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Review

Social Innovation, Circularity and Energy Transition for Environmental, Social and Governance (ESG) Practices—A Comprehensive Review

Catalin Popescu [1,*], Eglantina Hysa [2], Alba Kruja [3] and Egla Mansi [3]

[1] Department of Business Administration, Petroleum-Gas University of Ploiesti, 100680 Ploiești, Romania
[2] Department of Economics, Epoka University, 1000 Tirana, Albania
[3] Department of Business Administration, Epoka University, 1000 Tirana, Albania
* Correspondence: cpopescu@upg-ploiesti.ro

Abstract: It has been extensively debated how social innovation, circularity, and energy transition may all be considered environmental, social, and governance (ESG) components from a sustainability perspective. To comprehend the conceptual development of this subject in the academic literature, few studies, however, tackle the problems above by reviewing earlier research on the subject. By developing the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) technique, this study aims to address the current and anticipated advancements in social innovation, energy transition, and circularity. As a result, we create two metasynthesis analyses related to "social innovation–energy transition" and "social innovation–circularity." In the first analysis, the three databases Web of Science, Scopus, and JSTOR had a total of 1767 studies and reports, and in the second analysis, we reviewed the work from a total of 466 studies and reports. We emphasize that implementing environmental, social, and governance (ESG) practices require social innovation, circularity, and energy transition. The study's key contributions are the five cluster themes classification for the two metasynthesis analyses, which point to potential future directions for both firms and governments to pursue some macro-level goals concerning energy transition and circularity through social innovation.

Keywords: energy transition; social innovation; ESG; circularity; business models; climate change; PRISMA approach

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1. Introduction

Many policy organizations from various levels of government have united pursuing the idea of a decarbonized future [1]. In industrialized nations, some studies have concentrated on establishing direct relationships between Gross Domestic product (GDP), labor, and energy, highlighting the idea that energy may be seen as a basic element in production processes [2,3]. This movement comprises cities that are members of the European Covenant of Mayors, nations that have ratified the Paris Agreement, and the European Commission, whose president, von der Leyen [4], has expressed the organization's vision for an Energy Union and the European Green Deal. Current policy cannot be intensified in order to address long-term environmental issues. The approach focuses instead on "fixing the key environmental challenges needs system innovation; long drawn-out transformation processes involving technical, economic, socio-cultural, and institutional changes" [5].

Moreover, as today we face with environmental issues in different sectors, measures need to be treated carefully [6,7]. Depletion of natural resources, gas emissions, air pollution, nuclear risks, and as well as uncertainties regarding political sanctions on resource supply, has led to an increase in fear of energy poverty [8]. Even while social and environmental issues account for the majority of these difficulties, economic issues are as urgent. Existing infrastructure systems face enormous financial demands for infrastructure renewal and growth in many regions of the world [9,10], which are made even more daunting by the current economic crisis and public budget overruns [11]. As a result, it is proposed to transition toward low-carbon industries with a focus on reducing energy consumption, utilizing renewable energy sources, and raising energy efficiency levels. To accomplish this, a major shift in present energy supply systems is required, necessitating changes in governmental, social, and technological energy practices, as well as a concentration on both the supply and demand sides of energy markets [12]. As such, the demand on businesses to reveal their environmental, social, and governance (ESG) performance as a result of government rules, investors, and stakeholders has influenced on corporate sustainability policies. This has resulted in problems such as the manipulation of companies' ESG performance and the creation of ideas such as "green-washing," "value-washing," and "blue washing," all of which try to win over investors and appease stakeholders [13,14].

The study of transitions to sustainable development has grown significantly during the last decade. Most studies [15–18] have produced thorough literature reviews on sustainable development and transition. However, the studies often lack a proper analysis that can help channel toward the direction where energy transition and social innovation are heading. Thus, our paper introduces another approach to analyzing the literature on ESG and shedding light on future directions for social innovation and energy transition challenges. The PRISMA method is a minimal set of elements for documenting quantitative studies and meta-analyses that are backed by evidence. In this meta-analysis, it is critically helpful to assess the existing literature's strengths and weaknesses and the quality of the reviews.

Hence, despite increasing company awareness over the last few decades, there still needs to be more information regarding the influence of social innovation on challenges related to the energy transition, which is necessary to address the sustainability of businesses and society. Therefore, in this study, we try to examine the relationships between social innovation, circularity, and the energy transition, to describe the present and potential future research. Socially responsible investors employ a set of corporate behavior criteria known as environmental, social, and governance (ESG) standards to evaluate possible investments. Environmental considerations include climate change regulations and how businesses safeguard the environment. Lastly, the goal of this study is to conduct a thorough assessment of the literature and consider the future directions for social innovation and energy transition challenges.

The study uses the PRISMA approach to conduct a thorough search and analyze journal articles on social innovation, energy transitions, and circularity. In the context of this approach, we looked at several kinds of documents, such as reports and articles, from the three databases Web of Science, Scopus, and JSTOR. Finally, the main contribution of this study is the cluster themes classification for the two meta-synthesis analyses, indicating some future directions for both governments and businesses, as well as academics, to go for some micro-meso-macro-level targets concerning analyzing, developing, and implementing environmental, social, and governance practices for energy transition and circularity through social innovation.

In order to grasp the development of the topic in the academic literature, the current review intends to assess the energy transition idea by looking at previously completed research. We have organized the paper as follows. In the second section, we give a general overview of the relationship between social innovation, environment, and energy transition, followed by an extensive literature review to support our case. The third section contains details on the methodology and materials we use. The fourth and fifth sections contain a thorough analysis and discussion of our results. The last section includes our conclusions and future recommendations.

2. Background Literature

2.1. Energy Governance

Technological innovation must be linked with other factors, such as social innovation and "greenwashing", to effectively pave the way for the energy transition. Hoppe and Vries (2018) cover the behavioral and social sciences in 20 articles contributed from researchers from various academic fields [12]. The authors look for any effects of social innovation on the energy transition and what those effects might be. They conclude that social innovation attempts to achieve specific social goals, including community empowerment, eliminating [energy] poverty, [energy] justice, social equality, increasing local community well-being, and helping with the transition to low-carbon energy.

With a focus on policy entrepreneurs, knowledge brokers, network and process management, boundary transcending, and end-user involvement, Lammers and Hoppe (2018) publish the findings of a thorough literature review on the governance and planning of local energy systems [19]. Using the concepts of "activity venues" and "institutional norms" from Elinor Ostrom's (2009) institutional analysis and development framework, they look into municipal and district-level energy governance practices (i.e., planning and implementation) [20]. In common with Acosta et al. (2018) [21], they consider local energy systems as socio-technical systems and share Ostrom's (2009) conceptual conceptions of energy.

Leeuw and Groenleer (2018) talk about how local energy-efficient housing programs are governed in their contribution [22]. They create an analysis framework for regional energy innovation management and use it to examine three Dutch provinces. The authors contend that regional governance itself qualifies as a type of social innovation and that regions serve as "living laboratories" for both technological and social advancement, allowing for the testing and study of local and regional solutions. The case study demonstrates that social networks already present in districts play a major role in the regional management of energy-efficient housing developments, with situational elements such as the built environment having less of an impact.

Wierling et al. (2019) examine community dynamics and their effects on electricity transmission [23]. The performance of energy cooperatives in four European nations is examined empirically in this research. The findings indicate that collaboration in the transfer of energy is crucial. However, historically speaking, it seems that the emergence of government-backed enterprises coincided with the growth of energy cooperatives. The impact of strengthening or scrapping these strategies has left the function of cooperatives unclear. Energy cooperatives will increase portfolios, shares, and/or membership to sustain income in reaction to the withdrawal or tightening of incentive schemes, and will typically cease operations otherwise. Gabaldón-Estevan et al. (2018) looked into energy and community energy cooperatives in their study (they applied the case of the cooperative SOM Energia) [24]. According to them, Spain's energy strategy is too accommodating of the demands of the present energy lobby to encourage investment and keep its hegemonic status. Due to this, the number of investors has dropped, local and international investors have lost faith in the sustainable energy industry, and social innovation in the energy transition has been negatively impacted. However, the number of renewable energy cooperatives has increased, presumably in reaction to domestic energy market regulatory changes.

Wittmayer et al. (2020) present an overview of the literature and a more thorough understanding of social innovation [1]. They examine the concept's normative complexity, the complexity of social innovation, the idea that social innovation may be used to analyze the interaction of social and material forces, and, lastly, the idea that social innovation is the rationale for intervention based on experimentalism. The authors suggest delineating the factors that go into invention. The suggested conception of social innovation permits more extensive planning and structural system improvements.

In their comprehensive review of the literature on the social impact of renewable energy, Hewitt et al. (2019) compile, describe, and map, community energy (CE) projects from Belgium, France, Germany, Italy, Poland, Spain, Sweden, and the UK [25]. The authors also break down the idea of social innovation (SI) into four operational criteria that they contend are crucial for identifying SI in CE: (1) opportunities and crises; (2) the role of civic society; (3) the restructuring of social norms, institutions, and networks; and (4) new approaches to working. There are certain unsettling trends that can be seen in the future. The most recent CE boom has tapered down, and financial incentives are being eliminated or scaled back. Most likely, CE has peaked. Though it is probable that CE projects, in all their varied manifestations, will continue to serve as a breeding ground for concepts that eventually find acceptance in society. In this regard, the emphasis on sustainability, energy efficiency, and more equitable return distribution that is typical of many grassroots CE programs today is a positive development.

Lastly, the study conducted by Sareen et al. (2018) in Tamera (Portugal) looks at the difficulties associated with field testing future energy systems in an ecological community [26]. The researchers start by trying to analyze how the Tamera Solar Proving Ground has handled the difficulties of the energy transition. Finally, the findings that potentially influence policy and action in a European setting are identified. The study takes into account the demand for multiple initiatives that interact between applied researchers and practical agents, influence the size of communities and institutionalized power relations, and combine systems thinking and power dynamics in a transformative direction.

2.2. Social Innovation

Repo and Matschoss (2019) investigate social innovation's relationship to social mobilization and impact as well as the ideal strategy for resolving sustainability issues [27]. In 202 scenarios including innovations in the areas of climate action, the environment, resource efficiency, and raw materials, the study compares the idea of social innovation to five other categories of innovation (product, service, government, organizational, and systemic). The author finds that social innovations are, in fact, newer than other types of inventions.

Gulluscio et al. (2020) state that, in addition to financial, social, and environmental performance, corporate responsibility, particularly corporate accounting and reporting, should concentrate on concerns connected to sustainability [28]. The authors emphasize the current state and potential future directions of this field of study by focusing on SDG 13, "Combating Climate Change." The study takes into account the initial stage of accounting for and reporting on climate change research. The systematic review employed two methodologies: (1) a qualitative analysis carried out in accordance with the qualitative analysis framework, and (2) a bibliographic methodology. The findings showed that: (1) the main perspectives mentioned in the selected articles were related to accounting and reporting on sustainability in a broader sense; and (2) they have little contribution to climate change management. Especially in relation to strategic planning and operations, accounting, and monitoring of climate change action by office executives.

