

Sustainable Livelihoods of Indigenous Community: A Bibliometric Study

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ABSTRACT

Literature has shown the significance of sustainable livelihoods for community development to reduce poverty, address sustainable development goals, and increase well-being. However, indigenous people face threats to their identity, livelihoods, and sustainability. Nevertheless, little attention has been given to analyzing the literature pattern about sustainable livelihoods in indigenous communities through visual representation. This study aims to understand the general state and trend of literature, describe critical topics discussed, and describe the citation, coupling, co-authorship network patterns in the literature associated with indigenous people and sustainable livelihoods. Using bibliometric analysis and meta-knowledge approaches, this research used English-written and peer-reviewed journals in the Scopus database covering 1,378 documents from 1980 to 2021 with 159 authors and 111 countries identified. The data was then loaded into VOSviewer version 1.6.10 from Leiden University to produce networked data related to citation, coupling, scholar co-authorship, and keyword co-occurrence networks. The networks showed that the United States and Europe still dominate the production of literature regarding sustainable livelihoods and indigenous communities, with the Human Ecology journal as the significant contributor. It was found that climate change, food security, indigenous knowledge, traditional ecological knowledge, and sustainable development are extensively voiced in the literature and associated with sustainable livelihoods literature. Challenges confronted by native people involve vulnerability in the context of deforestation, food security, and sustainable development. Therefore, it requires them to develop resilience and adaptation to cope with risks and shocks.

Keywords: *Indigenous Community, Sustainable Livelihoods, Sustainable Development, Bibliometric, Networks, Literature*

1. INTRODUCTION

The notion of 'sustainable livelihoods' surfaced on the World Commission on Environment and Development in resource tenure, basic needs, and rural livelihood security in 1987 [1]. In the early 1990s, the idea of 'livelihoods' emerged in the international development literature, following Chambers and Conway's seminal report on Sustainable Rural Livelihoods [2]. The concept has evolved from poverty alleviation, increasing people's participation, and promoting sustainable development [2, 3]. As the concept of sustainable livelihoods became prominent, sustainable livelihoods were promoted by numerous agencies in the late 1990s, such as UNDP,

FAO, the World Food Program, DFID, CARE International, and Oxfam [3, 4]. The 1992 UN Conference on Environment and Development incorporated three dimensions (social, economic, and environment) that become the overarching goals in sustainable livelihoods [4].

Although there are numerous definitions of sustainable livelihoods, there is an agreement on the conception of sustainable livelihoods to incorporate social and economic aspects and the environment. Livelihoods are conceptualized as 'the means of gaining living' [4] while considering the sustainability dimension [5], meaning that sustainable livelihoods take into account the ability to cope and recover from stresses and

shocks and maintain or improve resources and capacities. The UK Department for International Development (DFID) SLF explains the four main components in the framework: vulnerability contexts, capital assets, livelihoods strategies, institutions, and processes [4]. Drawing on the 'capitals' and the 'asset pentagon,' sustainable livelihoods framework (SLF) incorporates natural (natural resources, stocks), social (social networks and trusts), economic/financial (saving, income, credit), physical (infrastructure, communications, water, energy, and building resources), and human capitals (skills, knowledge, labor) as vital resources to address livelihoods outcomes and sustainability (livelihood adaptation, vulnerability, and resilience and natural resource management) [6]. Sustainable livelihoods will help maintain and restore the environment as well as address food security [7], alleviate poverty [8], and vulnerability in the communities [9]. Although sustainable livelihood approaches (SLA) were criticized for their inability to resolve power relations [6], SLA is proven successful in proposing development [10] and supporting resilient and adaptive capacities [11].

1.1. Indigenous Community and Sustainable Livelihoods

The community becomes a focus of development to promote sustainable livelihoods in community development. Community is defined as a network of social relations reflected by mutuality and emotional ties [12]. Community members' interactions are essential to achieve sustainable community development, which encompasses economic viability, environmental protection, and social justice without compromising intergenerational equity [13]. By linking socio-economic and ecological development, community development is further extended to promote sustainable livelihoods to address issues beyond poverty alleviation, such as natural resources management [4]. However, communities also need to address vulnerabilities and adapt to cope with the stress and shocks as they rely on natural resources to support sustainable livelihoods.

Indigenous people, culturally diverse communities, become an essential part of society [14], with over 370 million people in 90 countries maintaining more than 5,000 cultures [15]. They are associated with resource-rich places as they depend on resources while contributing to resource preservation [16] through long-standing, sustainable ecological practices such as in Nepal [17], Taiwan [18], and Australia [11]. However, changes induced by human and natural stressors [18], such as land and resource use changes, population dynamics, and climate change, threaten native populations, especially regarding food security [19]. Other threats to tribal communities involve displacement, cultural erosion, social exclusion from modernization,

industrialization, and liberation [14]. Nevertheless, they only hold less than 10% of legal property and management rights [20].

