining discourse regarding the need for extractive companies to gain social acceptance of their operations in order to reduce their costs and conflicts (Franks et al., 2014).

Having emerged in developed countries, studies on SLO continue to be concentrated among researchers from those countries. Still very little participation is to be found from researchers from developing countries, where mining activities have expanded significantly in recent years (Fig. 2).

According to Karakaya and Nuur (2018), mineral production consistently expands in Africa, Latin America, Oceania, the United States, and China. The share of total world production for authors in developing countries increased from 53% to 60% in 2004.

In the analysed database, there is very significant participation from Australia, while important countries in the current scenario of mineral production such as Brazil, Chile, and South Africa, have a quite peripheral contribution to this knowledge construction using the SLO terminology. A higher level of interest in SLO among educational institutions and researchers in developed countries could be driven by sources of funding located in these regions. It is difficult to identify whether the comparative lack of research from authors in developing nations simply indicates a low level of interest, or whether it stems from a lack of funding resources. Fig. 3 shows principal funding organisations internationally.

Although a significant proportion of the scientific production on SLO is concentrated in three journals, there is a broad spectrum of periodicals publishing SLO beyond those linked to the extractive sector. Journals focused on governance, ethics, energy, environmental management, social science, and social and environmental impacts have also contributed to the increasing number of SLO publications (Table 2).

In order to draw some useful boundaries around the evolutionary stages of SLO, prominent shifts in approaches to SLO research over the last 20 years were identified, including the emergence of new areas of interest and focus such as new topics and/or industries, which is discussed in the following section.

3.2. Analysis of co-citations, influential authors, and evolutionary stages of SLO

The database organisation, incorporating groups of co-authors cited and their relationships, made it possible to explore the theoretical basis for SLO research at different points in time. Fig. 4 represents the most influential studies within five broad stages of SLO evolution in the WoS database, representing 24 years of research (1996–2019). This co-citation analysis allows us to go beyond the identification of the authors with the largest number of publications, as it also highlights those

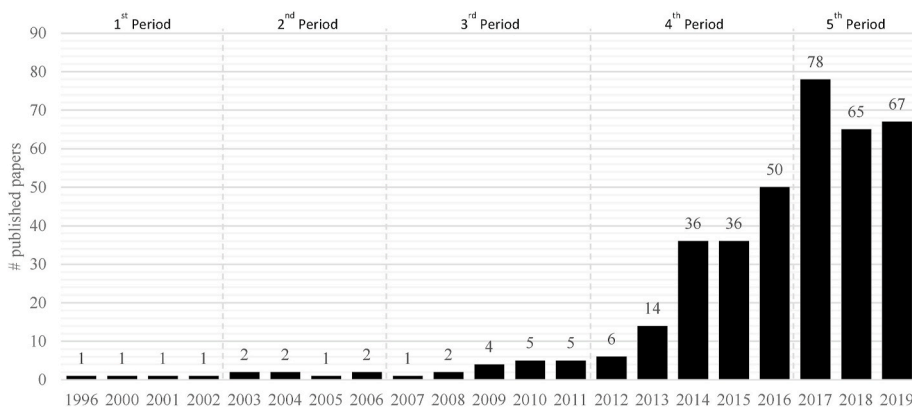


Fig. 1. Annual scientific production on SLO.
 Note: Annual Growth Rate of 23.4%. The numbers considered all SLO production from 1996 up to November 2019 including all papers non-contributory that was disposed to the depth literature review.

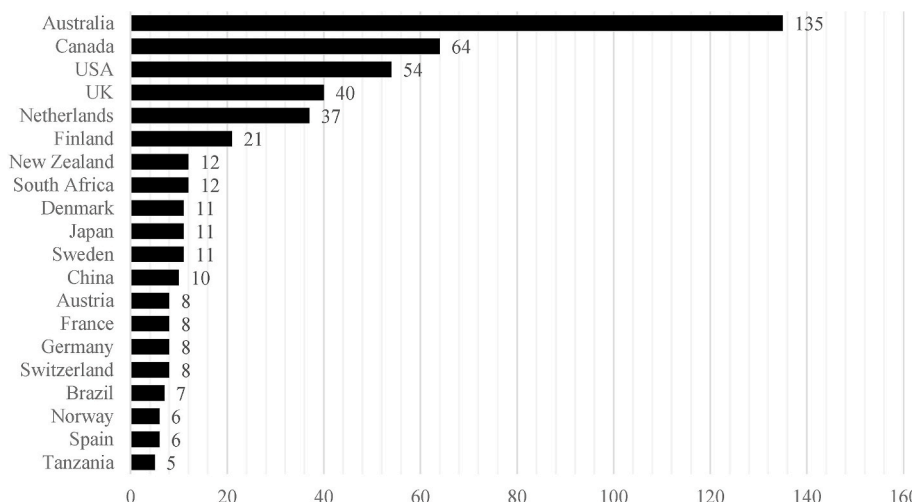


Fig. 2. Leading countries on SLO Scientific Production (from selected 378 SLO-Papers).

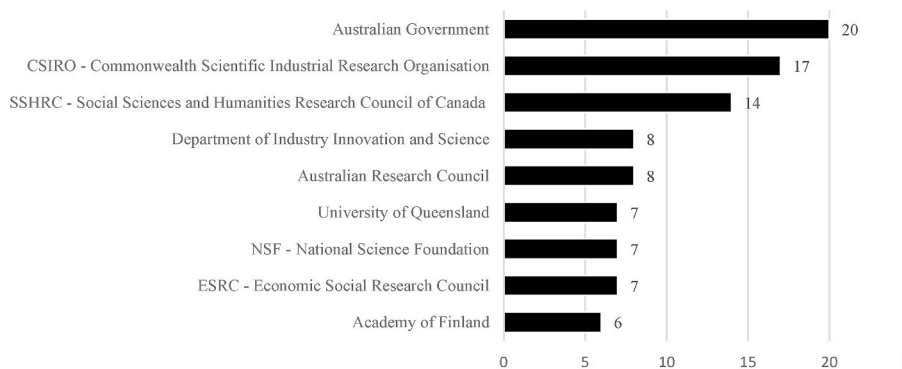


Fig. 3. Top 10th SLO funding agencies (1996–2019).
 Source: Research results. Note: Data from Web of Science. The numbers represent only the papers supported by funds provided by the mentioned Top 10 funding agencies. The agencies' names represent the exact name mentioned on the WoS database. While the extent of industry funding is not always readily available, it is important to note that some key funding sources are heavily supported by extractive industry funding, for example CSIRO (via the Gas Industry Social and Environmental Research Alliance (GISERA)); and the University of Queensland, through the Centre for Natural Gas Research, funded principally by four unconventional gas companies.

with the greatest influence on the development process of the SLO theoretical body.

The five stages of evolution and categories were organised as follows:

- First Stage: Historical Bases (1996–2002)
- Second Stage: SLO Recognition (2003–2006)
- Third Stage: First Management Models (2007–2011)
- Fourth Stage: Evolution of the SLO Models and initial critical studies (2012–2016)

- Fifth Stage: Critical Studies and increasing complexity (2017–2019)

The categories proposed represent predominant themes emerging from articles published during these periods. We must emphasise that while useful, these stages and categories proposed are not intended to represent hard boundaries. The themes of each stage are clearly connected with previous publications that reveal the ongoing processes of evolution in the SLO debate.

Each of the five different stages reveal a map of citations, with the

Table 2
Top leading journals on SLO.

#	Leading Journals	F	ISSN	IF	CS	SJR	SNIP
1	Resources Policy	27	0301-4207	3.185	4.09	1.170	1.685
2	Journal of Cleaner Production	18	0959-6526	6.395	7.32	1.620	2.308
3	Extractive Industries and Society - An Int. J. Impact	17	2214-790X	2.064	2.52	0.976	1.129
4	Assessment and Project Appraisal Social Epistemology	10	1471-5465	1.915	1.84	0.736	0.752
5	Forestry	8	1464-5297	1.123	0.83	0.406	0.916
6	Marine Policy	7	1464-3626	2.876	2.70	0.879	1.228
7	Journal of Business Ethics	6	0308-597X	2.865	3.08	1.242	1.316
8	Environmental Impact Assessment Review	5	1573-0697	3.796	4.46	1.86	2.006
9	Mineral Economics	4	0195-9255	3.749	4.32	1.424	1.766
10		4	2191-2211	-	1.07	0.305	0.753

Source: Research results **Notes:** "F" is the frequencies of SLO-papers published per journal; "ISSN" is the International Standard Serial Number used as an identifier of each journal. "IF" is the Impact Factor provided by the Clarivate's Journal Citation Report (JCR) is a measure of the frequency with which the "average article" in a journal has been cited in a particular year or period.; "CS" is the CiteScore, offering a more robust and accurate indication of a journal's impact. Its metrics calculate the citations from all documents in year one to all documents published in the prior three years for a title; "SJC" is a measure of scientific influence of scholarly journals that accounts for both the number of citations received by a journal and the importance or prestige of the journals where such citations come from.; "SNIP" means Source Normalised Impact per Paper. It is a sophisticated metric that intrinsically accounts for field-specific differences in citation practices. It does so by comparing each journal's citations per publication with the citation potential of its field, defined as the set of publications citing that journal.

authors most influential in future studies (first-authors depicted only), represented by points that are larger, based on the number of their citations. The in-depth analysis of the articles made it possible to identify and organise the common characteristics and main contributions to the theoretical knowledge construction of SLO. In addition, for each stage identified, an analysis of clusters formed by co-citations is displayed below, representing the theoretical body adopted by the authors and demonstrating the "invisible colleges" (Burt, 1977; Price, 1963). The results of the cluster analysis show an evolution in the research flows on the SLO, as researchers working on the theme have merged their experiences, leading to a theoretical body of greater density over the previous six to eight years.

The clusters formed highlight schools of thought adopted by researchers in each stage of SLO modelling, reveal three critical components (Lievrouw, 1990):

- the speciality of the subject;
- the environment;
- the fluency of the social process.

These three critical components demonstrate how a group of researchers who share the same basis of scientific interest - the co-citations that shape SLO knowledge - behave. The subject matter sheds light on the particular developments of the concept adopted by the research groups; the environment highlights the productive sectors, countries, funding agencies and universities, and the fluency of the social process demonstrates the existence (or not) of a relationship among the groups of researchers according to their theoretical position. From this organisation, the following topics illustrate the formation of the theoretical

foundations of the SLO, and its evolution.