In order to comprehend the conceptual development of the sustainability accounting concept in the academic literature, Gil-Marín et al. (2022) examine previously completed studies in the field [29]. This study is a metasynthesis in which 15 re-reviews are chosen in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) technique, and 334 publications from the Web of Science (WoS) database are chosen for the identification phase. The findings show that corporations, academics, and regulatory authorities do not share a standard nomenclature regarding sustainable approaches.

Rapid growth led to habitat loss and environmental deterioration, according to Tuan-Hock et al. (2020) [30]. Many nations are vulnerable to natural calamities if this problem is not addressed. Financial growth has been praised for its ability to reduce environmental concerns by funding the development of green technology. Despite being the main tenets of sustainable management, research about the effects of financial development on environmental, social, and governance (ESG) is very scarce. This study's primary goal is to close a knowledge gap by investigating the relationship between financial development and ESG performance in Asia. Country-level data for the years 2013 to 2017 were used in this analysis. Financial development is positively correlated with ESG performance, according to assessments based on the pooled ordinary least squares approach, the fixed effects regression model, the two-stage least squares method, and the system Generalised Method of Moments estimator. Furthermore, using a panel of 770 Chinese listed companies between 2011 and 2020, Zheng et al. (2022) study the bidirectional cointegration link between environmental, social, and governance (ESG) performance and corporate green innovation [31]. The authors discover a long-term, bidirectional correlation between corporate green innovation output and ESG performance.

Conversely, Dicuonzo et al. (2022) add to the literature by clarifying the significance of innovation in enhancing industrial enterprises' environmental and social practices [32]. Using an eight-year cluster data model, the authors also offer empirical proof of innovation's potential as a useful instrument for long-term corporate development through R&D expenditure and patent creation. The legal rights and obligations of consumers and consumers of particular technological advancements that enable social innovation in the electrical industry are the main subjects of Lavrijssen and Carrillo Parra's (2017) research [33]. They examine the most significant radical advances in the electricity sector in addition to the legal and associated unlawful hurdles to the empowerment of energy consumers and buyers. The authors identify ideas for enabling customers and buyers to benefit from these new energy-related technological and societal advancements. They discuss how to adapt to demand, how distribution network operators are changing, how to identify suppliers and active clients reliably, and how peer-to-peer trading came about.

2.3. Circularity

Hysa et al. (2020) study the relationship between specific circular economy indicators, such as critical elements of both environmental and economic growth [34]. Developed nations encourage producers as they transition from linear to circular economies by continually innovating to foster development. As a result, the no-waste strategy improves the efficiency of utilizing finite resources by recycling or reusing waste materials in industrial processes. Therefore, using a GMM method, the model used five independent variables, including the amount of environmental taxation, the amount of waste recycled, the amount of private investment and employment in the circular economy, the number of recycling-related patents, and the trade in recyclable raw materials. The findings emphasize the critical importance of innovation, sustainability, and funding for waste-free activities in promoting development.

Additionally, Sehnem et al. (2022)'s study examines the phenomenon of the function of start-ups in the Brazilian business ecosystem [35]. Sustainable business concepts are more likely to constitute the foundation of emerging enterprises. These models frequently integrate the circular economy's guiding concepts. As a result, this study examined how disruptive innovation and resource circularity are used in start-up business strategies. Fifty semi-structured interviews with managers and owners of start-up businesses made up the study. According to their results, there is a lot of evidence that the circular economy is supported by disruptive innovation in Brazilian start-ups.

The breadth and possibility of a "circular economy" in the future, one that extends beyond a focus on recycling and trash management, are described by Webster (2021) [36]. According to the author, three factors are crucial. The first and most well-known are its "circularity by design" traits. Second, while it is rarely mentioned, is the close connection between the financial and monetary systems and the material cycle. Thirdly, a topic that includes both but is sometimes overlooked: how a more comprehensive reading of the notion is connected to a worldview or "framework for thinking." The chance to develop a circular economy that is "systems aware"—consistent with our modern knowledge of ecosystemic linkages, the upkeep of capitals or stocks, the interconnectedness of various scales, and the significant difference between effective and efficient—is present.

Geissdoerfer et al. (2017)'s discussion of the connection between sustainability and the circular economy tries to bring conceptual clarity by defining the terms and synthesizing the many kinds of links that exist between them [37]. Because the relationships between the ideas are not explicitly stated in the literature, their conceptual boundaries are becoming muddled, which limits how effectively the techniques may be used in study and practice. The authors investigated the current state of the art in the area. They synthesized the similarities, differences, and correlations between both words by conducting a thorough literature study and using bibliometric analysis and snowballing approaches. They cited eight different relationship kinds found in the literature and highlighted the notions' most glaring parallels and variances.

Scarpellini et al. (2020) study, evaluate, and verify formal and informal environmental management systems, such as certification standards used in environmental innovation and CE, and other management and accounting techniques, within the theoretical framework of dynamic forces [38]. Using the case of a Spanish corporation, the study also used a partial least squares structural model to analyze and assess the causal link between corporate "Circular eco-innovation" and environmental effectiveness. Practitioners can use the findings of this study to manage skills and competencies used when investing in circular eco-innovation more effectively and to acquire skills that more effectively close material circuits than other talents do.

According to Konietzko et al. (2020), circulation should be viewed as a system characteristic rather than a feature of a particular good or service (such as an urban transportation system; such as a vehicle or a passenger service) [39]. A case study of the circular ecological innovation movement and a quick examination of the literature on eco-best innovation practices serve as the foundation for the "circular eco-innovation" philosophy. Twenty interviews, workshop data, and internal background materials that make up the case study data were used to evaluate the relevance and usefulness of these recommendations in circular innovation. Three categories can be made from the adopted principles: (1) cooperation (i.e., how a business can cooperate with other players in its ecosystem to create a circular economy); (2) experimenting (i.e., how companies can set up a planned trial and experimentation process); and (3) platformatization, wherein mistakes develop more circulation (i.e., companies can organize social and economic interaction through online platforms to achieve more circulation).

2.4. Environmental, Social and Governance (ESG)

In light of their efforts to address climate change, financial institutions can demand more from oil and gas businesses in terms of environmental protection, according to a report by Dye et al. from 2021 [40]. Companies in ecologically sensitive industries, including the oil and gas sector, carefully monitor their ESG performance in connection to climate change. Thirty sustainability reports from Alberta-based oil and gas firms make up the first sample. Another sample includes ESG reports from 19 financial organizations that have invested in the oil and gas industry. They discover that there needs to be coherence in both business data and ESG investor criteria. As a result, the financial sector works to include the SASB (Sustainability Accounting Standards Board) framework and TCFD (Task Force on Climate-related Financial Disclosures) principles in business evaluations.

Based on the "International Standards for Resource Extraction Engineers (ISREE)," Litvinenko et al. (2022) suggest a method for assessing the levels of professional capabilities of the "Professional Resource Extraction Engineer" [41]. The authors contend that ESG principles ought to provide guidelines for regulating technological usage and ensuring the biosphere's long-term viability. The methodology and digital metrics created for assessing the operations of publicly traded extractive firms while taking into account ESG principles and sustainable development goals (SDG) provide greater openness and local population trust in these companies' operations.

Young and Schumacher (2021) provide a summary of the communication and the measuring, reporting, and verification (MRV) of carbon emission mitigation performance to contextualize sustainable finance-related carbon washing [42]. By creating a new word, "carbon washing," the authors draw a special emphasis on the danger of greenwashing in relation to carbon emission reductions. Since reducing carbon emissions is a global priority, the corporate carbon performance data supply chain is comparatively better developed than the sustainability data landscape as a whole. Due to the monetary rewards associated with corporate carbon performance, carbon washing poses a threat that is much greater than generic greenwashing.

In order to detect the co-occurrence of environmental, social, and governance risk factors, Lèbre et al. (2020) study mining projects for 20 different metal commodities and build a set of global composites of environmental, social, and governance indicators [43]. Their research shows that 84% of platinum and 70% of cobalt deposits are found in high-risk environments. Major metals such as iron and copper are expected to disrupt more land as a result of increased demand.

Lastly, Deng et al. (2022) look at how stock prices of companies throughout the world responded to the Russia–Ukraine war and its effects [44]. Possibly as a result of market investors' expectations for greater governmental responses supporting renewable energy sources in light of Europe's significant reliance on Russian oil and gas, stocks with potential in the low-carbon transition have profited. In conclusion, investors anticipate that the US and Europe will transition to a low-carbon economy at different rates. The approach takes a variety of Environmental, Social, and Governance (ESG) factors into account, with inconsistent findings. Companies that mentioned inflation more frequently in analyst conference calls underperformed. Internationally focused businesses struggled, and investors were especially concerned about their exposure to China. Overall, the findings give a quick glimpse at the difficult economic effects of the Russia–Ukraine war.

3. Materials and Methods

In this review paper, we employed the PRISMA method. Accordingly, articles by document type have been examined—specifically, articles, studies, and reports included in the three databases of Web of Science, Scopus, and JSTOR. Then, the research was followed by extending it and adding some other detailed information also on the gray literature. The search was performed in September 2022.

Figure 1 summarizes all the followed steps and the inclusion criteria in each step. As a very first step, we included papers that were focused on social innovation and energy transition, that has been detected in the article title, abstract, or within the keywords. As a second step, we included a complete screening process of the full articles, studies, and reports resulting from the first stage, using again the same search terms. As such, the final screening has excluded the full text representing Books, Book chapters, Editorial Material, Notes, and Short surveys.

The search terms used were "*social innovation*" and "*energy transition*", which resulted in 3454 records in the identification phase. Then, during the check phase, a total of 1085 records were excluded because of not being published during 2018–2022. Similarly, 504 records were excluded because they were duplicated studies. Going on with the checking phase, 98 records were excluded for presenting other document types apart from articles and reports.

Data extraction from the selected articles and studies, and also to answer the research question "What is the current and future development of studies in the area of social innovation and energy transition?", was enacted in accordance with two processes:

- ➢ A template was designed and used as a summary form of the findings, in which the 12 most cited articles were revealed;
- ➢ A TreeMap Chart (converted in the summary table) was developed from the total of 1767 studies, to get an idea of the main categories covered by these publications, and the weight of each category was configured as a percentage of the total number of publications;
- ➢ Another categorization of studies distribution was done by the authors' affiliations (corresponding universities), which enabled the identification of the top countries to have published research with regard to social innovation, energy transition, and circularity;
- ➢ Another detailed analysis was done by using co-citation analysis and cited references, retrieving a mapping of the top cited references divided into clusters and items—the most cited authors, the most cited journals, etc.

