

Review

Sustainability Consciousness Research Trends: A Bibliometric Analysis

Yonis Gulzar ^{1,*} , Nisa Eksili ^{2,*}, Pınar Celik Caylak ³  and Mohammad Shuaib Mir ¹ 

¹ Department of Management Information Systems, College of Business Administration, King Faisal University, Al-Ahsa 31982, Saudi Arabia

² Department of Aviation Management, Faculty of Applied Sciences, Akdeniz University, Antalya 07058, Turkey

³ Department of Tourism Management, Serik Faculty of Business Administration, Akdeniz University, Antalya 07058, Turkey; pinarcelik@akdeniz.edu.tr

* Correspondence: ygulzar@kfu.edu.sa (Y.G.); nisaeksili@akdeniz.edu.tr (N.E.); Tel.: +966-545719118 (Y.G.)

Abstract: Sustainability consciousness (SC) is a crucial determinant for the successful execution of sustainability initiatives. The changing of citizens' knowledge, attitudes, and behaviors is an essential component in attaining sustainable development (SD). Ensuring a sustainable future hinges on cultivating a durable sense of awareness among citizens. The aim of this article is to present a systematic literature review (SLR) on SC and to reveal the research trends and future perspectives. The data were obtained from the Web of Science (WoS) database and the data analysis of 49 articles selected based on determined criteria was carried out with two approaches: bibliometric and content analysis. The analysis reveals that publications pertaining to the topic of SC have emerged mainly within the past decade, with a maximum annual publication count of nine. The analyzed publications were categorized into four primary themes: (1) SC through education for sustainable development (ESD), (2) SC of consumers, (3) SC in business, and (4) measurement tools for SC. Education and educational research emerged as the primary field of study, with students being selected as the focus of research. However, research has indicated that even among children who receive SC education, there may be a decline in SC levels over a period. The attainment of the United Nations' Sustainable Development Goals (SDGs) necessitates a society characterized by a high level of SC. The scope of SC should extend beyond educational institutions to encompass broader societal contexts, including corporations and professional environments. The findings of this study demonstrate significant deficiencies in the existing literature on SC and emphasize the significance of SC in attaining the UN SDGs.

Keywords: sustainability; sustainable development; sustainability consciousness; bibliometric analysis; awareness



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1. Introduction

The World Commission on Environment and Development's report Our Common Future defines [1] sustainability as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." This definition is still considered the most comprehensive definition of the concept of sustainability [2]. On 25 September 2015, the United Nations General Assembly adopted the Sustainable Development Goals (SDGs), consisting of 17 universal goals and 169 sub-goals covering social, economic, and environmental areas, within the scope of the Sustainable Development Agenda [3–5]. Sustainable development (SD) focuses on enhancing the well-being of people worldwide, improving the natural environment, and creating sustainable communities in the long term [6]. These widespread, transformational, and comprehensive goals, which reveal the real challenges facing humanity [7] were introduced as a roadmap that outlines a route to worldwide sustainability for people, the planet, and economic well-being by

2030 [8]. Covering global challenges that are critical to human survival, the SDGs concern all stakeholders, including governments, civil society, non-profit organizations, and the private sector. Considering their resources and activities, large-scale private sector enterprises, in particular, have an important role to play in achieving the SDGs [9]. Creating SD is one of the biggest challenges facing societies around the world today. The global sustainability debate focuses on how to achieve environmental sustainability and at the same time how to develop our world socially and economically [10,11]. Businesses that are aware of this have decided to adopt the SDGs as a roadmap to establish a balance between their self-interests and the overall well-being of the community [12].

Knowledge is needed to understand how the SDGs can be implemented, the attitudes and values they contain, and the consequences of their implementation [13]. For that, increasing public education and providing accessible information is of great importance [14]. The significance of this aspect also remains relevant in the context of SD transition strategies [15,16]. Education ensures that every citizen acquires the knowledge, skills, attitudes, and values necessary to shape a sustainable future [17]. Education is not only a distinct goal but also an integral component of all other goals [18]. Education is considered the highest priority by UNESCO as it is among the fundamental human rights and contributes to peace-building and SD in society [7].

Sustainability consciousness (SC) is a result of education for sustainable development (ESD), which was launched by UNESCO in 2014 with the aim of creating a society with sustainable living behavior [19,20]. UNESCO defines ESD as “the process of learning how to make decisions that take into account the long-term future of the economy, ecology, and equality of all communities” [21]. According to UNESCO, ESD should be integrated into the curriculum of all formal education, encompassing early childhood education through to higher education [22]. Because individuals of all ages are responsible for creating a sustainable future [23], ESD enhances the understanding of environmental, economic, and social problem-solving subjects through education [24], motivating individuals to tackle SD challenges by fostering their favorable knowledge, attitudes, and behaviors associated with sustainability [25,26]. In this way, individuals protect social, economic, and environmental well-being both today and in the future [27].

SC, an anticipated outcome of ESD [28,29], is a complex of cognitive and emotional learning [30]. Leaving aside the conceptual foundations, in daily language, consciousness replaces practical expressions such as awareness, wakefulness, the ability to respond to stimuli, attention, or awareness [31]. Consciousness: the state of being aware of a phenomenon, including perceptions and experiences associated with emotions, beliefs, and actions [32]. The study of consciousness often focuses on three primary themes. The first is when an individual is isolated from their surroundings; the second is when they are awake; and the third is when a person is aware of something and has information about it [33,34]. The term SC refers to the experience or awareness of the phenomenon of sustainability [35]. Moreover, SC, which is a concept that integrates the environmental, social, and economic dimensions of SD [25,26,28,36] consists of knowledge, attitudes, and behaviors [35,37]. Thus, knowing (the knowledge-based component that combines cognitive and active aspects) is a psychological construct represented by categories of attitude and behavior [38]. SC is more than just knowledge about sustainability [30] as it combines content on environmental, social, and economic issues, as well as psychological structures related to knowledge, attitudes, and behaviors towards these issues [29]. SC leads to an impact on individuals' emotions. Thus, it compels individuals to change and improve their attitudes toward sustainable behaviors [25].

SC is one of the essential factors needed for the effective implementation of sustainability [19,39]. Achieving SD requires a change in people's knowledge, attitudes, and behaviors according to a 2014 UNESCO report [38,40]. Developing individuals' SC is one of the foundations of ensuring a sustainable future [34]. However, the adoption of sustainability by society necessitates further measures. Endorsement by a collective or influential figure

is necessary [41]. Therefore, it is crucial to take into account the conscious human factor when it comes to the implementation and achievement of SD [20].

Over the past two decades, there has been substantial progress in the field of sustainability literature as a result of studies focused on the concept of sustainability. Although sustainability is a well-known concept, its application within the literature on SC studies presents a distinct perspective. The concept of SC has begun to attract attention in the literature with the increase in publications in the last decade. The purpose of this research was to perform a thorough inspection, assessment, and analysis of the existing body of literature on sustainability consciousness using a systematic literature review process. The article is organized into four sections. The first section defines sustainability, sustainable development (SD), education for sustainable development (ESD), SC, and the primary motives for pursuing research on this topic. The next section, Materials and Methods, describes the specific methods used to carry out the SLR, including the sources and criteria used to choose the items included in the study. The following part provides an in-depth analysis of the selected articles. The concluding section provides a brief summary of the main findings of the study and suggests potential directions for further research.