Literature has shown the significance of sustainable livelihoods (SL) for community development [6] with a focus on reducing poverty and addressing sustainable development goals [4]. For Aboriginal communities in Northern Australia, SLF is helpful to understand community perceptions regarding the use of water rights and identify the intra-community and inter-community conflicts [11] and livelihood strategies [21]. Indigenous people face threats to their identity, livelihoods, and sustainability, and several studies captured indigenous people living in poor livelihoods [17]. The communities dependent on a national park in South Africa are marginalized due to the Namibian Government's plan to prioritize tourism-based monetary benefits [23]. This literature shows how vulnerable indigenous people are that have consequences on their livelihoods.

1.2. A Bibliometric Study, Research Gaps, and Research Questions

The bibliometric study has long been used in recent studies to examine the trends and patterns in various written academic works that could depict the socio-cultural context of scientific literature production [24, 25]. Bibliometric maps could also synthesize and visualize a large body of literature metadata [26] and the performance of authors and institutions and their impacts on the scientific output at national and international levels [14]. Bibliometric or visual mapping of science represents the dynamic and structural features of scientific works and development [28]. Bibliometric analysis, commonly regarded as mapping science, has gained enormous attention to visualizing scientific work [27]. The bibliometric approach can study several bibliometric networks, from citation networks among scientists to co-occurrence networks [27].

There is a shortage of literature regarding the relationships between indigenous communities and sustainable livelihoods. Little is known on the impact of indigenous worldviews and indigenous communities on sustainable livelihoods and food security [29]. Although there is an increasing trend in the literature to document studies related to sustainable livelihoods, little attention has been given to analyzing the pattern of SL through visual representation [26]. Therefore, this study will attempt to document the research trend discussing the indigenous people and sustainable livelihoods, including how scholars are connected in the literature through bibliometric analysis. Provided that, this research aims to address the following questions: (1) What is the general state and trend of literature related to indigenous people and sustainable livelihoods? (2) what are the key topics discussed in the literature about indigenous people and sustainable livelihoods? (3) what are the citation,

coupling, and co-authorship network patterns in the literature relating to indigenous people and sustainable livelihood?

2. METHODOLOGY

This paper is a literature review using bibliometric analysis and meta-knowledge approaches by drawing on English-written literature available in Scopus as one of

the most extensive literature databases since it has comprehensive coverage of sources of publications [25]. VOSviewer is one of the most prominent bibliometric software used to perform a diverse type of analysis such as co-citation, co-occurrence of keywords, and co-authorship [30]. The co-citation study will understand relations among authors or documents through citation analysis while the bibliographic coupling informs the citing documents [14].

Table 1. Keyword strings for article searches in Scopus database

Element	Keywords Used in the "Article Title", "Keywords", and "Abstract" Domains ¹
First	<ul style="list-style-type: none"> indigenous people OR indigenous community OR tribal community OR tribal people OR tribal population OR ethnic people OR ethnic community OR tribal population OR native people OR native community OR native population OR primitive community OR primitive people OR primitive population OR aboriginal people OR aboriginal community OR aboriginal population OR domestic people OR domestic community OR domestic population OR autochthonous people OR autochthonous community OR autochthonous population OR born people OR born community OR born population OR local community OR born community OR local population OR first nations²
Second	<ul style="list-style-type: none"> sustain* AND livelihood* OR living OR liveliness OR liveness OR lively OR sustentation^{3,4}

¹ Documents other than English-written peer-reviewed journals such as book chapter, book, editorial, letter, notes, short survey, editorials, errata, and undefined documents were eliminated in the exported database for further analysis. ² The Boolean operator “OR” finds one term or the other. ³ The wildcard symbol (*) is used to search for all possible endings to that root. ⁴The Boolean operator “AND” means both terms used are required in the article search. Documents that are not closely related to social sciences, environmental sciences, agricultural sciences, energy, multidisciplinary, psychology, and humanities were removed from the list. Publications from the subject areas such as medicine, econometrics and finance, accounting, veterinary, health professions, biochemistry, genetics, molecular biology, computer science, pharmacology, toxicology, pharmaceuticals, immunology, microbiology, nursing, chemistry, physics, astronomy, chemical engineering, mathematics, material science, neuroscience, and undefined domains were excluded in the analysis as they are not closely linked to the central theme of the paper which is agricultural, environmental and social sciences.

2.1. Data Collection and Article Search

This study only uses peer-reviewed journals to be analyzed in the VOSViewer software. Relevant articles were collected using keyword searches from the Scopus database. Since the study aims to understand the linkages between indigenous communities and sustainable livelihoods, the combination of strings contains two elements which are 1) words associated with “indigenous communities” such as “indigenous communities,” “native people,” “tribal communities,” etc., and 2) words that mean “sustainable livelihoods” such as “sustainable livelihoods.” The articles were this collected using this combination of strings available until April 17, 2021, in Scopus. The entire mixture of keyword strings for article searches is presented in Table 1.

The articles and their bibliographic information were gathered based on article title, keywords, and abstract fields for all publications related to indigenous communities and sustainable livelihoods from 1980 to

2021 on April 17, 2021. Based on the initial search, there were 2,441 documents in the Scopus database. To determine the eligibility and check the accuracy of the article search, the titles and abstracts of the articles exported from the database were read to increase the author’s confidence in the article search. With the above screening process and eligibility criteria, the number of articles included in the analysis was 1,378 from 160 sources.