It is important to note that the first evolutionary stage, Historical Bases (1996–2002), is made up of predominantly non-academic articles from newsletters published in technical journals in the mineral and forest-based sector. In light of that, it was not possible to develop a cluster for the analysis of co-citations, bearing in mind that the articles do not have stated references in the Web of Science database for software to read. The relevant articles, which originate from technical bulletins, appear in the WoS database due to having been cited in succeeding articles.

3.3. Evolutionary first stage - Historical Bases (1996–2002)

3.3.1. Analysis of citations

The first stage reveals the 'Historical Bases' of SLO (1996–2002), based on four articles published in technical bulletins of extractive sectors, and present in the WOS database, which had notable influence on publications in the following years. An article originating from a technical bulletin of the forest-based extractive industry called Paper Industry Management Association (PIMA) refers to the term SLO for the first time in 1996 (Moore, 1996). However, it was not until 2000 that the term came to be cited in the mineral sector in the Canadian Mining and Metallurgical Technical Bulletin, in an article by Joyce and Thomson (2000). The corresponding article published in the technical journal CIM Bulletin, rated with an Impact Factor of 0.054, initiates the formal theoretical construction of scientific knowledge on the subject, allied with the demand of the mineral extraction sector to calm conflicts and promote the social acceptance of its operations.

Joyce and Thomson (2000) discuss SLO as a tool for managing the social acceptability of mineral operations, as well as contributing to mitigating risks to the company and ensuring access to mineral resources. As evidenced by the high number of threads emanating from it, this particular technical article stood out as the main influencer of future studies on SLO in the Web of Science database, also contributing to the predominance, from then on, of the SLO theme in the mineral sector. The article presents a case study of the Paguna copper mine in Bougainville, Papua New Guinea, owned by Rio Tinto. The mine closed its activities in 1988 due to strong conflicts with the local community, resulting in violent social protests with strong-armed insurrection leading to the closure of the mine. According to the authors, the Australian state-owned company Bougainville Copper Ltd (BCL), owned by the transnational Rio Tinto, managed the mine from 1969, but had to close it in 1989 after an uprising of landowners outraged by economic exploitation, land loss and degradation, and political marginalisation. Local opposition to the mine was exacerbated during the prospecting phase of the development, following contamination of the local river and air with mineral waste, affecting health, food safety, and water. Using the Bougainville Copper Mine case study as an example of social licence withdrawal, the authors emphasise that maintaining SLO is an aspect that all companies must integrate into their projects, especially those in the mining industry. Notably, this article is still used for a seminal definition of SLO in many texts.

In the year that followed, Wilson and Wilson (2001) published a comparative case study of the forestry sector that analysed the achievement of SLO for three companies that had adopted 'clearcutting', a practice in which trees in an area are uniformly cut down, creating a clear visual and biodiversity impact. Highlighted in this paper is the "emotional impact" of the choice of the forest planting site and the operating model adopted, therefore connecting SLO to public perceptions of the choice of technologies adopted. In the same evolutionary stage is the citation of Ednie's article (2002), cited in the WoS by succeeding articles; however, its content is not available in the database for further analysis.

The first stage of Historical Bases (1996–2002) highlights a recognition by some extractive company representatives, of the importance of gaining social acceptance for their operations, primarily for the benefit

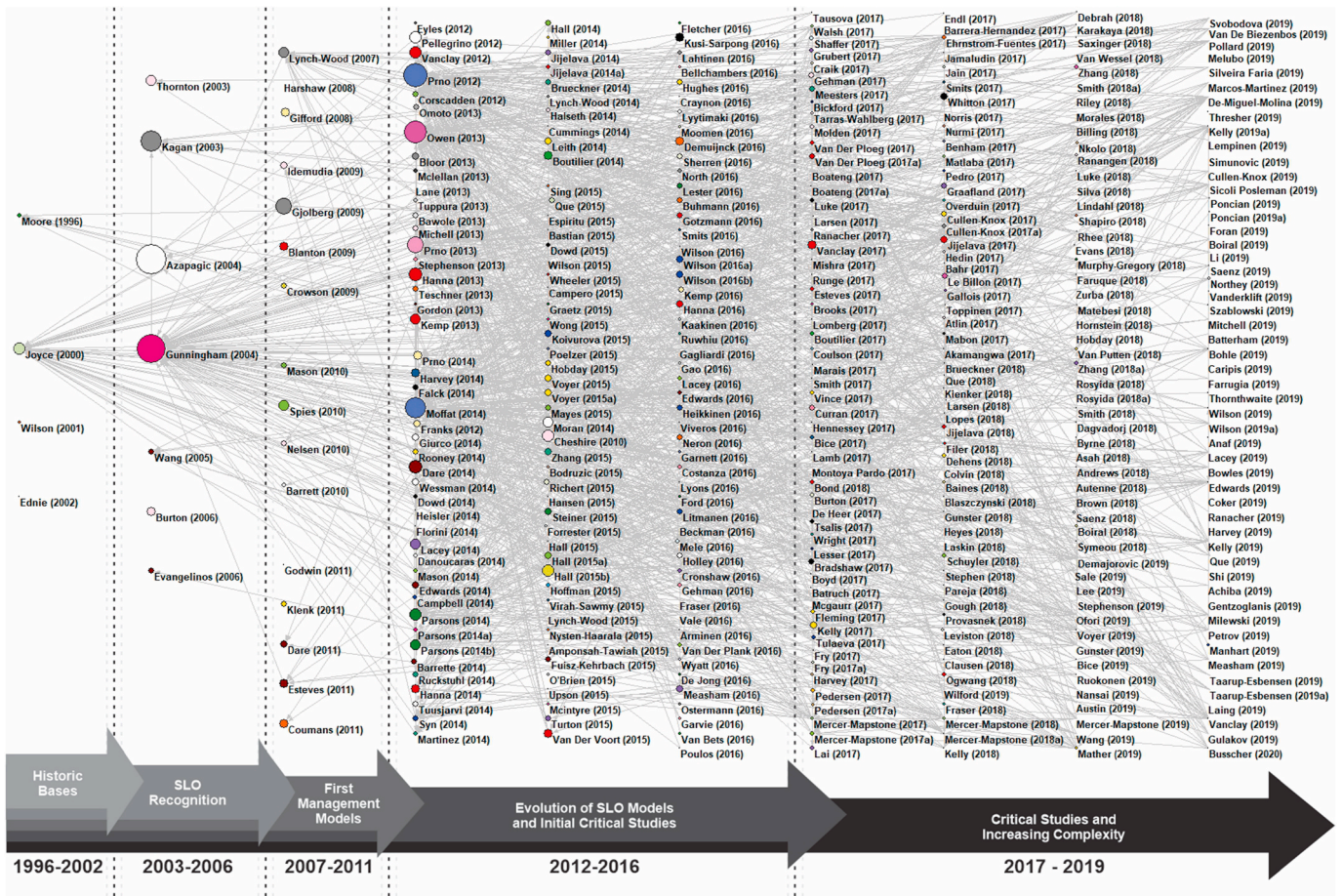


Fig. 4. Evolutionary stages of the Social Licence to Operate. Source: Prepared by the authors. Note: SLO citation analysis from 1996 to 2019 (24 years of publications on SLO). Data from WoS using Pajek software handling and critical analysis of stages of evolution. Key research clusters are explored further on the following pages.

of the enterprise’s development, or in order to access markets in more challenging social and/or environmental contexts. It reinforces that motivation to engage with the idea of SLO often emerges from cases where industry operations and project timelines are being impacted by conflicts with local communities, to the extent that enterprises can be forced to close occur when an SLO is withdrawn. From the analysis of the

articles in this period, it can be seen that the concept of SLO was borne from mineral and forest-based extractive industries, when a number of technicians involved in risk management realised that, in addition to the usual technological and management challenges, there was a growing need to respond to social challenges.

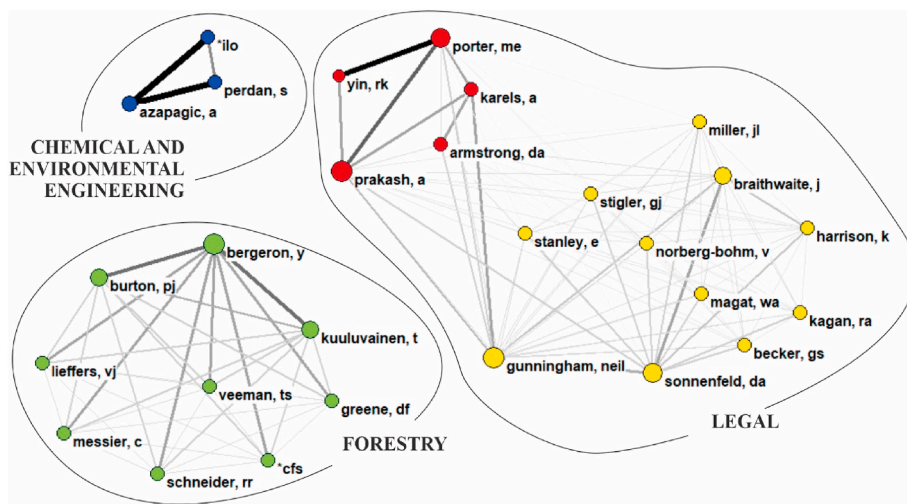


Fig. 5. Authors’ co-citation networks and the theoretical lines of SLO evolution (2003–2006). Note: SLO co-citation networks based on WoS data using Pajek software and in-depth critical analysis of the three clusters. Source: Research results.

3.4. Evolutionary second stage “SLO recognition” (2003–2006)

3.4.1. Formative cluster: Co-citations analysis

From this stage onwards, it is possible to search the references used by the authors to build a theoretical body that culminates with the publication of the first academic article, when Thornton et al. (2003) published a study on the environmental performance of fourteen pulp and paper mills in the California Management Review. To understand the theoretical lines of knowledge used by researchers to support SLO in its respective stages, we developed and analysed clusters formed by the similarity of the adopted knowledge and citation networks, shown in Fig. 5.