2. Materials and Methods

2.1. Systematic Literature Review (SLR)

We use the systematic literature review (SLR) methodology in this article to dive deeply into the field of SC research. SLR acts as a compass, guiding us across the complex terrain of scientific study in this sector. We meticulously reviewed a pool of studies, finding their relevance, analyzing their valuable contributions, sifting through data, weaving together information, and eventually building an evidence-based narrative that leads us to well-founded conclusions, using SLR as our tool [42]. Systematic literature review plays a pivotal role in elevating the practice of evidence-based decision-making. Rather than depending solely on isolated studies that address individual phenomena, SLR amalgamates collective knowledge, creating a robust foundation for informed and comprehensive decision-making [43]. Consequently, this aids researchers in the objective, efficient, and effective identification, analysis, and interpretation of the extant literature. The knowledge generated via a replicable methodology is characterized by its clarity, conciseness, and transparency [44,45]. Additionally, SLR also defines knowledge domains about specific phenomena, highlighting synergies in the existing literature, and bridging the gap between knowledge in the field and science, making significant contributions to the scientific knowledge base [46]. Moreover, it exposes gaps in the research field, allowing researchers to contribute their own work to the literature and make predictions for future research. To mitigate individual biases, multiple researchers have been included in the study [43]. The approach employed in this study adheres to the five phases outlined by Denyer and Tranfield [42]. These five steps are shown in Figure 1: question formulation; study location; study selection/evaluation; analysis/synthesis; and result reporting/application.

2.1.1. Question Formulation

Precisely articulating the research question holds great significance, as it provides guidance to researchers and elucidates the criteria for incorporating studies into the review. This study aims to address the following research questions:

RQ1: In which areas is SC researched in the literature?

RQ2: How can SC be assessed and measured?

RQ3: Is there a relationship between SC and SDGs?

RQ4: What is SC's role in achieving the SDGs?

RQ5: What is the publication frequency, topic distribution, and the main keywords that are emerging in the SC literature?

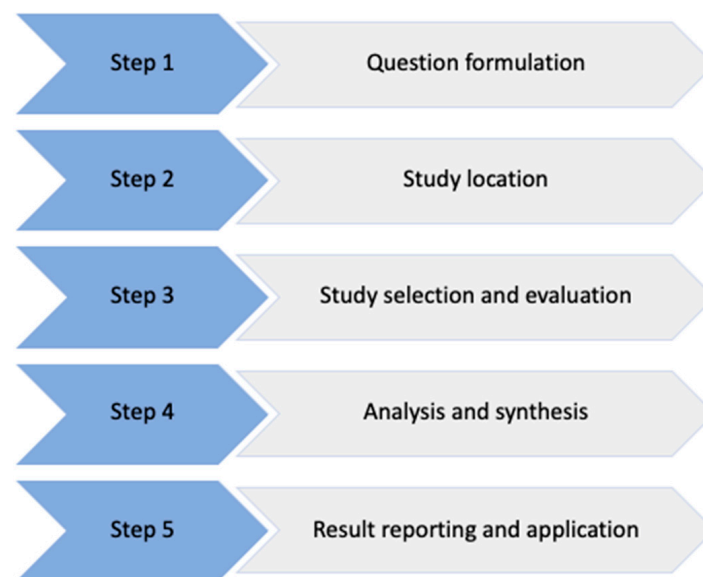


Figure 1. SLR flow chart.

2.1.2. Study Location

The purpose of researching relevant journal articles is to create a comprehensive list of the key contributions related to the research questions [42]. The Web of Science database was used as the source for data collection. The Web of Science is a comprehensive database that covers multidisciplinary fields and is widely used for the analysis of scientific publications [47,48]. The analysis of publications in the WoS database is crucial for obtaining a bibliometric analysis profile that sheds light on the dynamics of research activities worldwide. Keywords have been consistently used as search criteria in systematic reviews. For the purpose of our research, we conducted a search in the WoS database, specifically targeting papers that had the terms “sustainability consciousness” OR “consciousness of sustainability” in the “all fields” category.

2.1.3. Study Selection and Evaluation

To limit the search results, time horizon, source type, and publication language criteria were utilized. The research incorporates studies that were released subsequent to the year 2000, in accordance with the Millennium Development Goals [49] that were declared during the United Nations Summit in 2000. As shown in Figure 2, the screening included studies categorized as articles and written in English as the publication language. A total of 61 studies have been identified as meeting the specified selection criteria. These 61 studies were subjected to full-text analysis by the researchers. The abstracts, methods, and results of all articles were thoroughly reviewed, leading to the exclusion of 12 studies that were unrelated to SC and inaccessible in full text. A total of 49 publications, published between the years 2000 and 2023, were selected and evaluated for the subsequent phases of the SLR.

2.1.4. Analysis and Synthesis

In this stage, the individual articles were segmented into cohesive sections, and the interconnections between the parts were examined. The purpose of this stage is to measure the relationships between data [42]. The simplest and most well-known form of data synthesis is a narrative review, which attempts to identify what has been written about a topic [43]. In this review, the summarized data can take the form of descriptive information such as authors, publication years, subject, or study type, as well as relationships and findings. It may also take the form of conceptualization of a particular idea or theoretical perspective. The research applied two methodologies for data analysis, namely bibliometric analysis and content analysis.

The bibliometric mapping was carried out using VOSviewer 1.6.19 software and analyses were conducted to examine citation, co-citation, and bibliographic coupling. Content analysis was performed manually with MS Excel 16.77.1. In the process of analyzing the articles, four categories of analysis emerged with an exponential approach to identifying key contributions to the field:

- SC through ESD;
- SC of consumers;
- SC in business;
- SC measurement tool.

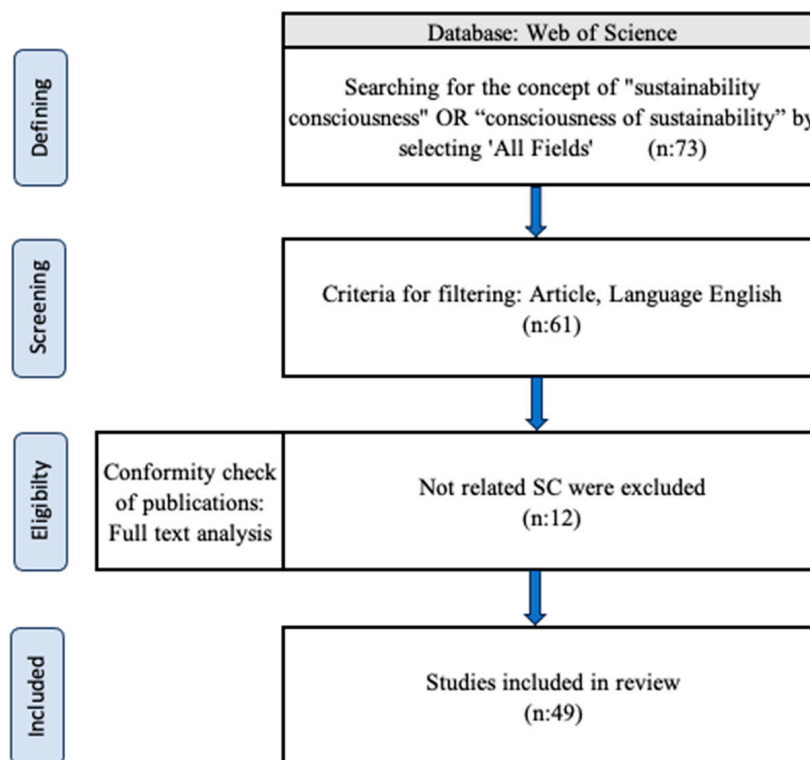


Figure 2. PRISMA flow diagram.