2.2. Data Analysis

Descriptive analysis was performed as the first step in the study using Microsoft Excel to organize and visualize the meta-information about the articles, including the number of articles by year, influential journals, funding, authors, and affiliations, and distribution of papers across countries or territories. Next, the resulting lists were exported from Scopus and imported to VOSviewer version 1.6.10 from Leiden University, the Netherlands, to be analyzed. VOSviewer is software capable of

producing and exploring maps by visualizing networked data, especially in bibliometric networks [30]. According to [30], VOSviewer is compatible with reading database files from Scopus, Web of Science, Dimensions, and PubMed. The dataset was then loaded and analyzed using VOSviewer to produce citation networks by publication sources and authors, coupling networks by publication sources and authors, scholar co-authorship networks, and keyword co-occurrence networks. The visualization of the networks is then interpreted based on the vertices and their relations. The size of nodes represents their weights. The width of the edge informs the strength of the connection between nodes. Nodes that are closely related to each other are assigned in the respective clusters identified with different colors in the bibliometric networks. The smaller is the distance between two nodes, the stronger is the relationship between these two nodes.

3. RESULTS AND DISCUSSION

To best reflect the trend, documents published before 2000 and during 2021 were excluded in the visualization, such as in Figure 1 but included in the further bibliometric analysis. This is because the sustainable livelihoods literature became popular in academic

literature after being promoted by The UK Department for International Development (DFID) in 1999. As the research was conducted during the first quarter of 2021, incorporating articles published in 2021 in the visualization is not representative and will mislead the overall trend. Overall, there has been an increasing trend in publications covering themes about indigenous communities and sustainable livelihoods over the last 20 years. After 2000, there was a steady growth of literature production since the notion of sustainable livelihoods have gained attention after the United Nations Conference on Environment and Development (UNCED) in 1992 promoted Agenda 21 to propose sustainable livelihoods as a means of reducing poverty which became the original goal of development [31]. This is also linked to the popularity of sustainable livelihoods literature after the DFID played a significant role in sustainable livelihoods discussion [4]. Although there were slight downturns in the number of articles in 2004, 2005, 2009, 2014, and 2017, the following years show the popularity of discussions about indigenous people and sustainable livelihoods with 158, 183, and 224 articles published in 2018, 2019, and 2020, respectively.

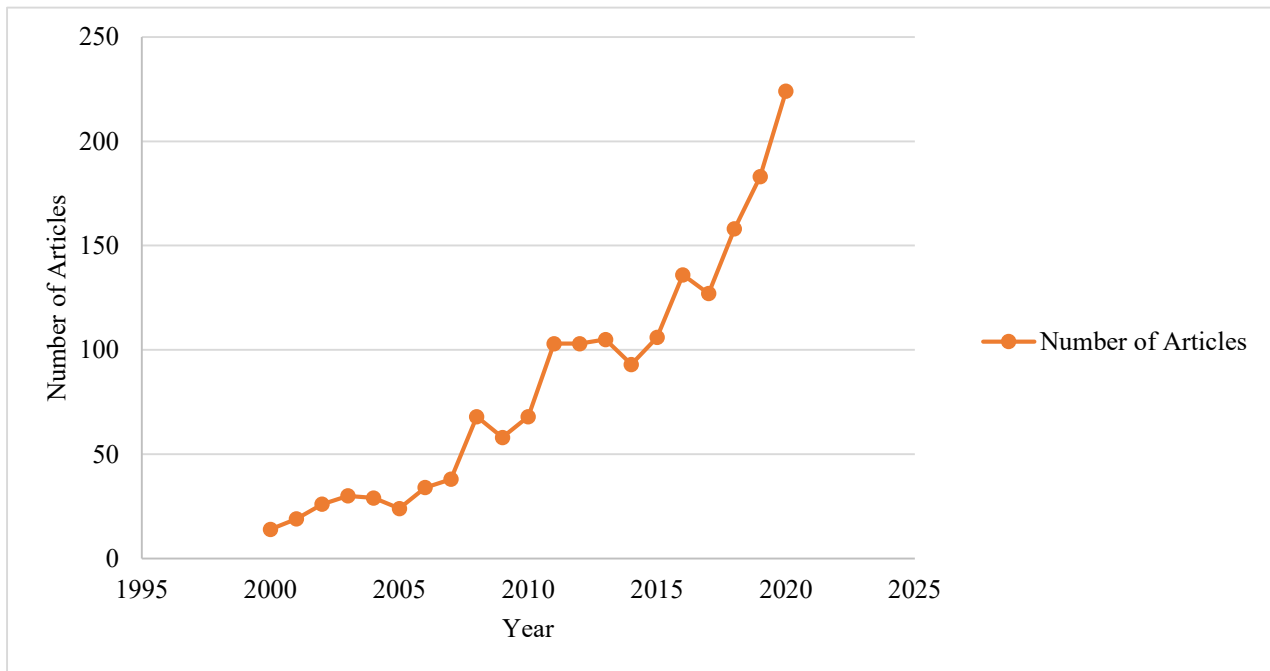


Figure 1. Number of articles by year (2000-2020)

The meta-information of literature about indigenous communities and sustainable livelihoods also informs journals, funding agencies, and authors and their

affiliations and geographical locations. Table 2 shows significant journals publishing articles associating indigenous communities and sustainable livelihoods.