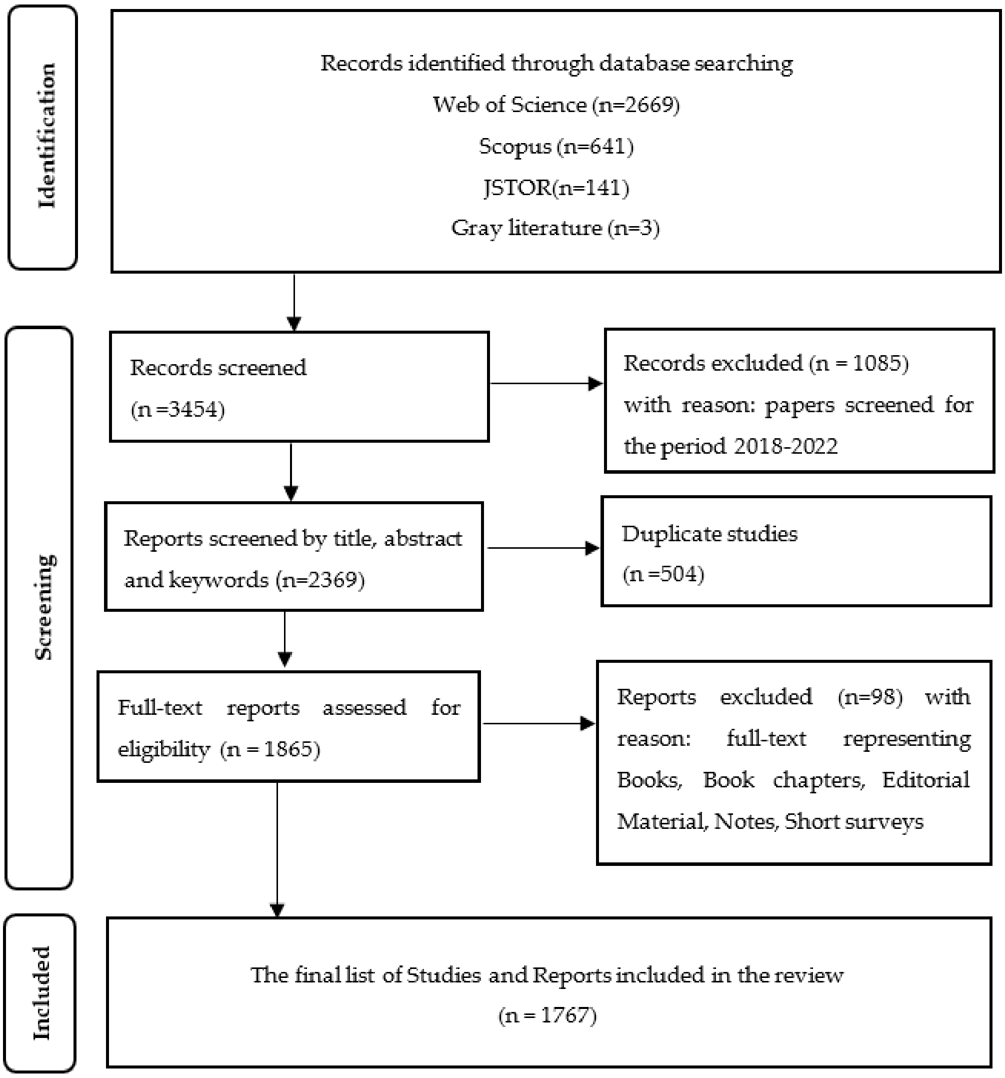

Figure 1. PRISMA flowchart of literature review process based on the combined search of two keywords: *social innovation* and *energy transition*. As shown, from a total of 3454 records initially retrieved, only 1767 records were included. All these articles were published during 2018–2022 in English.

Using the PRISMA approach, a first meta-analysis was produced related to the first main words used in this review, combining social innovation and energy transition (as the main item title) words.

Due to the large volume of citations received in the Web of Science (more than 80% of total citations) a WoS analysis was carried out, based on searching for the two key phrases Social Innovation and Energy transition, for the period 2018–2022, generating a list containing 1767 publications, from which 164 are review articles. Finally, the metasynthesis focused on examining the 12 most cited papers as selected articles in order to identify an understanding of the current development of research studies and topics, and the future of social innovation with regard to energy transition.

The second round of searches targeted another couple: *social innovation* and *circular**. Using the same PRISMA approach, a second meta-analysis was produced. The flowchart for the literature review process based on this combination of keywords is presented in Figure 2.

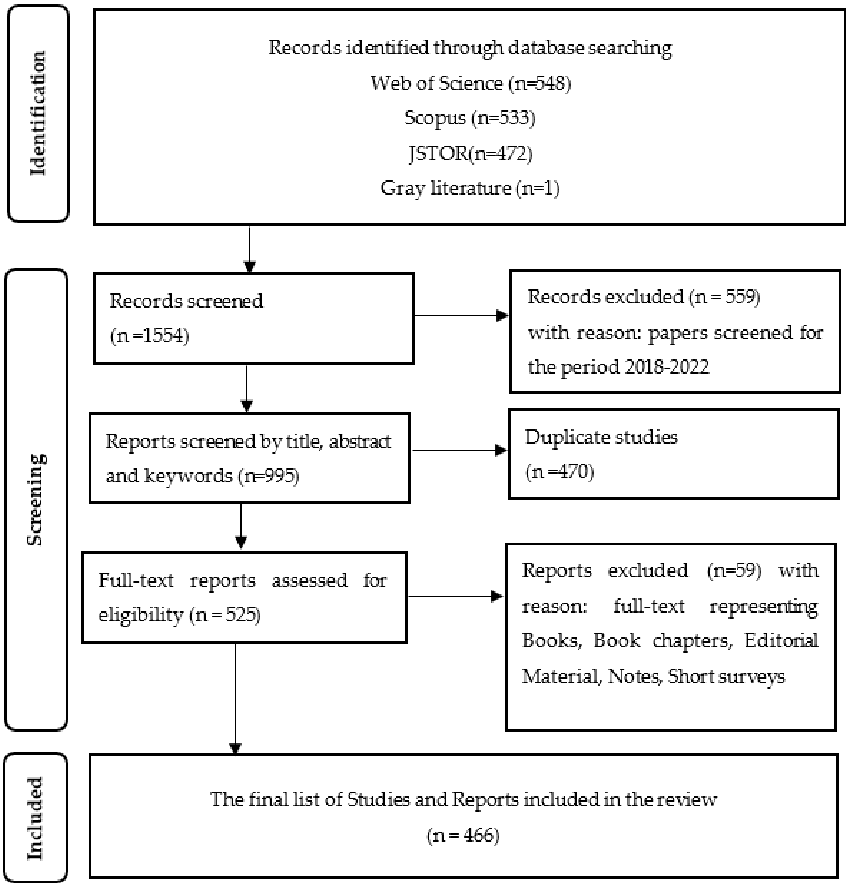

Figure 2. PRISMA flowchart of literature review process based on the combined search of two keywords: *social innovation* and *circular**.

In the second meta-analysis, we used the same methodology and the same criteria, but we changed the keywords we used as the search terms, such as "*social innovation*" and "*circular**", using topic field tags (TS, including title, abstract, authors, or keywords®), resulting in 1554 records in the identification phase.

As shown in Figure 2, from a total of 1554 records initially retrieved, in the check phase, only 466 records were included due to their publication date, because 559 records were not published during 2018–2022. In addition, 470 records were configured as duplicated studies, and 59 records represented other document types apart from articles and reports.

Data extraction from the selected articles and studies, and also to answer the research question "What is the current and future development of studies in the area of social innovation and circular*?", was enacted in accordance with two processes:

➢ A template was designed and used as a summary form of the findings, in which the 11 most cited articles were revealed;
➢ Another categorization of studies distribution was done by authors' affiliations (corresponding universities), which enabled the identification of the top countries to have published research with regard to social innovation, energy transition, and circularity;
➢ Another detailed analysis was done by using co-citation analysis and cited references, retrieving a mapping of the top cited references divided into clusters and items—the most cited authors, the most cited journals, etc.

Due to a large volume of citations received in the Web of Science (more than 90% of total citations) a WoS analysis was carried out, based on searching two keywords Social Innovation and Energy transition, for the period 2018–2022, generating a list containing 466 publications, from which 61 are review articles. The metasynthesis focused on examining the 11 most cited papers as selected articles that would serve to better identify the current development of research studies and the future of social innovation with regard to the circular* term.

4. Metasynthesis Results

4.1. Results for the Couple: Social Innovation and Energy Transition

At the beginning of this section, the results of the first search containing the pairing: *social innovation* and *energy transition* will be discussed. In addition to the 12 most cited papers as selected articles with the aim of presenting and understanding the current meaning of the studies carried out and the future of social innovation with regard to energy transition, for the period 2018–2022, it is also vital to identify the related subjects to the studies carried out but also the main concerns presented by the authors in their articles (Table 1). Thus, each selected study or research was analyzed and interpreted through the prism of the theoretical meanings attributed by the authors in relation to the content and the findings mentioned in their articles.

Table 1. Top 12 most cited papers for the combination social innovation–energy transition.

Authors	Title	Year	Journal	Citations (All Databases)	Author Keywords	Document Type
Kohler, J; Geels, FW; Kern, F; Markard, J; Onsongo, E; Wieczorek, A.; et.al. [15]	An agenda for sustainability transitions research: State of the art and future directions	2019	Environmental Innovation and Societal Transitions	659	Sustainability; Transformation; Transitions; Socio-technical systems; Research agenda	Article
Sovacool, BK; Axsen, J; Sorrell, S [45]	Promoting novelty, rigor, and style in energy social science: Towards codes of practice for appropriate methods and research design	2018	Energy Research & Social Sciences	452	Validity; Research methods; Research methodology; Interdisciplinary research; Research excellence	Review
Schot, J; Steinmueller, WE [46]	Three frames for innovation policy: R&D, systems of innovation and transformative change	2018	Research Policy	421	Transformation; Sustainable development goals; R&D; National systems of innovation; Innovation policy	Article
Morstyn, T; Farrell, N; Darby, SJ; McCulloch, MD [47]	Using peer-to-peer energy-trading platforms to incentivize prosumers to form federated power plants	2018	Nature Energy	300	N/A	Article
Guan, DB; Meng, J; Reiner, DM; Zhang, N; Shan, YL; Mi, ZF; Shao, S; Liu, Z; Zhang, Q; Davis, SJ [48]	Structural decline in China's CO_2 emissions through transitions in industry and energy systems	2018	Nature Geoscience	227	N/A	Article
Levin, N; Kyba, CCM; Zhang, QL; de Miguel, AS; Roman, MO; Li, X; Portnov, BA; Molthan, AL; Jechow, A; Miller, SD; Wang, Z; Shrestha, RM; Elvidge, CD [49]	Remote sensing of night lights: A review and an outlook for the future	2020	Remote Sensing of Environment	212	Night lights; Light pollution; DMSP/OLS; VIIRS/DNB; ISS; Urban; Human activity	Review
Meyfroid, P; Chowdhury, RR; de Bremond, A; Ellis, EC; Erb, KH; Filatova, T; Garrett, RD; Grove, JM; Heinimann, A; Kuemmerle, T; Kull, CA; Lambin, EF; Landon, Y; de Warow, YL; Messerli, P; Muller, D; Nielsen, JO; Peterson, GD; Garcia, VR; Schluter, M; Turner, BL; Verburg, PH [50]	Middle-range theories of land system change	2018	Global Environmental Change-Human and Policy Dimensions	209	Human-environment systems; Box and arrow framework; Indirect land-use change; Land-use intensification; Deforestation; Land-use spillover; Urban dynamics	Article
Cherp, A; Vinichenko, V; Jewell, J; Brutschin, E; Sovacool, B [51]	Integrating techno-economic, socio-technical and political perspectives on national energy transitions: A meta-theoretical framework	2018	Energy Research & Social Science	200	Energy transitions; Meta-theoretical framework; Variables; Co-evolution	Article