3. Results and Discussion

To provide context for the SC papers, the publication years, total number of references by year, publishers of the articles, and countries of origin of the articles are provided. The sources, authors, and documents contributing most are presented with citation analyses. A word cloud consisting of keywords is included. Finally, a content analysis of 49 articles consisting of key objectives, methods, and findings was conducted.

3.1. Time, Citation, and Publishers

Figure 3 shows the temporal distribution of scientific articles in the field of SC, as well as the overall number of citations received annually. The commencement of studies on SC 14 years after the announcement of the Millennium Development Goals is regarded as delayed. Although publications related to SC covering the last decade have increased on an annual basis, these increases are not seen as stable and consistent.

Table 1 includes the top five publishers with the highest number of publications. Elsevier, MDPI, and Taylor & Francis emerged as the top publishers, each having produced nine publications during the previous decade.

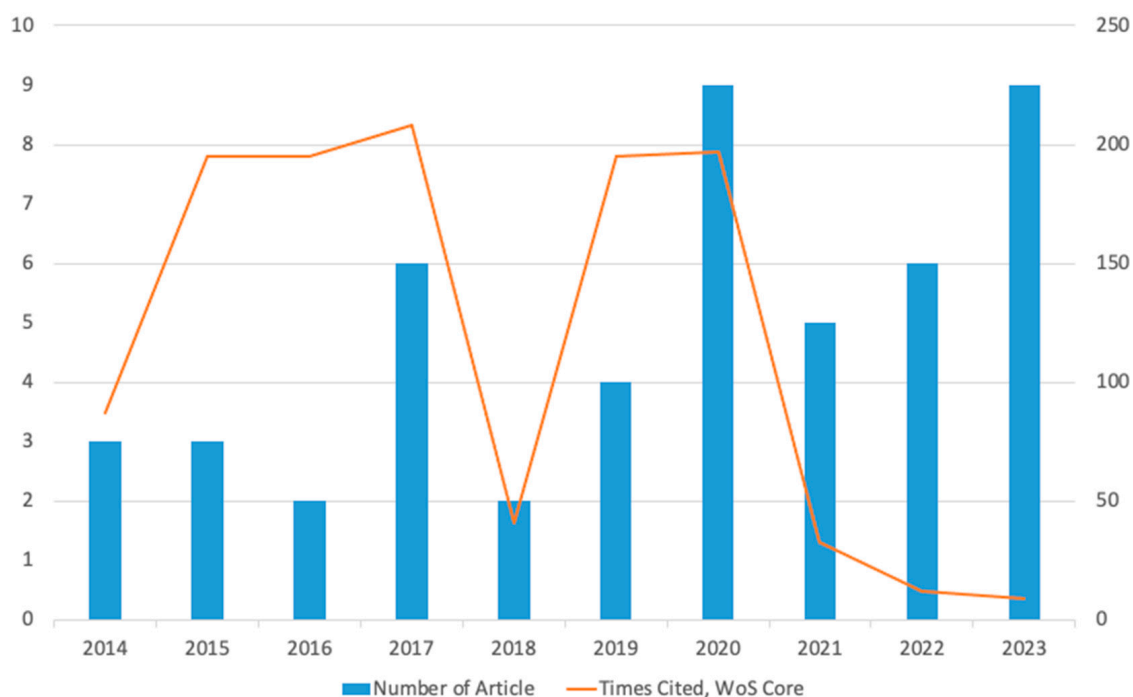


Figure 3. Timeline and times cited.

Table 1. Publishers of articles.

Publisher	Number of Articles	%
Elsevier	9	18.37
MDPI	9	18.37
Taylor & Francis	9	18.37
Emerald Group Publishing	8	16.32
Springer Nature	3	6.12

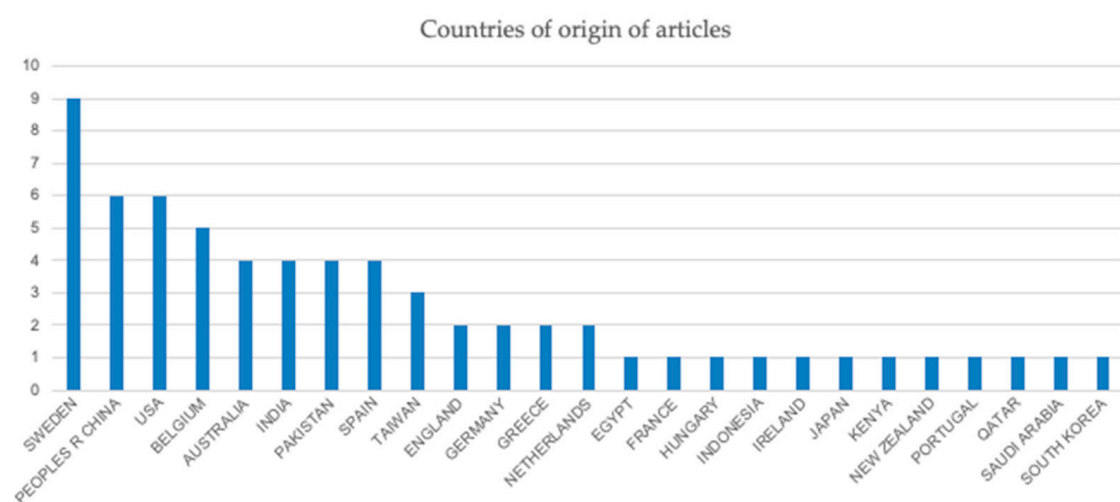
Table 2 shows the ranking of the top 10 main authors with the highest number of citations on SC. All the authors are from European Union nations such as Sweden, Germany, Belgium, and France. The H-index, which measures a researcher's impact, varies among authors depending on their contribution to the field. The high number of citations received by the top main authors in this field shows that their research is extremely effective and applicable. Niklas Gericke (487 cited), Daniel Olsson (422 cited), and Teresa Berglund (344 cited) from Karlstad University, Sweden, are the most cited main authors. Niklas Gericke's H-index, which has made significant contributions to the advancement of knowledge about SC, is 23. The various contributions provided by the other authors in the top 10 are reflected in their varying citation counts and H-indices.

3.2. Countries of Origin of Articles

Figure 4 shows the distribution of articles according to their origin. The country with the most publications about SC was Sweden. China, USA, Belgium, and Australia were the countries with the most publications, respectively.

Table 2. The most cited main authors' affiliation, country, citations, and H-index.

Rank	Authors	Affiliation	Country	Total Citations	H-Index
1	Niklas Gericke	Karlstad University	Sweden	487	23
2	Daniel Olsson	Karlstad University	Sweden	422	11
3	Teresa Berglund	Karlstad University	Sweden	344	8
4	Jelle Boeve-de Pauw	University of Antwerp	Belgium	287	19
5	Patrik Lammers	University Osnabruck	Germany	92	3
6	Qudsia Kalsoom	University of Dundee	England	84	5
7	Jean Noel Kapferer	Northwestern University	France	54	19
8	Mathias Peyer	University of Potsdam	Germany	49	7
9	Carmen Jaca	University of Navarra	Spain	37	16
10	Maarten Albert Van Eldik	University of Twente	Netherlands	28	1

**Figure 4.** Countries of origin of articles.

3.3. Citation Analysis

Citation analysis allows for the identification of citation networks and the observation of the development of the relevant literature in the field. A measure of scientific impact, citation analysis classifies publications [50], represents the dissemination of information in the network [51], measures the importance of publication, and defines research communities [50]. In this study, citation analysis of sources, documents, and authors was carried out.