Table 2. Major Journals in the full database (1980-2021)

No.	Journal	No. of Publications (No. of Citations)	No.	Journal	No. of Publications (No. of Citations)
1	Forests Trees and Livelihoods	31 (727)	16	Ambio	12 (343)
2	Sustainability Switzerland	29 (99)	17	Geoforum	12 (267)
3	Human Ecology	28 (914)	18	Forests	11 (95)
4	Ecology and Society	28 (600)	19	Land	11 (59)
5	International Forestry Review	28 (447)	20	Journal of Political Ecology	11 (57)
6	Rangeland Journal	18 (308)	21	Small-scale Forestry	11 (45)
7	Land Use Policy	16 (368)	22	Regional Environmental Change	11 (338)
8	Mountain Research and Development	15 (239)	23	International Journal of Sustainable Development and World Ecology	11 (154)
9	Development in Practice	15 (116)	24	Global Environmental Change	10 (799)
10	Livestock Research for Rural Development	14 (50)	25	Biodiversity	10 (79)
11	Conservation and Society	14 (147)	26	Geographical Journal	10 (418)
12	Society and Natural Resources	14 (116)	27	Environmental Conservation	10 (355)
13	Environmental Management	13 (200)	28	Journal of Peasant Studies	10 (329)
14	Geojournal	13 (164)	29	Climatic Change	10 (201)
15	Development and Change	12 (399)	30	Agroforestry Systems	10 (156)

Explicitly covering the theme of livelihoods, Forest Trees, and Livelihoods dominate the publications in the entire database from 1980 to 2021 with 31 articles and 727 citations (Table 2). Most research projects focusing on indigenous communities and sustainable livelihoods

received financial supports from the National Science Foundations, European Commission, Social Sciences and Humanities Research Council of Canada, UK Research and Innovation, and Government of Canada by issuing more than 20 papers (Figure 2).

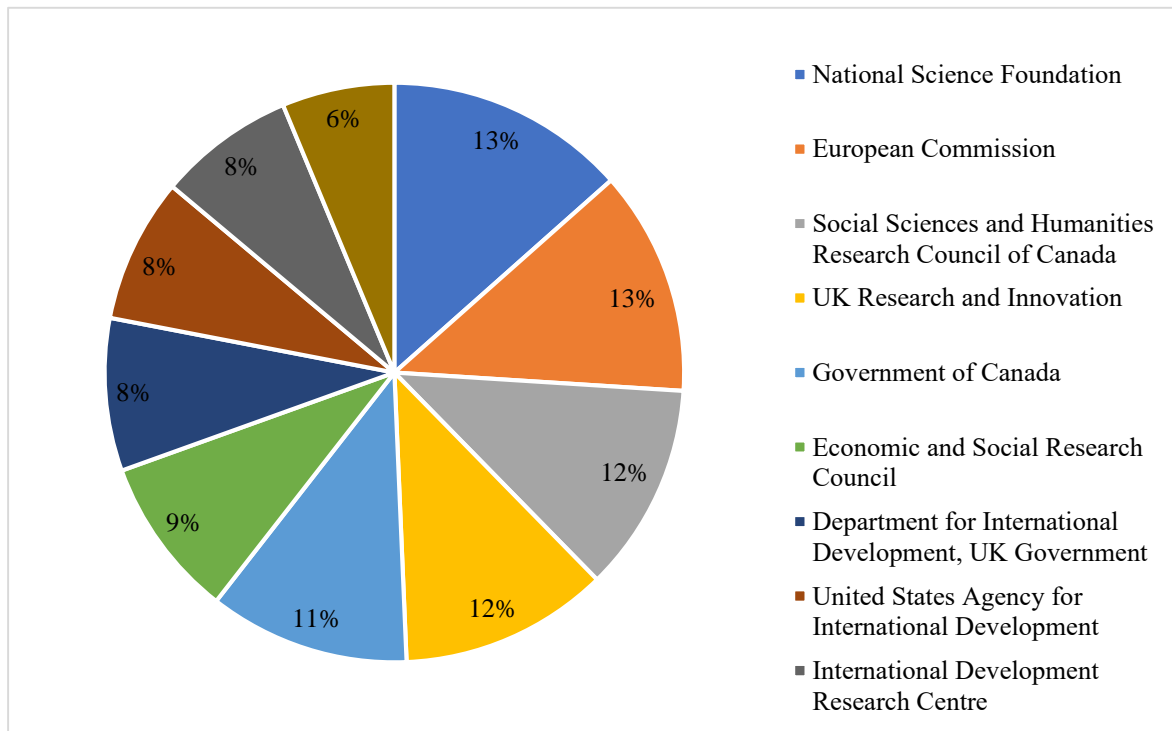


Figure 2. Major Funding Source in the full database (1980-2021)