Table 1. *Cont.*

Authors	Title	Year	Journal	Citations (All Databases)	Author Keywords	Document Type
Du, KR; Li, PZ; Yan, ZM [52]	Do green technology innovations contribute to carbon dioxide emission reduction? Empirical evidence from patent data	2019	Technological Forecasting and Social Change	184	Green technology innovations; CO_2 emissions; Income; Panel threshold model	Article
Docherty, I; Marsden, G; Anable, J [53]	The governance of smart mobility	2018	Transportation Research Part A-Policy and Practice	180	Governance; Transition; Public value; Smart technology; Mobility; Externalities	Article; Proceeding Paper
McCauley, D; Heffron, R [54]	Just transition: Integrating climate, energy and environmental justice	2018	Energy Policy	177	Just transitions; Climate justice; Energy justice; Environmental justice; Distributional justice; Procedural justice; Restorative justice	Article
Sengers, F; Wieczorek, AJ; Raven, R [55]	Experimenting for sustainability transitions: A systematic literature review	2019	Technological Forecasting and Social Change	171	Experiments; Sustainability transitions; Systematic literature review	Review

As can be observed, some keywords (from Table 1) are repeated in several cases: transition; innovation; sustainability.

In order to understand better the representation from above, the top record count publications based on the WoS Categories are given in Table 2.

Table 2. Top 11 record count publications based on WoS Categories, for the couple: social innovation–energy transition).

Field: Web of Science Categories	Record Count	% from 1.767 Articles
Environmental Studies	771	43.633%
Environmental Sciences	539	30.504%
Energy Fuels	347	19.638%
Green Sustainable Science Technology	319	18.053%
Economics	179	10.130%
Regional Urban Planning	118	6.678%
Business	105	5.942%
Engineering Environmental	95	5.376%
Geography	71	4.018%
Materials Science Multidisciplinary	55	3.113%
Management	48	2.716%

Additionally, if we follow the affiliations related to the main entities that are part of this complex research topic, we discover that, out of 2139 research entries, in the first 14 most productive countries, 9 entities come from the UK, 2 from the Netherlands, and one each from Denmark, Switzerland, and Sweden.

By using co-citation analysis and cited references, and by taking into account the top 500 most cited papers, taking the minimum number of citations for cited references as 25, resulted in 36 items that meet the threshold and are grouped in four clusters (a red cluster with 18 items and a green cluster with 10 items). This representation is generated through VOSviewer (Figure 3). The total number of cited references is 32,945.

At the same time, using the same co-citation method but changing the unit of analysis to cited authors, we discovered a total of 21,078. By imposing the minimum number of citations of an author (and the first author every time) as 60, we obtained 27 items divided into four clusters (11 authors in the red cluster and 10 authors in the green cluster). This is presented in Figure 4.

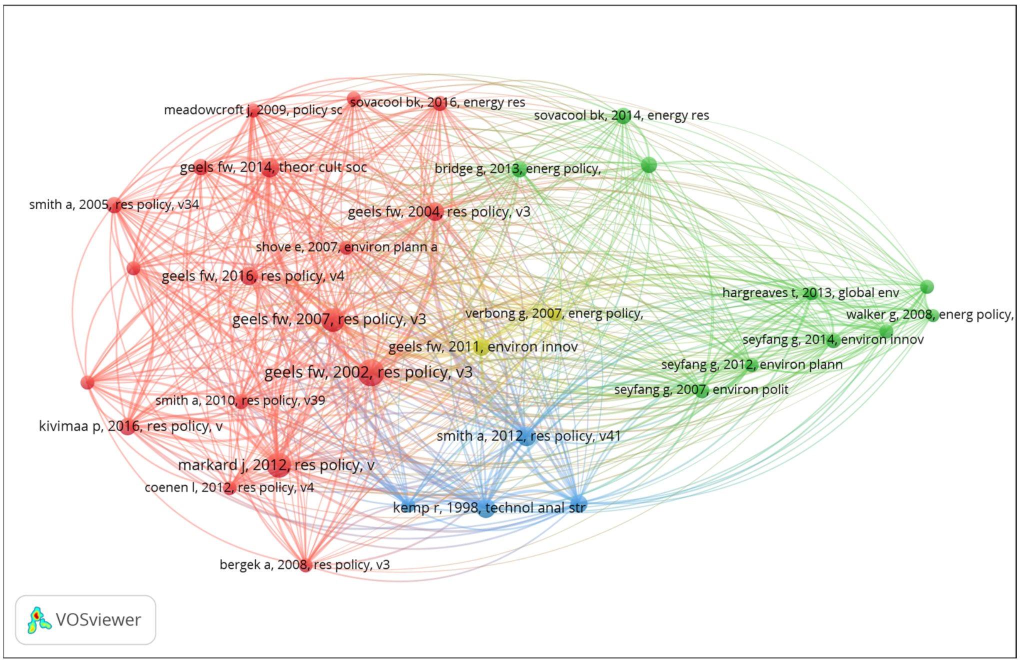

Figure 3. VOSviewer diagram containing the most cited papers with at least 25 citations (top 500), for the couple: *social innovation–energy transition*.

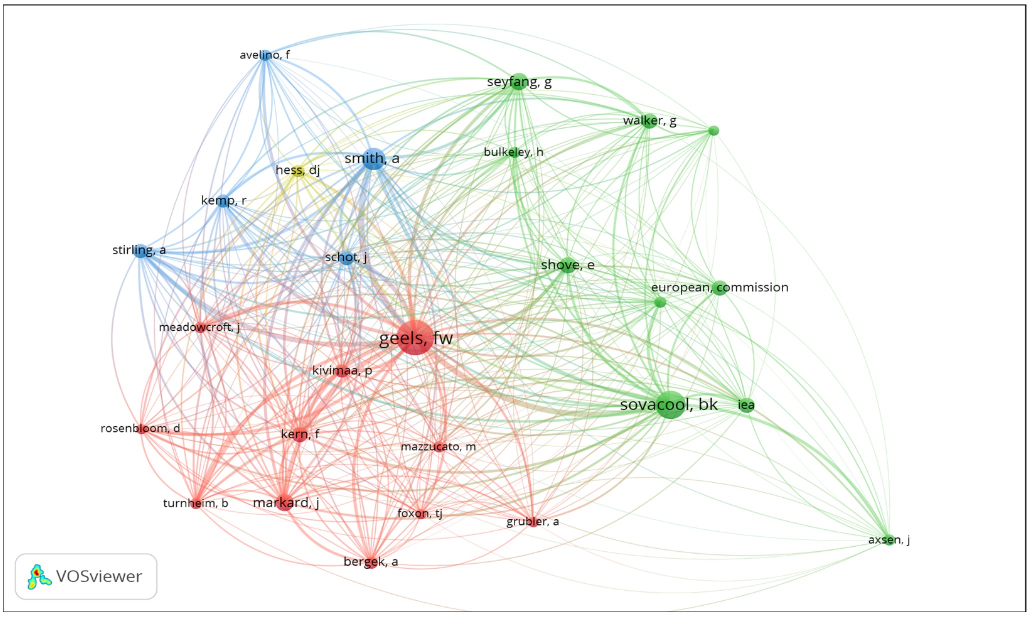

Figure 4. VOSviewer diagram containing the most cited authors with a minimum of 60 citations, for the couple: *social innovation–energy transition*.

From this representation, we could select three representative names, one from each cluster: Geels, W. [15] (from the red cluster), Sovacool, B.K. [45] (from the green cluster), Smith, A. (from the blue cluster), and Hess, D.J. (from the yellow cluster).

If we use the co-occurrence method and author keywords as a unit of analysis, by imposing the minimum number of occurrences of a keyword as 10, from a total of 1611 keywords, we have 18 keywords that meet the threshold (divided into five clusters). This representation is presented in Figure 5.

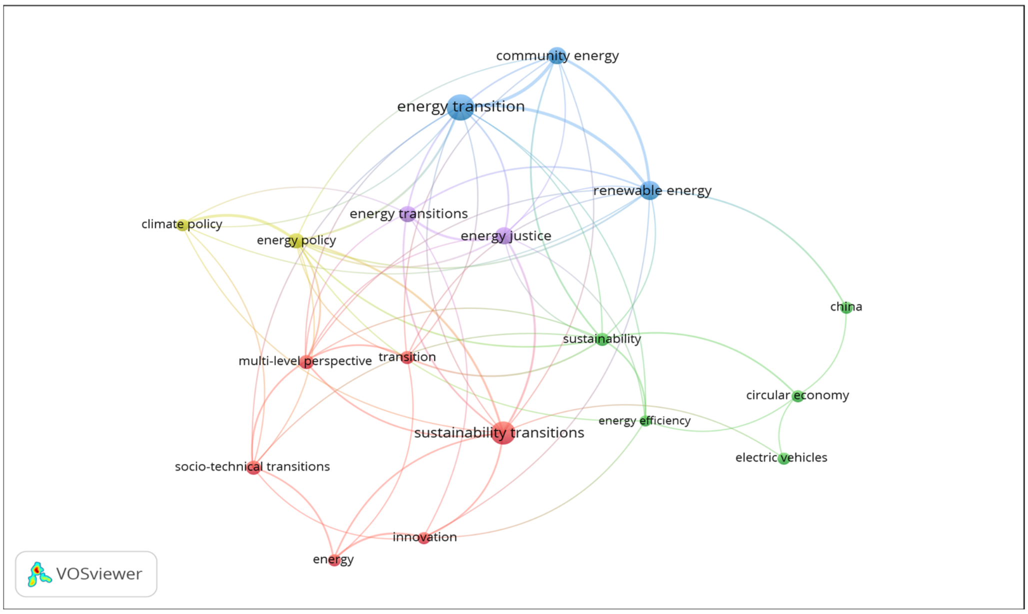

Figure 5. VOSviewer diagram containing the most important author keywords, for the couple: *social innovation–energy transition*.

By using the co-citation method and analyzing the cited sources, a map of the most cited journals is generated through VOSviewer. By imposing the minimum number of citations of a source as 80, from 14,172 identified sources, 49 meet the threshold (divided into four clusters). The top four journals are *Energy Policy* with 2785 citations, *Energy Research Social Science* with 1863 citations, *Research Policy* with 1333 citations, and *Renewable Sustainable Energy Reviews* with 985 citations (Figure 6).