3.3.1. Citation Analyses of Sources

In Figure 5, the citation analysis of sources is displayed in a map format. In the map, there are 20 items, 5 clusters, and 56 connections, yielding a total link strength of 99. The fields of study of the sources in the first cluster are development studies, science and technology, and education. The resources in the second cluster are in the business and economics study areas. The fields of study of the resources in the last three clusters are in the fields of education, educational research, and environmental sciences and ecology. The source with the highest citation network link is the journal *Sustainability* with a total link strength of 36. When the citation network map is considered, a technique used to identify pioneering research in the dissemination of an idea that develops in a particular area or subject at a particular time, it reveals that the journal *Sustainability* has made the most significant contributions to the development of the SC topic. This journal is also the source of the highest number of SC publications with eight articles. The next sources were the *International Journal of Sustainability* with 74 citations (23 total link strength) and the *Journal of Environmental Education* with 135 citations (23 total link strength).

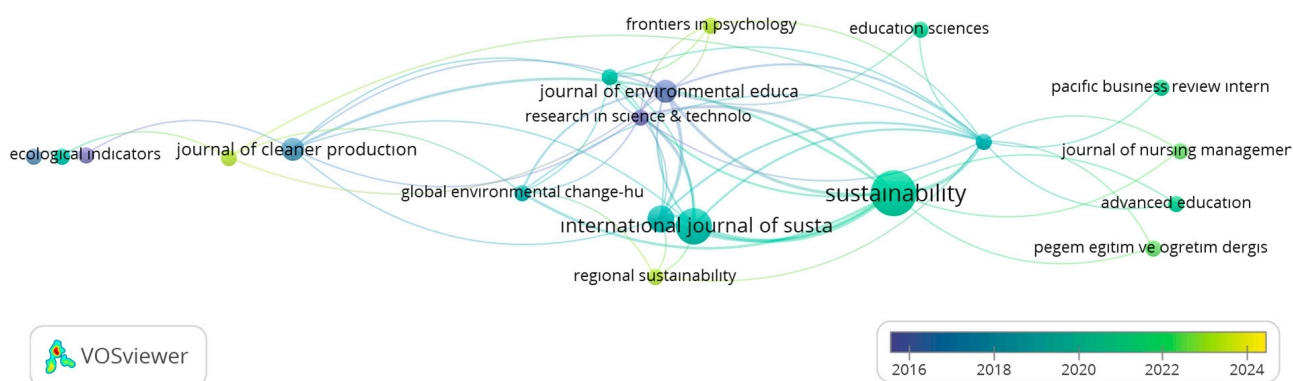


Figure 5. Citations network of sources.

3.3.2. Citation Analyses of Documents

In Figure 6, the citation analysis of the documents is shown in the form of a map. In the map with 21 items, 6 clusters, and 78 links, the document with the highest link strength is Boeve-de Pauw et al. [29] with 164 citations and a total link strength of 17. Subsequently, Olsson et al. [25] and Olsson and Gericke [52] emerged as the most frequently cited publications. The mentioned three documents are attracting attention with their significant impact on the SC literature due to the development of the Sustainability Consciousness Questionnaire (SCQ).

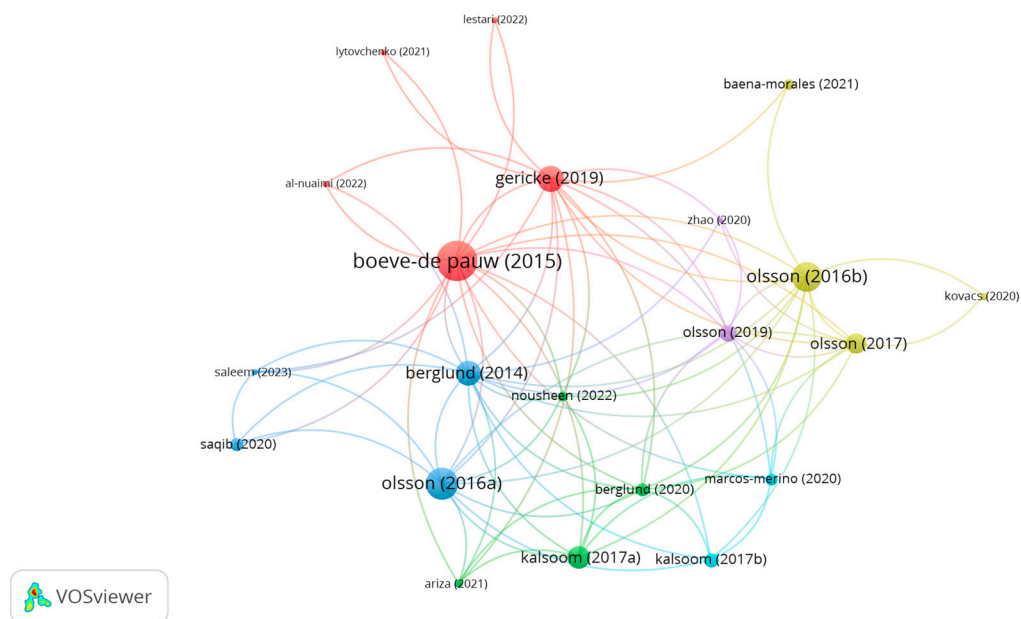


Figure 6. Citations network of documents.

As shown in Table 3, the most cited article belongs to Boeve-de Pauw et al. with 165 citations (published in *Sustainability* in 2015). The second article, by Olsson et al., has 105 citations (published in *Environmental Education Research* in 2016). The third most cited study belongs to Lammer et al., with 95 citations (published in *Food Quality and Preference* in 2019). The samples of six of the ten articles are students. These articles are on the theme of SC through ESD. The samples in three of the remaining articles are consumers. These articles are on the theme of SC of consumers. One article is on the theme of the SC measurement tool. The scale developed in this article is the most common measurement tool used to measure SC.

3.3.3. Citation Analyses of Authors

Figure 7 displays the citation analyses of authors in a map format. In the map with 55 items, 21 clusters, 363 links, and 983 link strength, the author with the highest link strength is Niklas Gericke (487 citations) with a total link strength of 355. He is followed by Daniel Olsson (422 citations), with a total link strength of 288, and Teresa Berglund (344 citations), with a total link strength of 257, as the most cited authors, respectively.

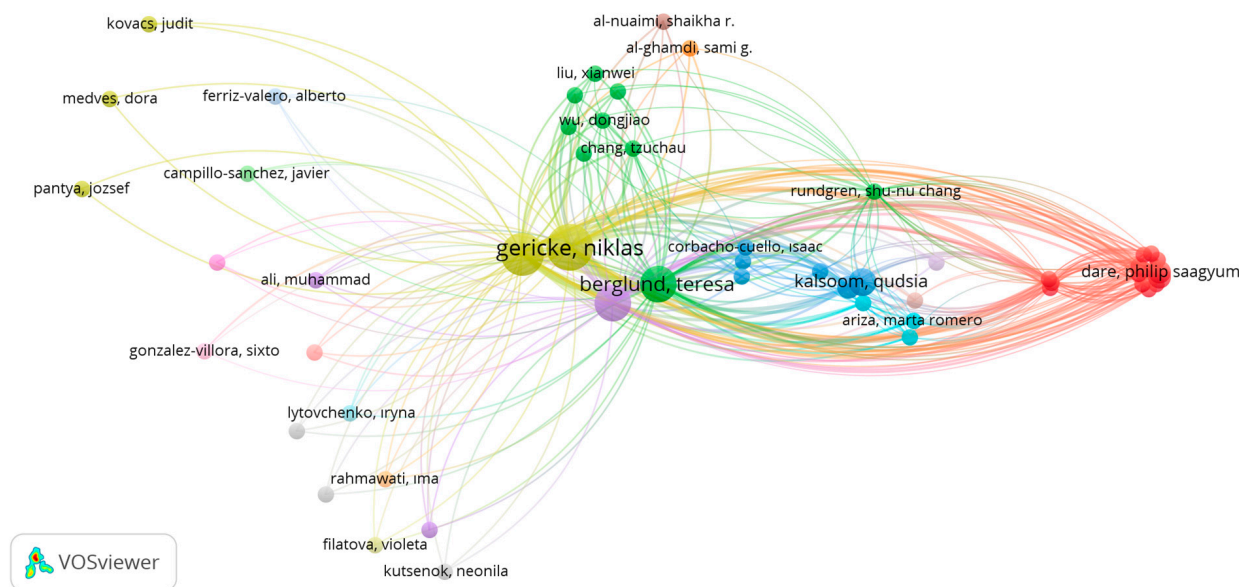


Figure 7. Citations network of authors.