In this stage (2003/2006) the cluster formed by the theoretical body adopted by the researchers shows three distinct conceptual lines used to theorise SLO (Fig. 5):

- **Chemical and Environmental Engineering Cluster:** In this group the authors base the theoretical knowledge construction of SLO on case studies focused on chemical and environmental engineering, using a theoretical body that deals with the adoption of new industrial processes and practices to mitigate the impacts of operations such as the management and prevention of pollution, environmental control, and life-cycle assessment.
- **Legal Cluster:** Analysis of this grouping shows the theoretical construction of SLO based on legal grounds, involving legal issues related to fines, punishments, and environmental crimes. They adopt the paradox of Porter and van der Linde (1995), which deals with environment and competitiveness. Finally, they support SLO modelling in corporate environmental policies (Prakash, 2000) and in the company’s operations beyond legal compliance
- **Forestry Cluster:** In this group the authors draw the theoretical construction of SLO from forest-based engineering. The narrative suggests that forestry approaches adopted can influence the obtaining of SLO, such as the technique of clear-felling; the source and destination of the wood; ecological patterns and processes; and the use of zoning for planting.

It is noteworthy that the three clusters identified in the groupings of the second evolutionary stage (2003–2006) are not related at any time, showing the uniqueness of the groups and the different specialties used for the theoretical knowledge construction of SLO. However, the grouping of Legal Fundamentals is distinguished from others by not focusing on productive technologies, but rather the relationship between legal licences and social licence. Articles in the legal cluster also differ with their connection to other fields of knowledge, such as business administration (e.g. Porter and van der Linde, 1995). A key contribution to knowledge produced by this cluster, led by Gunningham et al. (2004), is the social pressure exerted by local communities to drive companies beyond legal compliance, especially in sectors with potential social and environmental impact, linking to concept to corporate social responsibility.

3.4.2. Analysis of citations

The analysis of citations offers a new dimension of knowledge about SLO, because besides the co-citations being organised into clusters, it also analyses the relationship between citations and highlights the most influential studies in SLO’s conceptual construction (Fig. 5).

The first three articles of the second evolutionary stage (2003–2006): Thornton et al. (2003), Kagan et al. (2003), and Gunningham et al. (2004), reinforce the concept of SLO as an extension of legal and economic licences. In the article by Gunningham et al. (2004), published in the Law & Social Inquiry academic legal journal, SLO reflects the perception that compliance with legal regulations rarely meets societal demands. They point out that the expectations of communities affected by a venture are often broader than legal issues, with fines, economic constraints, and reputational losses identified as principle motivators for

companies to pursue SLO. This paper also reinforces the complementary relationship between the legal and SLO aspects, with the power granted by law for society to sue or prevent a company from operating increasing the importance of obtaining SLO, as well as individual or collective lawsuits filed by citizens impacted by the venture. Gunningham et al. (2004) propose three strands to warrant SLO in extractive companies, complementing the other licences:

- the legal licence aspect, pertaining to the current legislation;
- the economic licence aspect, granted by the market and investors; and
- the social licence aspect, granted by a range of stakeholders who albeit unofficially, enforce compliance.

Another prominent study is that of Thornton et al. (2003), which emphasises that SLO is more demanding than the legal licence because it results from social pressures coming from communities and environmental activists. Kagan et al. (2003) add that social pressures drive companies towards better performance compliance. Following the same legal narrative, Burton et al. (2006), reinforces SLO as a complement to legal licensing, proposing an increase in society’s participation in mineral enterprises. From another angle, but still with a legal focus, Evangelinos and Oku (2006) proposes the use of SLO in situations where the government, as a regulatory entity, is absent or inefficient. SLO is therefore constructed as an agreement between industries and communities to fill legal gaps left by state inefficiency.

In this stage, there is recognition of SLO meeting the social pressure exerted by communities. The urgency of environmental performance by companies, motivated by community pressure and state inefficiency, characterises the debate in the second stage of SLO theoretical evolution. The level of support granted is directly linked to society’s expectations of how a company conducts its activities. Analysis of the articles in this period shows that corporate behaviour cannot be explained purely in terms of instrumentalisation and law enforcement obligations.

3.5. Evolutionary third stage “first management models” (2007–2011)

3.5.1. Training cluster: analysis of Co-citations

This third evolutionary stage (2007–2011) highlights the progress of academic attention to the first SLO management models in the business environment. The articles of the period frame, for the first time, SLO concepts into business management models. The cluster formed by the theoretical body used by the authors shows four distinct conceptual schools, showing the low connection between the theories adopted, or in short, a dispersed theoretical body (Fig. 6).

The third evolutionary stage clusters (2007–2011), arranged into four different schools, shows the dispersion of the theoretical body adopted for the knowledge construction of SLO, as well as the lack of connections between the clusters. The following four schools emerged:

- **Mining Anthropology Cluster:** an area of knowledge adopted to support SLO mining anthropology contributes to the foundation of the theme with narratives about conflicts between mining companies and communities for access to mineral resources in conflicting environments where there is weak or no governance. This literature draws heavily on Ballard (1997) who, reveals that battles waged between mining companies and communities occur where government institutions have little or no presence. It also examines the effectiveness of agreements between communities, mining companies, and active governments. Strongly referenced by the same grouping, Filer (2012) narrates the fragmentation of the mining industry’s responsibilities and the battles waged over mineral resources. It also deals with the dilemmas of economic and social development versus the impact caused by extractive operations. Regarding the anthropological school, it is noteworthy that, despite

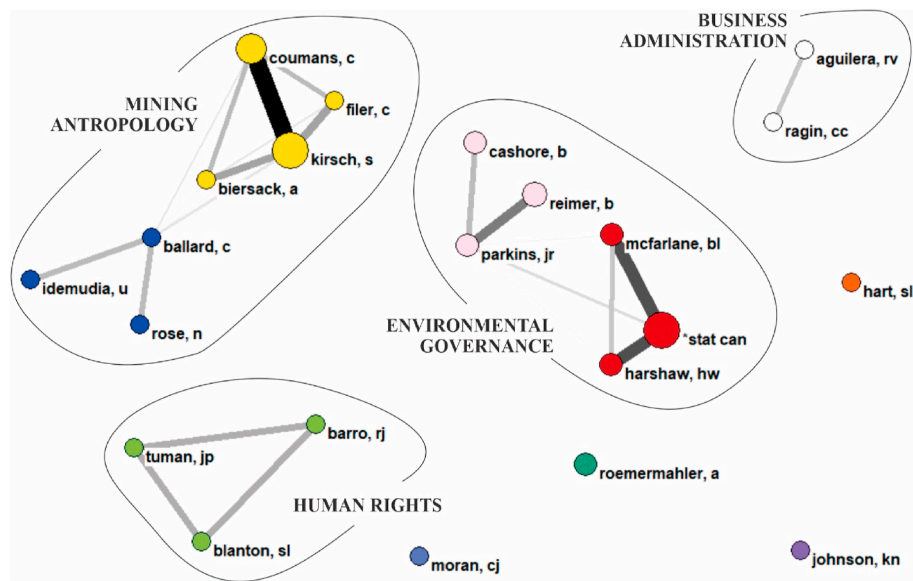


Fig. 6. Authors' co-citation networks and theoretical lines of SLO evolution (2007–2011). Note: SLO co-citation networks based on WoS data using Pajek software and in-depth critical analysis of the four clusters. Source: Research results.

the relevance to the knowledge construction of SLO, it had little influence on future studies.

- **Human Rights Cluster:** this theme was evidenced through citations and in-depth analysis of the references adopted by the authors to support the SLO. The narrative is characterised by the adoption of three main references, [Blanton and Blanton \(2009\)](#), by which the extractive sectors and industries of greatest impact must pay more attention to human rights.
- **Environmental Governance Cluster:** this theme was evidenced by the adoption of studies on the decentralisation of environmental governance, giving rise to environmental self-regulation by companies based on responding to community pressure. The cluster brings together authors who write about SLO predominantly in the forestry sector. The studies propose a business-community integration for environmental inspections and certifications.
- **Business Administration Cluster:** in this cluster, the SLO narrative is built from a relational concern, that is, from company, government, and society relations, morals, and ethical standards. SLO management models are built from publications of the Academy of Management Review, and its view on theories of corporate social responsibility (CSR). The main study used is that of [Aguilera et al. \(2007\)](#) which justifies the commitment of companies to CSR based on three concerns: 1) pressure from society; 2) instrumental reasons, driven by self-interest or market interest; 3) relational and moral reasons, when the company is concerned with the relationships between group members, ethical standards, and moral principles. These three concerns notwithstanding, relational and moral CSR were those adopted by the authors to shape knowledge in SLO.

In the clusters of the third stage (Fig. 6), it can be seen that there are still four isolated points. These refer to studies used by just one author when writing about SLO. For example, the name “Hart” is due to the fact that [Gifford and Kestler \(2008\)](#) adopted several of Hart’s studies that rethink social initiatives in companies. The isolated point “Moran” is due to the fact that [Barrett et al. \(2010\)](#) widely adopted the studies of Moran C.J. and other authors (2006–2009), dealing with water use and management between businesses and communities. The isolated point “Johnson” is due to [Spies et al. \(2010\)](#) having adopted Johnson’s studies (1999–2009) on the forest-based industry sector. The isolated point “Roermahler” was not identified in the period’s articles. It is interesting to note that in this stage the four schools identified are not

connected at any time, although having two dialogues with issues of interest to companies, those being CSR and self-regulation. From there on, there is a noticeable valuing of research focused on the first management models of SLO, and in a sense, a muting of the narratives that underlie SLO in the areas of human rights and mining anthropology.

3.5.2. Analysis of citations

[Gifford and Kestler \(2008\)](#) kick off the third evolutionary stage of SLO with a case study of Newmont Mining Corporation’s operations in Peru (see Fig. 6). The study proposes a management model to soften opposition from non-government organisations and local media. It analyses the results of a health program instigated by a mining company, and how this helped them to obtain an SLO, even in an environment of social vulnerability. Although the model of [Gifford and Kestler \(2008\)](#) advances aspects of SLO management, the article had little direct influence on future studies.

In contrast, the articles by [Idemudia \(2009\)](#), [Gjolberg \(2009\)](#), and [Esteves and Barclay \(2011\)](#) were most influential, involving case studies within the mineral sector and evaluating company performance in the context of partnerships with local communities. [Idemudia \(2009\)](#) proposes a management model for obtaining SLO, showing the contradictions of social investment versus management of the negative impacts of the operation. The article by [Esteves and Barclay \(2011\)](#) evaluates the performance of a mining company from both corporate and community perspectives, providing insights on the benefits of social investment to co-create value while building an SLO. SLO management models dealt with in the third evolutionary stage once again highlight risks to the company, and the strengthening of the corporate brand by the maintenance of reputation. This re-emphasises a bias in the SLO literature regarding the interpretation of social risk as a challenge to business operations, to the detriment of attention to the risks of operations to the community. Practices to reduce conflicts and risks to the company are valued, making clear a certain unilaterality in SLO management.