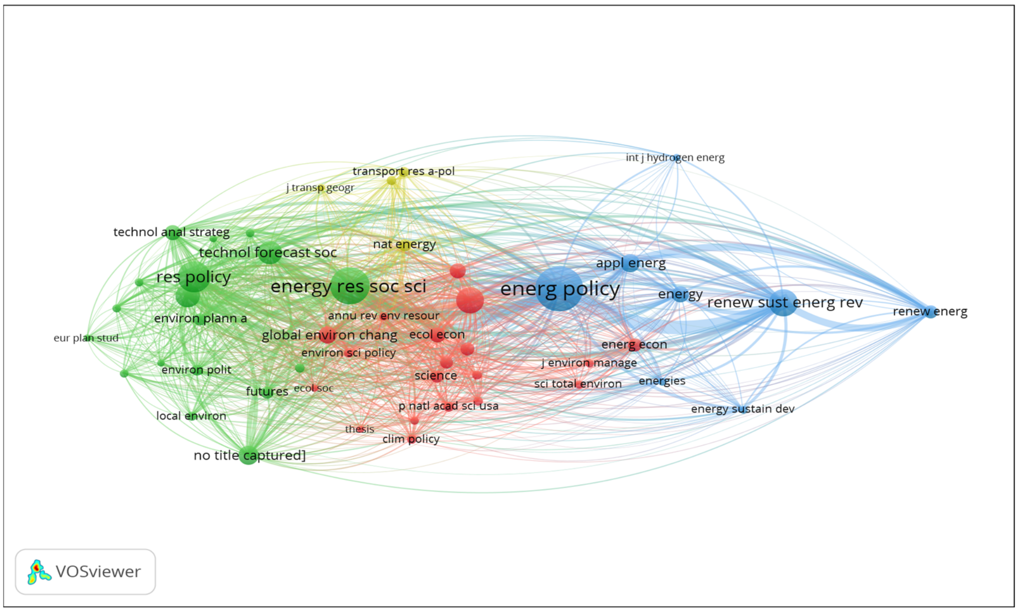

Figure 6. VOSviewer diagram containing the most cited journals, for the couple: *social innovation–energy transition*.

Furthermore, another analysis is produced using bibliographic coupling. We impose a minimum number of citations of a document as 70, and, thereby obtained 66 items (documents) that meet the threshold. As can be seen In Figure 7, these 66 items are grouped in eight clusters, with the most important ones being the red cluster containing 12 items, followed by the green cluster with 11 items and the blue cluster with 10 items.

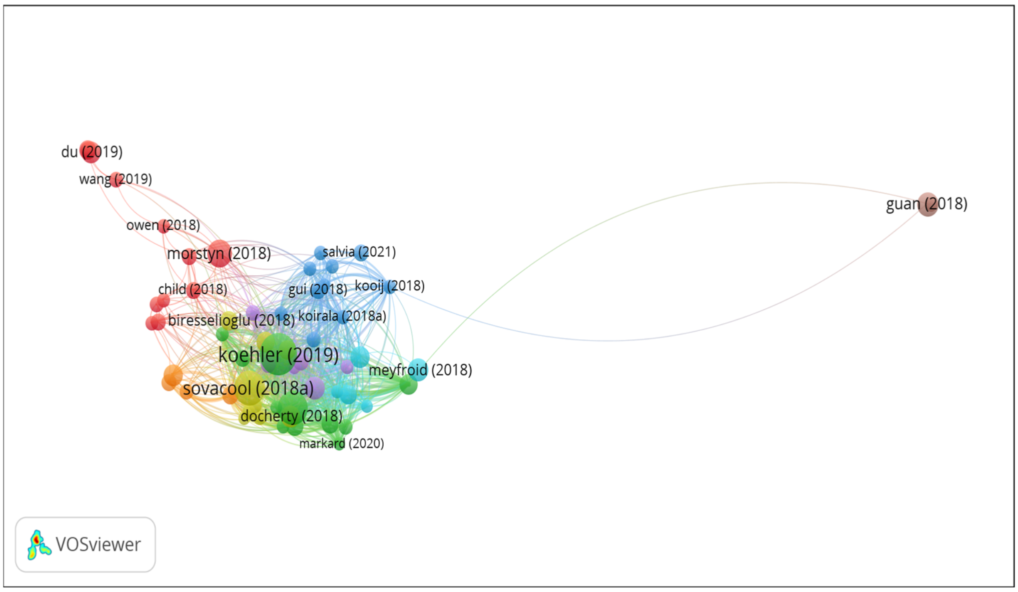

Figure 7. VOSviewer diagram containing the most cited papers (with at least 70 citations), for the couple: *social innovation–energy transition*.

4.2. Results for the Couple: Social Innovation and Circular*

The analysis continued with the second pair: *social innovation—circular**. In this case, in addition to the 11 most cited papers as selected articles with the aim of presenting and understanding the current meaning of the studies carried out and the future of social innovation with regard to the circular* term, for the period 2018–2022, it is also vital to identify the related subjects to the studies carried out but also the main concerns presented by the authors in their articles (Table 3). Thus, each selected study or research was analyzed and interpreted through the prism of the theoretical meanings attributed by the authors in relation to the content and the findings mentioned in their articles.

In the next representations, the same basic analysis pattern was used as that for the first combination of terms.

As can be observed some keywords (In Table 3) are repeated in most cases: circular economy; business models; sustainability.

Using co-citation analysis and cited references, and considering the minimum number of citations for cited references as 25, resulted in 27 items that meet the threshold, which are grouped in two clusters (a red cluster with 16 items and a green cluster with 11 items). This is presented in Figure 8. The total number of cited references is 29,414.

At the same time, using the same co-citation method but changing the unit of analysis to cited authors, we discovered a total of 21,414. By imposing the minimum number of citations of an author (the first author every time) as 40 we obtained 34 items divided into two clusters (18 authors in the red cluster and 16 authors in the green cluster). This is presented in Figure 9.

From this representation we could select three representative names: Kirchherr, J. (from the red cluster), and Bocken, N.M.P and Geissdoerfer, M. (from the green cluster). A special mention is related to the work done by representatives of the European Commission. Their work, based on the elaboration of strategies, policies, norms, regulations, and decisions, constituted an important source in the research and studies of various authors on the subjects related to social innovation and circularity.

If we use the co-occurrence method and author keywords as the unit of analysis, by imposing the minimum number of occurrences of a keyword as 10, from a total of 1535 keywords, we have 16 keywords that meet the threshold (divided into six clusters). This representation is shown in Figure 10.

Table 3. Top 11 most cited papers for the combination social innovation-circular*.

Authors	Title	Year	Journal	Citations (All Databases)	Keywords	Document Type
Ghobakhloo, M [56]	Industry 4.0, digitization, and opportunities for sustainability	2020	Journal of Cleaner Production	277	Industry 4.0; Smart manufacturing; Digitization; Sustainability; Environmentalism; Industrial internet	Review
Tura, N; Hanski, J; Ahola, T; Stahle, M; Piiparinen, S; Valkokari, P [17]	Unlocking circular business: A framework of barriers and drivers	2019	Journal of Cleaner Production	175	Circular economy; Sustainability; Driver; Barrier; Business model; Sustainable business	Article
Kristensen, HS; Mosgaard, MA [57]	A review of micro level indicators for a circular economy—moving away from the three dimensions of sustainability?	2020	Journal of Cleaner Production	165	Circular economy; Indicator; Micro level;Sustainability; Literature review	Review
Nosratabadi, S; Mosavi, A; Shamshirband, S; Zavadskas, EK; Rakotonirainy, A; Chau, KW [18]	Sustainable Business Models: A Review	2019	Sustainability	143	sustainable business model; sustainable development; sustainability; business model; review; survey; state-of-the-art; climate change; climate protection; global warming; research method; circular economy; sustainable mobility; mitigation; adaptation	Review
Veleva, V; Bodkin, G [58]	Corporate-entrepreneur collaborations to advance a circular economy	2018	Journal of Cleaner Production	93	Circular economy; Circular business models; Environmental entrepreneurs; Waste repurposing; Product reuse; Sustainability	Article
Curtis, SK; Lehner, M [59]	Defining the Sharing Economy for Sustainability	2019	Sustainability	90	sharing economy; sustainability; literature review; interdisciplinarity	Review
Shirvanimoghaddam, K; Motamed, B; Ramakrishna, S; Naebe, M [60]	Death by waste: Fashion and textile circular economy case	2020	Science of the Total Environment	87	Textile; Fashion industry; Circular economy; Sustainability	Article
Konietzko, J; Bocken, N; Hultink, EJ [39]	Circular ecosystem innovation: An initial set of principles	2020	Journal of Cleaner Production	86	Circular economy; Circular business models: Innovation ecosystems: Service ecosystems: Platform ecosystems	Article
Frishammar, J; Parida, V [61]	Circular Business Model Transformation: A Roadmap for Incumbent Firms	2019	California Management Review	80	business models; case study; circular economy; manufacturing; sustainability; servitization	Article
Ghisellini, P; Ulgiati, S [62]	Circular economy transition in Italy. Achievements, perspectives and constraints	2020	Journal of Cleaner Production	75	Circular economy; Circular design; Reduction; Repair; Reuse; Recover; Remanufacturing; Recycling	Article
Leipold, S; Petit-Boix, A [63]	The circular economy and the bio-based sector—Perspectives of European and German stakeholders	2018	Journal of Cleaner Production	75	Bioeconomy; Circularity; Transition; Business models; Innovation	Article

By using the co-citation method and analyzing the cited sources, the map of the most cited journals can be generated. By imposing the minimum number of citations of a source as 70, from 12,452 identified sources, 44 meet the threshold (divided into six clusters). The top four journals are the *Journal of Cleaner Production* with 3759 citations, *Sustainability* with

1238 citations, *Resources Conservation and Recycling* with 784 citations, and *Business Strategy and the Environment* with 508 citations (Figure 11).

We produced another analysis using bibliographic coupling. We impose a minimum number of citations of a document as 50 and thereby obtained 30 items (documents) that meet the threshold. As can be seen In Figure 12, these 30 items are grouped into six clusters, with the most important one being the red cluster containing 11 items.

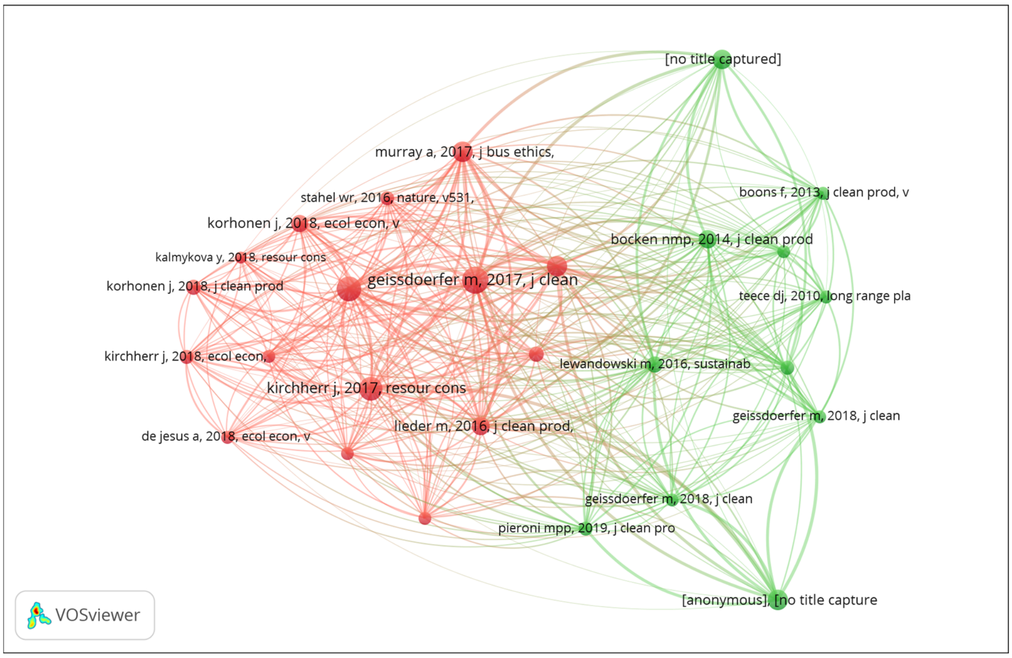

Figure 8. VOSviewer diagram containing the most cited papers with at least 25 citations, for the couple: *social innovation and circular**.