Table 3. The most cited articles' key objectives and findings.

No	Title	Citation	Key Objective and Findings
1	The Effectiveness of Education for Sustainable Development	165	The article evaluates the extent to which education can be characterized as holistic and pluralistic from the perspective of ESD. Research results show that ESD has a major impact on student outcomes, particularly about SC.
2	The effect of implementation of education for sustainable development in Swedish compulsory schools—assessing pupils' sustainability consciousness	105	The study compared the impact of the ESD approach on students in schools with and without ESD education. The results showed that schools with an ESD profile had a small positive effect on students' SC.
3	Acceptance of insects as food in Germany: Is it about sensation seeking, sustainability consciousness, or food disgust?	95	This study examines the acceptance of insect-based foods by consumers in Germany. Despite the participants' strong SC, SC was not a significant determinant of willingness to consume insects.
4	The adolescent dip in students' sustainability consciousness—Implications for education for sustainable development	93	This study investigates students' SC during the transition to adolescence. The results clearly demonstrate that Swedish students' SC declines during adolescence and that sustainability education for adolescents needs to be modified.
5	The Sustainability Consciousness Questionnaire: The theoretical development and empirical validation of an evaluation instrument for stakeholders working with sustainable development	78	This article introduces the concept of SC, which is an individual's experience and awareness of SD. A SCQ was developed theoretically and empirically. The SCQ scale was developed in two versions: long version (SCQ-L) and short (SCQ-S).

Table 3. Cont.

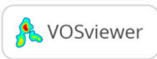
No	Title	Citation	Key Objective and Findings
6	The implementation of education for sustainable development in Sweden: investigating the sustainability consciousness among upper secondary students	65	The aim of this article was to investigate the effects of ESD implementation in Sweden in terms of improving students' SC. The results show that there are significant differences in terms of SC between students in schools providing education with the ESD approach and students in regular schools. Additionally, a significant difference was found in the underlying economic dimension of SC between the two groups of students.
7	Are millennials really more sensitive to sustainable luxury? A cross-generational international comparison of sustainability consciousness when buying luxury	64	The study investigates whether millennials are more sensitive to sustainable luxury. The research results revealed that the sensitivity of Generation Y regarding the sustainability of luxury brands when purchasing luxury is not much different from that of other generations.
8	Inquiry into sustainability issues by preservice teachers: A pedagogy to enhance sustainability consciousness	54	The study used action research to improve pre-service teachers' SC through inquiry-based learning. The data showed that preservice teachers' empirical examination of sustainability issues and research-based discussions improved preservice teachers' SC.
9	The role of sustainability in profiling voluntary simplifiers	50	This study, which investigates the sustainable purchasing intentions of minimalists, aims to create a multidimensional sustainability profile for minimalists. The results revealed that minimalists purchased more green products, and exhibited greater environmental and economic SC.
10	The effect of gender on students' sustainability consciousness: A nationwide Swedish study	45	This study extends previous environmental education research on gender differences by investigating the gender difference between boys' and girls' SC. The findings revealed a gender difference in students' SC. The gender gap increases across the age range and becomes even larger in ESD-focused schools.

3.4. Co-Citation Analysis

Co-citation analysis is a method employed to identify the leading authors, references, and sources within a particular academic field. Co-citation refers to the measure of how often two publications are cited together with each other [53].

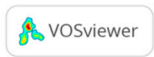
3.4.1. Co-Citation Analyses of Sources

Figure 8 displays the co-citation analyses of sources in a map with 89 items, 5 clusters, 2213 links, and 26,345 link strength. The sources in the first cluster, indicated in red, mostly consist of marketing and psychology journals. The sources in the second cluster, indicated in green, are environmental and education journals. The sources in the third cluster, indicated in blue, consist of production journals. The sources in the fourth cluster, indicated in yellow, are sustainability journals. The sources in the fifth cluster, indicated in purple, are related to the future. The source with the highest link strength is *Environmental Education Resource* with a total link strength of 5350. Then, the *Journal of Clean Production* with a total link strength of 4554, and *Sustainability* with a total link strength of 4462 were the sources with the highest link strengths, respectively.



3.4.2. Co-Citation Analyses of References

Figure 9 displays co-citation analysis



3.4.3. Co-Citation Analyses of Authors

Figure 10 displays co-citation analyses of authors in a map format. In the map with

Republic of China, Australia, the USA, Pakistan, Ukraine, Switzerland, and South Korea. The map of the countries with the most cooperation in co-authored studies is presented in Figure 13.

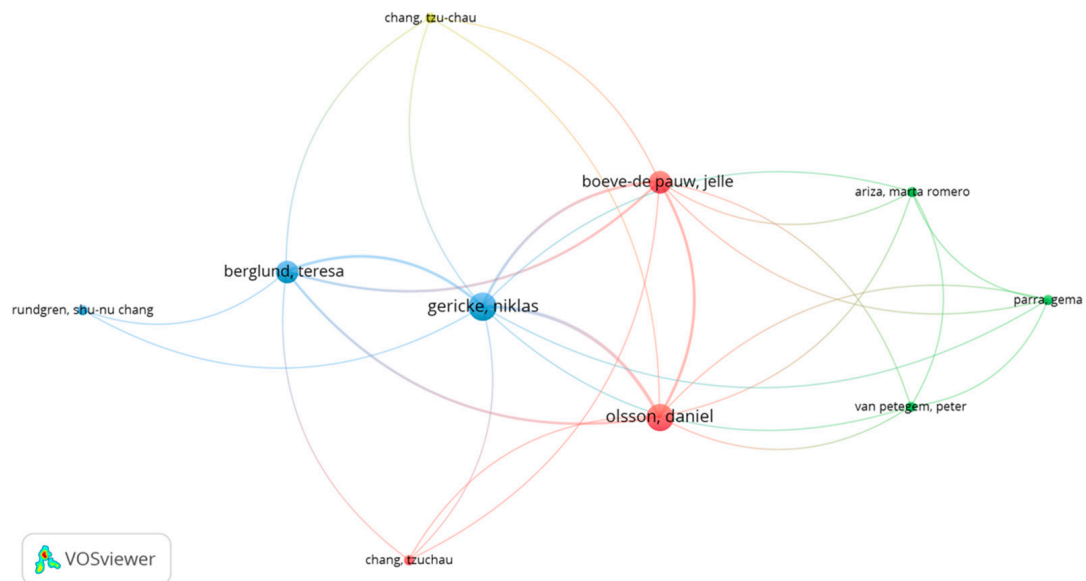


Figure 11. Co-authorship network of authors.