3.6. Evolutionary fourth stage “evolution of SLO management Models and Initial Critical Studies” (2012–2016)

3.6.1. Training cluster: analysis of Co-citations

An evolution of SLO management models is seen from 2012, joining governance issues, social acceptance measurement, and community impact perception as influence criteria for SLO obtainment, and thus

starting the fourth stage, that being the evolution of SLO management models (2012–2016). The clusters formed by the theoretical body adopted by the authors present in this stage shows a greater integration and connectivity in the construction of and attention to SLO compared to the clusters of previous stages. However, we still identify three clusters with authors who adopt different knowledge to theorise on SLO, represented by the denser lines in Fig. 7.

From the groupings formed by the co-citations, we identified three clear clusters with different conceptual lines adopted to theorise SLO:

- Social Acceptance, Metrics and Governance Cluster:** the main themes highlighted in this cluster are led by the studies of Thomson and Boutilier (2011), Prno (2013), Prno and Scott Slocombe (2012), Prno and Slocombe (2014), and Moffat and Zhang (2014). The cluster formed also shows a strong connection to the study by Joyce and Thomson (2000). Other peripheral studies are also adopted by cluster authors, providing a mixed theoretical body, such as the adoption of the study by Gunningham et al. (2004), which theorises SLO through a legal lens. This cluster is also linked strongly to the Impact Assessment cluster.
- Environmental Disclosure and Legitimacy Theory Cluster:** these stand out in group especially the adoption of Deegan's studies (of several years) based on the Theory of Organisational Legitimacy (Lindblom, 1994) related to social performance and its disclosure. In the same cluster, co-citations are identified about mining and oil company BHP Billiton, an Anglo-Australian company based in Melbourne, Australia.
- Impacts Assessment Cluster:** this is clearly the main theme in group, led by Vanclay's vast academic production, an important reference for knowledge construction of SLO, as well as studies by Esteves regarding the contribution to SLO made by the social investments made by mining companies, including a criticism of the paternalism of the companies when assuming the functions of the state. Other studies also stand out in the cluster and adopt the narrative of impact, namely Kemp et al. (2016), Franks et al. (2014), Dare et al. (2014), Hanna et al. (2014), Hanna (2016), O'Faircheallaigh and Corbett (2016), O'Faircheallaigh and Gibson (2012), and Brueckner (2014). However, it is the studies of Vanclay (2012) and Esteves et al. (2012) that are most adopted, evidenced by the denser lines that represent a greater quantity of co-citations.

- Sustainable Development and Mining Cluster:** although this cluster has a more homogeneous distribution of citations, it draws together prominent literature on sustainable development and corporate social responsibility in the mining sector, linking to previous influential studies of corporate social responsibility (Carroll and Shabana, 2010) and stakeholder management (Freeman, 2010; Freeman et al., 2007). For example, Hilson and Murc (2000) discuss options for reconciling sustainable development and mining operations, whereas the study by Hilson and Basu, 2003 presents a series of indicators of sustainable development to be applied in mining activities. Other relevant studies in the cluster address the importance of information disclosure as a tool to support the legitimatisation of mining enterprises (Jenkins and Yakovleva, 2006) and the between social license and social responsibility practices (Slack, 2012).

The stage four clusters show, for the first time, the significance of the relationships established in the two main co-citation clusters, indicating the strong relationship of the marrying of these studies to the formation of the field of knowledge about SLO, linking back to studies on corporate social responsibility and legal perspectives in the previous stages. On the one hand there is the impact assessment resulting from Vanclay's studies. On the other hand, there is the governance model of Prno's studies and the measurement of SLO, with an emphasis on the studies of Moffat and Zhang.

3.6.2. Analysis of citations

In the citations of the fourth stage (2012–2016), presented in Fig. 7, the intangibility of SLO and its complex measurement are points reinforced by the authors. From then on, the complexity of SLO is highlighted by the multiplicity of actors and their different outlooks, in contrast to the unilaterality of the company vision that often prevailed in previous stages. In this stage, studies by Prno and Slocombe (2012), Prno's articles (2013; 2014) stand out as key influencers in the development of future work. Prno and Slocombe (2014) surveyed mines in Northern Canada and provided a new paradigm for SLO, adding governance issues and identifying influences for SLO obtainment and maintenance. Key influences include collaborative governance, the adoption of sustainable practices, and the company's adaptability to address the complexity of different social contexts and community expectations. Another prominent study, being a strong influencer of future research, is the work of Moffat and Zhang (2014). The authors

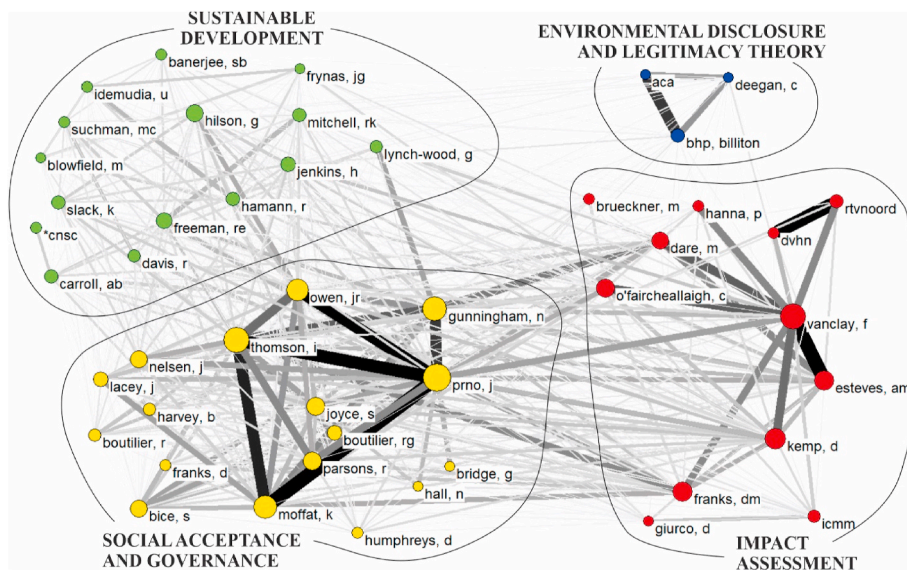


Fig. 7. Authors' co-citation networks and theoretical lines of SLO evolution (2012–2016). Note: SLO co-citation networks based on WoS data using Pajek software and in-depth critical analysis of the three clusters. Source: Research results.

contribute new variables to SLO through a social acceptance measurement model (Moffat and Zhang, 2014). The management model, based on social acceptance, contributes to dialogue and trust building in the relationships between the company and the parties affected by the enterprise. They present an integrative model for SLO, based on the trust and acceptance of mining company operations by the local community.

In the same year, the influence of Boutilier's (2014) study in relation to SLO management models is revealed. The study, previously published by Thomson and Boutilier (2011) in handbook format, systemises a process to achieve and maintain SLO, proposing a model with a scale of levels of acceptance of the company by the community. It's important to highlight that the studies of Prno (2013); Prno and Slocombe (2014); Prno and Slocombe (2012), Moffat and Zhang (2014), and Boutilier (2014), become key influencers of future research and management models in SLO. Franks et al. (2014) interviewed 50 mining companies in various countries to typify and quantify costs associated with conflicts with the local community, demonstrating the importance of management in the business-community relationship. However, the fourth phase also marks the emergence of a different academic perspective of the SLO process. From 2012, SLO management models evolved from a unilateral view of social risks to the company, to the need to consider industry risk to local communities.

Other studies stand on the stage as clear influencers and contributors to the knowledge construction of SLO, albeit with a lower intensity than those previously mentioned. In that regard, Franks and Cohen (2012) identify that SLO is susceptible to influences over time, demanding continuous negotiation between the company and the community for its legitimacy. Vanclay (2012) adds to SLO studies the need to predict and mitigate the potential social impact generated by the enterprise, and the intensity of impact being seen according to each social subgroup being affected differently and having differing interests. Vanclay's studies, a benchmark in social impact assessment, add the need to consider the role of perceptions of risk for impacted communities.

This period also marks a surge in critical studies to SLO framing. In an extremely well-cited critical review of SLO, Owen and Kemp (2013) reaffirm a consensus in the literature that the population potentially impacted by the venture is the main actor in granting an SLO. They warn of the reductionism of companies' views of populations who live around them, with gaps between what the company assumes are its main impacts, and those that the community actually perceives as important. Further pursuing a critical perspective on SLO management concepts and models, Parsons and Moffat (2014) critique how mining industries shape social license discourse in ways that can reduce tensions and conflicts, while perpetuating asymmetric power relationships. Demuijnck and FASTERLING (2016) criticise the use of community relations and investment strategies by companies to gain the trust of local stakeholders, while at the same time community damage is hidden or disregarded. They argue that therefore, legitimisation is created from opaque processes of disinformation and manipulation of the community. Demuijnck and FASTERLING (2016) deconstruct the normative ideal of SLO, which assumes that populations, although vulnerable, can evaluate the actions of business organisations in order to legitimise, or not, operations that have potential social and environmental impact.

In this evolutionary stage, there is a consensus that sustainability, or triple-bottom line principles must be met before SLO is granted: local communities must believe that a company's social, environmental, and economic benefits outweigh its potential social, environmental, and economic impacts. The importance of transparency and fair process is also noted in this stage.

3.7. Evolutionary Fifth Stage "Critical Studies and Increasing Complexity" (2017–2019)

3.7.1. Formative cluster/analysis of Co-citations

More recently, the two main perspectives identified in the previous evolutionary stage have been consolidated as influential lines in SLO

debate. On the one hand there are critical studies discussing the limits of SLO, and on the other, studies are aimed at improving management and measurement models. The cluster formed by the co-citations of the fifth evolutionary stage, differs from the previous ones by a particularly strong connection between the studies of four authors, that is, a polarisation of the use of the studies by Prno, Moffat, Owen, and Thomson. Therefore from 2017, clusters formed by the theoretical body of knowledge in SLO become more focused. The theoretical support of the theme becomes shared. The groups are no longer isolated as they were in the previous stages, and they increasingly feed on the rich knowledge generated from on SLO research, either to advance this knowledge or to counter it. The denser lines of the cluster in Fig. 8, below, represent the main studies adopted in co-citations to support SLO narratives.