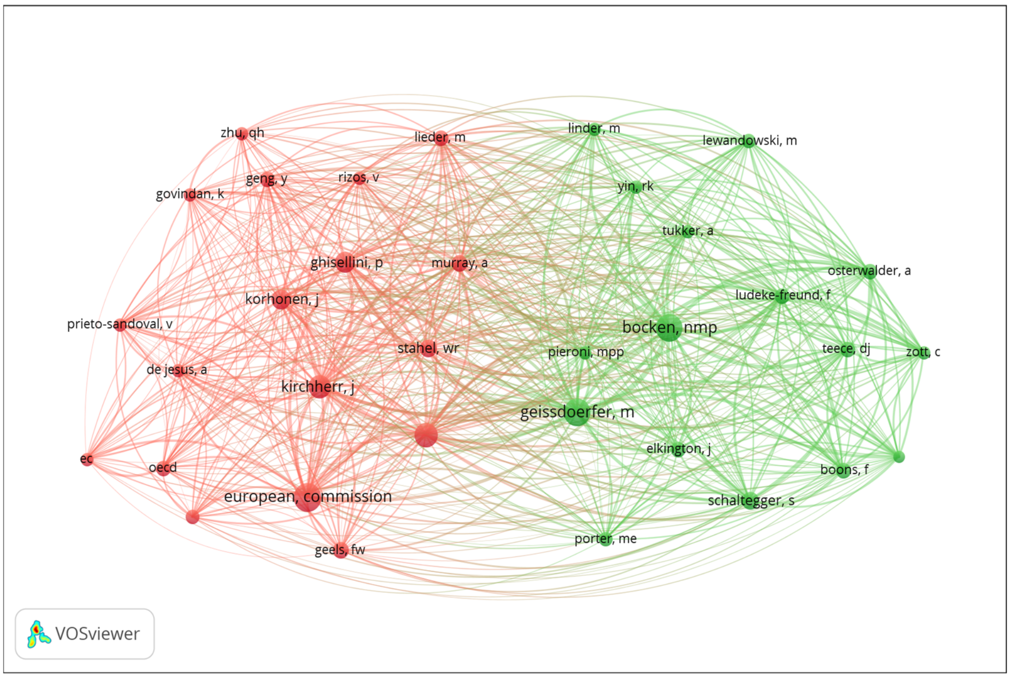

Figure 9. VOSviewer diagram containing the most cited authors with a minimum of 40 citations, for the couple: *social innovation and circular**.

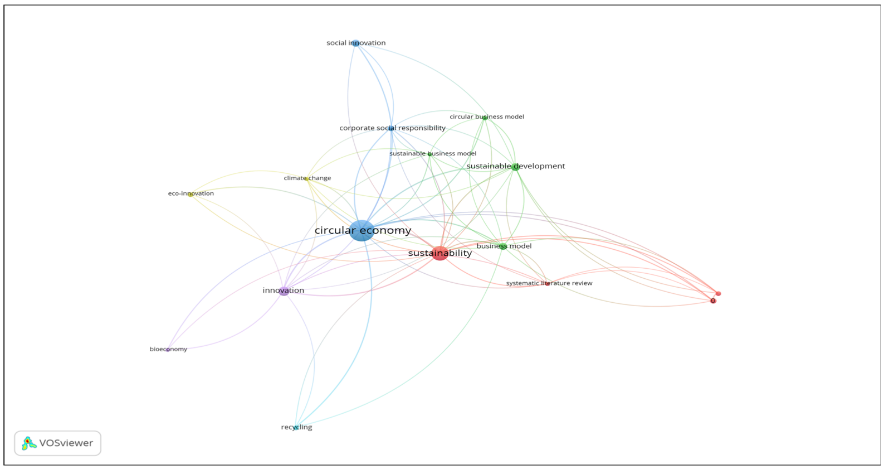

Figure 10. VOSviewer diagram containing the most important author keywords for the couple: *social innovation and circular**.

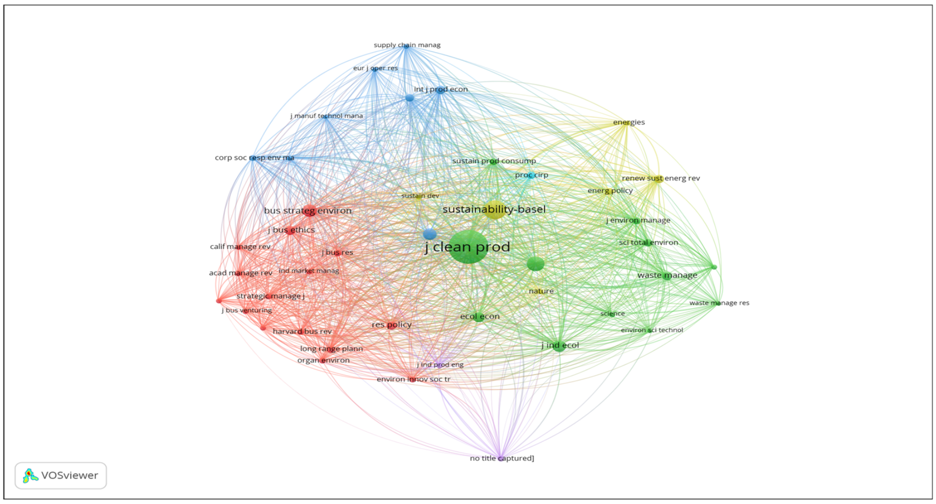

Figure 11. VOSviewer diagram containing the most cited journals for the couple: *social innovation and circular**.

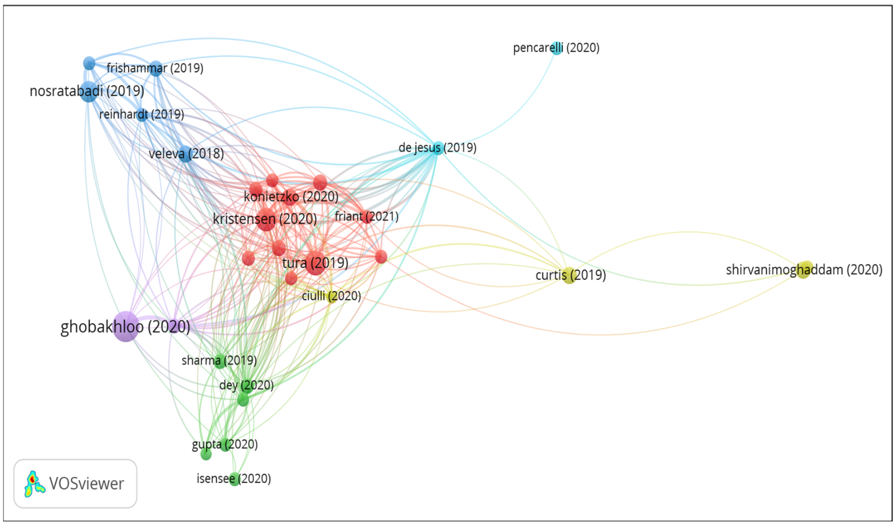

Figure 12. VOSviewer diagram containing the most cited papers (with at least 50 citations) for the couple: *social innovation and circular**.

Data included in the Figure 12 confirm information from Table 3 where Ghobakhloo, M [56], Tura, N. et al. [17], Kristensen, HS [57] and Nosratabadi, S. et. al. [18]. have the most cited papers.

5. Discussions

The idea for the analysis carried out in this review came from the study of the main challenges of our times. Without pretending to be an objective ranking, here are the main topics of discussion at the global level: Can population growth be brought into balance with the available resources (including water and food) of the Earth? Can sustainable development be generated in relation to global climate change? Can growing energy demands be met safely and efficiently? How can ethical market economies be supported to help close the gap between rich and poor? How can the threat of new diseases and pandemics be reduced? How can global ICT convergence apply to everyone? How can the development of general policies be achieved more directly and convergent to the long-term global perspectives? How can scientific and technological advances be used and accelerated to improve the human condition? What can be done to reduce unemployment, which is on the rise? Why are discussions, analyzes, and solutions necessary in this case? This is mandatory because humanity is facing vital problems: increasing population growth; increasing total debt; increasing income inequality; increasing human ecological footprint; increasing greenhouse gas emissions; reducing bio-capacity ratio; and increasing unemployment.

Through this review, we aimed to explore the existing literature orientation of the studies in the areas of social innovation, energy transition, and circularity, and shed some light on the future development of this topic. As such, we proceed with the next step of understanding whether there exists a relation in the studied literature among the research areas of social innovation–energy transition (SIET) and social innovation–circularity (SIC). In Figure 13, the ESG framework is represented as integrated through social innovation in relation to energy transition and circularity derived from the PRISMA model applied in this research. According to this framework, it is evident that, at the top of the relations "social innovation–energy transition" and "social innovation–circularity", can be clearly identified the ESG aspects that are incorporated as clusters and subclusters of these relations. Secondly, it is again clear that there are some overlapping aspects among both relations "social innovation–energy transition" and "social innovation–circularity".

Figure 13. ESG Framework through integration of social innovation with energy transition and circularity.

From the analysis conducted by using the co-occurrence method and author keywords as the unit of analysis, we identified 18 keywords that met the threshold for the term pairing of social innovation–energy transition. These 18 keywords were grouped into five cluster themes, as represented in Table 4.

Table 4. Cluster themes of studies in the area of social innovation and energy transition.

Cluster Name	**Cluster Topics**
Energy	Energy Transition Renewable Energy Community Energy
Transition	Sustainability Transitions Transition Multi-level Perspective Socio-technical Transitions Innovation Energy
Sustainability	Sustainability Energy Efficiency Electric Vehicles Circular Economy
Policy	Energy Policy Climate Policy
Justice	Energy Transitions Energy Justice

At the same time, by using the term pairing of social innovation–circular, we identified, through the co-occurrence method and author keywords as the unit of analysis, 14 keywords that meet the threshold, which are grouped in five clusters, as shown in Table 5.