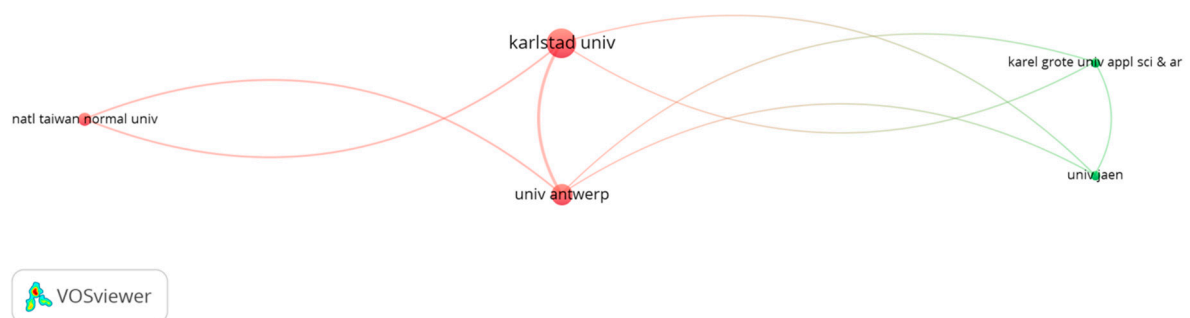


Figure 12. Co-authorship network of organizations.

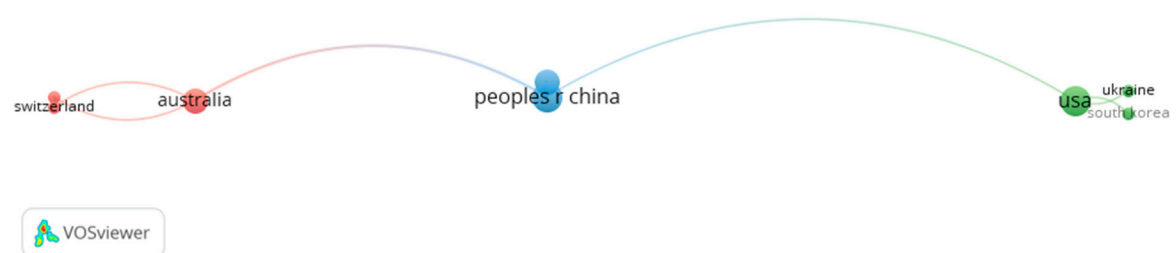


Figure 13. Co-authorship network of countries.

Figure 14 displays a word cloud that showcases the wide range of frequently utilized keywords found in the examined publications. The most frequently used keywords in the analyzed articles are, in order, “sustainable,” “education,” “consciousness,” “environmental,” and “development”.

All the articles included in the analysis have been classified in Tables 4–7 according to the four emerging themes (SC through ESD, SC of consumers, SC in business, and SC measurement tool) in terms of key objectives, methods, and findings.



Figure 14. Word cloud of keywords.

Among the 49 analyzed articles, 28 are focused on the theme of SC through ESD. The samples of 27 of these articles are students. The sample of one article was determined as adults. Among the studies under evaluation, a total of 21 employed quantitative methodologies, while 6 adopted mixed methods, and just 1 study relied on qualitative approaches. The most commonly used scale for measuring SC is the SCQ-S (27 items) developed by Gericke et al. [35]. Lytovchenko et al.'s [54] studies were structured as pretest, posttest, and experiment. In quantitative studies within the field of education, the sample sizes ranged from 113 to 2413. The results of academic studies on SC through ESD are promising and enlightening. ESD represents a critical framework for promoting SC. One of the most significant findings from the studies is the significant positive effect of ESD on increasing SC [28–30,32,55]. Whether implemented in schools, universities, or community settings, ESD programs have been successful in raising awareness about environmental, social, and economic sustainability issues. Awareness plays a positive role in enhancing SC [56]. However, it has been determined that the role of ESD in enhancing SC varies across cultures [57,58]. Furthermore, there are gender differences in students' SC that increase with age [59]. Academic research emphasizes the importance of interdisciplinary and experiential approaches within the context of ESD. Integrating sustainability principles into various academic disciplines, and offering practical experiences such as environmental projects or community engagement initiatives, appears to be highly effective in deepening SC [60]. Such approaches not only improve students' understanding of sustainability but also empower them to apply sustainable thinking to real-world challenges.

However, the studies also highlight certain challenges in the field of SC through ESD. One notable challenge is the need for continuous evaluation and measurement to ensure the effectiveness of ESD programs. Researchers and educators must continually monitor and implement their approaches to adapt to changing social and environmental contexts. The studies indicate the need for improvements in the inclusivity and equity aspects of ESD [11]. SC efforts should prioritize reaching underserved communities and addressing issues related to environmental justice and social equity. Ensuring that ESD initiatives are accessible and culturally appropriate for individuals is critical to long-term success.

In conclusion, academic studies on SC within the scope of ESD show that ESD is a valuable tool for increasing consciousness of sustainability issues and promoting responsible and sustainable behaviors. The studies offer valuable insights into strategies that are beneficial in the context of ESD and emphasize the significance of continuous evaluation and inclusivity in ESD initiatives. Considering the ongoing sustainability difficulties faced

by our global community, the outcomes of these studies offer a fundamental basis for fostering a more sustainable and conscientious approach to global citizenship.

Table 4. Key objectives, methodologies, and findings of articles on the theme of SC through ESD.

Ref.	Key Objective	Method			Sample and Frequency	Findings
		SCQ Scales	Research Design	Country		
[11]	It explores students' SC and discusses ESD policy implications.	SCQ-S	Quantitative	Taiwan, Sweden	1200 students	It shows that there are significant differences in terms of SC between the two samples.
[20]	To analyze the impact of the ESD-focused RADEC learning model on students' SC.	SCQ-S	Quantitative	Indonesia	150 students	ESD integrated with the RADEC learning model helps students achieve SC.
[26]	It aims to determine the status and effectiveness of ESD by using students' and teachers' sustainability perceptions.	SCQ-L	Quantitative	Pakistan	1915 students; 120 teachers	The prevalence of ESD in Pakistan is low and teachers have inadequate knowledge on sustainability.
[27]	It aims to investigate how ESD applications and SC are linked.	SCQ-S	Quantitative	Malaysia	2678 students; 1013 teachers	Significant relationships were found between ESD approaches and SD.
[28]	To reveal the effects of ESD in terms of improving SC.	Michalos et al. (2012)	Quantitative	Sweden	638 students	There is a difference between students with ESD and those who are not educated.
[57]	Action research has been used to improve the SCs of candidate teachers through query-based learning.	Michalos et al. (2015)	Mixed	Pakistan	27 students	The data indicate that research-based discussions enhance the SC of teacher candidates.
[36]	It reveals the SC of physical education teachers.	SCQ-S	Quantitative	Spain	203 teachers	It shows that physical education teachers have a high awareness of SD.
[38]	Evaluating SC of primary school Students.	SCQ-S	Quantitative	Spain	151 students	It revealed positive relationships between SC and sustainability attitudes.
[52]	To explore the significance of SC in the process of transitioning to puberty.	Michalos et al. (2011)	Quantitative	Sweden	2413 students	It clearly shows that students' SC decreases during adolescence.
[54]	Analyzing the effectiveness of online sustainability education in ESP classrooms.	SCQ-S	Quantitative	Ukraine	33 students	It has shown an increase in their knowledge of SD issues and more responsible environmental behavior.
[55]	The paper examines a service-learning initiative that combines life cycle nutrition and developmental psychology courses, with a focus on intergenerational and multidisciplinary collaboration.		Mixed	USA	21 students	The SC of students attending the course has increased throughout the duration of the period.