Table 3. Major authors in the full database (1980-2021)

No.	Author	No. of Publications (No. of Citations)	No.	Author	No. of Publications (No. of Citations)
1	Dressler, W. H.	9 (89)	16	Teketay, D.	5 (47)
2	Schreckenber, K.	8 (405)	17	Mbosso, C.	5 (229)
3	Potvin, C.	7 (50)	18	Akinnifesi, F. K.	5 (208)
4	Tchoundjeu, Z.	7 (361)	19	Leakey, R. R. B.	5 (203)
5	Degrande, A.	7 (327)	20	Russell-Smith, J.	5 (115)
6	Ford, J. D.	7 (144)	21	Macía, M. K. J.	5 (102)
7	Maikhuri, R. K.	7 (139)	22	Maraseni, T. N.	4 (88)
8	Reyes-García, V.	6 (91)	23	Paneque-Gálvez, J.	4 (77)
9	Chirwa, P. W.	6 (40)	24	Gorman, J. T.	4 (77)
10	Theilade, I.	6 (36)	25	Curry, G. N.	4 (60)
11	Berkes, F.	6 (336)	26	Koczberski, G.	4 (60)
12	Ticktin, T.	6 (178)	27	Bussmann, R. W.	4 (54)
13	Davies, J.	6 (161)	28	Rao, K. S.	4 (54)
14	Negi, V. S.	5 (74)	29	Mistry, J.	4 (46)
15	Singh, R. K.	5 (62)	30	Jr.	4 (37)

In terms of significant authors, Dressler, W. H., Schreckenber, K., Potvin, C., Tchoundjeu, Z., Degrande, A., Ford, J. D., and Maikhuri, R. K. are among top leading researchers. They conducted studies in the field of native communities and sustainable livelihoods with at least seven articles disseminated (Table 3).

Table 3 shows the major authors in the full database. In this case, this bibliometric study can provide information regarding institutions concerned about funding studies related to indigenous communities and sustainable livelihood. These are the authors of literature that mostly appear in the literature related to those topics.

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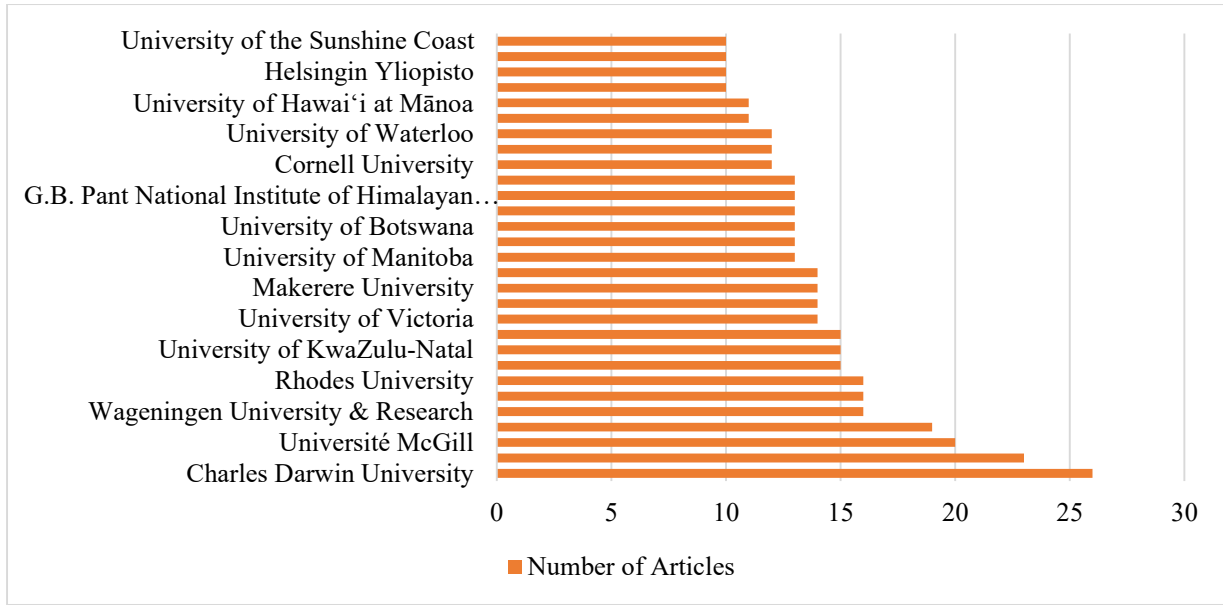


Figure 3. Major Institutions in the full database (1980-2021)

Figure 3 depicts major affiliations of authors working on projects regarding sustainable livelihoods and indigenous communities. There is a significant number of articles reported by Charles Darwin Universities (26), The University of British Columbia (23), Université McGill, Chinese Academy of Sciences (19), Wageningen University & Research (16), Universitat Autònoma de Barcelona (16), and Rhodes University (15).