3.7.2. Analysis of citations

In the 5th evolutionary stage (2017–2019) presented in Fig. 8, there is an emergence of further critical studies, such as the study of Demajorovic et al. (2019), which highlights how the SLO model implemented by the Brazilian mining company Samarco contributed to the silencing of risks to community and to business itself, enabling one of the worst disasters related to the operation of mining projects. Studies on management models continue to be developed and refined, especially Boutilier and Zdziarski (2017) and Luke (2017), in the search for refinement of SLO measurement. Boutilier and Zdziarski (2017) reinforce the method already developed, adding social perception in the assessment of the quality of the business-community relationship, including items related to the distributive justice of the benefits generated by the enterprises. Luke (2017), in turn, brings light to studies on the measurement of SLO by proposing a critical model reflecting the pyramid proposed by Thomson and Boutilier (2011). Luke (2017) assesses the dynamics of a social resistance movement against an unconventional gas company, which results in the industry's regional loss of SLO. The Thomson and Boutilier pyramid (2011) are thus expanded to provide a diamond model for measuring SLO, which also highlights processes involved in social resistance, leading to SLO loss. Also encompassing new dimensions of increasing complexity, the relationship between gender issues and SLO gain ground in the debate. The study of Measham and Zhang (2019) show distinct differences in perceptions between men and women in regards to the associated risks and environmental impacts of mining activities, with women evaluating the procedural fairness of mining companies and their economic benefits more negatively than men, thus reducing their trust and negatively impacting the company's SLO.

Beyond management models, in this stage the critique and deconstruction of SLO concepts continues from the previous stage and consolidates itself. In that regard, Gehman et al. (2017) and Meesters and Behagel (2017) play a role, criticising the unilaterality of SLO narratives while reinforcing a need to draw on community perceptions of industrial activities that may impact them. Esteves et al. (2017) describe an emphasis on the adoption of strategies to improve company reputation for encouraging minimal opposition to the enterprise, since community resistance can directly affect company profitability via delays in production or increased levels of government regulation. They argue that through ongoing and transparent dialogue with a community, companies can minimise risks and enhance understandings of the economic benefits of a project, while addressing community fears around potential risks. Meesters and Behagel (2017) critique an over-emphasis on developing industry actions to promote local economic benefits, as a central theme in SLO case studies: an example of a misused idea to ensure SLO. Luke et al. (2018) conducted a thorough literature review of literature related to SLO in the Australian extractive sector, identifying conceptual issues for further exploration, including how an SLO evolves across space and time, and in relationship to other potentially impacted natural resources such as water and climate. As with many others, their research points out that there is much work yet to be done in the SLO space.

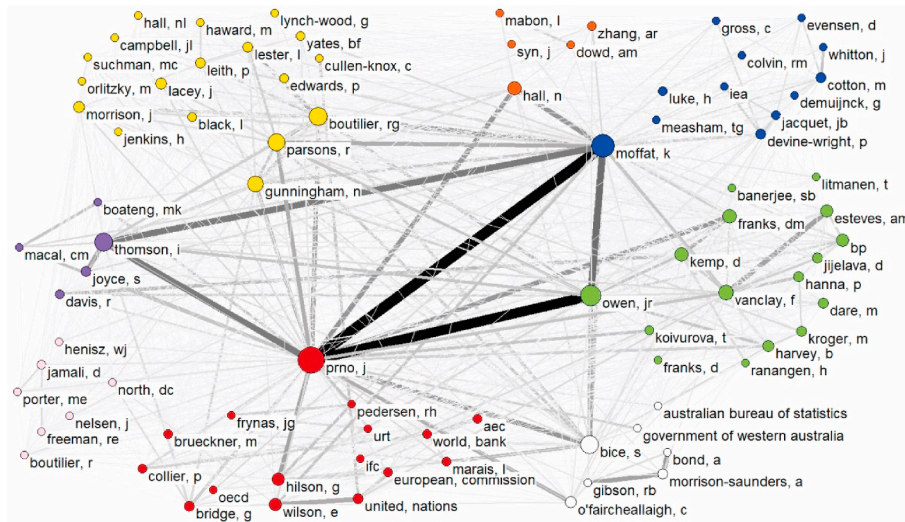


Fig. 8. Authors' co-citation networks and theoretical lines of SLO evolution (2017–2019).

Notes: SLO co-citation networks based on WoS data using Pajek software and in-depth critical analysis of the five clusters. Source: Research results.

One of the greatest challenges along this path is the growing number of sectors under discussion in regard to SLO. Most current debates are still driven by experiences in mining contexts. As Mather and Fanning (2019) claim, it is important to examine to what extent knowledge about models and critical studies applied to the mining sector could progress to other sectors such as aquaculture and farming.

A comparative analysis of clusters generated by stages of evolution shows that while early research drew heavily on other fields, such as from anthropology and engineering, studies specifically focused on citing primarily SLO literature are identified from 2017, 21 years after the

publication of the first identified publication (1996). Thus, SLO then emerges as a self-sufficient field of knowledge, no-longer borrowing knowledge from other fields for its intellectual development. Studies become theoretically based, with more rigor as the search for SLO management models continues (Fig. 9).

4. SLO trends and conclusions

The evolution of SLO using a longitudinal systematic review over 24-years, along with citation and co-citation analysis, social network

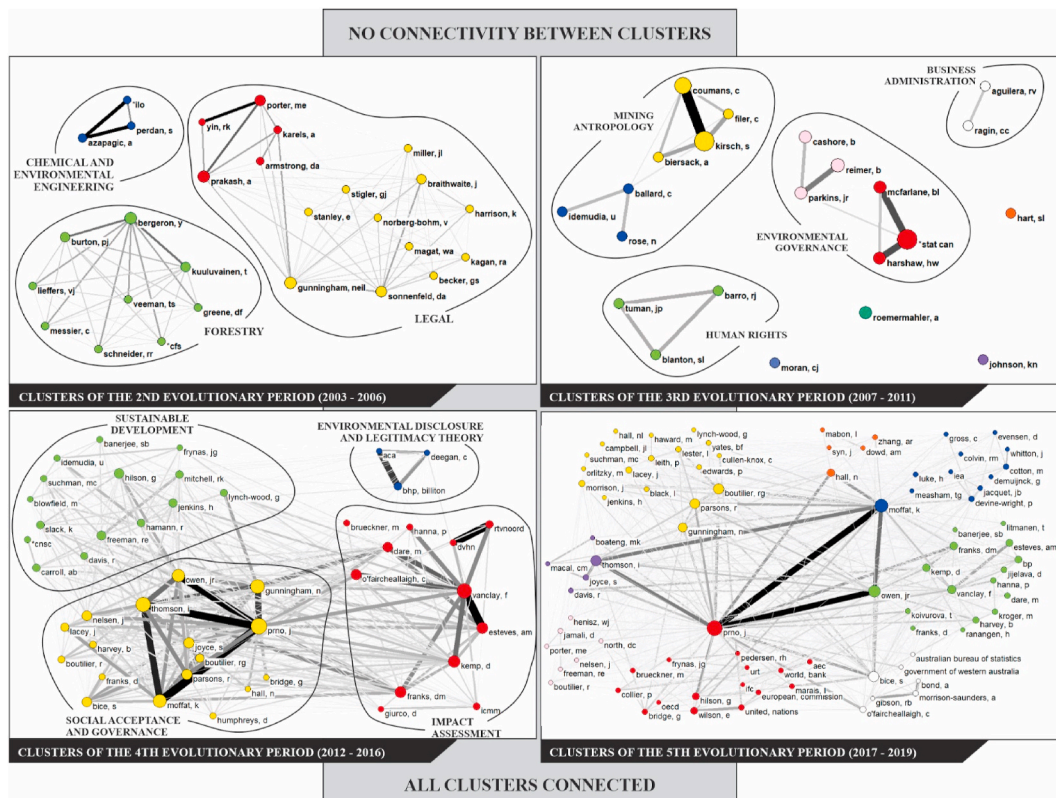


Fig. 9. Author's co-citation networks and the theoretical evolution over the last 24 years of SLO research (1996–2019).

Source: Prepared by the authors.

analysis, and bibliometric techniques, identifies trends in research flows, showing how researchers working in the SLO space merged their experiences from disassociated clusters, with increasing density being added to the theoretical body in the last six years. The organisation and analysis of this knowledge has made the tracing of SLO trends possible, helping to envision future research and provide companies with a broad managerial view of the subject.

This article highlights the increasing importance of SLO in recent research related to developments in various extractive sectors, and in particular the minerals and mining sector, including oil and gas extractive industries, which composes 43% of all articles on SLO identified in the WoS scientific database. However, it is possible also to identify a growing number of economic and industrial sectors that are paying increasing attention to their SLO in recent years. Articles include research on everything from animal welfare and aquaculture, to public health, finance and sports organisations. In addition to the growth in number of publications and its diversification, this article also discusses the process of how different fields of knowledge influenced the construction of SLO knowledge, impacting on the practices of very diverse sectors. In this process, it is important to understand why some sectors, such as the mining sector, have embraced this discourse and led it, while others are picking it up more recently. For the mining sector, SLO was listed as the most salient risk in risk rankings published by Ernst and Young in 2018–2019, having risen no less than 6 positions in relation to the previous publication, where it occupied the seventh position (Mitchell, 2018). The same publication updated with the ranking risks for the period of 2019–2020 show that SLO continues to remain at the top of mining industry concerns (Mitchell, 2018).

It could be considered that the tragedy of the Samarco dam breach in Brazil in 2015, which continues to paralyse the operations of the company until this present day (Demajorovic et al., 2019), followed by the most recent catastrophe of Brumadinho, contribute to the understanding of the greater importance of SLO within the sector during recent years. However, seeking the origins of SLO allows for a much deeper analysis. Part of the answer is highlighted per Morrison (2014) when he mentions that SLO is a term “*invented by Business, for Business*”, that is, to seek alternatives to legitimise mining projects in the eyes of local populations, while reducing risks associated with social resistance and conflicts that can directly affect profitability, production, and reputation. Against this backdrop, this systematic review revealed a decisive influence of class associations and consultancies on early SLO literature (1996–2002). In addition, the development of SLO shows the important influence of the forestry literature in its initial cluster (2003–2006), followed by the contribution of anthropology and human rights in the third stage of clusters (2008–2011). However, those contributing a critical view of SLO practices were shown to be relegated to secondary place as the SLO debate progressed.

From that point forward, the predominant instrumental approach in the literature is based on the argument that it is necessary to go beyond recognizing the need for social acceptance by the community alone (2012–2016), making it essential to ensure that the company anticipates conflicts through the ongoing management of the SLO process. During this period, there is a notable growth in studies focused on management models of SLO which relate back to the origins of SLO literature, considering early contributions from the industry itself and from consulting firms. Legitimation of the company, governance, reputation, acceptance, and trust in the company and governance processes are predominant themes originating from an industry perspective, prioritising risks to the business in a more nuanced way.