Table 4. Cont.

Ref.	Key Objective	Method				Findings
		SCQ Scales	Research Design	Country	Sample and Frequency	
[56]	It aims to understand psychosomatic mechanisms such as mindfulness and SC, which have a potential impact in promoting sustainable lifestyles.	SCQ-S	Quantitative	India	157 students	It has a positive role in developing SC.
[30]	To draw attention to the SC of teacher candidates for SD.	Michalos et al. (2015)	Quantitative	Pakistan	361 students	The study reports that the SCs of Pakistani teacher candidates are much lower than the SCs of Swedish high school students.
[58]	It focuses on filling the gap in academic research and critical thinking on the impacts of sustainability education initiatives in Taiwan.	SCQ-L	Quantitative	Taiwan	1741 students	Green schools in Taiwan have no influence on students' SC.
[59]	Exploring the gender difference between boys' and girls' SC and extends previous studies.	SCQ-L	Quantitative	Sweden	2413 students	Students SCs differ by gender and become even larger in ESD-focused schools.
[60]	It measures students' SC competency outcomes through the ESD framework.	SCQ-S	Quantitative	Malaysia	975 students; 458 academicians	Action-based ESD has demonstrated its potential to be successful.
[61]	It aims to provide data about students' self-perceptions regarding SC.	Leeming and Dwyer (1995)	Mixed	Hong Kong	787 students	Although there was an increase in students' SC perceptions, knowledge, and behavioral aspects, they showed low participation.
[62]	In business education, it aims to include sustainability principles in the curriculum.		Qualitative	USA		This article discusses various approaches to integrating sustainability into curriculum design.
[63]	Proposing sustainability-focused foresight training as a transformative intervention.		Quantitative	Taiwan	223 students	Students hold promise as potential change agents for creating alternative environmental values and sustainable behaviors.
[64]	To test structural connections between curriculum experiences, sustainable agency beliefs, and students' SC.		Quantitative	China	1804 students	Curriculum emphasis has an impact on students' SC.
[65]	To examine the connection between students' environmental knowledge and behavior.		Quantitative	Hungary	325 students	SC is mediated by environmental attitudes.

Table 4. Cont.

Ref.	Key Objective	Method			Sample and Frequency	Findings
		SCQ Scales	Research Design	Country		
[66]	To explore the potential of the SCQ scale to evaluate different educational interventions.	SCQ-S	Mixed	Spain	68 adults	Pre-intervention scores indicate high SC and a positive impact on sustainability behavior after the intervention.
[67]	It aims to evaluate the impact of sustainability pedagogies on Students' SC in online education environments.	Michalos et al. (2015)	Mixed	Pakistan	49 students	It shows that teacher candidates improve their SC in online education environments during the COVID-19 epidemic.
[68]	It explores the role of specific sustainability education pedagogies in developing SC of pre-service teachers.	SCQ-L	Mixed	Greece	77 students	While it was concluded that concept maps were the most effective factors affecting the learning of teacher candidates, the general principles of teaching were also determined.
[69]	It evaluates the impact of ESD and SC on higher education students in Qatar.	SCQ-S	Quantitative	Qatar	212 students	It has been reported that more than 80% of students have an adequate understanding of sustainability-related information.
[70]	It aims to investigate the Integration of the ESD Program in Nursing.	SCQ-S	Quantitative	Egypt, Saudi Arabia	160 nurses	A difference was found in the SC of nurses before and after the intervention.
[71]	Students' SC level was investigated.	SCQ-S	Quantitative	India	205 students	It has been revealed that sustainability attitude affects sustainability behavior more than sustainability knowledge.
[72]	It aims to assess its students' knowledge of the SDGs.		Quantitative	UAE	112 students	The results of students who received and did not receive the ESD awareness program showed differences.

As shown in Table 5, out of the analyzed 49 articles, 11 are related to the theme of SC of consumers. Consumers were selected as the unit of analysis in all articles. In an article that used mixed methods, website content analysis was conducted [73]. Although there is no common scale widely used to measure consumers' SC, in two studies, the Sustainable Consumption Consciousness Scale developed by Balderjahn et al. [74] was used. The studies on consumers' SC provide insights into how consumers perceive and engage with issues related to sustainability. Although there are cross-cultural differences in studies [75,76], it can be said that there is an increasing awareness of sustainability among consumers [77]. The studies emphasize that consumers are willing to make choices that align with sustainability values [5,73]. Although consumers have SC, there are various barriers that can limit their ability to make sustainable choices. These barriers include price

sensitivity, lack of information, and the convenience factor. The research indicates that overcoming these barriers is necessary to promote more sustainable consumer behavior [78]. Furthermore, the research found no difference in sustainability sensitivity during purchasing among generations, indicating that Generation Y does not prioritize sustainability more in their purchase decisions [79]. Research findings on consumers' SC frequently differ between countries and cultural contexts. [75,76]. Cultural norms, socioeconomic factors, and regional sustainability challenges can influence how consumers perceive and act on sustainability issues.

In summary, studies on consumers' SC provide valuable insights into the motivations, barriers, and behaviors of individuals in the market. These findings are crucial for businesses, policymakers, and advocacy groups aiming to promote more sustainable consumption patterns. As sustainability continues to gain importance on the global stage, understanding and addressing the complexity of consumer SC will remain a critical area of research and action.

Table 5. Key objectives, methodologies, and findings of articles on the theme of SC of consumers.

Ref	Key Objective	Method			Findings	
		SCQ Scales	Research Design	Country		
[5]	To examine the relationships between consumers' SC and behavioral intentions towards environmentally friendly products and its impact on SDGs endorsement.		Quantitative	India	410 consumers	SC of consumers influenced Consumers' SDGs-endorsing behavioral intentions.
[73]	It aims to discover how responsible consumers' motivations for choosing green products should be taken into consideration.		Mixed	Spain-Latin America-Africa	30 website analysis and 141 consumers	It provides information for companies that want to align their eco-innovation strategies with the motivations of green consumers.
[75]	To examine the perception of consumers towards SC and the extent to which they incorporate it into their practices of sustainable consumption.		Qualitative	Kyrgyzstan	50 consumers	The results show that participants have very little knowledge about sustainability
[76]	To examine the factors that determine consumer characteristics and marketing perspective to stimulate consumption behavior.		Quantitative	England-USA-China	711 consumers	Differences have emerged between the three countries, indicating a positive impact on behavioral intention towards sustainable apparel products.
[77]	It discusses the role of mobile applications developed in preventing food waste.		Quantitative	Turkey	439 consumers	It shows that people who care about sustainability care about food waste and turn it into sustainable purchasing behavior.

Table 5. Cont.

Ref	Key Objective	Method				Findings
		SCQ Scales	Research Design	Country	Sample and Frequency	
[78]	Sustainable purchase intentions for minimalists are to create a multidimensional sustainability profile that includes human values and sustainable consumption consciousness.		Quantitative	Germany	1458 consumers	Minimalists have a SC that is ecological and economical.
[79]	Investigating the true sensitivity of millennials to sustainability when purchasing luxury goods.	32 items scale	Quantitative	China-USA- Japan- France- Germany- Brazil	3217 luxury consumers	Generation Y does not stand out as being more sensitive about sustainability when purchasing.
[80]	It aims to understand customers regarding sustainability and purchasing by defining customer market segments.	Shen et al. 2012	Quantitative	USA	754 consumers	Participants demonstrated significant differences in consumer characteristics related to both sustainability-related factors and shopping characteristics.
[81]	Examines the acceptance of insect-based foods by consumers in Germany.	SCQ-L	Quantitative	German	516 consumers	Despite the participants' strong SC, it was revealed that SC was not a significant determinant of their willingness to consume insects.
[82]	Explains why and how mindfulness affects SC.		Quantitative	India	726 consumers	There is a significant positive relationship between mindfulness and SC.
[83]	To evaluate the effectiveness of teachers and parents on children's SCs.		Mixed	Australia	300 students, parents, and teachers	At the end of the project, the processes that cause changes in children's SCs will be evaluated.