As presented in Figure 4, the major contributors of the studies about indigenous communities and sustainable livelihoods are the United States with approximately 301-500 articles, United Kingdom, Australia, India, Canada, and South Africa with around 101-200 publications.

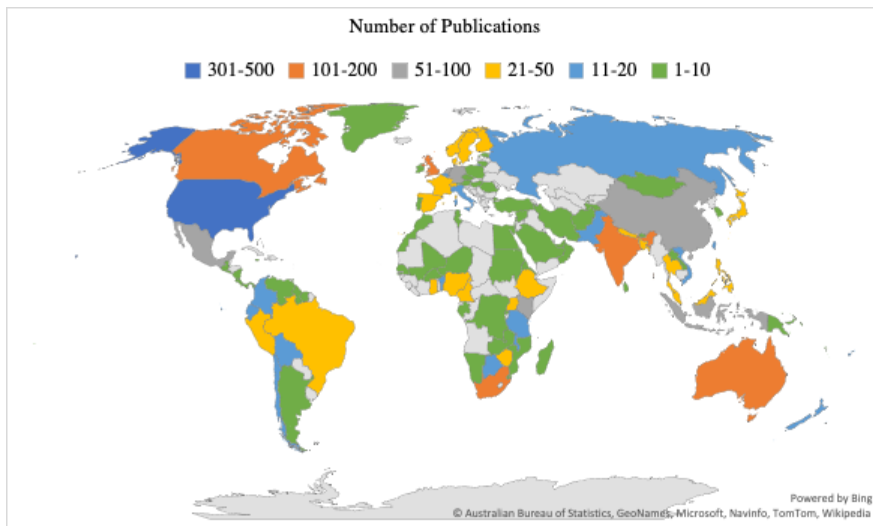


Figure 4. Distribution of articles by country in the full database (1980-2021)

Figure 5 illustrates the citation based on the article source weighted by the total number of documents. Different color represents different clusters and year of publications while the number of articles weights the size of nodes. For example, the color of violet represents the cluster for International Forestry Review as one of the journals publishing earlier papers. As a different cluster, Sustainability (Switzerland) has averagely produced recent publications. This citation network informs the number of citations obtained by all documents published by a journal. Using a threshold of 12 papers, the citation network by source received 19 journals with 5 clusters, 26 links, and total link strength of 50. As the most significant source, Ecology and Society and Sustainability (Switzerland) produce approximately 29 articles each with 606 and 101 citations, respectively.

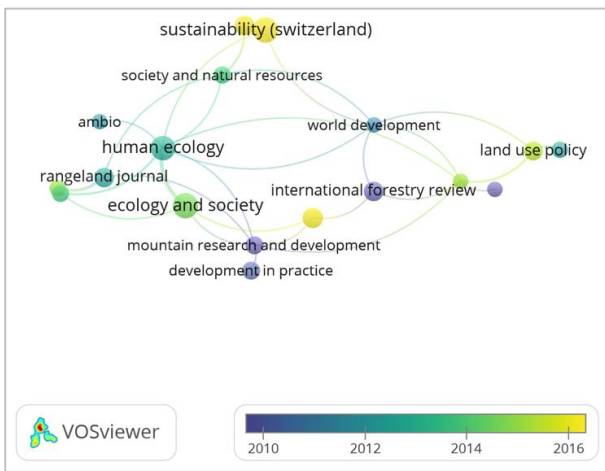


Figure 5. Citation network by publication source. Note: The size of the circle is weighted based on the number of articles. Different color denotes different clusters respecting the year of publications. The width of the line represents the strength of citation relations.

Figure 6 describes the citation by the author weighted by the number of documents. Using a cutoff of at least four papers for each author, the study found 33 authors with only six authors citing one another with 3 clusters, three links, and a total link strength of 9. In the citation network, Berkes, F. as the central node that studied indigenous communities and sustainable livelihoods in earlier years connects to Ford, J. D., Paneque-Gálvez, J., Reyes-García, V., Bussmann, R.W., and Macía, M. J.

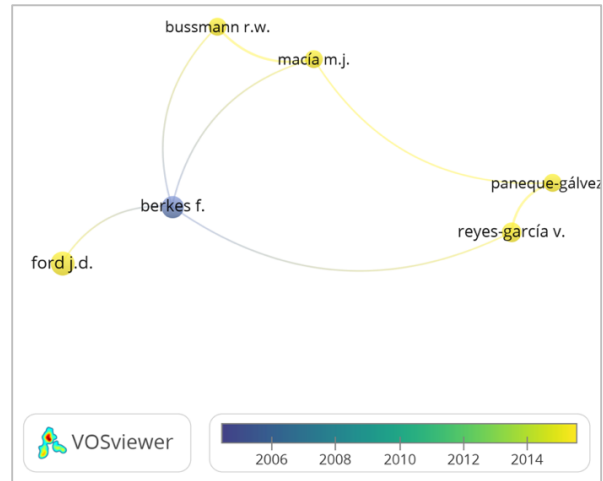


Figure 6. Citation network by publication author. Note: The size of the circle is weighted based on the number of articles. Different color denotes different clusters respecting the year of publications. The width of the line represents the strength of citation relations.