Therefore, SLO focuses more intensely on developing an instrumental approach, related to the improvement of management models, in order to ensure the legitimacy of mining enterprises with regard to their multiple stakeholders and especially, the local community. Through this process, the citation analysis indicated a heavy representation of studies in the area of industry’s engagement approaches in theoretical constructions, while at the same time a muting of contributions from other

areas that could broaden the understanding of the complexity of social licence processes in different contexts. Investigations of important funding sources (including those shown in Fig. 3) suggest that there may be a relationship between industry funded research and this salient research focus, suggesting further investigations in this space could prove enlightening.

The needs of the company, in the face of conflicts and resistance from local communities, shape SLO according to the risks to the business, and can distance it from the interests of the communities that accommodate them. As a result, this instrumental bias is increasingly valued through the third and fourth stages in the theoretical construction of SLO, in which besides managing SLO, it is also necessary to measure it. However, as inferred above, it can be perceived that some models may be created in an uncritical context. The predominance of SLO research based on management models and measuring trust and acceptance of community towards mining projects leads us to consider this finding in relation to funding agencies. The world’s leading financial organisations are supported by industry itself, which, as discussed in this paper, played a key role in fostering SLO as an important consideration in mining activities. Thus, it would be important to ask whether more critical studies would have comparable opportunities to access research funding. After all, as Kemp et al. (2016) states, companies tend to be prioritised and manage risks to the business, disregarding in numerous examples the risks to community. In this context, the instrumental measurement models, which meet the more urgent needs of companies to manage the relationship with communities, may be prioritised in the distribution of available resources. Although this inference depends on future research to deepen the discussion, the process of SLO taking this more well-worn path has an inherent danger of disregarding the local context and its specificities. This could also pave the way for the emergence of a new avenue of critical studies which bring to light another argument, that of the fragility of SLO, hitherto constructed and limited to the vision of the business. In fact, the growing interest in critical studies can be already observed in stage 4 with the emerging of works that will have an important influence on SLO debate (Owen and Kemp, 2013; Parsons and Moffat, 2014; Kemp et al., 2016; Demuijnck and Festerling, 2016). It is notable how these studies increasingly question the way in which social acceptance can be engineered or manipulated.

An expansion of the critical trend, notably emerging in the fourth period, is evident from the most recent evolutionary stage of SLO (2017–2019), which advances in parallel with its instrumental bias. Recent work underlines the role of social projects being sold as social responsibility programs when in fact they may serve more to shield companies in order to uphold their reputation and dampen conflicts (Meesters and Behagel, 2017), while at the same time concealing risks to the community (Demajorovic et al., 2019). Therefore, on the one hand, the models to measure trust and social acceptance, captained by authors such as Moffat and Zhang, continue to advance, including new variables, as a matter of gender and SLO (Meashan and Zhang, 2019). On the other, there is a great development of critical studies based on the works of Owen and Kemp (2013) questioning the risks of mineral operations from the perception of communities and to the detriment of business risks. The SLO concept is also more firmly linked to the field of social resistance (Luke, 2017). In turn, the perception of the omission of risks to the community in the practice of SLO, and likewise the fragility of models to measure the environmental and social dimension of projects in the perception of the community, opens the door to a third path. The work of Vanclay and Esteves, a major influencer on this path, highlights the importance of thinking beyond the need to evaluate the quality of relationships and the perception of how mining projects impact the economic conditions and infrastructure of the territory. From this perspective, the community perceptions of potential impacts can be valued from ‘the first rumour of a project’, including how the community suffers impacts in their various dimensions, including in relation to their cultural and environmental context (Parsons et al., 2019).

The arrival of new areas of knowledge in the construction of SLO narratives points to issues for further investigation and future research paths. First, by moving beyond the mining sector, such as some recent studies in the areas of biosecurity (Ogilvie et al., 2019), biotechnology (Thresher et al., 2019), and aquaculture (Mather and Fanning, 2019), etc, these studies with their specific contexts, could provide new governance arrangements that could ensure a more equitable relationship in the SLO process between companies, communities and the public sector. Second, gender issues, as enhanced by Meashan and Zhang (2019), could provide new insights for more effective SLO processes. Although, studies in the mining sector have advanced in qualifying the distinguished impacts among gender, few studies focus on this issue regarding SLO. Considering the more critical attitude of women towards the process of acceptance of mining projects, cited by Meashan and Zhang (2019), future research on how to improve female engagement in the SLO processes could help to mitigate some of the asymmetric power relations identified. Third, when thinking about SLO from a critical perspective and including social impact assessment in this process, the importance of changing is emphasised. Starting by integrating social impact assessment throughout the project cycle opens the way for a transition from an SLO approach that is no longer objective, to being the result of preventive and compensatory measures to broaden benefits and lessen negative impacts (e.g. Parsons et al., 2019). Finally, considering that management models were largely organised by researchers and funding agencies located in developed countries, it is necessary to include cases and debates addressing common themes in developing or underdeveloped countries, focusing on elements such as social vulnerability and local economic dependency on a company or industry. The deepening and extension of SLO studies in these contexts can contribute to minimising power asymmetries in the relationships between local communities, companies and government. Understanding how to expand public engagement and participation in vulnerable territories, and adapting SLO models to this reality, as well as improving understandings of how this process can strengthen formal community input into land-use planning and decision-making, is essential for supporting long-term resilience for affected communities and landscapes. From this, new governance models may emerge that can better balance the needs of community and industry, in relation to considering economic, social, environmental and benefits for all concerned, for proposed and existing activities and developments, across industries.

Endnotes

¹The search was performed with articles published until December 31, 2019.

CRediT authorship contribution statement

Ana Lúcia Santiago: Conceptualization, Methodology, Software, Validation, Formal analysis, Investigation, Data curation. **Jacques Demajorovic:** Conceptualization, Methodology, Software, Validation, Formal analysis, Investigation, Data curation. **Dennys Eduardo Rossetto:** Conceptualization, Methodology, Software, Validation, Formal analysis, Data curation. **Hanabeth Luke:** Conceptualization, Formal analysis, Data curation.

Acknowledgments

The authors would like to thank our funders (1) Technology and Innovation for Sustainability Managing of Vale Company; (2) National Council for the Improvement of Higher Education–CAPES from the Brazilian Ministry of Education (Grant n° 88882.317243/2019-01 PNP/DCAPES), (3) The University Center of FEI, and (4) all reviewers and people who contributed with their suggestions and feedbacks.

References

- Aguilera, R.V., Rupp, D.E., Williams, C.A., Ganapathi, J., 2007. Putting the S back in corporate social responsibility: a multilevel theory of social change in organizations. <https://doi.org/10.5465/amr.2007.25275678>, 32,3, 836–863.
- Aria, M., Cuccurullo, C., 2017. bibliometrix: an R-tool for comprehensive science mapping analysis, 2017/11/01/ Journal of Informetrics 11 (4), 959–975. <https://doi.org/10.1016/j.joi.2017.08.007>.
- Ballard, C., 1997. It's the land, stupid! the moral economy of resource ownership in Papua New Guinea. In: Larmour, P. (Ed.), *The Governance of Common Property in the Pacific Region*. Australian National University, pp. 47–65.
- Barrett, D., Moran, C., Cote, C., 2010. A method for estimating the potential trading of worked water among multiple mines [article]. *Jun Mine Water Environ.* 29 (2), 92–98. <https://doi.org/10.1007/s10230-010-0110-8>.
- Batagelj, V., Mrvar, A., 1996. Pajek V.2.05. <http://pajek.imfm.si/>.
- Bellardo, T., 1980. The use of Co-citations to study science. *Library Research* 2 (3), 231–237.
- Bice, S., Brueckner, M., Pforr, C., 2017. Putting social license to operate on the map: a social, actuarial and political risk and licensing model (SAP Model) [Article]. *Sep Resour. Pol.* 53, 46–55. <https://doi.org/10.1016/j.resourpol.2017.05.011>.
- Blanton, S.L., Blanton, R.G., 2009. A sectoral analysis of human rights and FDI: does industry type matter? [Article]. *Jun Int. Stud. Q.* 53 (2), 469–493. <https://doi.org/10.1111/j.1468-2478.2009.00542.x>.
- Boutillier, R.G., 2014. Frequently asked questions about the social licence to operate [Article]. *Impact Assess. Proj. Apprais.* 32 (4), 263–272. <https://doi.org/10.1080/14615517.2014.941141>.
- Boutillier, R.G., Zdziarski, M., 2017. Managing stakeholder networks for a social license to operate [Article]. *Construct. Manag. Econ.* 35 (8–9), 498–513. <https://doi.org/10.1080/01446193.2017.1289229>.
- Brueckner, Martin, et al., 2014. The civic virtue of developmentalism: on the mining industry's political licence to develop Western Australia. *Impact Assess. Proj. Apprais.* 32 (4), 315–326. <https://doi.org/10.1080/14615517.2014.929784>.
- Brueckner, M., Eabrasu, M., 2018. Pinning down the social license to operate (SLO): the problem of normative complexity, 2018/12/01/ *Resour. Pol.* 59, 217–226. <https://doi.org/10.1016/j.resourpol.2018.07.004>.
- Bunnell, F., 2013. Social licence in British Columbia: some implications for energy development [research paper], 2013-10-21 *Journal of Ecosystems and Management* 14 (2). <https://jem-online.org/index.php/jem/article/view/550>.
- Burt, R.S., 1977. Positions in multiple network systems, Part One: a general conception of stratification and prestige in a system of actors cast as a social typology. *Soc. Forces* 56 (1), 106–131. <https://doi.org/10.1093/sf/56.1.106>.
- Burton, P.J., Messier, C., Adamowicz, W.L., Kuuluvainen, T., 2006. Sustainable management of Canada's boreal forests: progress and prospects [Proceedings Paper]. *Ecoscience* 13 (2), 234–248. <https://doi.org/10.2980/11195-6860-13-2-234.1>.
- Carroll, A.B., Shabana, K.M., 2010. The business case for corporate social responsibility: a review of concepts, research and practice. *Int. J. Manag. Rev.* 12 (1), 85–105. <https://doi.org/10.1111/j.1468-2370.2009.00275.x>.
- Cullen-Knox, C., Haward, M., Jabour, J., Ogier, E., Tracey, S.R., 2017. The social licence to operate and its role in marine governance: insights from Australia [Article]. *May Mar. Pol.* 79, 70–77. <https://doi.org/10.1016/j.marpol.2017.02.013>.
- Culnan, M.J., 1986. The intellectual development of management information systems, 1972–1982: a Co-citation analysis. *Manag. Sci.* 32 (2), 156–172. <https://doi.org/10.1287/mnsc.32.2.156>.
- Culnan, M.J., 1987. Mapping the intellectual structure of mis, 1980-1985: a Co-citation analysis. *MIS Q.* 341–353. <https://doi.org/10.2307/248680>.
- Culnan, M.J., O'reilly, C.a., Chatman, J.A., 1990. Intellectual structure of research in organizational behavior, 1972–1984: a cocitation analysis. *J. Am. Soc. Inf. Sci.* 41 (6), 453–458. [https://doi.org/10.1002/\(SICI\)1097-4571\(199009\)41:6<453::AID-ASI13>3.0.CO;2-E](https://doi.org/10.1002/(SICI)1097-4571(199009)41:6<453::AID-ASI13>3.0.CO;2-E).
- Dare, M., Schirmer, J., Vanclay, F., 2014. Community engagement and social licence to operate [Article]. *Impact Assess. Proj. Apprais.* 32 (3), 188–197. <https://doi.org/10.1080/14615517.2014.927108>.
- Demajorovic, J., Lopes, J.C., Santiago, A.L.F., 2019. The Samarco dam disaster: a grave challenge to social license to operate discourse, 2019/06/01/ *Resour. Pol.* 61, 273–282. <https://doi.org/10.1016/j.resourpol.2019.01.017>.
- Demuijnck, G., Fasterling, B., 2016. The social license to operate [article]. *Jul J. Bus. Ethics* 136 (4), 675–685. <https://doi.org/10.1007/s10551-015-2976-7>.
- Ednie, H., 2002. Sustainable development - toward a social license to operate [Article]. *Jul Cim. Bull.* 95 (1063), 11–14. <Go to ISI>://WOS:00017748100002.
- Egghe, L., 2006. An improvement of the H-index: the G-index. *ISSI newsletter* 2 (1), 8–9.
- Esteves, A.M., Barclay, M.A., 2011. New approaches to evaluating the performance of corporate-community partnerships: a case study from the minerals sector [article]. *Oct J. Bus. Ethics* 103 (2), 189–202. <https://doi.org/10.1007/s10551-011-0860-7>.
- Esteves, A.M., Factor, G., Vanclay, F., Gotzmann, N., Moreira, S., 2017. Adapting social impact assessment to address a project's human rights impacts and risks [Article]. *Nov Environ. Impact Assess. Rev.* 67, 73–87. <https://doi.org/10.1016/j.eiar.2017.07.001>.
- Esteves, Ana, Franks, Daniel, Vanclay, Frank, 2012. Social impact assessment: the state of the art. *Impact Assess. Proj. Apprais.* 30 (1), 34–42. <https://doi.org/10.1080/14615517.2012.660356>.
- Evangelinos, K.I., Oku, M., 2006. Corporate environmental management and regulation of mining operations in the Cyclades, Greece [Article]. *J. Clean. Prod.* 14 (3–4), 262–270. <https://doi.org/10.1016/j.jclepro.2004.10.003>.
- Filer, C., 2012. Dilemmas of Development: the Social and Economic Impact of the Porgera Gold Mine, 1989-1994. ANU E Press.