Among the 49 publications that were examined, it was found that 5 pertain to the topic of SC in business, as indicated in Table 6. Four of the studies used qualitative methods, while one study utilized quantitative methods. Managers, entrepreneurs, experts, and employees were selected as the sample group in the studies. Four studies that used the interview method were structured as case analyses [84–87]. A sustainable business model serves as the driving force for SC in business [84]. It provides valuable information about the role and impact of individuals in organizations in promoting sustainability. The employees are aware of the importance of environmental and social responsibility both in business and social life. Many employees express a desire to work for organizations that align with their values, including sustainability SC dimensions in business, upskilling in sustainable practices, operationalizing sustainability, and disseminating the sustainability message, which is useful in clarifying prior knowledge in the context of sustainable “for-profit” activities [85]. Employees with a strong SC are more likely to engage in sustainable behaviors in the workplace. These behaviors may include conserving resources, reducing waste, and advocating for sustainability initiatives within the organization. Entrepreneurs

with a value-driven consciousness, on the other hand, channel their values and vision into the work they do [84].

Employees play a crucial role in advancing sustainability in organizations. Organizations should meet the need for engaging and empowering their employees, promoting a culture of sustainability, and aligning their values and practices with broader sustainability goals. As businesses and organizations increasingly prioritize sustainability, understanding and harnessing employees' SC will remain a critical aspect of driving positive change.

Table 6. Key objectives, methodologies, and findings of articles on the theme of SC in business.

Ref	Key Objective	Method			Findings	
		SCQ Scales	Research Design	Country		Sample and Frequency
[84]	To determine the opinions of craft entrepreneurs regarding SC in their businesses.		Qualitative	New Zealand	8 entrepreneurs	In a sustainable business model, SC is a driving motivation and an important starting point.
[85]	It includes the firm’s Knowledge-Based View to examine knowledge management in the context of sustainable practices.		Qualitative	Vietnam	5 stakeholders	The SC dimension, depicted by their attitudes towards sustainability-based principles, is aligned with the “information needs of production”.
[86]	It aims to develop a sustainable BIM-based EIA for infrastructure projects.		Qualitative	Netherlands	Case	The design team of the framework has been shown to increase SC.
[87]	Proving that environmental innovation is the key to sustainability in the luxury yachting industry.		Qualitative	Poland	Case	It emphasizes that everyone has a role (awareness) in being aware of the challenges faced in terms of sustainability and ensuring sustainability.
[88]	To investigate composite indicators linked to agricultural sustainable supply chain management (ASSCM).		Mixed	China	8 experts	Environmental legislation, regulation, licensing, and government subsidies have been found to be the main drivers of ASSCM.

As shown in Table 7, 5 of the 49 articles analyzed are on the SC measurement tool theme. One of the studies is the consumer SC scale, which has 19 items and 5 dimensions, developed to measure consumers' SC [89]. Students were selected as samples in three studies. In the first of these studies [29], the 50-item SCQ scale was developed. This study has the strongest link network in the citation of document analysis. In their later studies, the authors improved the scale and revised it to 49 items. This scale is called SCQ-L [25]. The third study belongs to the same authors and they applied the shortening procedure of SCQ-L and obtained SCQ-S with 27 items [35]. The final study on this theme is the Japanese adaptation of SCQ-S [37]. Analyses revealed that the Japanese version of the SCQ consists of two single-level factors (sustainability knowledge/attitude and sustainability behavior).

Table 7. Key objectives, methodologies, and findings of articles on the theme of the SC measurement tool.

Ref	Key Objective	Method			Sample and Frequency	Findings
		SCQ Scales	Research Design	Country		
[25]	The effect of the ESD approach is compared to that of students in regular schools.	SCQ-L	Quantitative	Sweden	1773 students	Schools with ESD profiles have shown that students have a small positive impact on SC.
[29]	To measure the extent to which education can be labeled as holistic and pluralistic from ESD.	Olsson et al. (2015)	Quantitative	Sweden	2413 students	ESD significantly influences student outcomes, especially regarding SC.
[35]	The aim of the study is to introduce the concept of SC and develop the SCQ scale.		Quantitative	Sweden	638 students	The SCQ scale was developed in two versions: long version (SCQ-L) and short (SCQ-S).
[37]	Developed a Japanese version of the SCQ and examined the reliability and validity of the questionnaire.	SCQ-S	Quantitative	Japan	1268 adults	Showed that the Japanese version of the SCQ consists of two single-level factors: sustainability knowledge/attitude and sustainability behavior.
[89]	Extensive research has been conducted on the factors that motivate consumers to engage in sustainable consumption behavior.	19 items Consumer SCQ	Quantitative	Portugal	174 consumers	The suggested structure of the SC consists of five dimensions. Sense of Retribution; Access to Information; Labeling and Peer Pressure; Health Issues; and Crisis Scenario

4. Conclusions

This study, which uses the SLR approach to examine 49 SC publications from the WoS database, gives useful information concerning SC research. According to the findings of this study, SC is becoming increasingly relevant and is regarded as an interdisciplinary topic in academic research. A thorough examination of the current literature suggests a remarkable increase in academic interest in SC. This tendency reflects the growing global recognition of sustainability as a key concern.

The investigation's findings unveil compelling trends within the sustainability consciousness literature. Notably, there is an ongoing surge in the volume of SC-related publications, indicative of a mounting interest among researchers. Additionally, the application of bibliometric analysis has unveiled noteworthy research themes, influential authors, and productive institutions in this field. These insights offer invaluable knowledge for scholars, policymakers, and practitioners seeking to address sustainability awareness challenges. The systematic literature review has cast light on the intricate landscape of SC research, elucidating its multifaceted structure, which encompasses individual awareness, business behaviors, and societal reforms. This underscores the significance of employing comprehensive and diverse methodologies within the SC literature. Moreover, this study has identified gaps in the existing SC literature, opening doors to new avenues of research. These gaps call for a deeper exploration of cross-cultural studies, a more profound investigation into how education and communication contribute to the development of SC, and a

thorough evaluation of the tangible impact of SC on businesses and government agencies. Another gap that stands out strikingly in the theme distribution of articles in the field of SC is the large number of articles in the field of education that take students as samples. Within the framework of the SDGs' lifelong learning approach, continuity of the awareness-raising process is required for the SC instilled in individuals through their education to continue throughout their lives. It is recommended that research on SC be conducted to include all segments of society. Studies measuring SC in different sample groups, such as business employees and local people, will contribute to the literature with their results regarding individuals' understanding of SC. The quest for knowledge in these uncharted territories promises to further enrich our understanding of SC and its real-world implications.

In summary, this study advances our understanding of SC and its role within the broader discourse on sustainability. This resource is extremely useful for academics, policymakers, and practitioners. It emphasizes the importance of continuous research and participation in developing sustainability awareness for a more sustainable and equitable future. As sustainability challenges continue and become more urgent, the effort to build a global community aware of its obligations to the planet and future generations remains a priority goal. We hope that this research will contribute to advancing this goal.

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