Bibliographic coupling networks provide insight to comprehending the link between two documents that both cite the same document [30], and it is shown in Figure 7. With a cutoff of 12 papers, it illustrates bibliographic coupling links with a total of 18 items, 5 clusters, 144 associations, and a total link strength of 2466. As a central node, Human Ecology is linked to other significant journals such as Ecology and Society Sustainability (Switzerland), Environmental Management, Forest Policy and Economics, International Forestry Review, and other sources.

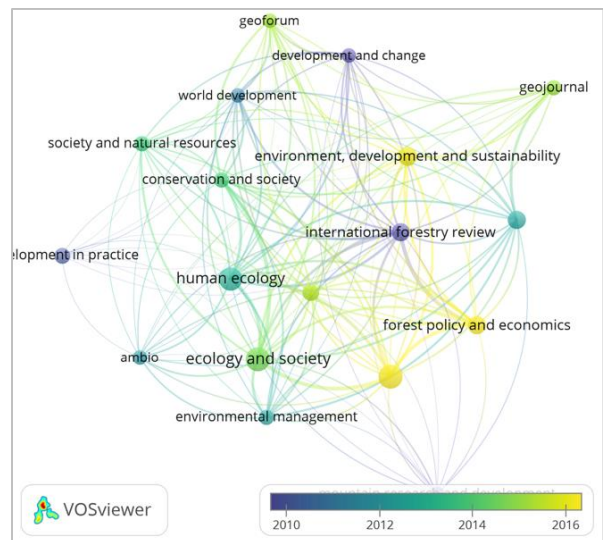


Figure 7. Coupling network by publication source. Note: The size of the circle is weighted based on the number of articles. Different color denotes different clusters. The width of the line represents the strength of bibliographic coupling relations.

Weighted by the total number of copies, Figure 8 exhibits a bibliometric coupling network by the author with seven authors, 3 clusters, 16 links, and 185 total link strengths. As releasing much earlier documents, Berkes, F. is found to be linked with other prominent authors in the coupling network such as Ford, J. D., Maikhuri, R. K., Singh, R. K., Potvin, C., Davies, J., and Dressler, W. H.

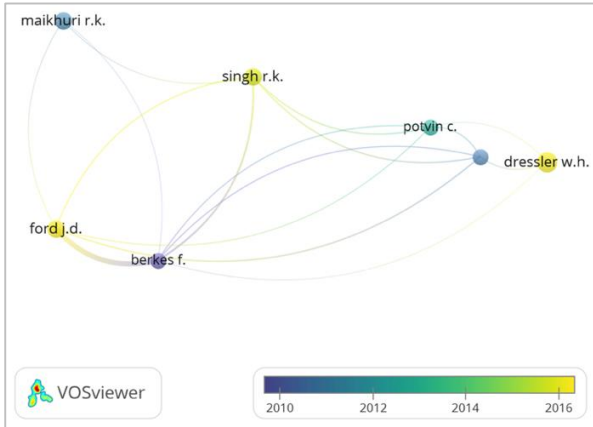


Figure 8. Coupling network by author. Note: The size of the circle is weighted based on the number of articles. Different color denotes different clusters. The width of the line represents the strength of bibliographic coupling relation.

The idea of co-authorship by countries provides an understanding that literature about indigenous communities and sustainable livelihoods can be coauthored by some countries where the authors are located. The minimum threshold was set to 17 documents, resulting in 31 countries with 4 clusters, 245 links, and 701 total link strengths. Much earlier literature was made public and coauthored in the United States, United Kingdom, Canada, India, Australia, and South Africa. Relatively recent literature was published in Indonesia, Brazil, Peru, and Nepal (Figure 9). Finally, the thematic trend in the literature of indigenous communities and sustainable livelihoods can be analyzed through the author keyword co-occurrence network (Figure 10).

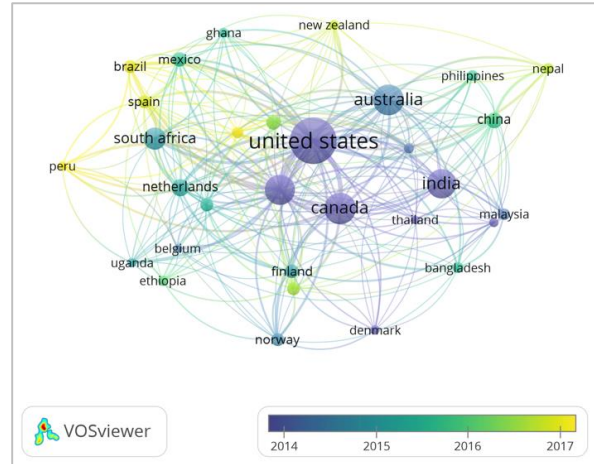


Figure 9. Co-authorship network by countries. Note: The size of the circle is weighted based on the number of articles. Different color denotes different clusters. The width of the line represents the strength of co-authorship relations.