Table 5. Cluster themes of studies in the area of social innovation and circular.

Cluster Name	**Cluster Topics**
Circular	Circular Economy Corporate Social Responsibility Social Innovation Recycling
Business Model	Sustainable Development Sustainable Business Model Business Model Circular Business Model
Climate Change	Climate Change Eco-innovation
Innovation	Innovation Bioeconomy
Sustainability	Sustainability Systematic Literature Review

Sustainability is a common cluster name generated from the analysis conducted by using the co-occurrence method for both study areas of SIET and SIC. The cluster topics derived from the SIET study area are: Sustainability, Energy Efficiency, Electric Vehicles, and Circular Economy [48,51,52,54,55]; while from the SIC, they are: Sustainability and Systemic Literature Review [56–61,64]. This approach is represented in Figure 14.

Sengers et al. (2019) [55] in their systemic literature review of Sustainability Transition, analyzed 170 papers, where they found "experimentation" to be defined as a crucial approach "to proactively explore radically new ways to meet societal needs, such as the need for energy" [55] (p. 157). Moreover, they found in the literature the concept of "sustainability experiments", used while testing highly novel sustainability transition ideas, which differ thoroughly from the prevalent solutions, are goal-oriented, taking place in a societal context, and foreseen to embrace not only environmental but social and economic perspectives of development as well [55]. However, there are new emerging concepts of experimentation such as the "urban climate change experiment" or other concepts which need to be explored further, such as "governance experiments" or "real-world experiments" [45]. Moreover, the role of businesses, local government, and city officials during these experimentation processes needs further attention as a future avenue.

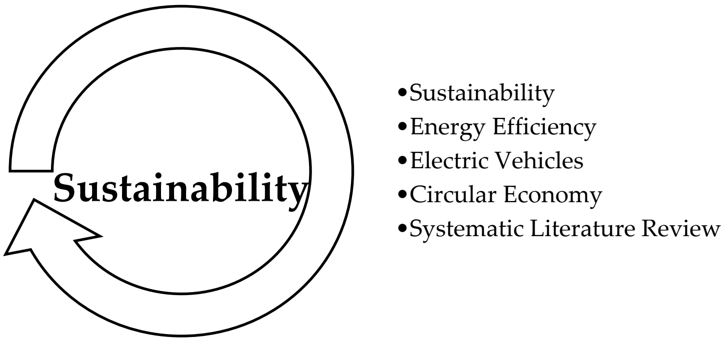

Figure 14. Main topics of the Sustainability Cluster.

Recognizing that sustainability transition introduces a lot of challenges to reaching a comprehensive assessment of it, Cherp et.al. (2018) in their meta-theoretical study, built a three-perspective framework— "techno-economic, socio-technical, and political"—to analyze national energy transitions [51]. Concurrently, the study in Reference [52] covering 71 countries during the time period 1996–2012 found that green technology innovations have a significant impact on reducing CO_2 emissions only for high-income level countries, while for undeveloped countries they advocate the enforcement of innovation mechanisms to diminish the dispersion cost.

Next, we associate the Energy cluster from SIET with the Business Model cluster of SIC. Under the Energy cluster are derived topics such as Energy Transition, Renewable Energy, and Community Energy [46–49,51–53,65], while under the Business Model cluster of SIC, we have the topics of Sustainable Development, Sustainable Business Model, Business Model, and Circular Business Model [18,39,57,58,60–63,66]. The topic of Sustainable Development is studied together with the topics of Circular and Sustainable Business Models.

Veleva and Bodkin (2018) [58] investigate 12 companies based in the U.S. to explore how small entrepreneurs partner with large enterprises to accelerate the circular business model innovation [58]. They found sustainability commitments as well as zero-waste goals of the enterprises and local government as key drivers of such initiatives; meanwhile, technology know-how and strategic partnership play a crucial role in cutting costs, time, energy, environmental impacts, and resources. With the purpose of enhancing the enterprise–entrepreneur commitment to circular business model innovation, [58] the authors come up with a new framework for developing strategic partnerships targeting product reuse, remanufacturing, or waste repurposing.

To need to achieve a sustainable energy transition focus needs to be addressed on circular business model developments of renewable energy. All these issues are described in Figure 15.

Next, we associate the Transition cluster from SIET with the Innovation cluster of SIC. The Transition cluster of SIET includes the topics of Innovation in Energy Transition which require a Multi-level perspective of Socio-technical transition and Sustainability [45–48,50,52,53,55,65]. In fact, due to the main societal challenges to fulfilling the energy transitions, innovation under different approaches is required: by designing decarbonization plans [48,50,52], by using new technologies (a new type of energy storage, thermal plants with carbon capture and storage, burning clean fuels through biomass, etc.) [47,53,55], increasing the contribution of renewable energy in providing the necessary amounts of energy in a flexible manner [15], and using policies and promoting awareness solutions to the population regarding the sustainable future of society [45]. In addition, technical solutions are needed to keep the electricity supply secure. Such an approach involves ensuring sufficient energy, including meeting peak capacity requirements, keeping the power system stable during short-term disturbances, flexible energy planning in power systems, etc.

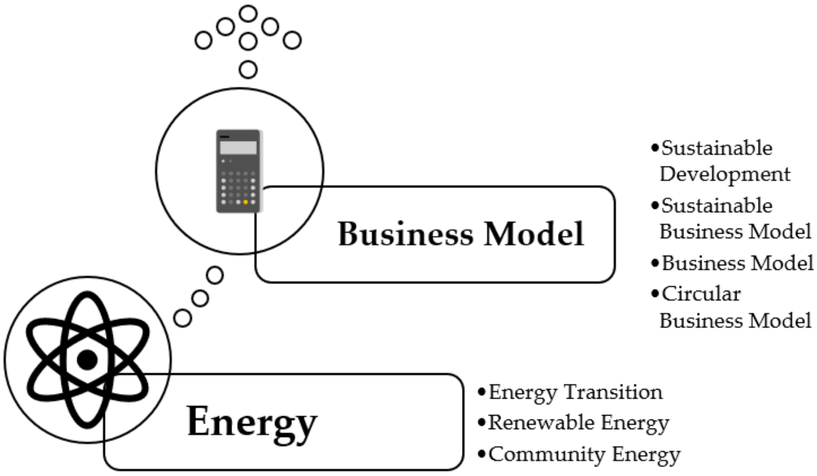

Figure 15. Main topics of Energy–Business Model Clusters.

At the same time, from the SIC study area for the Innovation cluster, the topics are Innovation and Bioeconomy [39,50,53,56,62,63]. Innovation is a common topic in both study areas. Building business models by addressing bioeconomy innovation is seen as a solution for sustainable development. In fact, Bioeconomy envisages a conscious use of natural resources, using biological processes through which economic goods and services can be created in an environmentally friendly manner [39,50,63]. In order to be able to generate such goods and services, a similar and responsible approach to the energy transition is necessary, and to which innovation processes are mandatory [56,62]. Innovation must include solutions regarding the sustainable management of natural resources, reducing dependence on non-renewable resources, ensuring food security, and proposing ecological innovations to limit the negative impact of pollution on the planet [60]. Figure 16 addresses all these components.

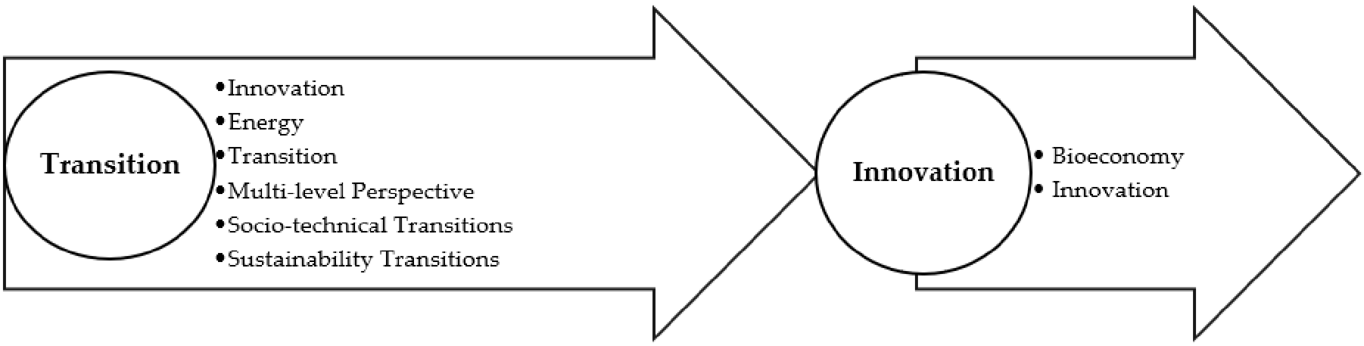

Figure 16. Main topics of Transition–Innovation Clusters.

The next clusters are Justice from SIET and Circular from SIC. Scholars have addressed Energy Transitions together with Energy Justice [16,46,47,50–54], while the topics of Circular Economy, Corporate Social Responsibility, Social Innovation, and Recycling [39,57,58,60–63,66] addressed in the Circular cluster can be incorporated to achieve this justice (Figure 17).

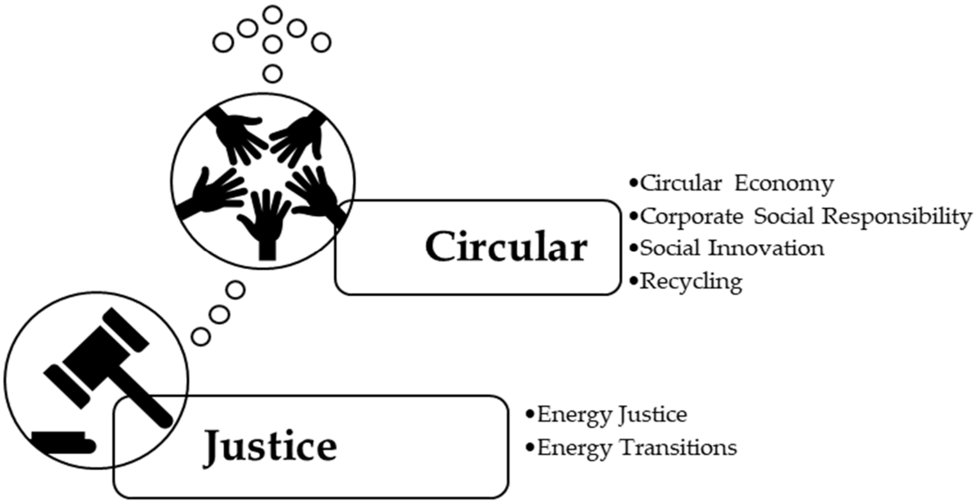

Figure 17. Main topics of Justice–Circular Clusters.

In the short term, energy transition requires major investments that generate increased costs in energy production, an aspect that does not confirm the implementation of the principles of energy justice. However, through concerted measures of strategies and policies aimed at reducing energy costs, ensuring the fair distribution of the benefits of energy generation and transport, offering access to reliable, cheap, and clean energy, and community involvement in making decisions and developing the energy systems, these desired goals will be achieved [47,50,51,54,67]. In addition, by applying the defining measures of the Circular Economy, calling on Corporate Social Responsibility programs and projects, proposing solutions that satisfy new social needs, supporting the SME sector through various financings, by involving private investors and public entities in the life of local communities, and by promoting solutions to transform waste materials into new material and objects, the energy justice concept can reach its goals much faster [39,50,60,62,63,67].