- Ford, R.M., Williams, K.J.H., 2016. How can social acceptability research in Australian forests inform social licence to operate? [Article]. *Sep Forestry* 89 (5), 512–524. <https://doi.org/10.1093/forestry/cpv051>.
- Franks, D.M., Cohen, T., 2012. Social Licence in Design: constructive technology assessment within a mineral research and development institution [Article]. *Sep Technol. Forecast. Soc. Change* 79 (7), 1229–1240. <https://doi.org/10.1016/j.techfore.2012.03.001>.
- Franks, D.M., Davis, R., Bebbington, A.J., Ali, S.H., Kemp, D., Scurrah, M., 2014. Conflict translates environmental and social risk into business costs [10.1073/pnas.1405135111]. *Proc. Natl. Acad. Sci. Unit. States Am.* 111 (21), 7576. <http://www.pnas.org/content/111/21/7576.abstract>.
- Freeman, R.E., 2010. *Strategic Management: A Stakeholder Approach*. Cambridge university press.
- Freeman, R.E., Harrison, J.S., Wicks, A.C., 2007. *Managing for Stakeholders: Survival, Reputation, and Success*. Yale University Press.
- Fruchterman, T.M., Reingold, E.M., 1991. Graph drawing by force-directed placement. *Software Pract. Ex.* 21 (11), 1129–1164. <https://doi.org/10.1002/spe.4380211102>.
- Gallois, C., Ashworth, P., Leach, J., Moffat, K., 2017. The language of science and social licence to operate [Article]. *Jan J. Lang. Soc. Psychol.* 36 (1), 45–60. <https://doi.org/10.1177/0261927x16663254>.
- Garfield, E., Merton, R.K., 1979. *Citation Indexing: its Theory and Application in Science, Technology and Humanities*, vol. 8. Wiley, New York.
- Gehman, J., Lefsrud, L.M., Fast, S., 2017. Social license to operate: legitimacy by another name? [Article]. *Jun, 60. Canadian Public Administration-Administration Publique Du Canada*, pp. 293–317. <https://doi.org/10.1111/capa.12218.2>.
- Gifford, B., Kestler, A., 2008. Toward a theory of local legitimacy by MNEs in developing nations: Newmont mining and health sustainable development in Peru [Article]. *Dec J. Int. Manag.* 14 (4), 340–352. <https://doi.org/10.1016/j.intman.2007.09.005>.
- Gjolberg, M., 2009. The origin of corporate social responsibility: global forces or national legacies? [Article]. *Oct Soc. Econ. Rev.* 7 (4), 605–637. <https://doi.org/10.1093/ser/mwp017>.
- Gmür, M., 2003. Co-citation analysis and the search for invisible colleges: a methodological evaluation. *Scientometrics* 57 (1), 27–57. <https://doi.org/10.1023/a:1023619503005>.
- Gunningham, N., Kagan, R.A., Thornton, D., 2004. Social license and environmental protection: why businesses go beyond compliance [Article]. *Spr Law and Social Inquiry-Journal of the American Bar Foundation* 29 (2), 307–341. <https://doi.org/10.1111/j.1747-4469.2004.tb00338.x>.
- Gupta, S., Kumar, A., 2018. Social licence to operate: a review of literature and a future research agenda. *Social Business* 8 (2), 187–203. <https://doi.org/10.1362/204440818X15333820366450>.
- Hanna, Philippe, et al., 2016. Conceptualizing social protest and the significance of protest actions to large projects. *The Extractive Industries and Society* 3 (1), 217–239. <https://doi.org/10.1016/j.exis.2015.10.006>.
- Hanna, Philippe, Vanclay, Frank, Langdon, Esther, Arts, Jos, 2014. Improving the effectiveness of impact assessment pertaining to Indigenous peoples in the Brazilian environmental licensing procedure. *Environ. Impact Assess. Rev.* 46, 961–971. <https://doi.org/10.1016/j.eiar.2014.01.005>.
- Hilson, G., Basu, A.J., 2003. Devising indicators of sustainable development for the mining and minerals industry: an analysis of critical background issues. *Int. J. Sustain. Dev. World Ecol.* 10 (4), 319–331. <https://doi.org/10.1080/13504500309470108>.
- Hilson, G., Murck, B., 2000. Sustainable development in the mining industry: clarifying the corporate perspective. *Resour. Pol.* 26 (4), 227–238. [https://doi.org/10.1016/S0301-4207\(00\)00041-6](https://doi.org/10.1016/S0301-4207(00)00041-6).
- Hirsch, J.E., 2005. An index to quantify an individual's scientific research output. *Nov 15 Proc. Natl. Acad. Sci. U. S. A.* 102 (46), 16569–16572. <https://doi.org/10.1073/pnas.0507655102>.
- Idemudia, U., 2009. Assessing corporate-community involvement strategies in the Nigerian oil industry: an empirical analysis [Article]. *Sep Resour. Pol.* 34 (3), 133–141. <https://doi.org/10.1016/j.resourpol.2009.01.002>.
- Jenkins, H., Yakovleva, N., 2006. Corporate social responsibility in the mining industry: exploring trends in social and environmental disclosure. *J. Clean. Prod.* 14 (3–4), 271–284. <https://doi.org/10.1016/j.jclepro.2004.10.004>.
- Joyce, S., Thomson, I., 2000. Earning a social licence to operate: social acceptability and resource development in Latin America [Article]. *Feb Cim. Bull.* 93 (1037), 49–53. <https://doi.org/10.1016/j.resourpol.2018.05.014>.
- Kagan, R.A., Thornton, D., Gunningham, N., 2003. Explaining corporate environmental performance: how does regulation matter? [Article]. *Mar Law Soc. Rev.* 37 (1), 51–90. <https://doi.org/10.1111/1540-5893.3701002>.
- Karakaya, E., Nuur, C., 2018. Social sciences and the mining sector: some insights into recent research trends, 2018/10/01/ *Resour. Pol.* 58, 257–267. <https://doi.org/10.1016/j.resourpol.2018.05.014>.
- Kelly, R., Pecl, G.T., Fleming, A., 2017. Social licence in the marine sector: a review of understanding and application [Article]. *Jul Mar. Pol.* 81, 21–28. <https://doi.org/10.1016/j.marpol.2017.03.005>.
- Kemp, D., Worden, S., Owen, J.R., 2016. Differentiated social risk: rebound dynamics and sustainability performance in mining [Article]. *Dec Resour. Pol.* 50, 19–26. <https://doi.org/10.1016/j.resourpol.2016.08.004>.
- Lester, L., 2016. Media and social licence: on being publicly useful in the Tasmanian forests conflict [Article]. *Sep Forestry* 89 (5), 542–551. <https://doi.org/10.1093/forestry/cpw015>.
- Lievrouw, L.A., 1990. Reconciling structure and process in the study of scholarly communication. In: Borgman, C.L. (Ed.), *Scholarly Communication and Bibliometrics*. Sage, pp. 59–69.
- Lindblom, C.K., 1994. *The Implications of Organizational Legitimacy for Corporate Social Performance and Disclosure*. Critical Perspectives on Accounting Conference, New York, 1994.
- Luke, H., 2017. Social resistance to coal seam gas development in the Northern Rivers region of Eastern Australia: proposing a diamond model of social license to operate [Article]. *Dec Land Use Pol.* 69, 266–280. <https://doi.org/10.1016/j.landusepol.2017.09.006>.
- Luke, H., Brueckner, M., Emmanouil, N., 2018. Unconventional gas development in Australia: a critical review of its social licence. *The Extractive Industries and Society* 5 (4), 648–662. <https://doi.org/10.1016/j.exis.2018.10.006>, 2018/11/01/.
- Mather, C., Fanning, L., 2019. Social licence and aquaculture: towards a research agenda. *Mar. Pol.* 99, 275–282. <https://doi.org/10.1016/j.marpol.2018.10.049>.
- Mazzola, B.G., Esteves, K., 2018. *Gestão de Stakeholders: Fundação renova e o desastre de Mariana*. Dec 2018. XX ENGEMA, São Paulo, SP.
- McCain, K.W., 1990. Mapping authors in intellectual space. A technical overview 41 (6), 433–443. [https://doi.org/10.1002/\(sici\)1097-4571\(199009\)41:6<433::Aid-asi11>3.0.Co;2-q](https://doi.org/10.1002/(sici)1097-4571(199009)41:6<433::Aid-asi11>3.0.Co;2-q).
- Measham, T.G., Zhang, A., 2019. Social licence, gender and mining: moral conviction and perceived economic importance. *Resour. Pol.* 61, 363–368. <https://doi.org/10.1016/j.resourpol.2018.11.001>.
- Meesters, M.E., Behagel, J.H., 2017. The social licence to operate: ambiguities and the neutralization of harm in Mongolia [article]. *Sep Resour. Pol.* 53, 274–282. <https://doi.org/10.1016/j.resourpol.2017.07.006>.
- Miller, T., 2016. Greenwashed sports and environmental activism: formula 1 and FIFA, 2016/11/01 *Environmental Communication* 10 (6), 719–733. <https://doi.org/10.1080/17524032.2015.1127850>.
- Mitchell, P., 2018. *Top 10 Business Risks and Opportunities – 2020*. EY Global.
- Moffat, K., Zhang, A.R., 2014. The paths to social licence to operate: an integrative model explaining community acceptance of mining [Article]. *Mar Resour. Pol.* 39, 61–70. <https://doi.org/10.1016/j.resourpol.2013.11.003>.
- Moore, W.H., 1996. The social licence to operate [Article]. *Oct PIMA Mag.* 78 (10), 22–23. <https://doi.org/10.1016/j.resourpol.2013.11.003>.
- Morrison, John, 2014. *The Social License: How to Keep Your Organization Legitimate*. Palgrave Macmillan UK.
- Nerur, S.P., Rasheed, A.a., Natarajan, V., 2008. The intellectual structure of the strategic management field: an author Co-citation analysis. *Strat. Manag. J.* 29 (3), 319–336. <https://doi.org/10.1002/smj.659>.
- O'Faircheallaigh, Ciaran, Corbett, Tony, 2016. Understanding and improving policy and regulatory responses to artisanal and small scale mining. *Extractive Industries and Society* 3 (4), 961–971. <https://doi.org/10.1016/j.exis.2016.11.002>.
- O'Faircheallaigh, Ciaran, Gibson, Ginger, 2012. Economic risk and mineral taxation on Indigenous lands. *Resour. Pol.* 37 (1), 10–18. <https://doi.org/10.1016/j.resourpol.2011.12.009>.
- Ogilvie, S., McCarthy, A., Allen, W., Grant, A., Mark-Shadbolt, M., Pawson, S., Richardson, B., Strand, T., Langer, E., Marzano, M.J.F., 2019. Unmanned aerial vehicles and biosecurity: enabling participatory-design to help address social licence to operate issues, 10 (8), 695.
- Owen, J.R., Kemp, D., 2013. Social licence and mining: a critical perspective [Article]. *Mar Resour. Pol.* 38 (1), 29–35. <https://doi.org/10.1016/j.resourpol.2012.06.016>.
- Parsons, R., Moffat, K., 2014. Constructing the meaning of social licence. *Soc. Epistemol.* 28 (3–4), 340–363. <https://doi.org/10.1080/02691728.2014.922645>.
- Parsons, R., Everingham, J.-A., Kemp, D., 2019. Developing social impact assessment guidelines in a pre-existing policy context. *Impact Assess. Proj. Apprais.* 37 (2), 114–123. <https://doi.org/10.1080/14615517.2018.1485612>, 2019/03/04.
- Porter, M.E., van der Linde, C., 1995. Toward a new conception of the environment-competitiveness relationship. *J. Journal of Economic Perspectives* 9 (4), 97–118. <https://doi.org/10.1257/jep.9.4.97>.
- Prakash, A., 2000. *Greening the Firm: the Politics of Corporate Environmentalism*. Cambridge University Press.
- Price, D.J.D.S., 1963. *Big Science, Little Science... And beyond*. Columbia University Press.
- Price, D.J.D.S., 1965. Networks of scientific papers. *Jul 30 Science* 149 (3683), 510–515. <https://www.ncbi.nlm.nih.gov/pubmed/14325149>.
- Prno, J., 2013. An analysis of factors leading to the establishment of a social licence to operate in the mining industry [Article]. *Dec Resour. Pol.* 38 (4), 577–590. <https://doi.org/10.1016/j.resourpol.2013.09.010>.
- Prno, J., Scott Slocombe, D., 2012. Exploring the origins of 'social licence to operate' in the mining sector: perspectives from governance and sustainability theories, 2012/09/01/ *Resour. Pol.* 37 (3), 346–357. <https://doi.org/10.1016/j.resourpol.2012.04.002>.
- Prno, J., Slocombe, D.S., 2012. Exploring the origins of 'social licence to operate' in the mining sector: perspectives from governance and sustainability theories [Article]. *Sep Resour. Pol.* 37 (3), 346–357. <https://doi.org/10.1016/j.resourpol.2012.04.002>.
- Prno, J., Slocombe, D., 2014. A systems-based conceptual framework for assessing the determinants of a social licence to operate in the mining industry [article]. *Mar Environ. Manag.* 53 (3), 672–689. <https://doi.org/10.1007/s00267-013-0221-7>.
- Ramos Rodríguez, A.R., Ruiz Navarro, J., 2004. Changes in the intellectual structure of strategic management research: a bibliometric study of the strategic management journal. 1980–2000. *Strategic management journal* 25 (10), 981–1004. <https://doi.org/10.1002/smj.397>.
- Reuters, T., 2014. Web of Science. Retrieved 19/05/2014 from <http://wcs.webofknowledge.com/>.
- Rossetto, D.E., Bernardes, R.C., Borini, F.M., Gattaz, C.C., 2018. Structure and evolution of innovation research in the last 60 years: review and future trends in the field of business through the citations and co-citations analysis [journal article]. *June 01 Scientometrics* 115 (3), 1329–1363. <https://doi.org/10.1007/s11192-018-2709-7>.