By specifying a minimum of 15 occurrences, this network obtained 34 keywords with 4 clusters, 269 links, and 629 total link strengths (Figure 10). The first cluster, indigenous knowledge, is mainly used in earlier literature around 2013, and it connects to climate change, livelihoods, sustainable livelihoods, food security, sustainability, sustainable development, and conservation. Founded in a slightly newer publication, livelihoods term is associated with indigenous people, sustainable development, protection, food security, indigenous communities, climate change, and indigenous knowledge.

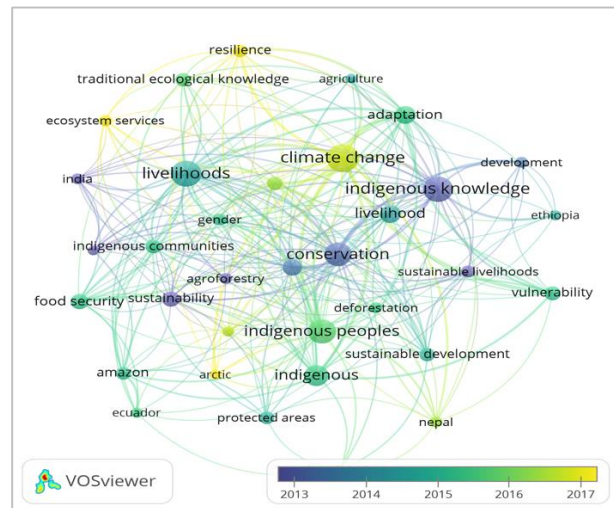


Figure 10. Co-occurrence network. Note: The size of the circle is weighted based on the number of articles. Different color denotes different clusters. The width of the line represents the strength of co-occurrence relations.

The co-occurrence network map in Figure 10 provides an overall picture of how the term ‘sustainable livelihoods’ is connected to factors affecting indigenous community livelihoods. This livelihood term has relations with indigenous communities, indigenous knowledge, and traditional ecological knowledge. Through their study, [32] witnessed how indigenous communities have contributed to natural resource management by using indigenous knowledge, skills, and practices that promote resource conservation. Many studies, such as in Asia [33], Canada [34], Australia [34], and South Africa [22], depict the efforts of the native population to preserve available resources by increasing biodiversity and habitat protection.

In this keyword co-occurrence network, some countries emerge as keywords often found in the author's terms, such as Ethiopia and Nepal. The role of indigenous resource management systems performed by Central Highlands community that help protect Afro-alpine landscapes [36]. In Nepal. Native communities perform Community-based natural resource management (CBNRM) practices to preserve soil, water, and resource biodiversity to promote resilience and adaptability to climate change [37].

However, the map also marks that livelihood also appears along with the terms such as climate change, deforestation, food security, sustainability, sustainable development, adaptation, and vulnerability. The more recent literature documents how climate change is linked to indigenous knowledge and communities, livelihoods, food security, sustainability, and biodiversity. The sustainable livelihoods framework (SLF) proposed by DFID involves vulnerability contexts exposed to risks, shocks, and their Spatio-temporal variations. [18] explain how both human-induced and naturally occurring stressors could affect indigenous communities' livelihoods. These factors are likely to affect vulnerability due to changes in landscapes, population dynamics, and climate change that will subsequently affect food security.

4. CONCLUDING REMARKS

A bibliometric study is a powerful approach to understanding the trend in literature with some implications. One notable contribution is its capability to inform the performance of authors, institutions, and funding agencies in particular disciplines and their interests in the studies. Many governments and funding agencies face obstacles in allocating budgets for research due to budget restrictions, so researchers may find difficulties finding resources to support their research projects [38]. The bibliometric study, known as a relatively economical, time-saving, yet exhaustive research approach, could support researchers and help governments and institutions efficiently investigate global literature [38]. Researchers interested in studying

indigenous communities and sustainable livelihood themes, for example, could target major sponsoring agencies such as the National Science Foundation, European Commissions, Social Sciences and Humanities Research Council in Canada, The UK Research and Innovation. Moreover, this bibliometric study can also measure research quality produced by research units by evaluating citations per paper [39]. However, incentives are provided to scientists whose works and performances are publicized in prestigious publication channels [40].

The intersection between indigenous communities and sustainable livelihoods informs how these themes are connected to sustainable development. The literature in these studies has developed in terms of the distributions, institutions, funding agencies, and researchers concerning the topics. The discussion of indigenous communities is emphasized more in sustainability by involving vulnerability, resilience, and adaptation. Thus, governments, community developers, stakeholders are suggested to work with indigenous people in addressing their problems. However, this study could be elaborated by specifying the contexts of sustainable livelihoods. Since this research studied the overview of general literature regarding indigenous communities and sustainable livelihoods, research analyzing detailed information about indigenous communities in sustainable livelihoods is encouraged. Finally, this study could inform governments, funding agencies, and stakeholders to allocate research projects that focus on how indigenous communities could foster sustainable livelihoods.

AUTHORS' CONTRIBUTIONS

The author confirms sole responsibility for the research design and conceptualization, data collection and analyses, interpretation of results, and manuscript preparation.

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