Affordability and accessibility to reliable and cheap energy are one of the goals of energy justice. Various studies in the field of energy burden have shown that rural communities and families with low incomes pay a much higher share of their income toward their energy bills.

At the same time, energy justice refers also to the issues related to pollution, noise, or health impacts generated by energy production or transmission facilities [67]. That is why community participation or consideration of energy justice issues during energy facility siting decisions is more than necessary [67]. These decisions must respect at least two conditions: not to affect the state of health of the citizens and not to affect economic development in the community. In response to the second requirement, there is the solution to follow the transition from coal mines by placing solar, wind, or nuclear power on those former coal sites in an effort to preserve jobs (this is the case in some US states).

The Circularity approach connects Corporate Social Responsibility to the Circular Economy by including the key terms sustainability and environmental issues [68]. In the last few years, many companies understood their new role in society regarding involvement in projects aimed at communities regarding the aspects of sustainability, environment, energy transition, reuse and recycling of waste, etc. [27,34,36–38,57,58,64].

Moreover, the Policy cluster of SIET includes the topics of Energy Policy together with Climate Policy [16,47–53].

Climate is a common topic also for the Climate Change cluster of SIC, which at the same time addresses Eco-innovation too [18,39,56,58,60,62,63,66]. So, energy policy should be developed under eco-innovation and integrated into the framework of climate change policy (Figure 18).

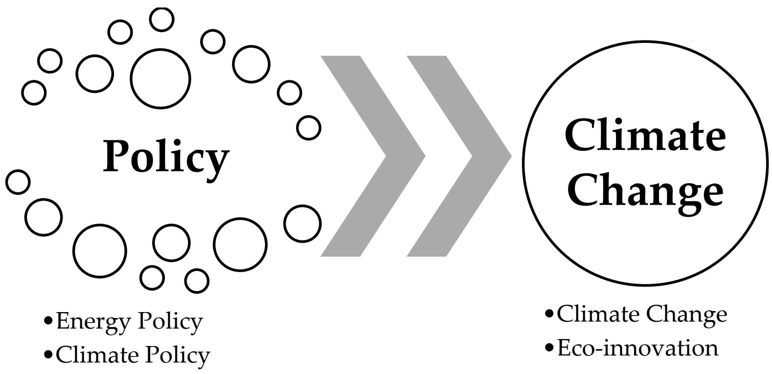

Figure 18. Main topics of Policy–Climate Change Clusters.

Therefore, in order to avoid catastrophic climate change, one of the most important challenges of society today, it is desired that global carbon emissions be brought to zero in two to three decades [15,41,65]. This aspect requires a new approach and a transformation of the global energy system. The connection between the concepts of climate change and energy policy must also be seen through the role of political decision-makers and in economic–financial terms. Thus, the state and supra-state decision-making structures are obliged to build strategies, scenarios, and technical solutions that impact the energy policies of regional and national governments (local, regional, and central administrations), but also the investment decisions of the private sector in the fields of energy and environmental conservation [69,70].

One thing is certain, about 95% of economic losses caused by catastrophic events in Europe since 1980 are attributable to climate and weather [71]. This means that the Earth has suffered massive deterioration in the balance of the environment in the last 30–40 years in relation to the rate of economic and industrial development. So, the role of companies needs to be redefined in the light of preserving the environment and this is happening through eco-innovations (in many cases used under the approach of sustainable innovations) [72].

Companies have to act in four basic directions: make changes in product design; accept and adapt the product user feedback in order to improve the product or services; develop a sustainable business model in order to be competitive, satisfy customer needs, and have a lower environmental impact than conventional business models; take action in relation to the governance innovation related to the institutional solutions towards the resolution of conflicts around innovative environmental-friendly practices [73–76].

Eco-innovation is aimed at driving progress toward sustainable business models and green economic growth, through new technologies, new products, or new processes. To succeed in promoting Eco-innovations, it is necessary to: analyse the full life cycles of products or services, to design and implement strategic changes to build sustainability and to communicate and collaborate with the customers, suppliers, and partners to achieve the sustainability goals for the entire business process.

Through eco-innovation comprehensive processes, in relation to these complex worldwide difficulties and overall challenges, companies could boost their performance and competitiveness.

In addition to the current literature on the relations "social innovation–energy transition" and "social innovation–circularity", this study explored some clear cuts of the above-mentioned relations with ESG practices demonstrated as an integrated framework in Figure 13. Consequently, we arrive at the proposal that social innovation, circularity, and energy transition are crucial dimensions for building and implementing environmental, social, and governance (ESG) practices.

Secondly, as this study aimed to identify some future directions of this topic, referring to the above five groups of cluster themes classification for the two metasynthesis analyses, some future directions for both governments and businesses, namely, to go for some macro-level targets with regard to energy transition and circularity through social innovation are indicated. By associating the cluster themes derived from both social innovation–energy transition and social innovation–circularity cluster themes, we propose five key elements that need to receive attention and be put forward as future agenda directions, as shown in Figure 19; specifically: (1) policy for climate change; (2) circular justice; (3) energy business models; (4) transition innovation; and (5) sustainability.

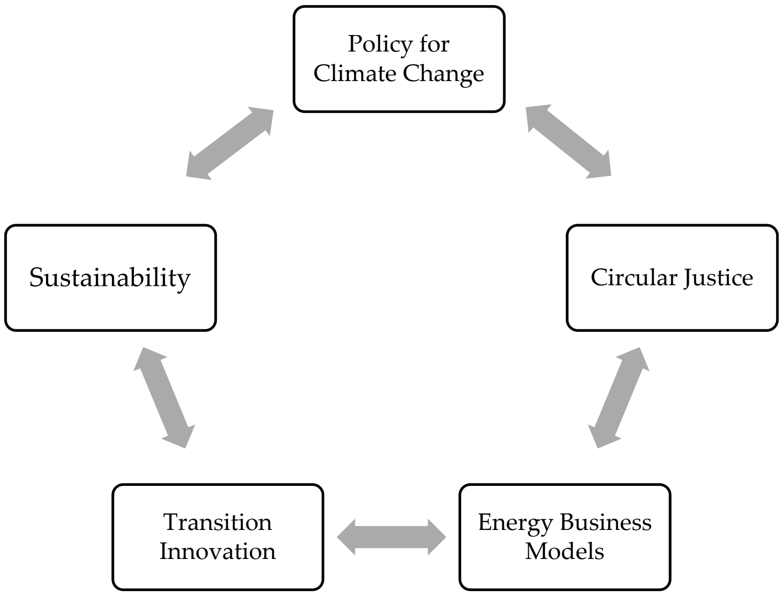

Figure 19. Major future agenda topics in relation to the main challenges facing society.

The following future avenues to be further experimented with and explored for establishing ESG practices are proposed: exploring the role of the businesses, local government, and city officials during these experimentation processes; identifying critical success/failure factors of experimentation; analyzing energy transition from the techno-economic, socio-technical, and political perspectives; exploring how current enterprises can develop strategic partnerships targeting product reuse, remanufacturing, or waste repurposing with small entrepreneurs; and how to enforce innovation mechanisms to diminish the dispersion cost of green technology innovations for having a significant impact on reducing CO_2 emissions in undeveloped countries.

The experts on these subjects have as their essential mission to propose future economic models of development and future consumption models that relate to Climate Change, Digital Transformation, Innovation (under all aspects: technological, social, etc.), business models correlated with the developments in the energy sector, the treatment of the harmful behavior of citizens and economic entities, in order to reduce damages and identify ways to promote accountability on a large scale and individually, as well.

6. Conclusions and Future Recommendations

This review paper sought to identify the current progress in the research in three topical areas: social innovation, circularity, and energy transition. Through a double, combined screening process of the papers published worldwide in these areas are identified major concerns and important contributions that could help in treating the critical issues of these topics.

Moreover, we analyzed the connections of these approaches with an important concept of our times: ESG. This complex and broad contemporary issue requires ESG investments to identify a general framework and concrete ways of economic revitalization for the reduction of carbon emissions, the more efficient use of resources, the reduction of waste production and compliance with environmental regulations, ensuring security at the site employment, decent work, diversity and inclusion and compliance with data and privacy requirements for employees, executive pay levels, shareholder voting rights, and the company's stance on bribery and corruption.

In order to achieve more and more SDG goals, on a global scale, we need to implement ESG metrics. By establishing their objectives in relation to ESG metrics, companies could generate more and more value, develop their business and be more accurate, faster, and flexible in addressing new customer needs. This approach could lead also to better employee retention, a reduction in the consumption of resources, operating costs, and polluting behavior, and better treatment of all the issues related to the circular economy, sustainable development, energy transition, climate change, eco-innovations, and their functional business model.

Thus, we identified clusters of studies in the scanned fields with the aim of proposing a complex, holistic approach that would respond to the main challenges of the present to create a favorable framework for the implementation of policies at the local, regional, and international level through which most of the problems arising from these challenges can be solved.

Through this study, we aimed to integrate social innovation, circularity, and energy transition as components of environmental, social, and governance (ESG) practices for achieving sustainable development. By examining previously conducted studies on these topics we sought to understand the thematic progress in the academic literature by implementing the PRISMA method.

Therefore, we came up with two metasynthesis analyses referring to the areas of study on "social innovation–energy transition" from 1767 research and reports covered in the databases of Web of Science, Scopus, and JSTOR, as well as for "social innovation–circularity" from a total of 466 publications.

The main contribution of the study is the cluster themes classification for the two metasynthesis analyses, indicating some future directions for both governments and businesses, as well as academics, to pursue some micro-meso-macro-level targets with regard to analyzing, developing, and implementing environmental, social, and governance practices for energy transition and circularity through social innovation. We emphasized the links and connections between the main concepts and approaches related to social innovation, energy transition, and circularity through five key clusters: Sustainability, Energy–Business Model, Transition–Innovation, Justice–Circular, and finally, Policy–Climate Change.

At the same time, the limitation of the analysis or the identification of new less-explored research directions is related to the reporting on the fulfillment of sustainable development objectives that require the verification of the reaction, involvement, and dedication of citizens, companies, and decision-making administrative structures. The last few years in Europe were marked by devastating climatic phenomena: floods, fires, earthquakes, etc. The climate changes produced affect the health and well-being of people and also reduce the resilience of nature. More precisely, it is necessary for everyone to become aware and act in solidarity with all the challenges that have arisen. Unfortunately, this issue related to social solidarity has not really been taken into account in the research and studies published in recent years. Financing mechanisms and measures to reduce the negative impact on the environment are needed, and this requires taking into account the social costs for those most in need and affected by these problems. Therefore, it is mandatory to analyze, deeper and more comprehensively, the social component through the prism of solidarity in order to reduce, or even eliminate, the social inequalities generated by existing or future transitions.

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