- Silva, J.T.M., Ablanedo-Rosas, J.H., Rossetto, D.E., 2018. A longitudinal literature network review of contributions made to the academy over the past 55 years of the IJPR. *Int. J. Prod. Res.* 1–27. <https://doi.org/10.1080/00207543.2018.1484953>.
- Slack, K., 2012. Mission impossible?: adopting a CSR-based business model for extractive industries in developing countries. *Resour. Pol.* 37 (2), 179–184. <https://doi.org/10.1016/j.resourpol.2011.02.003>.
- Small, H., 1973. Co-Citation in the scientific literature: a new measure of the relationship between two documents. *J. Am. Soc. Inf. Sci.* 24 (4), 265–269. <https://doi.org/10.1002/asi.4630240406>.
- Small, H., Boyack, K.W., Klavans, R., 2014. Identifying emerging topics in science and technology, 10 *Res. Pol.* 43 (8), 1450–1467. <https://doi.org/10.1016/j.respol.2014.02.005>.
- Smith, L.C., 1981. Citation analysis. *Libr. Trends* 30 (1), 83–106.
- Spies, T.A., Giesen, T.W., Swanson, F.J., Franklin, J.F., Lach, D., Johnson, K.N., 2010. Climate change adaptation strategies for federal forests of the Pacific Northwest, USA: ecological, policy, and socio-economic perspectives [Article; Proceedings Paper]. *Oct Landsc. Ecol.* 25 (8), 1185–1199. <https://doi.org/10.1007/s10980-010-9483-0>.
- Thomson, I., Boutilier, R.G., 2011. Social license to operate. In: Darling, P. (Ed.), *SME Mining Engineering Handbook*, vol. 1.
- Thornton, D., Kagan, R.A., Gunningham, N., 2003. Sources of Corporate Environmental Performance 46 (1), 127–141. <https://doi.org/10.2307/41166235>.
- Thresher, R.E., Jones, M., Drake, D.A.R., 2019. Stakeholder attitudes towards the use of recombinant technology to manage the impact of an invasive species: sea Lamprey in the North American Great Lakes, 2019/02/01 *Biol. Invasions* 21 (2), 575–586. <https://doi.org/10.1007/s10530-018-1848-3>.
- Üsdiken, B., Pasadeos, Y., 1995. Organizational analysis in North America and Europe: a comparison of Co-citation networks. May 1, 1995 *Organ. Stud.* 16 (3), 503–526. <https://doi.org/10.1177/017084069501600306>.
- Vanclay, F., 2012. The potential application of social impact assessment in integrated coastal zone management [Article]. *Nov Ocean Coast Manag.* 68, 149–156. <https://doi.org/10.1016/j.ocecoaman.2012.05.016>.
- Voyer, M., van Leeuwen, J., 2019. 'Social license to operate' in the Blue economy, 2019/08/01/ *Resour. Pol.* 62, 102–113. <https://doi.org/10.1016/j.resourpol.2019.02.020>.
- White, H.D., McCain, K.W., 1998. Visualizing a discipline: an author Co-citation analysis of information science, 1972–1995. *Journal of the American Society for Information Science* 49 (4), 327–355. [https://doi.org/10.1002/\(SICI\)1097-4571\(19980401\)49:4<327::AID-AS14>3.0.CO;2-W](https://doi.org/10.1002/(SICI)1097-4571(19980401)49:4<327::AID-AS14>3.0.CO;2-W).
- Wilson, B., Wilson, L., 2001. An economic perspective on clearcut harvesting [Article]. *May-Jun For. Chron.* 77 (3), 467–473. <https://doi.org/10.5558/tfc77467-3>.